Introduction

Pancreatic cancer has been known to be a deadly disease. We conducted an exploratory data analysis, where the purpose of the study was to examine the potential prognostic factors that predicted a patient's overall survival after being diagnosed with pancreatic cancer.

Method

The data was provided in the Excel sheet "2018_Pancreatic Cancer" with corresponding variable descriptions and codes chart. There were a total of 90 patients included in the study. Table 1 portrayed patient demographics and characteristics. In terms of gender, there were more females than males. The highest percentage of females were in stage one, and the highest percentage of males were in stage three.

Table 1: Patient Demographics & Disease Characteristics by Gender

	Female		Male		P-value
	n	%	n	%	
Total Patients	52	100.0	38	100.0	
Age (years)					
Mean (SD)	63.73(10.92)		65.82(10.66)		0.3685
Median (min-max)	63.5(43-86)		66.0(41-86)		
Cancer Stage					
1	23	44.2	10	26.3	0.1180
2	10	19.2	7	18.4	
3	15	28.8	12	31.6	
4	4	7.7	9	23.7	

*Chi-square, or two-sample t-test.
**The p-value for gender was 0.0119

All statistical analyses were performed in SAS University Edition. Overall survival was examined as the event of interest, and it was defined as the elapsed time in months between the date of diagnosis and date of death or last follow-up. Age at diagnosis was measured in years, so the median age of the sample was used as a cut-point to produce two age groups for comparison. Using PROC LIFETEST, Kaplan-Meier estimates were obtained to compare the differences in overall survival between genders, age groups, and cancer stages. Additionally, graphical analyses were obtained via PROC LIFETEST and used to assess the proportional hazard assumptions as well as the appropriateness of assuming a Weibull distribution for the survival functions.

If the graphical analyses indicated that Weibull may be appropriate, further analyses would be conducted using PROC LIFEREG to test the shape parameter of a potential Weibull distribution. If the shape parameter was significantly different than one, then the scale would be estimated and used for further analyses.

If the shape parameter was not significantly different from one, an exponential distribution was assumed and Cox proportional hazard regression would be used for additional analyses.

After assessing the proportional hazards assumption, we performed an univariate analysis via PROC PHREG on the potential prognostic factors to examine their significance. We then conducted a multivariate analysis using PROC PHREG with a full model that contained all possible prognostic factors and potential interactions. A final model was obtained by using stepwise selection and by considering biological bases (i.e., clinically important factors). Lastly, the fit of the final model was assessed using a likelihood ratio test.

Results

Table 2: Kaplan-Meier Estimates of Overall Survival Rates with 95% Confidence Intervals (CI)) at 2, 4, 6, and 8 Months

Prognostic Factor	2 months		4 months		6 months		8 months	
	S(t)	95%CI	S(t)	95%CI	S(t)	95%CI	S(t)	95%CI
Gender								
Female	0.788	(0.651, 0.877)	0.653	(0.501, 0.769)	0.598	(0.440, 0.725)	0.381	(0.188, 0.573)
Male	0.658	(0.485, 0.785)	0.435	(0.274, 0.586)	0.357	(0.199, 0.519)	0.179	(0.061, 0.346)
Stage								
1	0.939	(0.779, 0.984)	0.710	(0.515, 0.838)	0.593	(0.391, 0.748)	0.404	(0.191, 0.610)
2	0.824	(0.547, 0.939)	0.665	(0.364, 0.849)	0.665	(0.364, 0.849)	0.399	(0.110, 0.683)
3	0.593	(0.386, 0.750)	0.519	(0.319, 0.685)	0.467	(0.267, 0.644)	0.250	(0.078, 0.471)
4	0.385	(0.141, 0.628)	0.103	(0.007, 0.355)	NA	NA	NA	NA
Age								
<65years	0.762	(0.603, 0.864)	0.552	(0.384, 0.691)	0.509	(0.336, 0658)	0.436	(0.243, 0.615)
≥65 years	0.708	(0.558, 0.816)	0.569	(0.414, 0.698)	0.487	(0.330, 0.626)	0.222	(0.089, 0.392)

**NA meaning not applicable since there were no stage 4 patients at risk at 6 and 8 months*

Table 3: Median Survival Times in Months & 95% Confidence Intervals (CI)

Prognostic Factors	Median Survival Time	95%CI
Gender		
Female	7.4	(4.3, -*)
Male	3.6	(2.0, 6.2)
Stage		
1	6.5	(4.3, -*)
2	7.0	(3.6, -*)
3	5.0	(1.6, 7.8)
4	1.5	(0.4, 3.6)
Age		
<65years	7.0	(3.5, -*)
≥65 years	6.0	(3.6, 6.5)

**Not available due to lack of sufficient sample size*

Table 4: Deaths & Censoring by Prognostic Factors

Prognostic factor	N	Deaths	Censored	% Censored
Gender				
Female	52	23	29	55.8
Male	38	27	11	28.9
Stage				
1	33	15	18	54.5
2	17	7	10	58.8
3	27	17	10	37.0
4	13	13	2	15.4
Age				
<65years	42	20	22	52.4
≥65 years	48	30	18	37.5

We presented Kaplan-Meier Survival estimates by gender, cancer stage, and age at selected time points in table 2. We also provided median survival times for each prognostic factor as displayed in table 3. For each

prognostic factor in table 4, the group with the highest median survival time had the highest percentage of patients censored. Therefore censoring was non-informative because patients with higher survival times had more opportunities to be censored.

We conducted a Mantel-Haenszel log-rank test to compare the Kaplan-Meier estimates of overall survival (OS) in females versus males and obtained a chi-square test statistic of 6.326 (df=1) with a corresponding p-value of 0.0119. Therefore, we rejected the null hypothesis and concluded that there was a significant difference in OS between genders. The Kaplan-Meier curves were provided in figure 1. We observed graphically that OS was better in females.

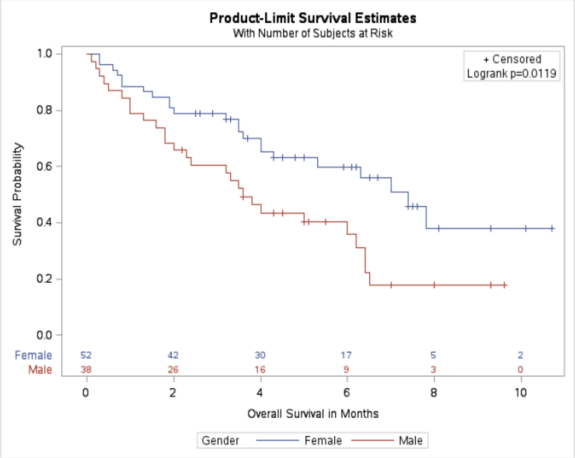

Figure 1: Kaplan-Meier Survival Estimates by Gender

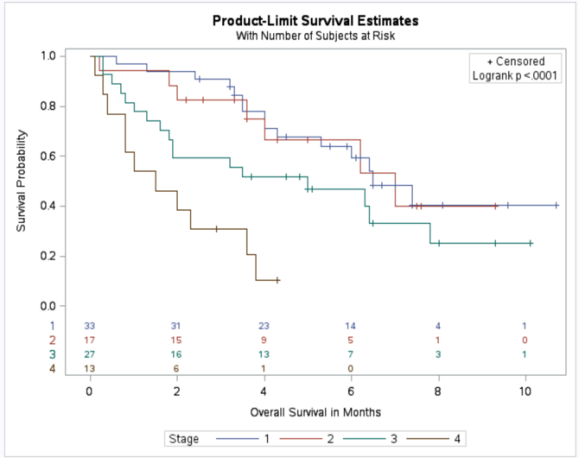

Figure 2: Kaplan-Meier Survival Estimates by Stages

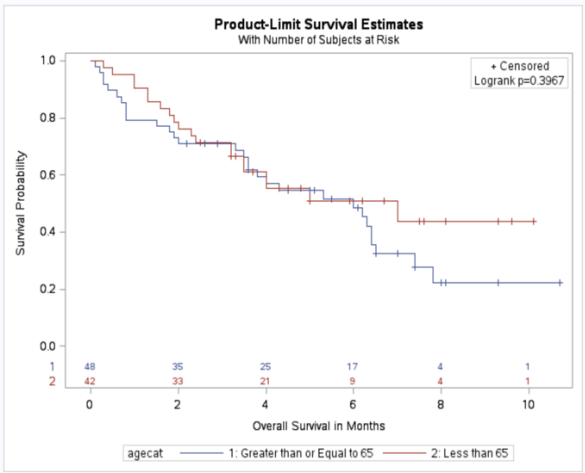

Figure 3: Kaplan-Meier Survival Estimates by Age Groups

Additionally, we conducted a Mantel-Haenszel log-rank test to compare the Kaplan-Meier estimates of OS by stages and obtained a chi-square test statistic of 22.763 (df=3) with a corresponding p-value of <0.0001. Therefore, we rejected the null hypothesis and concluded that there was a significant difference in OS in at least one of the stages. These Kaplan-Meier curves were provided in figure 2. Graphically, we did not observe a

separation between stage one and stage two survival curves (i.e., they crossed each other multiple times). Stage three and stage four displayed lower survival curves, where the stage four survival rate was the lowest.

The median age of patients was 65 years, so this age was used as a cut-point to create two groups for the age prognostic factor (i.e., age <65 versus age ≥ 65). We conducted a Mantel-Haenszel log-rank test to compare the Kaplan-Meier estimates of OS by the established age groups and obtained a chi-square test statistic of 0.718 with a corresponding p-value of 0.3967. Therefore, we failed to reject the null hypothesis and concluded that there was not a significant difference in OS between age groups. This result we obtained was further supported by the graph in figure 3.

From these figures, we observed that the proportional hazards assumptions appeared to be met for gender and disease stage. In figure 1 the survival curves did not cross. In figure 2 the survival curves for stages one and two overlapped; therefore, there was not a change in the hazard ratio between these two stages. Furthermore, the survival curves for stages three and four did not cross with any other stage. Figures 4 and 5 confirmed the previous notion that the proportional hazards assumption appeared to be met for both gender and disease stage. The graphs in figure 4 were roughly straight and roughly parallel. The graphs for stages three and four in figure 5 were roughly straight and roughly parallel, but stages one and two crossed. Since we previously observed that the Kaplan-Meier survival curves for stages one and two overlapped, the log of the negative log of the estimated survival functions for stages one and two were expected to cross. Ultimately, the proportional hazards assumption was not assessed for age because it was not a significant prognostic factor.

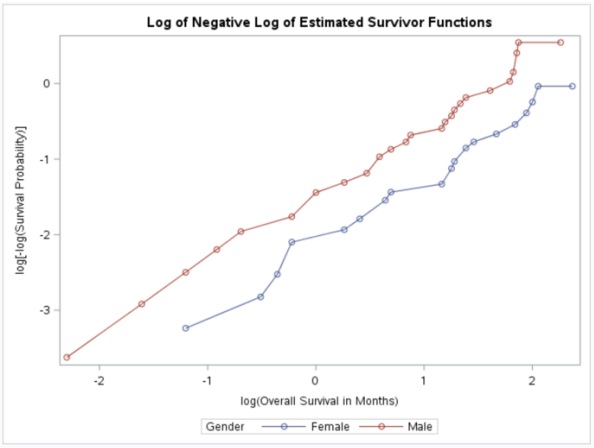

Figure 4: Log of Negative Log of Estimated Survival Function by Gender

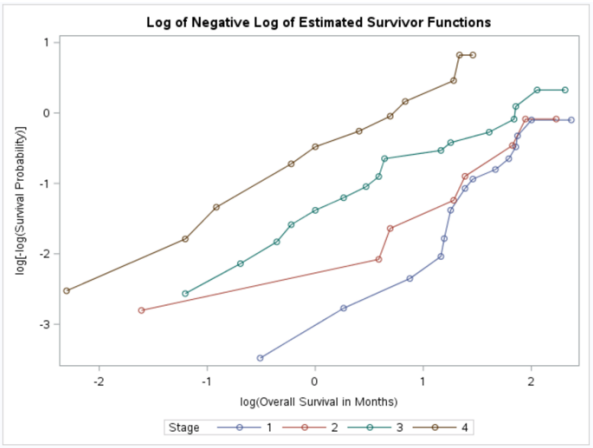

Figure 5: Log of Negative Log of Estimated Survival Function by Stage

Since these log of the negative log survival probabilities appeared roughly straight, we tested the shape parameter for a potential Weibull distribution. We obtained a Weibull shape parameter estimate of 1.130 with a corresponding 95% confidence interval, 1.130 (95%CI: 0.889, 1.438) and failed to reject the null hypothesis of

the Weibull shape parameter equal to one. Thus, we assumed an exponential distribution for the survival functions.

The univariate hazard ratios for each prognostic factor were given in table 5, where gender and stage four pancreatic cancer were statistically significant.

Table 5: Univariate Analysis of Potential Prognostic Factors for OS

Unadjusted Effects		**HR**	**95% Confidence Interval**	**P-value**
Gender:	**male vs female (ref)**	2.017	(1.154, 3.525)	0.0138
Age:	**≥65 vs <65 (ref)**	1.275	(0.723, 2.250)	0.4010
Stage:	**2 vs 1 (ref)**	1.067	(0.434, 2.620)	0.8876
	3 vs 1 (ref)	1.849	(0.922, 3.710)	0.0835
	4 vs. 1 (ref)	5.668	(2.492, 12.896)	<0.0001

We then conducted a stepwise selection procedure, where we obtained a Score chi-square test statistic of 22.877 (df=3) with a corresponding p-value of <0.0001 for stage of pancreatic cancer. Although the stepwise selection procedure eliminated all other prognostic factors and interactions, we could not ignore the biological importance of gender being incorporated in the model; therefore, we included it in the final model.

$$\text{Likelihood ratio test statistic} = -2\text{Log } L_{\text{Reduced}} - (-2\text{Log } L_{\text{Full}}) = 375.084 - 375.060 = 0.024$$

We assessed the goodness of fit of the final model and obtained a likelihood ratio test statistic of 0.024 (df=1) with a corresponding p-value of 0.877. We failed to reject the null hypothesis and found the final model to be sufficient. Lastly, our final model was the following Cox proportional hazards regression model:

$$h(t, stage, gender) = h_0(t) \times e^{0.038 \times Stage\,2 \; + 0.578 \times Stage3 \; + \; 1.529 \times Stage4 \; + \; 0.446 \times Gender}$$

where stage 2 = { 1 if stage 2, 0 otherwise}

stage 3 = {1 if stage 3, 0 otherwise}

stage 4 = {1 if stage 4, 0 otherwise}

gender = {1 if male, 0 if female}

Conclusion

We found in our secondary data analysis that when diagnosed with pancreatic cancer, overall survival was best predicted by observing the stage of the cancer and the gender of the patient. The later the stage of the cancer, the higher the hazard rate. A patient diagnosed with stage 4 cancer had a hazard rate 4.6 times a patient diagnosed with stage 1 cancer. We also found that males with pancreatic cancer had about a 56% higher hazard

rate than females with pancreatic cancer. Future research should study other prognostic factors of pancreatic cancer with larger sample sizes. The efficacy of treatments should also be examined.

Problem 1

Prognostic Factor	Reg. Coeff.	Std. Error	Wald Z-value	Wald X^2-value	2-sided P – value	Hazard Ratio	95% CI LB	95% CI UB
Therapy								
New vs. Standard (ref)	-0.925	0.328	-2.820	7.953	0.005	0.397	0.208	0.754
P16								
Negative vs. Postive (ref)	1.415	0.625	2.264	5.126	0.024	4.116	1.209	14.013
Age (yrs)								
1-year increase	0.075	0.040	1.875	3.516	0.061	1.078	0.997	1.166
Age 65 vs. 55 years (ref)	0.750	0.400	1.875	3.516	0.061	2.117	0.967	4.637

b) $h(t, therapy, P16, age) = h_0(t) \times e^{-0.925 \times therapy + 1.415 \times P16 + 0.075 \times age}$

where therapy = {1 if new, 0 if standard}

p16 = {1 if negative, 0 if positive}

c) $Hazard\ Ratio = \frac{e^{65 \times 0.075}}{e^{55 \times 0.075}} = e^{[65(0.075) - 55(0.075)]} = 2.117$

d) $Hazard\ Ratio = \frac{e^{[65(0.075) - 0.925]}}{e^{[55(0.075) - 0.925]}} = e^{[65(0.075) - 55(0.075)]} = 2.117$

e) In part c, participants are both P16 positive and receiving the standard therapy. So only a difference in age is being compared. In part d, participants are both P16 positive and receiving the new therapy, thus the only difference being compared is age. Therefore the two hazard ratios from part c and d are the same because in both scenarios age is the only difference being compared.

f) Therapy and P16 are clearly significant. Age approaches significance, so if there is a biological basis for it to be in the model it should remain in the model. The new therapy provides a protective effect in

that it reduces the hazard rate by about 60% compared to the standard therapy. A patient that is P16 negative has a hazard rate that is over 4 times the hazard rate of a patient that is P16 positive. While not statistically significant, as patients age their hazard rate seems to increase.

Problem 2

a) The power of the study is 0.539. If there is a difference between the two treatment groups, there is nearly a 54% chance to observe the difference. This trial should not be conducted because the probability of type 2 error is high (beta is 0.461). A trial with a larger sample size should be conducted to adequately detect the effectiveness of this drug.

```
proc power;
        twosamplesurvival test=logrank
        accrualtime=12
        alpha=.05
        followuptime=18
        groupmedsurvtimes =(10 15)
        ntotal=140
        power=.
        ;
run;
```

The POWER Procedure
Log-Rank Test for Two Survival Curves

Fixed Scenario Elements	
Method	Lakatos normal approximation
Form of Survival Curve 1	Exponential
Form of Survival Curve 2	Exponential
Accrual Time	12
Follow-up Time	18
Alpha	0.05
Group 1 Median Survival Time	10
Group 2 Median Survival Time	15
Total Sample Size	140
Number of Sides	2
Number of Time Sub-Intervals	12
Group 1 Loss Exponential Hazard	0
Group 2 Loss Exponential Hazard	0
Group 1 Weight	1
Group 2 Weight	1

Computed Power
Power
0.539

b) We need 260 patients (130 per group) to detect a difference with 80% power.

```
proc power;
        twosamplesurvival test=logrank
        accrualtime=12
        alpha=.05
        followuptime=18
        groupmedsurvtimes =(10 15)
        ntotal=.
        power=0.8
        ;
run;
```

The POWER Procedure
Log-Rank Test for Two Survival Curves

Fixed Scenario Elements	
Method	Lakatos normal approximation
Form of Survival Curve 1	Exponential
Form of Survival Curve 2	Exponential
Accrual Time	12
Follow-up Time	18
Alpha	0.05
Group 1 Median Survival Time	10
Group 2 Median Survival Time	15
Nominal Power	0.8
Number of Sides	2
Number of Time Sub-Intervals	12
Group 1 Loss Exponential Hazard	0
Group 2 Loss Exponential Hazard	0
Group 1 Weight	1
Group 2 Weight	1

Computed N Total	
Actual Power	N Total
0.801	260

c) The power to detect a 60% increase to 16 months (60% increase in median survival under the new treatment) is 0.657.

```
proc power;
        twosamplesurvival test=logrank
        accrualtime=12
        alpha=.05
        followuptime=18
        groupmedsurvtimes =(10 16) /*60% increase */
        ntotal=140
        power=.
        ;
run;
```

The POWER Procedure
Log-Rank Test for Two Survival Curves

Fixed Scenario Elements	
Method	Lakatos normal approximation
Form of Survival Curve 1	Exponential
Form of Survival Curve 2	Exponential
Accrual Time	12
Follow-up Time	18
Alpha	0.05
Group 1 Median Survival Time	10
Group 2 Median Survival Time	16
Total Sample Size	140
Number of Sides	2
Number of Time Sub-Intervals	12
Group 1 Loss Exponential Hazard	0
Group 2 Loss Exponential Hazard	0
Group 1 Weight	1
Group 2 Weight	1

Computed Power
Power
0.657

There is a 0.755 power to detect a 70% increase to a median survival of 17 months.

```
proc power;
        twosamplesurvival test=logrank
        accrualtime=12
        alpha=.05
        followuptime=18
        groupmedsurvtimes =(10 17) /*70% increase */
        ntotal=140
        power=.
        ;
run;
```

The POWER Procedure
Log-Rank Test for Two Survival Curves

Fixed Scenario Elements	
Method	Lakatos normal approximation
Form of Survival Curve 1	Exponential
Form of Survival Curve 2	Exponential
Accrual Time	12
Follow-up Time	18
Alpha	0.05
Group 1 Median Survival Time	10
Group 2 Median Survival Time	17
Total Sample Size	140
Number of Sides	2
Number of Time Sub-Intervals	12
Group 1 Loss Exponential Hazard	0
Group 2 Loss Exponential Hazard	0
Group 1 Weight	1
Group 2 Weight	1

Computed Power
Power
0.755

d) If it was possible to increase the effectiveness of the drug that would be ideal; however, that is not the case. I would suggest that at minimum the investigators should consider achieving 80% power for the study. After increasing the follow-up period and using a less stringent alpha level (i.e. 0.10), I found that neither increased the power to 0.80. Ultimately, I would suggest increasing the sample size of the study to achieve a power of 0.80. This would require a sample size of 260, so there would 130 participants in each group. Although a sample size of 230 is nearly double what they were willing to enroll, I would highly advocate the additional enrollment because there is no point in conducting an inadequately powered study; it would result in a waste of resources if a true effect goes undetected. Moreover I would suggest collaborating with colleagues at other clinics to bring in more patients. They could also consider making changes to the inclusion and exclusion criteria of the study if possible. These approaches would help increase the sample size.

Appendix / Relevant SAS Output for Reference

Demographic Info

Gender p-value:

Test of Equality over Strata			
Test	Chi-Square	DF	Pr > Chi-Square
Log-Rank	6.3260	1	0.0119

Age Continuous p-value

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	88	-0.90	0.3685
Satterthwaite	Unequal	80.959	-0.91	0.3669

Stage p-value

Statistics for Table of Gender by Stage			
Statistic	DF	Value	Prob
Chi-Square	3	5.8713	0.1180

Kaplan Meier Estimates of Overall Survival for Gender

Obs	Gender	TIMELIST	OS_mos	_CENSOR_	SURVIVAL	SDF_LCL	SDF_UCL	STRATUM
1	Female	2	2.0	0	0.78846	0.65066	0.87683	1
2	Female	4	4.0	0	0.65331	0.50086	0.76943	1
3	Female	6	5.3	0	0.59848	0.44040	0.72516	1
4	Female	8	7.8	0	0.38085	0.18769	0.57291	1
5	Male	2	2.0	0	0.65789	0.48482	0.78493	2
6	Male	4	4.0	0	0.43537	0.27369	0.58646	2
7	Male	6	6.0	0	0.35723	0.19920	0.51854	2
8	Male	8	6.5	0	0.17861	0.06117	0.34579	2

median survival time female

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	.	LOGLOG	7.8000	.
50	7.4000	LOGLOG	4.3000	.
25	3.5000	LOGLOG	1.3000	4.3000

median survival time male

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	6.4000	LOGLOG	5.0000	.
50	3.6000	LOGLOG	2.0000	6.2000
25	1.6000	LOGLOG	0.4000	2.4000

Censoring by gender

Summary of the Number of Censored and Uncensored Values					
Stratum	Gender	Total	Failed	Censored	Percent Censored
1	0	52	23	29	55.77
2	1	38	27	11	28.95
Total		90	50	40	44.44

Kaplan Meier Estimates of Overall Survival for age (categorical)

Obs	agecat	TIMELIST	OS_mos	_CENSOR_	SURVIVAL	SDF_LCL	SDF_UCL	STRATUM
1	0	2	2.0	0	0.76190	0.60268	0.86413	1
2	0	4	4.0	0	0.55155	0.38377	0.69095	1
3	0	6	5.0	0	0.50912	0.33603	0.65844	1
4	0	8	7.0	0	0.43639	0.24296	0.61509	1
5	1	2	2.0	0	0.70833	0.55779	0.81571	2
6	1	4	4.0	0	0.56948	0.41427	0.69787	2
7	1	6	6.0	0	0.48661	0.33045	0.62592	2
8	1	8	7.8	0	0.22245	0.08942	0.39232	2

median survival time age >= 65

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	7.8000	LOGLOG	6.4000	.
50	6.0000	LOGLOG	3.6000	6.5000
25	1.8500	LOGLOG	0.6000	3.6000

median survival time age < 65

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	.	LOGLOG	7.0000	.
50	7.0000	LOGLOG	3.5000	.
25	2.3000	LOGLOG	1.3000	3.5000

Censoring by age

Summary of the Number of Censored and Uncensored Values					
Stratum	agecat	Total	Failed	Censored	Percent Censored
1	0	42	20	22	52.38
2	1	48	30	18	37.50
Total		90	50	40	44.44

Kaplan Meier Estimates of Overall Survival for stage

Obs	Stage	TIMELIST	OS_mos	_CENSOR_	SURVIVAL	SDF_LCL	SDF_UCL	STRATUM
1	1	2	1.3	0	0.93939	0.77877	0.98449	1
2	1	4	4.0	0	0.71000	0.51545	0.83778	1
3	1	6	6.0	0	0.59301	0.39088	0.74775	1
4	1	8	7.4	0	0.40432	0.19065	0.60971	1
5	2	2	2.0	0	0.82353	0.54713	0.93941	2
6	2	4	4.0	0	0.66548	0.36437	0.84851	2
7	2	6	4.0	0	0.66548	0.36437	0.84851	2
8	2	8	7.0	0	0.39929	0.10995	0.68264	2
9	3	2	1.9	0	0.59259	0.38626	0.74990	3
10	3	4	3.5	0	0.51852	0.31910	0.68548	3
11	3	6	5.0	0	0.46667	0.26738	0.64381	3
12	3	8	7.8	0	0.25000	0.07803	0.47073	3
13	4	2	2.0	0	0.38462	0.14054	0.62796	4
14	4	4	3.8	0	0.10256	0.00666	0.35527	4
15	4	6	.	.	.	.	.	4
16	4	8	.	.	.	.	.	4

median survival time stage 1

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	.	LOGLOG	7.4000	.
50	6.5000	LOGLOG	4.3000	.
25	4.0000	LOGLOG	2.4000	6.0000

Median survival time stage 2

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	.	LOGLOG	6.2000	.
50	7.0000	LOGLOG	3.6000	.
25	3.6000	LOGLOG	0.2000	7.0000

Median survival time stage 3

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	.	LOGLOG	6.3000	.
50	5.0000	LOGLOG	1.6000	7.8000
25	1.3000	LOGLOG	0.3000	1.9000

Median survival time stage 4.

Quartile Estimates				
Percent	Point Estimate	95% Confidence Interval		
		Transform	[Lower	Upper)
75	3.6000	LOGLOG	1.0000	.
50	1.5000	LOGLOG	0.4000	3.6000
25	0.8000	LOGLOG	0.1000	1.5000

Censoring by stage

Summary of the Number of Censored and Uncensored Values					
Stratum	Stage	Total	Failed	Censored	Percent Censored
1	1	33	15	18	54.55
2	2	17	7	10	58.82
3	3	27	17	10	37.04
4	4	13	11	2	15.38
Total		90	50	40	44.44

Univariate Analysis for Stage (Table 5)

Analysis of Maximum Likelihood Estimates										
Parameter		DF	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	95% Hazard Ratio Confidence Limits		Label
Stage	2	1	0.06481	0.45843	0.0200	0.8876	1.067	0.434	2.620	Stage 2
Stage	3	1	0.61481	0.35519	2.9962	0.0835	1.849	0.922	3.710	Stage 3
Stage	4	1	1.73490	0.41939	17.1127	<.0001	5.668	2.492	12.896	Stage 4

Univariate Analysis for Gender (Table 5)

Analysis of Maximum Likelihood Estimates									
Parameter	DF	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	95% Hazard Ratio Confidence Limits		Label
Gender	1	0.70142	0.28493	6.0603	0.0138	2.017	1.154	3.525	Gender

Univariate Analysis for categorical Age (Table 5)

Analysis of Maximum Likelihood Estimates								
Parameter	DF	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	95% Hazard Ratio Confidence Limits	
agecat	1	0.24324	0.28960	0.7055	0.4010	1.275	0.723	2.250

Score chi-square test statistic

Summary of Stepwise Selection								
Step	Effect Entered	Effect Removed	DF	Number In	Score Chi-Square	Wald Chi-Square	Pr > ChiSq	Effect Label
1	Stage		3	1	22.8771		<.0001	Stage

Final Model: (Stage and Gender)

Model Fit Statistics		
Criterion	Without Covariates	With Covariates
-2 LOG L	393.727	375.084
AIC	393.727	383.084
SBC	393.727	390.732

Parameter Estimates used to formulate Cox Proportional Regression Model

Analysis of Maximum Likelihood Estimates									
Parameter		DF	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio	95% Hazard Ratio Confidence Limits	Label
Stage	2	1	0.03814	0.45883	0.0069	0.9337	1.039	0.423	2.553	Stage 2
Stage	3	1	0.57847	0.35628	2.6362	0.1045	1.783	0.887	3.585	Stage 3
Stage	4	1	1.52874	0.43931	12.1095	0.0005	4.612	1.950	10.911	Stage 4
Gender	1	1	0.44602	0.30277	2.1702	0.1407	1.562	0.863	2.828	Gender 1

Full Model (age, stage, gender)

Model Fit Statistics		
Criterion	Without Covariates	With Covariates
-2 LOG L	393.727	375.060
AIC	393.727	385.060
SBC	393.727	394.620