```
options ls=78 ps=60;
Data bone;
    infile "data_chap5_BMT.txt"  firstobs=13;
    input allo hodgkins time status kscore wtime;
     hodgkins=hodgkins-1;
     if allo=2 then allo=0;
run;

title "Exponential fit";
proc lifereg data=bone;
   model time*status(0) = allo hodgkins kscore wtime /
dist=exponential;
run;

title "Weibull fit";
proc lifereg data=bone;
   model time*status(0) = allo hodgkins kscore wtime / dist=weibull;
run;

title "Log-normal fit";
proc lifereg data=bone;
model time*status(0) = allo hodgkins kscore wtime / dist=lnormal;
run;

title "Log-logistic fit";
proc lifereg data=bone;
model time*status(0) = allo hodgkins kscore wtime / dist=llogistic;
run;

title "Gamma fit";
proc lifereg data=bone;
model time*status(0) = allo hodgkins kscore wtime / dist=gamma;
run;
```

Exponential fit

The LIFEREG Procedure

Model Information	
Data Set	WORK.BONE
Dependent Variable	Log(time)
Censoring Variable	status
Censoring Value(s)	0
Number of Observations	43
Noncensored Values	26
Right Censored Values	17
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	5
Name of Distribution	Exponential
Log Likelihood	-62.49090652

Number of Observations Read	43
Number of Observations Used	43

Fit Statistics	
-2 Log Likelihood	124.982
AIC (smaller is better)	134.982
AICC (smaller is better)	136.603
BIC (smaller is better)	143.788

Fit Statistics (Unlogged Response)	
-2 Log Likelihood	336.632
Exponential AIC (smaller is better)	346.632
Exponential AICC (smaller is better	348.253
Exponential BIC (smaller is better)	355.438

Algorithm converged.

Type III Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
allo	1	0.0837	0.7723
hodgkins	1	6.2467	0.0124
kscore	1	64.8976	<.0001
wtime	1	1.6610	0.1975

Analysis of Maximum Likelihood Parameter Estimates						
Parameter	DF	Estimate	Standard Error	95% Confidence Limits	Chi-Square	Pr > ChiSq
Intercept	1	0.6834	0.6408	-0.5726 1.9394	1.14	0.2862
allo	1	0.1333	0.4607	-0.7697 1.0363	0.08	0.7723
hodgkins	1	-1.3185	0.5275	-2.3524 -0.2845	6.25	0.0124
kscore	1	0.0758	0.0094	0.0574 0.0942	64.90	<.0001
wtime	1	0.0093	0.0072	-0.0049 0.0235	1.66	0.1975
Scale	0	1.0000	0.0000	1.0000 1.0000		
Weibull Shape	0	1.0000	0.0000	1.0000 1.0000		

Exponential fit

The LIFEREG Procedure

Lagrange Multiplier Statistics		
Parameter	Chi-Square	Pr > ChiSq
Scale	1.9089	0.1671

Weibull fit

The LIFEREG Procedure

Model Information	
Data Set	WORK.BONE
Dependent Variable	Log(time)
Censoring Variable	status
Censoring Value(s)	0
Number of Observations	43
Noncensored Values	26
Right Censored Values	17
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	6
Name of Distribution	Weibull
Log Likelihood	-61.21034611

Number of Observations Read	43
Number of Observations Used	43

Fit Statistics	
-2 Log Likelihood	122.421
AIC (smaller is better)	134.421
AICC (smaller is better)	136.754
BIC (smaller is better)	144.988

Fit Statistics (Unlogged Response)	
-2 Log Likelihood	334.070
Weibull AIC (smaller is better)	346.070
Weibull AICC (smaller is better)	348.404
Weibull BIC (smaller is better)	356.638

Algorithm converged.

Type III Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
allo	1	0.1351	0.7132
hodgkins	1	4.5212	0.0335
kscore	1	43.2179	<.0001
wtime	1	1.2210	0.2692

Analysis of Maximum Likelihood Parameter Estimates							
Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	0.4258	0.8463	-1.2329	2.0845	0.25	0.6148
allo	1	0.2080	0.5659	-0.9012	1.3172	0.14	0.7132
hodgkins	1	-1.3746	0.6465	-2.6417	-0.1075	4.52	0.0335
kscore	1	0.0793	0.0121	0.0557	0.1029	43.22	<.0001
wtime	1	0.0104	0.0094	-0.0081	0.0289	1.22	0.2692
Scale	1	1.2733	0.2044	0.9297	1.7440		
Weibull Shape	1	0.7854	0.1260	0.5734	1.0757		

Log-normal fit

The LIFEREG Procedure

Model Information	
Data Set	WORK.BONE
Dependent Variable	Log(time)
Censoring Variable	status
Censoring Value(s)	0
Number of Observations	43
Noncensored Values	26
Right Censored Values	17
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	6
Name of Distribution	Lognormal
Log Likelihood	-60.93151115

Number of Observations Read	43
Number of Observations Used	43

Fit Statistics	
-2 Log Likelihood	121.863
AIC (smaller is better)	133.863
AICC (smaller is better)	136.196
BIC (smaller is better)	144.430

Fit Statistics (Unlogged Response)	
-2 Log Likelihood	333.513
Lognormal AIC (smaller is better)	345.513
Lognormal AICC (smaller is better)	347.846
Lognormal BIC (smaller is better)	356.080

Algorithm converged.

Type III Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
allo	1	0.3556	0.5509
hodgkins	1	3.6277	0.0568
kscore	1	21.5358	<.0001
wtime	1	1.5309	0.2160

Analysis of Maximum Likelihood Parameter Estimates							
Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	0.5064	1.1563	-1.7600	2.7727	0.19	0.6614
allo	1	0.3520	0.5902	-0.8048	1.5088	0.36	0.5509
hodgkins	1	-1.3137	0.6898	-2.6656	0.0382	3.63	0.0568
kscore	1	0.0663	0.0143	0.0383	0.0944	21.54	<.0001
wtime	1	0.0142	0.0115	-0.0083	0.0367	1.53	0.2160
Scale	1	1.6296	0.2441	1.2149	2.1857		

Log-logistic fit

The LIFEREG Procedure

Model Information	
Data Set	WORK.BONE
Dependent Variable	Log(time)
Censoring Variable	status
Censoring Value(s)	0
Number of Observations	43
Noncensored Values	26
Right Censored Values	17
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	6
Name of Distribution	LLogistic
Log Likelihood	-61.15252729

Number of Observations Read	43
Number of Observations Used	43

Fit Statistics	
-2 Log Likelihood	122.305
AIC (smaller is better)	134.305
AICC (smaller is better)	136.638
BIC (smaller is better)	144.872

Fit Statistics (Unlogged Response)	
-2 Log Likelihood	333.955
LLogistic AIC (smaller is better)	345.955
LLogistic AICC (smaller is better)	348.288
LLogistic BIC (smaller is better)	356.522

Algorithm converged.

Type III Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
allo	1	0.3518	0.5531
hodgkins	1	4.6895	0.0303
kscore	1	24.0413	<.0001
wtime	1	1.4635	0.2264

Analysis of Maximum Likelihood Parameter Estimates							
Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	0.5715	1.0620	-1.5101	2.6530	0.29	0.5905
allo	1	0.3419	0.5764	-0.7878	1.4715	0.35	0.5531
hodgkins	1	-1.4494	0.6693	-2.7613	-0.1376	4.69	0.0303
kscore	1	0.0669	0.0137	0.0402	0.0937	24.04	<.0001
wtime	1	0.0131	0.0108	-0.0081	0.0343	1.46	0.2264
Scale	1	0.9382	0.1567	0.6763	1.3016		

Gamma fit

The LIFEREG Procedure

Model Information	
Data Set	WORK.BONE
Dependent Variable	Log(time)
Censoring Variable	status
Censoring Value(s)	0
Number of Observations	43
Noncensored Values	26
Right Censored Values	17
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	7
Name of Distribution	Gamma
Log Likelihood	-60.91369551

Number of Observations Read	43
Number of Observations Used	43

Fit Statistics	
-2 Log Likelihood	121.827
AIC (smaller is better)	135.827
AICC (smaller is better)	139.027
BIC (smaller is better)	148.156

Fit Statistics (Unlogged Response)	
-2 Log Likelihood	333.477
Gamma AIC (smaller is better)	347.477
Gamma AICC (smaller is better)	350.677
Gamma BIC (smaller is better)	359.806

Algorithm converged.

Type III Analysis of Effects			
Effect	DF	Wald Chi-Square	Pr > ChiSq
allo	1	0.4046	0.5247
hodgkins	1	3.7275	0.0535
kscore	1	11.3847	0.0007
wtime	1	1.2282	0.2678

Analysis of Maximum Likelihood Parameter Estimates							
Parameter	DF	Estimate	Standard Error	95% Confidence Limits		Chi-Square	Pr > ChiSq
Intercept	1	0.4299	1.1407	-1.8057	2.6656	0.14	0.7062
allo	1	0.3734	0.5870	-0.7772	1.5240	0.40	0.5247
hodgkins	1	-1.3098	0.6784	-2.6394	0.0199	3.73	0.0535
kscore	1	0.0696	0.0206	0.0292	0.1100	11.38	0.0007
wtime	1	0.0133	0.0120	-0.0102	0.0367	1.23	0.2678
Scale	1	1.5771	0.3805	0.9829	2.5307		
Shape	1	0.2047	1.0278	-1.8098	2.2192		