# Title
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**sts list** — List the survivor or related function

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Description      Quick start          Menu                    Syntax
Options         Remarks and examples  Methods and formulas    References
Also see

## Description

sts list lists the estimated survivor, failure, or the Nelson–Aalen estimated cumulative (integrated) hazard function. See [ST] **sts** for an introduction to this command.

sts list can be used with single- or multiple-record or single- or multiple-failure st data.

## Quick start

Kaplan–Meier survivor function using stset data
      sts list

Show the number at risk and the survivor function only at specified times
      sts list, risktable(10 20 30 40 50)

Survivor function for each level of v1
      sts list, by(v1)

Results of above saved in mydata.dta
      sts list, by(v1) saving(mydata)

Show numbers at risk and survivor functions for groups of v1 only at specified times
      sts list, by(v1) risktable(10(10)50)

Same as above, but report survivor functions for each group side by side
      sts list, by(v1) risktable(10(10)50) compare

Failure function
      sts list, failure

Failure function adjusted for $v2 = 0$
      sts list, failure adjustfor(v2)

Same as above, but adjusted for mean value of v2
      sts list, failure adjustfor(v2, atmeans)

Failure function adjusted for $v2 = 10$ and stratified on levels of svar
      sts list, failure adjustfor(v2, at(v2=10)) strata(svar)

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## Menu

## Syntax

> sts <u>list</u> [*if*] [*in*] [, *options*]

| options | Description |
|---|---|
| [Main] | |
| <u>survival</u> | report Kaplan–Meier survivor function; the default |
| <u>failure</u> | report Kaplan–Meier failure function |
| <u>cumhaz</u> | report Nelson–Aalen cumulative hazard function |
| by(*varlist*) | estimate separate functions for each group formed by *varlist* |
| strata(*varlist*) | stratify on different groups of *varlist*; requires adjustfor() |
| <u>adj</u>ustfor(*varlist* [ , *suboptions* ]) | adjust the estimates to specific values of *varlist*; default is zero values |
| [Options] | |
| <u>level</u>(#) | set confidence level; default is level(95) |
| <u>risk</u>table | report estimated survivor or related function at all distinct observed times; the default |
| <u>risk</u>table(*numlist*) | report estimated survivor or related function at specified times |
| tmax(#) | display estimated function for $t \leq$ # |
| tmin(#) | display estimated function for $t \geq$ # |
| <u>enter</u> | report number who entered and number lost as pure censored instead of censored minus lost (net lost) |
| <u>nosh</u>ow | do not show st setting information |
| <u>compare</u> | report groups of estimated functions side by side; requires by() or strata() |
| <u>saving</u>(*filename* [ , replace ]) | save results to *filename*; use replace to overwrite existing *filename* |
| atrisk0 | report number who entered as number at risk at time 0 instead of a zero |

You must stset your data before using sts list; see [ST] stset.

fweights, iweights, and pweights may be specified using stset; see [ST] stset.

atrisk0 does not appear in the dialog box.

## Options

    [Main]

survival, failure, and cumhaz specify the function to report.

>   survival specifies that the Kaplan–Meier survivor function be listed. This option is the default if a function is not specified.

>   failure specifies that the Kaplan–Meier failure function $1 - S(t + 0)$ be listed.

>   cumhaz specifies that the Nelson–Aalen estimate of the cumulative hazard function be listed.

by(*varlist*) estimates a separate function for each by-group. By-groups are identified by equal values of the variables in *varlist*. by() may not be combined with strata().

strata(*varlist*) requests estimates of the survivor or failure function stratified on variables in *varlist*. It requires specifying adjustfor() and may not be combined with by() or cumhaz.

adjustfor(*varlist* [ , *suboptions* ]) adjusts the estimate of the survivor or failure function to specific values of *varlist*. The default is to adjust to 0 values, that is, to produce a baseline function. If you want to adjust the function to values different from 0, you can use adjustfor()'s at() suboption.

*suboptions* are atzeros (the default), atmeans, atomeans, atbase, and at(); see [ST] *adjustfor_option*.

Say you want to produce the survivor function adjusted to age of patients and the ages in your sample are 40–60 years. If you want to adjust the function to age 40, type

```
. sts list, adjustfor(age, at(age=40))
```

Or if you want to adjust the function to the mean age, type

```
. sts list, adjustfor(age, atmeans)
```

adjustfor() is not available with cumhaz.

If you specify adjustfor() with by(), sts list fits separate Cox regression models for each group, using the adjustfor() variables as covariates. The separately calculated baseline functions are then retrieved.

If you specify adjustfor() with strata(), sts list fits a stratified-on-group Cox regression model, using the adjustfor() variables as covariates. The stratified baseline function is then retrieved.

If adjustment to covariate values other than 0 is requested, the function is estimated at the specified covariate values.

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◻ Options ◻

level(*#*) specifies the confidence level, as a percentage, for the Greenwood pointwise confidence interval of the survivor or failure function or for the pointwise confidence interval of the Nelson–Aalen cumulative hazard function; see [U] **20.8 Specifying the width of confidence intervals**.

risktable or risktable(*numlist*) reports the estimated survivor, failure, or cumulative hazard function.

risktable, the default, reports the results at all the distinct observed times or, if functions are being compared, at about 10 times chosen over the observed interval. At time 0, the number at risk is zero. At other times, the number at risk records the number of subjects who are under observation and did not fail immediately prior to the reported time.

risktable(*numlist*) reports the results at time points specified in *numlist*. You can think of risktable(*numlist*) as a table representation of sts graph, risktable(*numlist*), except the number of failures is always reported with sts list, and the number at risk at time 0 is not the number of subjects in a study but is a zero. To match sts graph, you can use the atrisk0 option to report the number at risk at time 0 as the number who entered at that time instead of a zero.

risktable(5 10 20 30 50 90) would display the function at the designated times.

risktable(10 20 to 100) would display the function at times 10, 20, 30, 40, . . . , 100.

risktable(0 5 10 to 100 200) would display the function at times 0, 5, 10, 15, . . . , 100, and 200.

risktable(20) would display the function at time 20.

See example 1 under *Remarks and examples*.

tmax(*#*) specifies that the estimated function and other summaries be reported only for $t \leq$ *#*. This option does not affect the calculation of the function, rather the portion that is displayed, but it does affect the calculation of certain summaries such as the number of failures and the number lost. tmax(*#*) is ignored when *#* is smaller than the maximum time specified in risktable(*numlist*).

tmin(*#*) specifies that the estimated function and other summaries be reported only for $t \geq$ *#*. This option does not affect the calculation of the function, rather the portion that is displayed, but it does affect the calculation of certain summaries such as the number who entered. tmin(*#*) is ignored when *#* is larger than the minimum time specified in risktable(*numlist*).

enter specifies that the table contain the number who entered and, correspondingly, that the number lost be displayed as the pure number censored rather than censored minus entered (net lost). The logic underlying this is explained in *Counting the number lost to censoring* in [ST] **sts**.

noshow prevents sts list from showing the key st variables. This option is seldom used because most people type stset, show or stset, noshow to set whether they want to see these variables mentioned at the top of the output of every st command; see [ST] **stset**.

compare is specified only with by() or strata(). It compares the survivor, failure, or cumulative hazard functions and lists them side by side rather than first one and then the next.

saving(*filename* [ , replace ]) saves the results in a Stata data file (.dta file).

replace specifies that *filename* be overwritten if it exists.

The following option is available with sts list but is not shown in the dialog box:

atrisk0 specifies to report the number who entered as the number at risk at time 0 instead of the default zero value. By definition, the number at risk at time 0 is a zero. atrisk0 is useful with risktable(*numlist*) to match the at-risk table as reported by the corresponding sts graph, risktable(*numlist*) specification.

# Remarks and examples

sts list reports the estimated survivor, failure, or cumulative hazard function and, in the absence of probability weights, its standard errors and confidence intervals.

The Kaplan–Meier product-limit estimate of the survivor function is displayed by default or if you specify the survival option. Use the failure option to display the Kaplan–Meier product-limit estimate of the failure function. Or use the cumhaz option to display the Nelson–Aalen estimate of the cumulative hazard function.

Only three of sts list's options—adjustfor(), by(), and strata()—modify the calculation of a function. All the other options merely determine how the results of the calculation are displayed.

Specify the by() option to perform the calculation separately on the different groups and the compare option to see the results side by side.

Specify the adjustfor() option to calculate an adjusted survivor or failure function. If you also specify by() or strata(), this further modifies how the adjustment is made. With by(), the function is estimated after fitting separate Cox regression models for each group using the adjustfor() variables as covariates. With strata(), which requires adjustfor(), the function is estimated after fitting a stratified-on-group Cox regression model using the adjustfor() variables as covariates. Only the estimate of the function is reported with adjustfor().

By default, `sts list` displays the estimated function and other summaries such as the number at risk, the number of failures, and the number lost (censored) at all distinct observed times. You can specify the `risktable(numlist)` option to see the results at specific times. This is recommended for large datasets. In the presence of delayed entry or gaps, the command reports the number lost as net lost—the number of censored minus the number who entered. You can specify the `enter` option to see the number lost and the number who entered separately; see *Counting the number lost to censoring* in [ST] **sts**.

You can also restrict the maximum and minimum ranges of the observed times using the `tmax(#)` and `tmin(#)` options. These options do not affect the calculation of the estimated function but will affect the computation of certain summaries such as the number of failures and the number lost and will affect the display of the results; see example 1.

We demonstrate many of `sts list`'s features in [ST] **sts**. This discussion picks up where that entry leaves off.

▷ Example 1: Using option risktable()

By default, `sts list` will bury you in output. With the Stanford heart transplant data introduced in [ST] **stset**, the following commands produce 154 lines of output.

```
. use https://www.stata-press.com/data/r18/stan3
(Heart transplant data)

. stset, noshow

. sts list, by(posttran)

Kaplan-Meier survivor function
By variable: posttran
```

| Time | At risk | Fail | Net lost | Survivor function | Std. error | [95% conf. int.] | |
|---|---|---|---|---|---|---|---|
| posttran=0 | | | | | | | |
| 1 | 103 | 1 | 3 | 0.9903 | 0.0097 | 0.9331 | 0.9986 |
| 2 | 99 | 3 | 3 | 0.9603 | 0.0195 | 0.8976 | 0.9849 |
| 3 | 93 | 3 | 3 | 0.9293 | 0.0258 | 0.8574 | 0.9657 |
| (*output omitted*) | | | | | | | |
| 1400 | 1 | 0 | 1 | 0.2359 | 0.1217 | 0.0545 | 0.4882 |
| posttran=1 | | | | | | | |
| 1 | 0 | 0 | -3 | 1.0000 | . | . | . |
| 2 | 3 | 0 | -3 | 1.0000 | . | . | . |
| (*output omitted*) | | | | | | | |
| 5.1 | 14 | 1 | 0 | 0.9286 | 0.0688 | 0.5908 | 0.9896 |
| 6 | 13 | 0 | -1 | 0.9286 | 0.0688 | 0.5908 | 0.9896 |
| (*output omitted*) | | | | | | | |
| 1799 | 1 | 0 | 1 | 0.1420 | 0.0546 | 0.0566 | 0.2653 |

Note: Net lost equals the number lost minus the number who entered.

`risktable()` is the solution. Here is another detailed, but more useful, view of the heart transplant data:

```
. sts list, risktable(10 40 to 170) by(posttran)
Kaplan-Meier survivor function
By variable: posttran
```
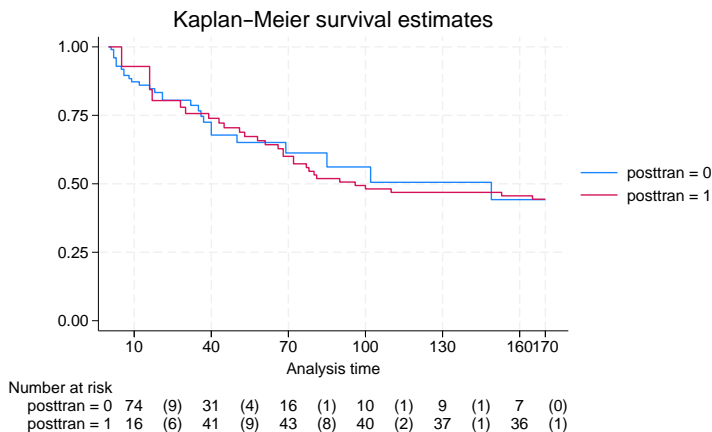
| Time | At risk | Fail | Net lost | Survivor function | Std. error | [95% conf. int.] | |
|------|---------|------|----------|-------------------|------------|------------------|------|
| posttran=0 | | | | | | | |
| 10 | 74 | 9 | 34 | 0.8724 | 0.0346 | 0.7858 | 0.9256 |
| 40 | 31 | 4 | 11 | 0.6781 | 0.0601 | 0.5446 | 0.7801 |
| 70 | 16 | 1 | 5 | 0.6126 | 0.0704 | 0.4603 | 0.7339 |
| 100 | 10 | 1 | 0 | 0.5616 | 0.0810 | 0.3900 | 0.7022 |
| 130 | 9 | 1 | 1 | 0.5054 | 0.0903 | 0.3199 | 0.6646 |
| 160 | 7 | 2 | 5 | 0.4422 | 0.0986 | 0.2480 | 0.6204 |
| posttran=1 | | | | | | | |
| 10 | 16 | 6 | -31 | 0.9286 | 0.0688 | 0.5908 | 0.9896 |
| 40 | 41 | 9 | -11 | 0.7391 | 0.0900 | 0.5140 | 0.8716 |
| 70 | 43 | 8 | -5 | 0.6002 | 0.0841 | 0.4172 | 0.7423 |
| 100 | 40 | 2 | 1 | 0.4814 | 0.0762 | 0.3271 | 0.6198 |
| 130 | 37 | 1 | 0 | 0.4687 | 0.0752 | 0.3174 | 0.6063 |
| 160 | 36 | 18 | 18 | 0.4561 | 0.0742 | 0.3076 | 0.5928 |

```
Notes: Survival-time summaries shown for specified times in (0, 1799].
       Net lost equals the number lost minus the number who entered.
```

We specified `risktable(10 40 to 170)`, but the time 170 was not displayed because the numlist 10 40 to 170 ends at 160. Specifying the numlist as 10 40 to 160 would have been clearer.

We obtain the same numbers at risk as produced by `sts graph`:

```
. sts graph, risktable(10 40 to 170, failevents lastfailure) by(posttran)
> xlabel(10 40 to 160 170) tmax(170)
```



The number of failures for the last interval reported by `sts graph` is 0 in the first group and 1 in the second group, whereas `sts list` reported 2 and 18, respectively. We specified `tmax(170)` with `sts graph` to restrict the range of the observed times to the maximum of 170, whereas `sts list` used the observed maximum times for each group (1,400 and 1,799). If we want to match the numbers of failures, we could specify `tmax(170)` with `sts list`:

```
. sts list, risktable(10 40 to 170) by(posttran) tmax(170)
```

Kaplan–Meier survivor function
By variable: posttran

| Time | At risk | Fail | Net lost | Survivor function | Std. error | [95% conf. int.] | |
|---|---|---|---|---|---|---|---|
| posttran=0 | | | | | | | |
| 10 | 74 | 9 | 34 | 0.8724 | 0.0346 | 0.7858 | 0.9256 |
| 40 | 31 | 4 | 11 | 0.6781 | 0.0601 | 0.5446 | 0.7801 |
| 70 | 16 | 1 | 5 | 0.6126 | 0.0704 | 0.4603 | 0.7339 |
| 100 | 10 | 1 | 0 | 0.5616 | 0.0810 | 0.3900 | 0.7022 |
| 130 | 9 | 1 | 1 | 0.5054 | 0.0903 | 0.3199 | 0.6646 |
| 160 | 7 | 0 | 1 | 0.4422 | 0.0986 | 0.2480 | 0.6204 |
| posttran=1 | | | | | | | |
| 10 | 16 | 6 | -31 | 0.9286 | 0.0688 | 0.5908 | 0.9896 |
| 40 | 41 | 9 | -11 | 0.7391 | 0.0900 | 0.5140 | 0.8716 |
| 70 | 43 | 8 | -5 | 0.6002 | 0.0841 | 0.4172 | 0.7423 |
| 100 | 40 | 2 | 1 | 0.4814 | 0.0762 | 0.3271 | 0.6198 |
| 130 | 37 | 1 | 0 | 0.4687 | 0.0752 | 0.3174 | 0.6063 |
| 160 | 36 | 1 | -1 | 0.4561 | 0.0742 | 0.3076 | 0.5928 |

Notes: Survival-time summaries shown for specified times in (0, 170].
       Net lost equals the number lost minus the number who entered.

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▷ Example 2: Nelson–Aalen estimated cumulative hazard

Continuing with example 1, we can produce similar output for the Nelson–Aalen estimated cumulative hazard by specifying the cumhaz option:

```
. sts list, cumhaz risktable(10 40 to 170) by(posttran)
```

Nelson–Aalen cumulative hazard function
By variable: posttran

| Time | At risk | Fail | Net lost | Cumulative hazard | Std. error | [95% conf. int.] | |
|---|---|---|---|---|---|---|---|
| posttran=0 | | | | | | | |
| 10 | 74 | 9 | 34 | 0.1349 | 0.0391 | 0.0764 | 0.2382 |
| 40 | 31 | 4 | 11 | 0.3824 | 0.0871 | 0.2448 | 0.5976 |
| 70 | 16 | 1 | 5 | 0.4813 | 0.1124 | 0.3044 | 0.7608 |
| 100 | 10 | 1 | 0 | 0.5646 | 0.1400 | 0.3473 | 0.9178 |
| 130 | 9 | 1 | 1 | 0.6646 | 0.1720 | 0.4002 | 1.1037 |
| 160 | 7 | 2 | 5 | 0.7896 | 0.2126 | 0.4658 | 1.3385 |
| posttran=1 | | | | | | | |
| 10 | 16 | 6 | -31 | 0.0714 | 0.0714 | 0.0101 | 0.5071 |
| 40 | 41 | 9 | -11 | 0.2929 | 0.1176 | 0.1334 | 0.6433 |
| 70 | 43 | 8 | -5 | 0.4981 | 0.1360 | 0.2916 | 0.8507 |
| 100 | 40 | 2 | 1 | 0.7155 | 0.1542 | 0.4691 | 1.0915 |
| 130 | 37 | 1 | 0 | 0.7418 | 0.1564 | 0.4908 | 1.1214 |
| 160 | 36 | 18 | 18 | 0.7689 | 0.1587 | 0.5130 | 1.1523 |

Notes: Survival-time summaries shown for specified times in (0, 1799].
       Net lost equals the number lost minus the number who entered.

We can use the `compare` option to compare the cumulative hazard functions of the two groups side by side:

```
. sts list, cumhaz risktable(10 40 to 170) by(posttran) compare

Nelson-Aalen cumulative hazard function
By variable: posttran

posttran                 0            1
─────────────────────────────────────────
Time      10       0.1349       0.0714
          40       0.3824       0.2929
          70       0.4813       0.4981
         100       0.5646       0.7155
         130       0.6646       0.7418
         160       0.7896       0.7689
─────────────────────────────────────────
```

◁

## Video example

How to calculate the Kaplan-Meier survivor and Nelson-Aalen cumulative hazard functions

## Methods and formulas

See [ST] **sts**.

## References

See [ST] **sts** for references.

## Also see

[ST] **sts** — Generate, graph, list, and test the survivor and related functions

[ST] **sts generate** — Create variables containing survivor and related functions

[ST] **sts graph** — Graph the survivor or related function

[ST] **sts test** — Test equality of survivor functions

[ST] **stset** — Declare data to be survival-time data

[ST] *adjustfor_option* — Adjust survivor and related functions for covariates at specific values