Example 1: Assess the effects of age, gender, and race on risk of death following kidney transplant. Use an exponential accelerated failure time model.

The LIFEREG Procedure

Model Information	
Data Set	BST665.KIDNEY
Dependent Variable	Log(Years)
Censoring Variable	Died
Censoring Value(s)	0
Number of Observations	2582
Noncensored Values	420
Right Censored Values	2162
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	5
Name of Distribution	Exponential
Log Likelihood	-1691.172608

Fit Statistics	
-2 Log Likelihood	3382.345
AIC (smaller is better)	3392.345
AICC (smaller is better)	3392.369
BIC (smaller is better)	3421.627

Type III Analysis of Effects			
Effect	**DF**	**Wald Chi-Square**	**Pr > ChiSq**
Age	1	10.6708	0.0011
AgeSq	1	1.9466	0.1629
Gender	1	0.0063	0.9366
Race	1	0.8042	0.3699

Example 1: Assess the effects of age, gender, and race on risk of death following kidney transplant. Use an exponential accelerated failure time model.

The LIFEREG Procedure

Analysis of Maximum Likelihood Parameter Estimates								
Parameter		**DF**	**Estimate**	**Standard Error**	**95% Confidence Limits**		**Chi-Square**	**Pr > ChiSq**
Intercept		1	6.2842	0.6184	5.0723	7.4962	103.28	<.0001
Age		1	-0.0891	0.0273	-0.1426	-0.0356	10.67	0.0011
AgeSq		1	0.0004	0.0003	-0.0002	0.0010	1.95	0.1629
Gender	Female	1	-0.0080	0.1009	-0.2057	0.1897	0.01	0.9366
Gender	Male	0	0.0000	.	.	.	.	.
Race	Black	1	-0.1101	0.1228	-0.3507	0.1305	0.80	0.3699
Race	White	0	0.0000	.	.	.	.	.
Scale		0	1.0000	0.0000	1.0000	1.0000		
Weibull Shape		0	1.0000	0.0000	1.0000	1.0000		

Lagrange Multiplier Statistics		
Parameter	**Chi-Square**	**Pr > ChiSq**
Scale	66.0205	<.0001

Example 1: Assess the effects of age, gender, and race on risk of death following kidney transplant. Use a Weibull accelerated failure time model.

The LIFEREG Procedure

Model Information	
Data Set	BST665.KIDNEY
Dependent Variable	Log(Years)
Censoring Variable	Died
Censoring Value(s)	0
Number of Observations	2582
Noncensored Values	420
Right Censored Values	2162
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	6
Name of Distribution	Weibull
Log Likelihood	-1640.896931

Fit Statistics	
-2 Log Likelihood	3281.794
AIC (smaller is better)	3293.794
AICC (smaller is better)	3293.826
BIC (smaller is better)	3328.932

Type III Analysis of Effects			
Effect	**DF**	**Wald Chi-Square**	**Pr > ChiSq**
Age	1	12.1627	0.0005
AgeSq	1	3.3653	0.0666
Gender	1	0.0417	0.8382
Race	1	0.5741	0.4486

Example 1: Assess the effects of age, gender, and race on risk of death following kidney transplant. Use a Weibull accelerated failure time model.

The LIFEREG Procedure

Analysis of Maximum Likelihood Parameter Estimates								
Parameter		**DF**	**Estimate**	**Standard Error**	**95% Confidence Limits**		**Chi-Square**	**Pr > ChiSq**
Intercept		1	8.7391	0.9869	6.8049	10.6733	78.42	<.0001
Age		1	-0.1450	0.0416	-0.2265	-0.0635	12.16	0.0005
AgeSq		1	0.0008	0.0004	-0.0001	0.0017	3.37	0.0666
Gender	Female	1	-0.0307	0.1504	-0.3254	0.2640	0.04	0.8382
Gender	Male	0	0.0000	.	.	.	.	.
Race	Black	1	-0.1385	0.1829	-0.4969	0.2198	0.57	0.4486
Race	White	0	0.0000	.	.	.	.	.
Scale		1	1.4908	0.0646	1.3695	1.6228		
Weibull Shape		1	0.6708	0.0290	0.6162	0.7302		

Example 1: Assess the effects of age, gender, and race on risk of death following kidney transplant. Use a log-logistic accelerated failure time model.

The LIFEREG Procedure

Model Information	
Data Set	BST665.KIDNEY
Dependent Variable	Log(Years)
Censoring Variable	Died
Censoring Value(s)	0
Number of Observations	2582
Noncensored Values	420
Right Censored Values	2162
Left Censored Values	0
Interval Censored Values	0
Number of Parameters	6
Name of Distribution	LLogistic
Log Likelihood	-1642.557866

Fit Statistics	
-2 Log Likelihood	3285.116
AIC (smaller is better)	3297.116
AICC (smaller is better)	3297.148
BIC (smaller is better)	3332.254

Type III Analysis of Effects			
Effect	**DF**	**Wald Chi-Square**	**Pr > ChiSq**
Age	1	12.9327	0.0003
AgeSq	1	3.7013	0.0544
Gender	1	0.0961	0.7566
Race	1	0.3770	0.5392

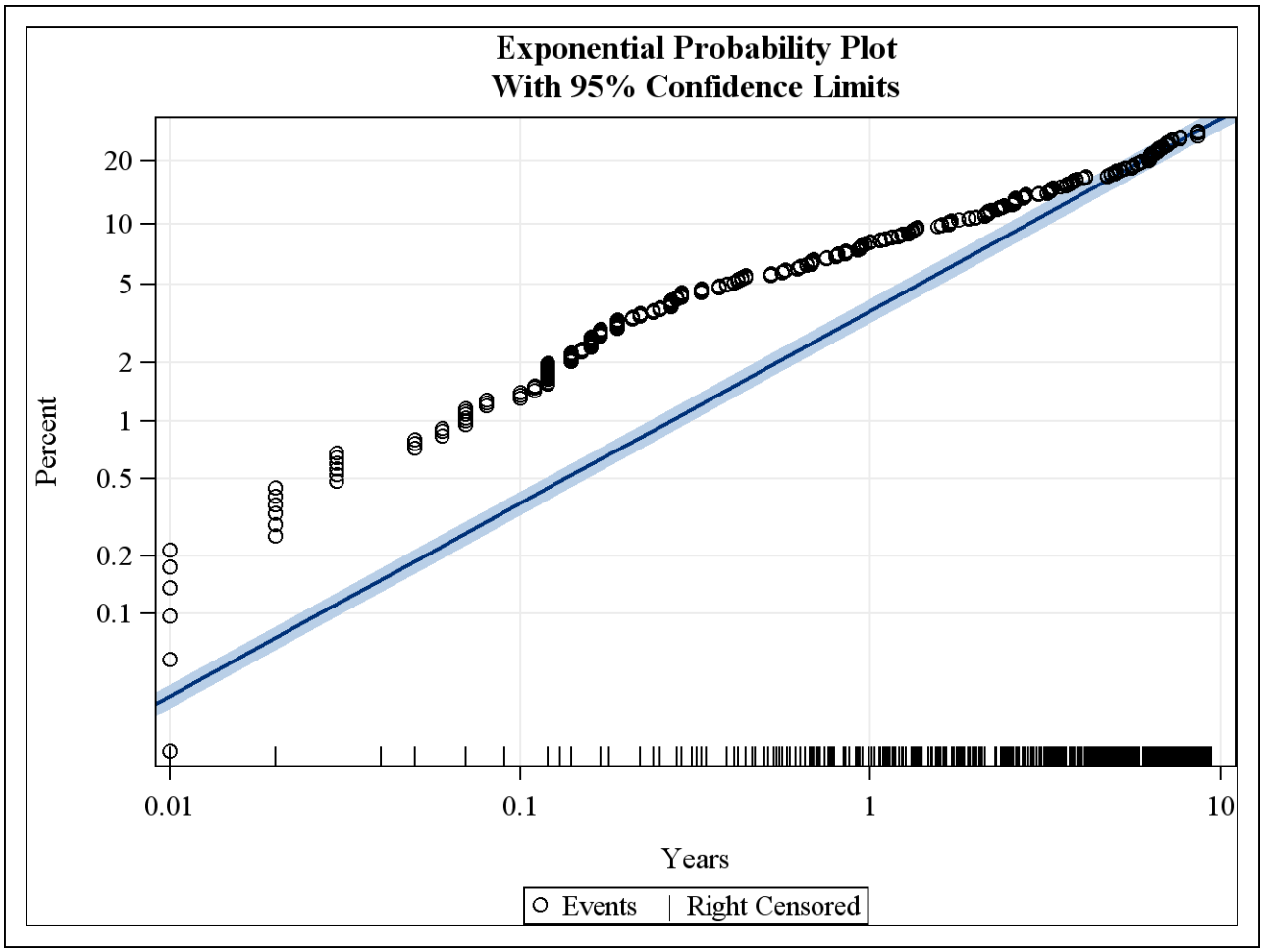
Example 1: Assess the effects of age, gender, and race on risk of death following kidney transplant. Use a log-logistic accelerated failure time model.

The LIFEREG Procedure

Analysis of Maximum Likelihood Parameter Estimates								
Parameter		**DF**	**Estimate**	**Standard Error**	**95% Confidence Limits**		**Chi-Square**	**Pr > ChiSq**
Intercept		1	8.6086	0.9895	6.6692	10.5479	75.69	<.0001
Age		1	-0.1519	0.0422	-0.2347	-0.0691	12.93	0.0003
AgeSq		1	0.0009	0.0004	-0.0000	0.0017	3.70	0.0544
Gender	Female	1	-0.0495	0.1596	-0.3623	0.2634	0.10	0.7566
Gender	Male	0	0.0000	.	.	.	.	.
Race	Black	1	-0.1199	0.1952	-0.5025	0.2627	0.38	0.5392
Race	White	0	0.0000	.	.	.	.	.
Scale		1	1.3983	0.0598	1.2858	1.5206		

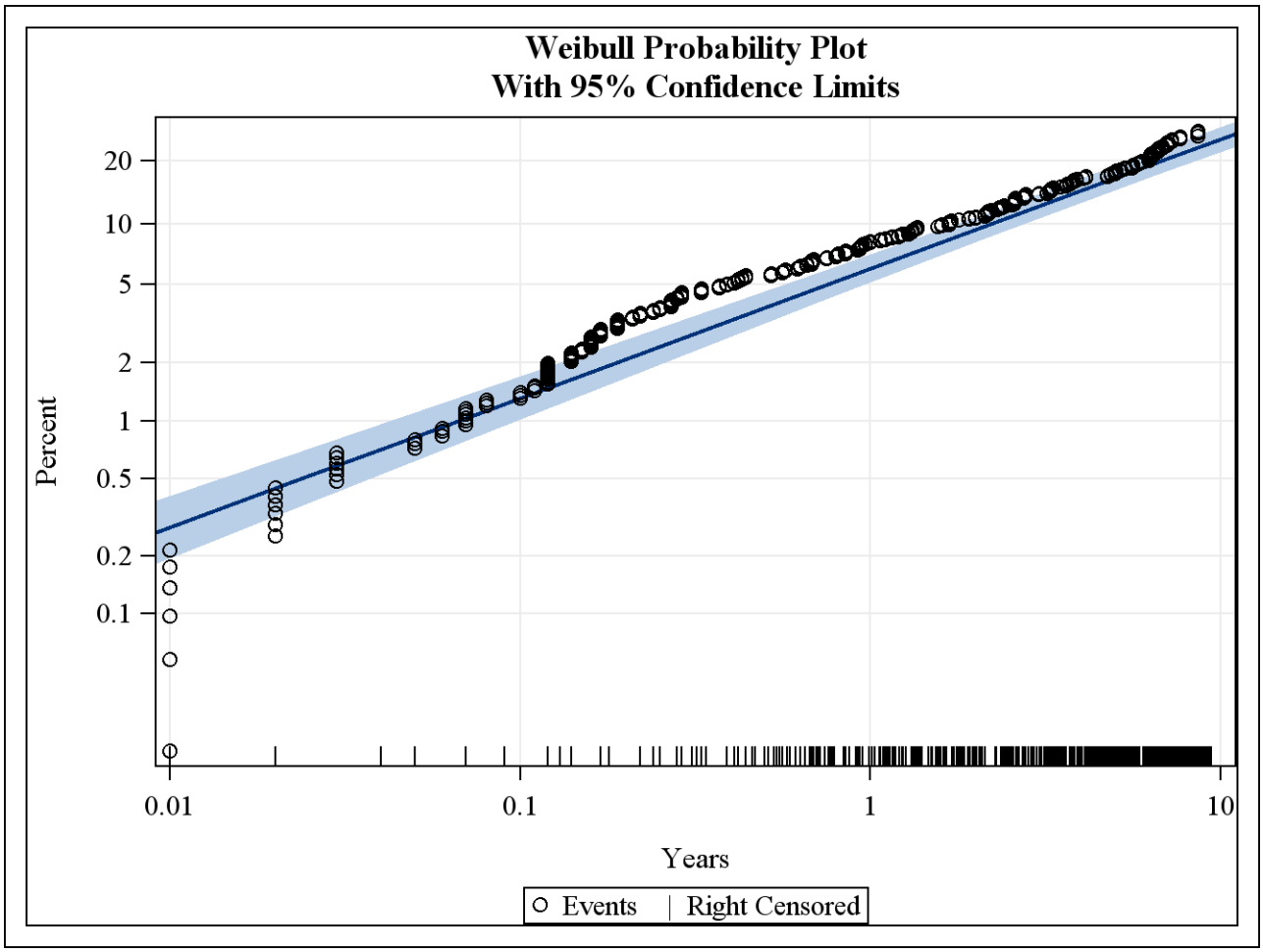
Example 2: Use probability plots to assess the fits of the accelerated failure time models.

The LIFEREG Procedure



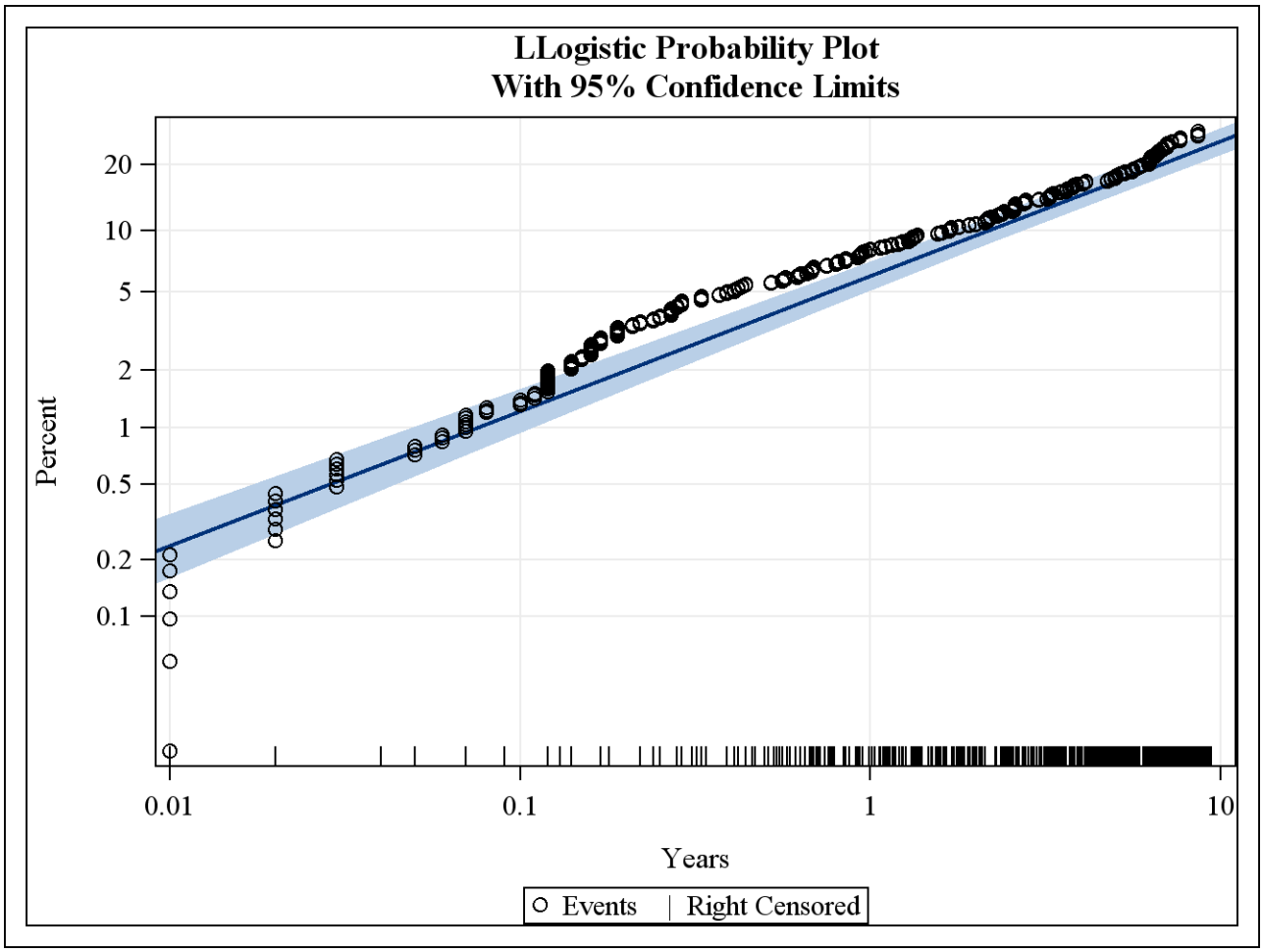
Example 2: Use probability plots to assess the fits of the accelerated failure time models.

The LIFEREG Procedure



Example 2: Use probability plots to assess the fits of the accelerated failure time models.

The LIFEREG Procedure



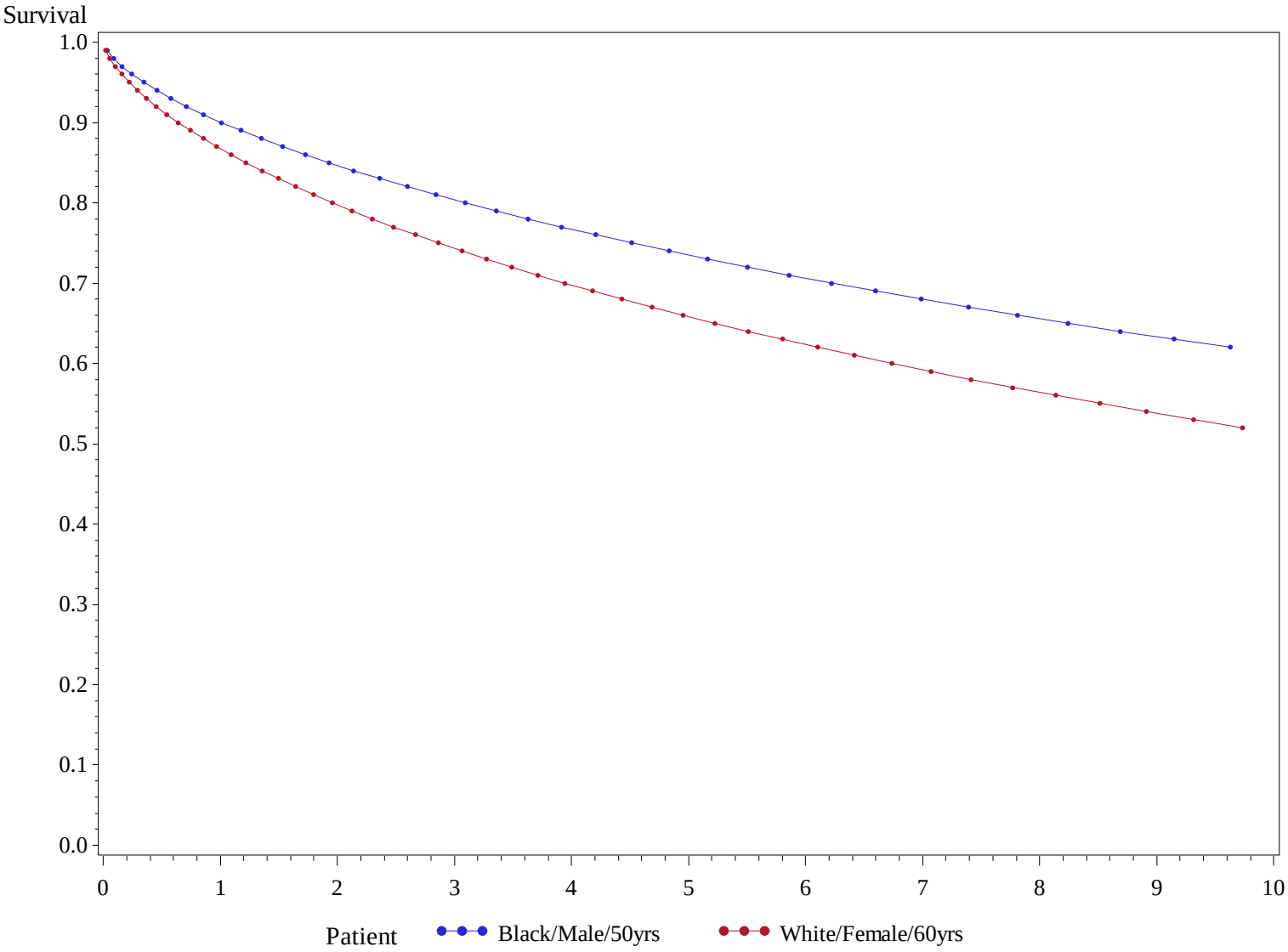
Example 3: Estimate percentiles of survival time.

Type III Analysis of Effects			
Effect	**DF**	**Wald Chi-Square**	**Pr > ChiSq**
Age	1	12.1627	0.0005
AgeSq	1	3.3653	0.0666
Gender	1	0.0417	0.8382
Race	1	0.5741	0.4486

Analysis of Maximum Likelihood Parameter Estimates								
Parameter		**DF**	**Estimate**	**Standard Error**	**95% Confidence Limits**		**Chi-Square**	**Pr > ChiSq**
Intercept		1	8.7391	0.9869	6.8049	10.6733	78.42	<.0001
Age		1	-0.1450	0.0416	-0.2265	-0.0635	12.16	0.0005
AgeSq		1	0.0008	0.0004	-0.0001	0.0017	3.37	0.0666
Gender	Female	1	-0.0307	0.1504	-0.3254	0.2640	0.04	0.8382
Gender	Male	0	0.0000	.	.	.	.	.
Race	Black	1	-0.1385	0.1829	-0.4969	0.2198	0.57	0.4486
Race	White	0	0.0000	.	.	.	.	.
Race	white	0	0.0000	.	.	.	.	.
Scale		1	1.4908	0.0646	1.3695	1.6228		
Weibull Shape		1	0.6708	0.0290	0.6162	0.7302		

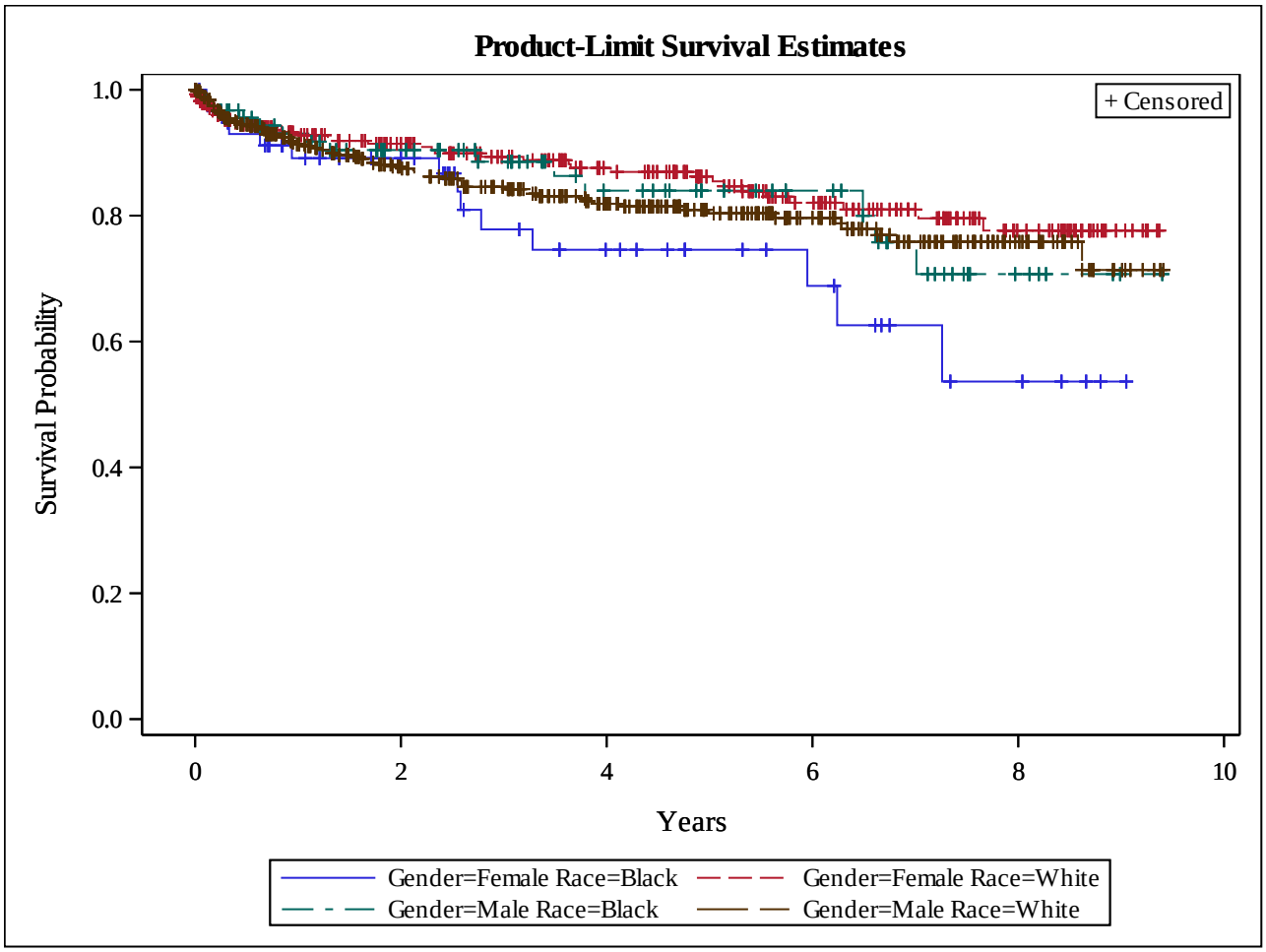
Obs	**Age**	**Gender**	**Race**	**_PROB_**	**pred**
1	50	Male	Black	0.25	4.5152
2	50	Male	Black	0.50	16.7502
3	50	Male	Black	0.75	47.0745
4	60	Female	white	0.25	2.8621
5	60	Female	white	0.50	10.6176
6	60	Female	white	0.75	29.8396

Example 4: Plot the estimated survival function.



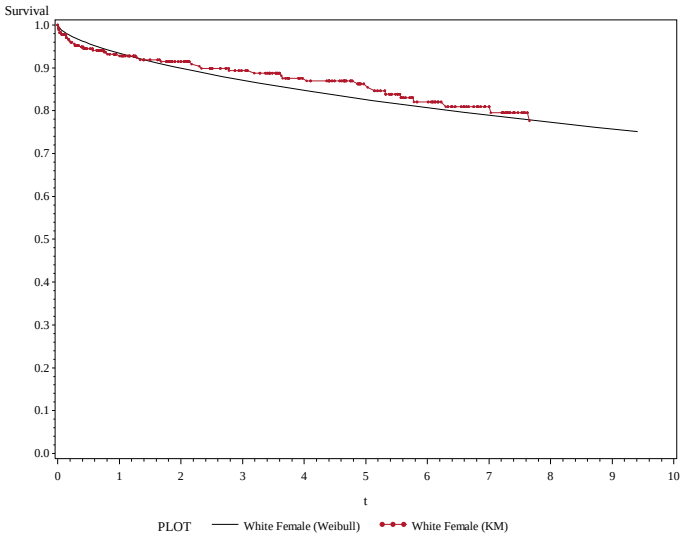
Example 5: Compare the survival estimates from the Weibull accelerated failure time model to those from Kaplan-Meier.

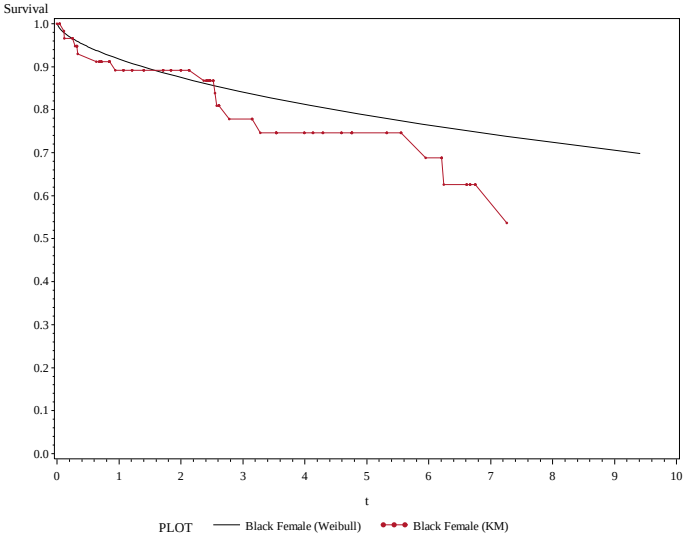
The LIFETEST Procedure

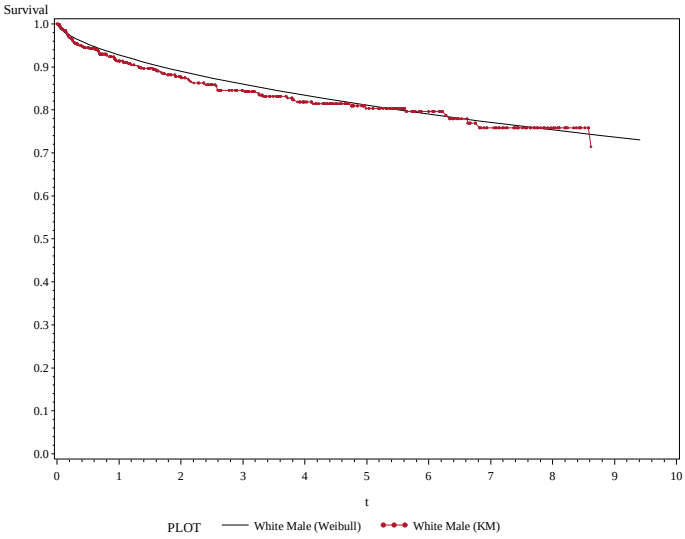


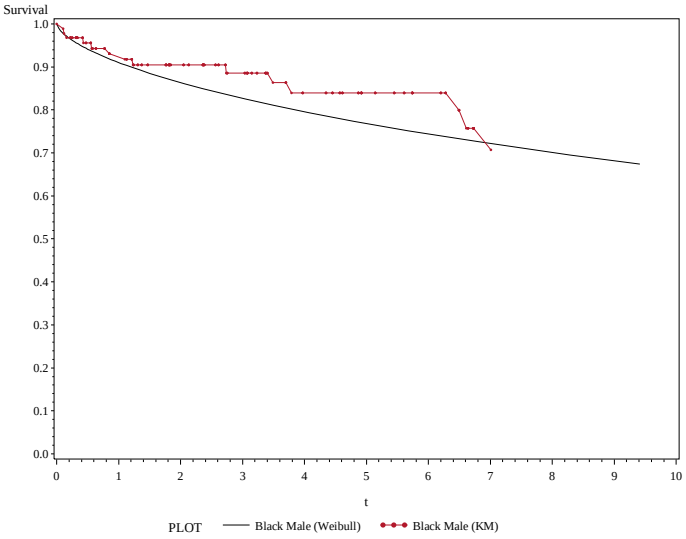
Example 5: Compare the survival estimates from the Weibull accelerated failure time model to those from Kaplan-Meier.

The LIFETEST Procedure









Example 6: Analyze left, right, and interval censored data.

The LIFEREG Procedure

Model Information	
Data Set	BST665.REARREST2
Dependent Variable	Log(Start)
Dependent Variable	Log(Stop)
Number of Observations	432
Noncensored Values	84
Right Censored Values	318
Left Censored Values	30
Interval Censored Values	0
Number of Parameters	8
Name of Distribution	LLogistic
Log Likelihood	-321.1449972

Type III Analysis of Effects			
Effect	**DF**	**Wald Chi-Square**	**Pr > ChiSq**
PriorGroup	2	8.4712	0.0145
AgeGroup	3	16.1313	0.0011
Aid	1	3.4200	0.0644

Analysis of Maximum Likelihood Parameter Estimates								
Parameter		**DF**	**Estimate**	**Standard Error**	**95% Confidence Limits**		**Chi-Square**	**Pr > ChiSq**
Intercept		1	3.9943	0.2385	3.5268	4.4617	280.49	<.0001
PriorGroup	0	1	0.2802	0.3486	-0.4031	0.9635	0.65	0.4216
PriorGroup	1-2	1	0.6069	0.2085	0.1982	1.0157	8.47	0.0036
PriorGroup	3+	0	0.0000	.	.	.	.	.
AgeGroup	20-29	1	0.8135	0.2411	0.3410	1.2860	11.39	0.0007
AgeGroup	30-39	1	1.4408	0.4211	0.6156	2.2661	11.71	0.0006
AgeGroup	40-49	1	1.0926	0.5883	-0.0604	2.2457	3.45	0.0633
AgeGroup	< 20	0	0.0000	.	.	.	.	.
Aid	0	1	-0.3617	0.1956	-0.7451	0.0216	3.42	0.0644
Aid	1	0	0.0000	.	.	.	.	.
Scale		1	0.8581	0.0868	0.7038	1.0463		

Example 7: Redo Example 1 using PROC NLMIXED to get confidence intervals. Use a Weibull accelerated failure time model

The NLMIXED Procedure

Specifications	
Data Set	KIDNEY
Dependent Variable	Years
Distribution for Dependent Variable	General
Optimization Technique	Dual Quasi-Newton
Integration Method	None

Initial Parameters						
beta_0	**beta_A**	**beta_S**	**beta_G**	**beta_R**	**alpha**	**Negative Log Likelihood**
8.7391	-0.145	0.0008	-0.0307	-0.1385	0.6708	1598.39522

Fit Statistics	
-2 Log Likelihood	3196.7
AIC (smaller is better)	3208.7
AICC (smaller is better)	3208.8
BIC (smaller is better)	3243.9

Parameter Estimates								
Parameter	**Estimate**	**Standard Error**	**DF**	**t Value**	**Pr > |t|**	**95% Confidence Limits**		**Gradient**
beta_0	8.7391	1.0196	2582	8.57	<.0001	6.7398	10.7384	-2.81E-7
beta_A	-0.1450	0.04268	2582	-3.40	0.0007	-0.2287	-0.06131	0.000847
beta_S	0.000806	0.000451	2582	1.79	0.0744	-0.00008	0.001691	0.051652
beta_G	-0.03070	0.1504	2582	-0.20	0.8382	-0.3256	0.2642	0.000026
beta_R	-0.1385	0.1828	2582	-0.76	0.4487	-0.4970	0.2200	0.000448
alpha	0.6708	0.02943	2582	22.80	<.0001	0.6131	0.7285	-0.00008

Example 7: Redo Example 1 using PROC NLMIXED to get confidence intervals. Use a Weibull accelerated failure time model

The NLMIXED Procedure

Additional Estimates								
Label	**Estimate**	**Standard Error**	**DF**	**t Value**	**Pr > |t|**	**Alpha**	**Lower**	**Upper**
HR for Gender	1.0208	0.1030	2582	9.91	<.0001	0.05	0.8189	1.2227
HR for Race	1.0974	0.1346	2582	8.15	<.0001	0.05	0.8334	1.3613
HR comparing 65-yr old to 60-yr old	1.1601	0.06211	2582	18.68	<.0001	0.05	1.0384	1.2819

Example 7: Redo Example 1 using PROC NLMIXED to get confidence intervals. Use a log-logistic accelerated failure time model

The NLMIXED Procedure

Specifications	
Data Set	KIDNEY
Dependent Variable	Years
Distribution for Dependent Variable	General
Optimization Technique	Dual Quasi-Newton
Integration Method	None

Initial Parameters						
beta_0	**beta_A**	**beta_S**	**beta_G**	**beta_R**	**alpha**	**Negative Log Likelihood**
8.6086	-0.1519	0.0009	-0.0495	-0.1199	0.71515	1600.77772

Fit Statistics	
-2 Log Likelihood	3200.1
AIC (smaller is better)	3212.1
AICC (smaller is better)	3212.1
BIC (smaller is better)	3247.2

Parameter Estimates								
Parameter	**Estimate**	**Standard Error**	**DF**	**t Value**	**Pr > |t|**	**95% Confidence Limits**		**Gradient**
beta_0	8.6086	1.0118	2582	8.51	<.0001	6.6247	10.5926	-0.00031
beta_A	-0.1519	0.04293	2582	-3.54	0.0004	-0.2361	-0.06771	-0.01906
beta_S	0.000865	0.000456	2582	1.89	0.0583	-0.00003	0.001760	-0.97003
beta_G	-0.04947	0.1596	2582	-0.31	0.7566	-0.3625	0.2635	-0.00012
beta_R	-0.1199	0.1952	2582	-0.61	0.5392	-0.5026	0.2629	-0.00030
alpha	0.7152	0.03090	2582	23.14	<.0001	0.6546	0.7758	0.000247

Example 7: Redo Example 1 using PROC NLMIXED to get confidence intervals. Use a log-logistic accelerated failure time model

The NLMIXED Procedure

Additional Estimates								
Label	**Estimate**	**Standard Error**	**DF**	**t Value**	**Pr > |t|**	**Alpha**	**Lower**	**Upper**
OR for Gender	0.9652	0.1102	2582	8.76	<.0001	0.05	0.7492	1.1813
OR for Race	0.9178	0.1281	2582	7.16	<.0001	0.05	0.6666	1.1691
OR comparing 65-yr old to 60-yr old	0.8550	0.05012	2582	17.06	<.0001	0.05	0.7567	0.9532