

**STATA FOR PROPORTIONAL HAZARDS REGRESSION  
USING THE FRAMINGHAM DATA TO PREDICT TIME TO CHD  
AS A FUNCTION OF GENDER (ADJUSTING FOR AGE OR AGE CATEGORY)**

```
. use "C:\Users\Desktop\framingham.dta", clear

. generate timechdyrs = timechd/365.25

. generate female = sex - 1

. sort anychd

. by anychd: summarize timechdyrs female agecat age
```

---

```
-> anychd = 0
```

Variable	Obs	Mean	Std. Dev.	Min	Max
timechdyrs	3194	21.21977	5.69053	.1451061	24
female	3194	.6136506	.4869885	0	1
agecat	3194	2.435817	.9067624	1	4
age	3194	48.86349	8.495102	32	70

---

```
-> anychd = 1
```

Variable	Obs	Mean	Std. Dev.	Min	Max
timechdyrs	1240	10.6042	7.587798	0	23.9781
female	1240	.4274194	.4949036	0	1
agecat	1240	2.819355	.9115595	1	4
age	1240	52.6621	8.543646	34	70

---

```
. sort agecat

. by agecat: summarize female age
```

---

```
-> agecat = 1
```

Variable	Obs	Mean	Std. Dev.	Min	Max
female	559	.5420394	.4986758	0	1
age	559	37.42934	1.49369	32	39

---

```
-> agecat = 2
```

Variable	Obs	Mean	Std. Dev.	Min	Max
female	1692	.5591017	.4966415	0	1
age	1692	44.31974	2.867054	40	49

---

```
-> agecat = 3
```

Variable	Obs	Mean	Std. Dev.	Min	Max
female	1399	.5739814	.4946733	0	1
age	1399	54.33452	2.835681	50	59

```
-> agecat = 4
```

Variable	Obs	Mean	Std. Dev.	Min	Max
female	784	.5586735	.4968625	0	1
age	784	63.0676	2.344913	60	70

```
. stset timechdyrs, failure(anychd)
```

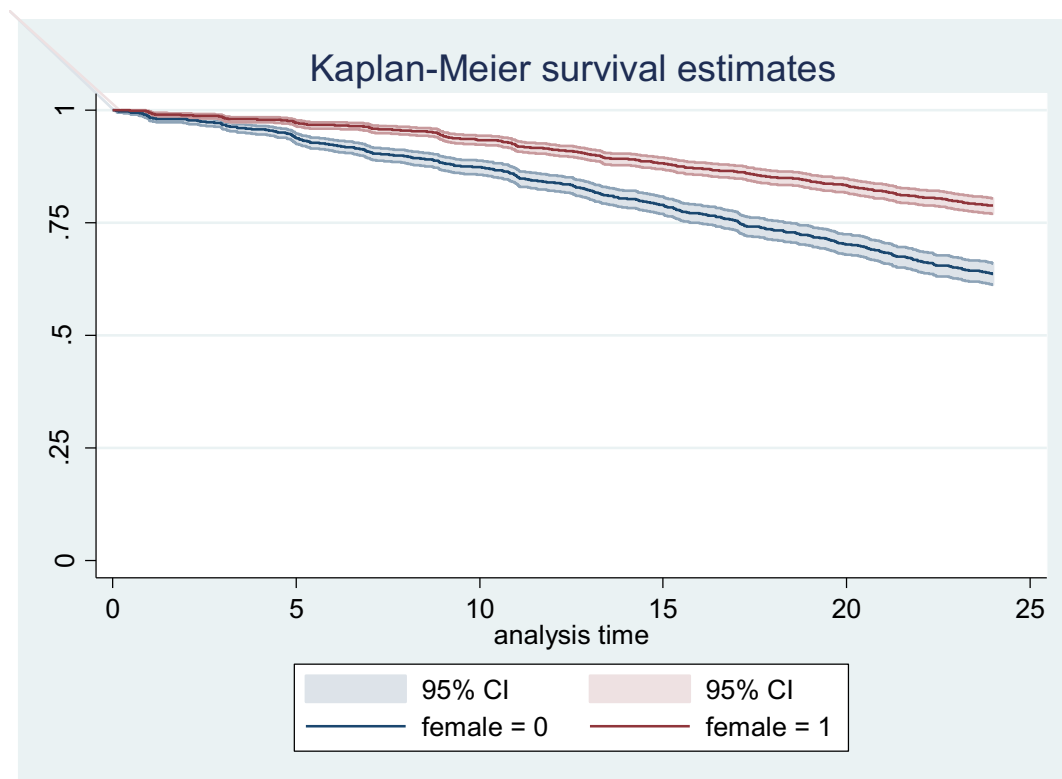
```
failure event:   anychd != 0 & anychd < .
obs. time interval:  (0, timechdyrs]
exit on or before:  failure
```

```
4434 total observations
194 observations end on or before enter()
```

```
4240 observations remaining, representing
1046 failures in single-record/single-failure data
80925.16 total analysis time at risk and under observation
               at risk from t = 0
earliest observed entry t = 0
last observed exit t = 24
```

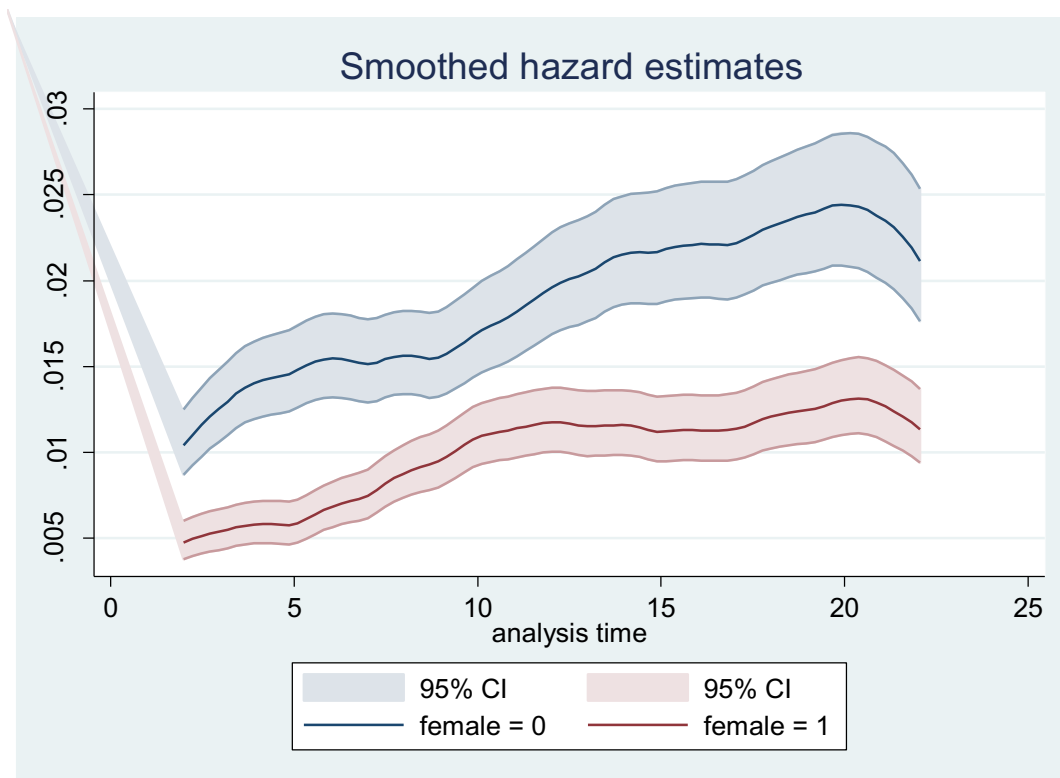
```
. sts graph, ci by(female)
```

```
failure _d:   anychd
analysis time _t:  timechdyrs
```



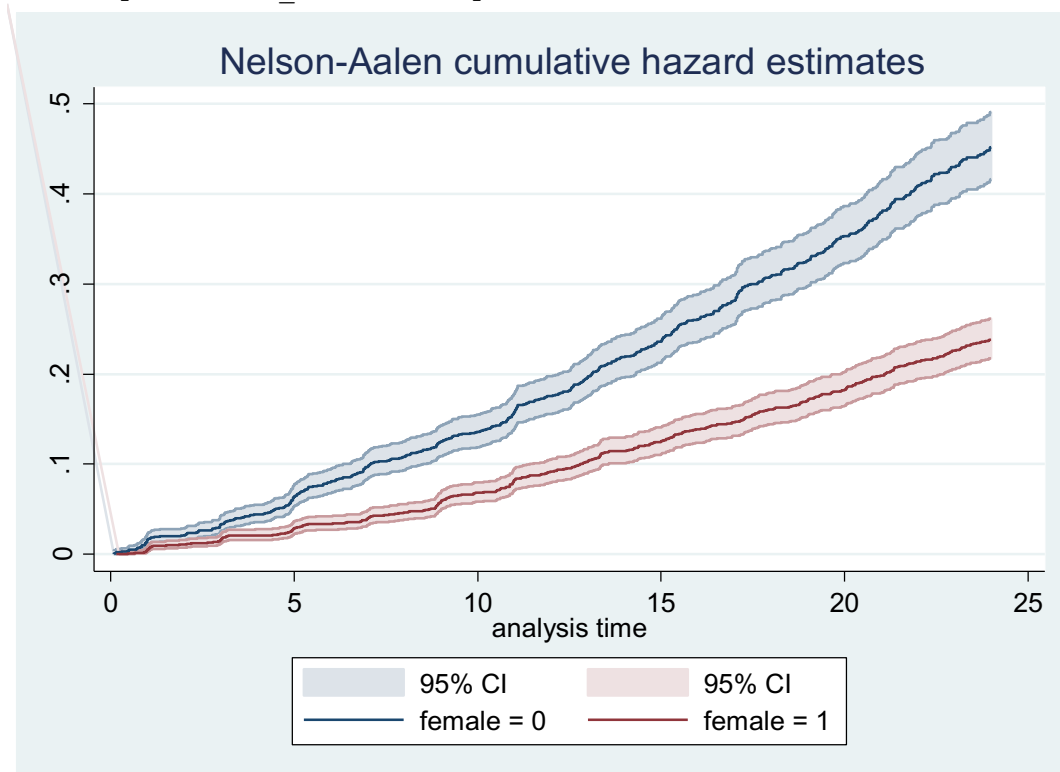
```
. sts graph, hazard ci by(female)
```

```
    failure _d: anychd  
analysis time _t: timechdyrs
```



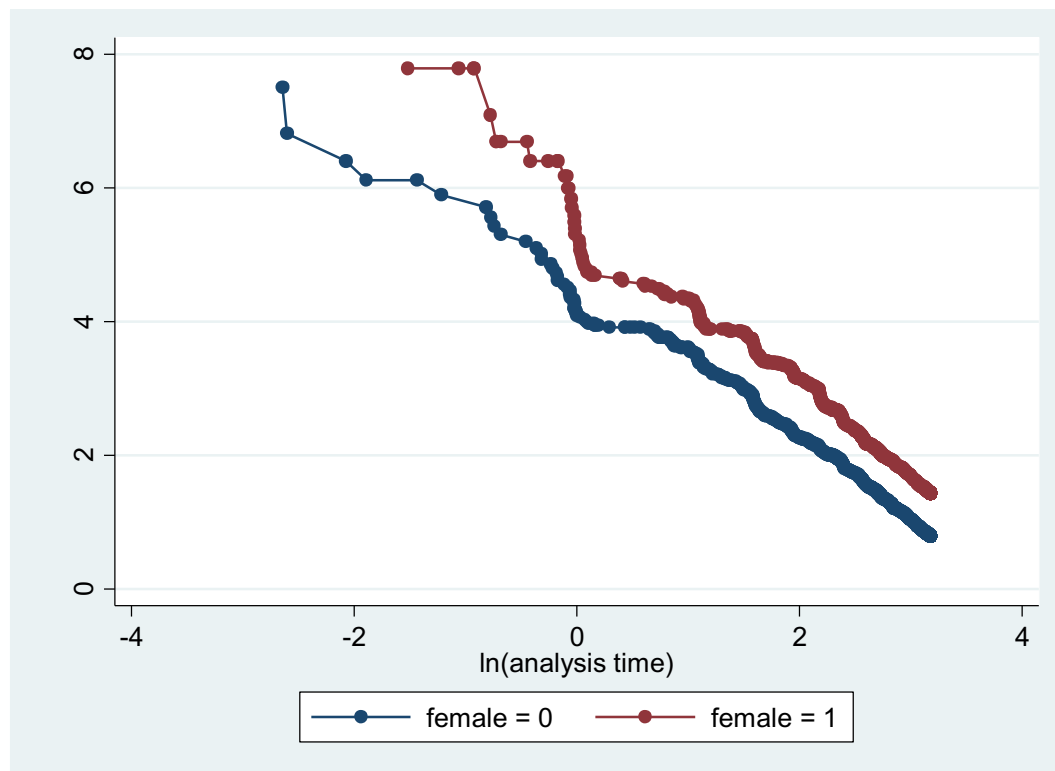
```
. sts graph, cumhaz ci by(female)
```

```
    failure _d: anychd  
analysis time _t: timechdyrs
```



```
. sthplot, by(female)

      failure _d:  anychd
analysis time _t:  timechdyrs
```



```
. sts test female

      failure _d:  anychd
analysis time _t:  timechdyrs
```

Log-rank test for equality of survivor functions

female	Events observed	Events expected
0	586	418.74
1	460	627.26
Total	1046	1046.00

chi2(1) = 111.58  
Pr>chi2 = 0.0000

```
. stcox female
```

```
      failure _d:  anychd  
analysis time _t:  timechdyrs
```

```
Iteration 0:  log likelihood = -8468.8091  
Iteration 1:  log likelihood = -8414.5034  
Iteration 2:  log likelihood = -8414.4526  
Refining estimates:  
Iteration 0:  log likelihood = -8414.4526
```

```
Cox regression -- Breslow method for ties
```

```
No. of subjects =          4240      Number of obs   =          4240  
No. of failures =          1046  
Time at risk    =  80925.15537  
  
Log likelihood   =  -8414.4526      LR chi2(1)      =       108.71  
                                          Prob > chi2    =        0.0000
```

```
-----+-----  
      _t | Haz. Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]  
-----+-----  
female |   .5235128   .0326364   -10.38  0.000   .4633002   .5915509  
-----+-----
```

```
. sts test female, strata(agecat) detail
```

```
      failure _d:  anychd  
analysis time _t:  timechdyrs
```

```
Stratified log-rank test for equality of survivor functions
```

```
-> agecat = 1
```

```
      |      Events      Events  
female | observed      expected  
-----+-----  
0      |      56      38.36  
1      |      32      49.64  
-----+-----  
Total  |      88      88.00  
  
      chi2(1) =      14.38  
      Pr>chi2 =      0.0001
```

```
-> agecat = 2
```

```
      |      Events      Events  
female | observed      expected  
-----+-----  
0      |     215     138.33  
1      |     128     204.67  
-----+-----  
Total  |     343     343.00  
  
      chi2(1) =      71.30  
      Pr>chi2 =      0.0000
```

```
-> agecat = 3
```

	Events observed	Events expected
female		
0	211	145.75
1	166	231.25
Total	377	377.00

chi2(1) = 47.75  
Pr>chi2 = 0.0000

```
-> agecat = 4
```

	Events observed	Events expected
female		
0	104	88.46
1	134	149.54
Total	238	238.00

chi2(1) = 4.36  
Pr>chi2 = 0.0367

```
-> Total
```

	Events observed	Events expected(*)
female		
0	586	410.91
1	460	635.09
Total	1046	1046.00

(\*) sum over calculations within agecat

chi2(1) = 123.34  
Pr>chi2 = 0.0000

```
. stcox female i.agecat
```

```
      failure _d:  anychd  
analysis time _t:  timechdyrs
```

```
Iteration 0:  log likelihood = -8468.8091  
Iteration 1:  log likelihood = -8333.6461  
Iteration 2:  log likelihood = -8329.2878  
Iteration 3:  log likelihood = -8329.2816  
Refining estimates:  
Iteration 0:  log likelihood = -8329.2816
```

```
Cox regression -- Breslow method for ties
```

No. of subjects = 4240  
No. of failures = 1046  
Time at risk = 80925.15537  
  
Log likelihood = -8329.2816

Number of obs = 4240  
  
  
LR chi2(4) = 279.06  
Prob > chi2 = 0.0000

_t	Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
female	.5043025	.0314799	-10.97	0.000	.4462281	.5699351
agecat						
2	1.448167	.1730899	3.10	0.002	1.145724	1.830447
3	2.356372	.2793009	7.23	0.000	1.867888	2.972602
4	3.656652	.4581166	10.35	0.000	2.860503	4.674388

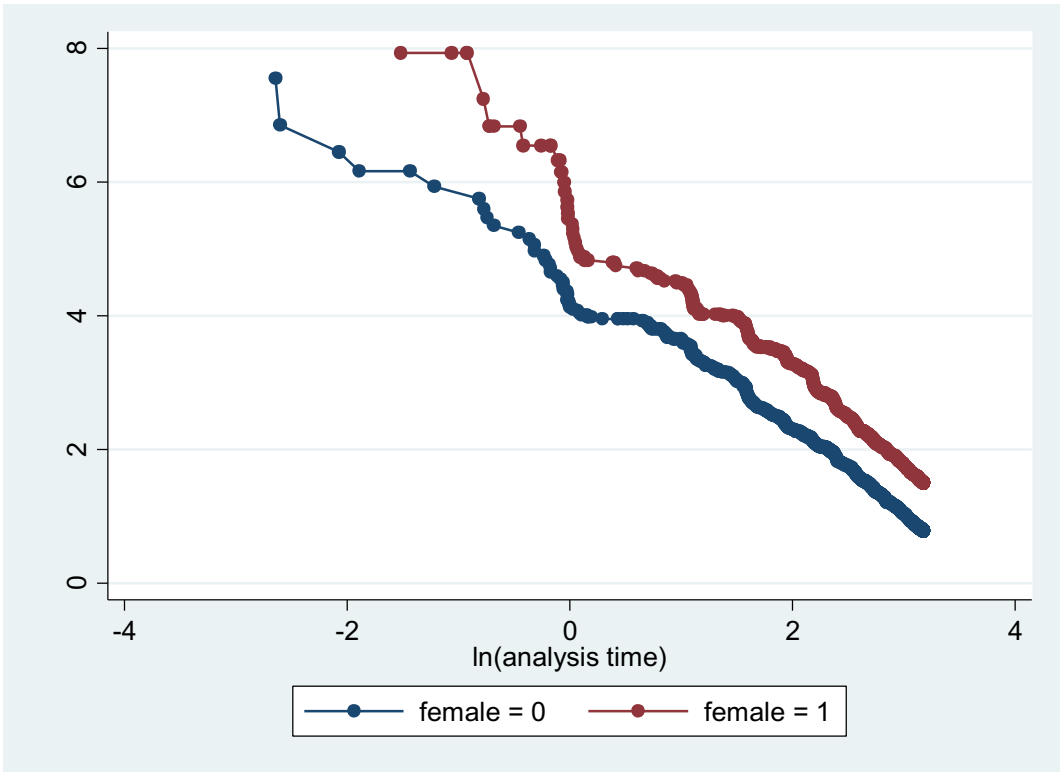
```
. estimates store main

. stphplot, by(female) adjust(i.agecat)
factor variables and time-series operators not allowed
(error in option adjust())
r(101);

. generate age2 = agecat == 2
. generate age3 = agecat == 3
. generate age4 = agecat == 4

. stphplot, by(female) adjust(age2 age3 age4)

    failure _d: anychd
analysis time _t: timechdyrs
```



```
. stcox female, strata(agecat)
```

```
      failure _d:  anychd  
analysis time _t:  timechdyrs
```

```
Iteration 0:  log likelihood = -7069.9463  
Iteration 1:  log likelihood = -7010.1605  
Iteration 2:  log likelihood = -7010.0851  
Refining estimates:  
Iteration 0:  log likelihood = -7010.0851
```

Stratified Cox regr. -- Breslow method for ties

No. of subjects =	4240	Number of obs =	4240
No. of failures =	1046		
Time at risk =	80925.15537		
		LR chi2(1) =	119.72
Log likelihood =	-7010.0851	Prob > chi2 =	0.0000

	_t   Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
	female	.5065488	.0316167	-10.90	0.000	.4482216 .5724661

Stratified by agecat



```
. stcox female age
```

```
      failure _d:  anychd  
analysis time _t:  timechdyrs
```

```
Iteration 0:  log likelihood = -8468.8091  
Iteration 1:  log likelihood = -8320.0295  
Iteration 2:  log likelihood = -8319.8409  
Refining estimates:  
Iteration 0:  log likelihood = -8319.8409
```

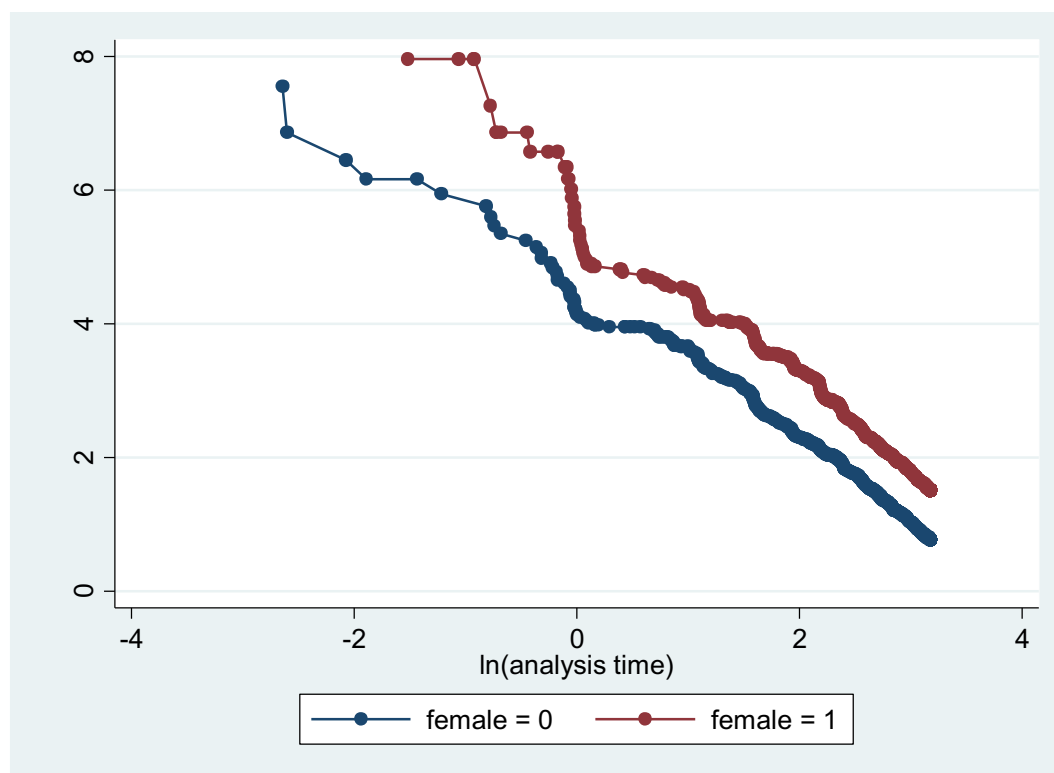
```
Cox regression -- Breslow method for ties
```

```
No. of subjects =          4240          Number of obs   =          4240  
No. of failures =          1046  
Time at risk    =  80925.15537  
  
Log likelihood   =  -8319.8409          LR chi2(2)       =          297.94  
                                          Prob > chi2      =          0.0000
```

	_t	Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]
female		.5009286	.0312809	-11.07	0.000	.4432225 .5661477
age		1.051844	.0038571	13.78	0.000	1.044311 1.059431

```
. stphplot, by(female) adjust(age)
```

```
      failure _d:  anychd  
analysis time _t:  timechdyrs
```



	_t	Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
	female	.5008745	.0312805	-11.07	0.000	.4431695	.5660933
	age	1.052749	.0124059	4.36	0.000	1.028713	1.077347
	agecat						
	2	1.016366	.1478892	0.11	0.911	.7641769	1.351782
	3	.990172	.2306498	-0.04	0.966	.6272382	1.563107
	4	.9945412	.3227452	-0.02	0.987	.5264943	1.878676

```
. stcox female age2 age3 age4, tvc(female age2 age3 age4) texp(ln(_t))
```

```
      failure _d:  anychd
analysis time _t:  timechdyrs
```

```
Iteration 0:  log likelihood = -8468.8091
Iteration 1:  log likelihood = -8314.3016
Iteration 2:  log likelihood = -8307.6015
Iteration 3:  log likelihood = -8307.3664
Iteration 4:  log likelihood = -8307.3646
Iteration 5:  log likelihood = -8307.3646
Refining estimates:
Iteration 0:  log likelihood = -8307.3646
```

Cox regression -- Breslow method for ties

```
No. of subjects =          4240          Number of obs   =          4240
No. of failures =          1046
Time at risk    =  80925.15537

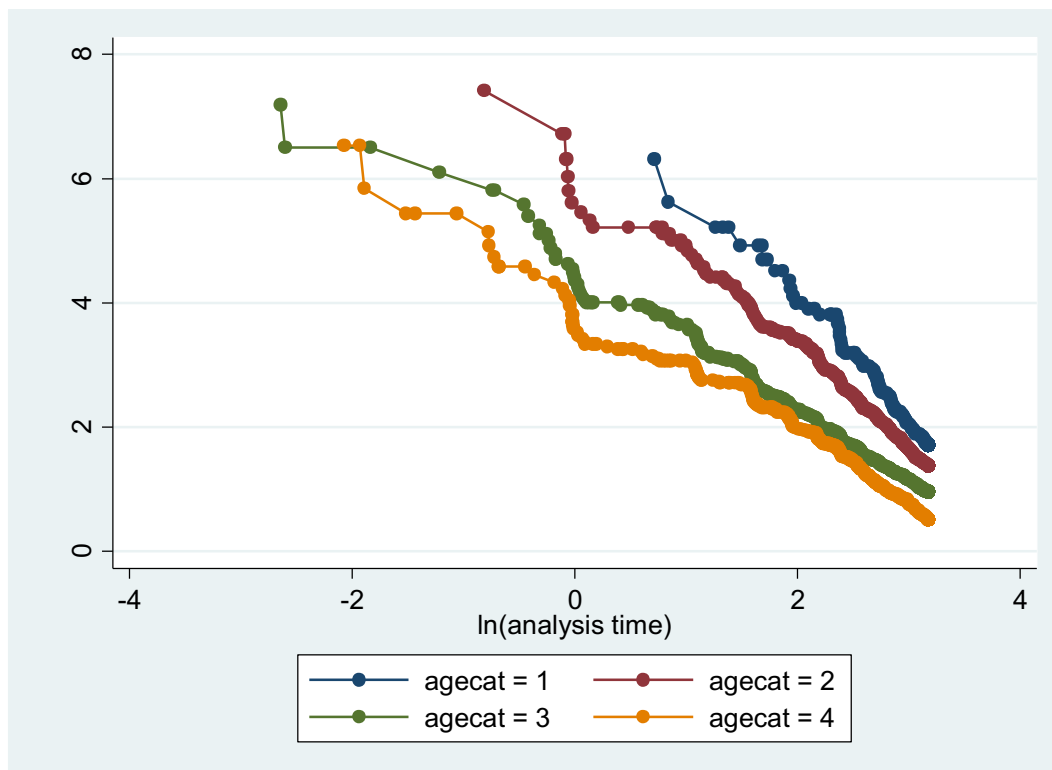
Log likelihood   =  -8307.3646          LR chi2(8)        =          322.89
                                          Prob > chi2        =          0.0000
```

		_t	Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
main								
	female		.4096062	.0737365	-4.96	0.000	.2878292	.5829054
	age2		5.019129	3.200581	2.53	0.011	1.438259	17.51539
	age3		24.72613	15.39236	5.15	0.000	7.299136	83.76081
	age4		33.185	20.87946	5.57	0.000	9.668956	113.8948
tvc								
	female		1.09695	.0803892	1.26	0.207	.9501827	1.266387
	age2		.6227307	.1468444	-2.01	0.045	.3922661	.9885981
	age3		.3882339	.0898363	-4.09	0.000	.2466764	.6110255
	age4		.4110687	.0969091	-3.77	0.000	.2589669	.6525059

Note: variables in tvc equation interacted with ln(\_t)

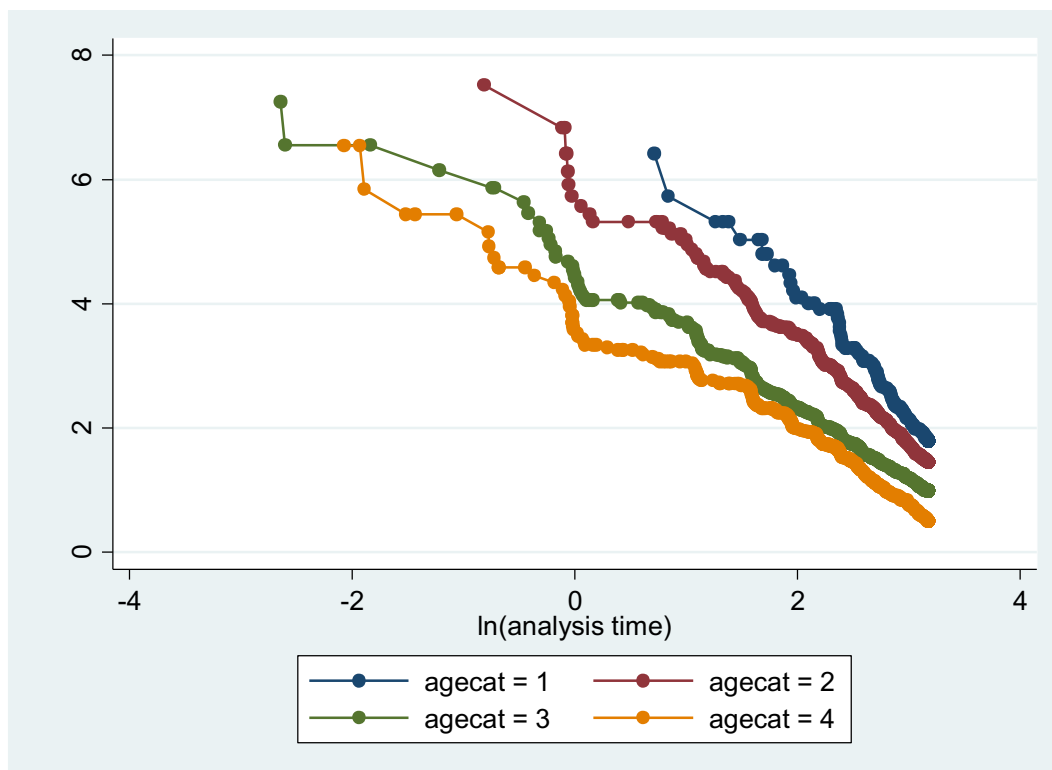
```
. stphplot, by(agecat)
```

```
    failure _d: anychd  
analysis time _t: timechdyrs
```



```
. stphplot, by(agecat) adjust(female)
```

```
    failure _d: anychd  
analysis time _t: timechdyrs
```



```
. generate femage2 = female * (agecat == 2)
. generate femage3 = female * (agecat == 3)
. generate femage4 = female * (agecat == 4)
. stcox female i.agecat femage2 femage3 femage4
```

```
      failure _d:  anychd
analysis time _t:  timechdyrs
```

```
Iteration 0:  log likelihood = -8468.8091
Iteration 1:  log likelihood = -8331.4699
Iteration 2:  log likelihood = -8322.3717
Iteration 3:  log likelihood = -8322.3311
Iteration 4:  log likelihood = -8322.3311
Refining estimates:
Iteration 0:  log likelihood = -8322.3311
```

Cox regression -- Breslow method for ties

```
No. of subjects =          4240          Number of obs   =          4240
No. of failures =          1046
Time at risk    =   80925.15537
Log likelihood   =   -8322.3311          LR chi2(7)       =          292.96
                                          Prob > chi2      =          0.0000
```

-----						
_t	Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]	
-----						
female	.4471672	.0990946	-3.63	0.000	.2896271	.6903996
agecat						
2	1.507597	.2262017	2.74	0.006	1.123492	2.023021
3	2.292721	.3448651	5.52	0.000	1.707323	3.078837
4	2.83858	.4716553	6.28	0.000	2.049588	3.931297
femage2	.9096773	.2257247	-0.38	0.703	.5593358	1.479456
femage3	1.082637	.2649168	0.32	0.746	.6701892	1.748914
femage4	1.69015	.4348419	2.04	0.041	1.02077	2.798481
-----						

```
. estimates store interact
```

```
. lrtest interact main
```

```
Likelihood-ratio test          LR chi2(3)  =          13.90
(Assumption: main nested in interact)  Prob > chi2 =          0.0030
```

```
. lrtest main interact
```

```
Likelihood-ratio test          LR chi2(3)  =          13.90
(Assumption: main nested in interact)  Prob > chi2 =          0.0030
```

```
( 1) female = 0
```

```
. lincom female + femage2, hr
```

( 1) female + femage2 = 0

```
. lincom female + femage3, hr
```

```
( 1) female + femage3 = 0
```

```
. lincom female + femage4, hr
```

```
( 1) female + femage4 = 0
```

	_t	Haz. Ratio	Std. Err.	z	P> z	[95% Conf. Interval]
	(1)	.7557795	.0988144	-2.14	0.032	.5849312 .9765297