

stptime — Calculate person-time, incidence rates, and SMR

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Description

`stptime` calculates person-time and incidence rates. `stptime` computes standardized mortality/morbidity ratios (SMRs) after merging the data with a suitable file of standard rates specified with the `using()` option.

Quick start

Person-time and incidence rate using `stset` data

```
stptime
```

Same as above, but tabulate in ten-year intervals from 20 to 50

```
stptime, at(20(10)50)
```

Same as above, but exclude observations less than or equal to 20 or greater than 50

```
stptime, at(20(10)50) trim
```

Same as above, but report rate per 1,000 person-years with two decimal places

```
stptime, at(20(10)50) trim per(1000) dd(2)
```

Person-time and incidence rates for each level of `v1`

```
stptime, by(v1)
```

Standardized mortality ratios in 10-year intervals from 20 to 50 from reference rates `rvar` for lower end-points `lower`, defining each cohort saved in `mydata.dta`

```
stptime, at(20(10)50) smr(lower rvar) using(mydata)
```

Menu

[Statistics](#) > [Survival analysis](#) > [Summary statistics, tests, and tables](#) > [Person-time, incidence rates, and SMR](#)

Syntax

```
stptime [if] [, options]
```

options

Description

Main`at(numlist)`

compute person-time at specified intervals; default is to compute overall person-time and incidence rates

`trim`exclude observations \leq minimum or $>$ maximum of `at()``by(varname)`compute incidence rates or SMRs by *varname***Options**`per(#)`

units to be used in reported rates

`dd(#)`

number of decimal digits to be displayed

`smr(groupvar ratevar)`use *groupvar* and *ratevar* in `using()` dataset to calculate SMRs`using(filename)`specify filename to merge that contains `smr()` variables`level(#)`set confidence level; default is `level(95)``noshow`

do not show st setting information

Advanced`jackknife`

jackknife confidence intervals

`title(string)`label output table with *string*`output(filename [, replace])`save summary dataset as *filename*; use *replace* to overwrite existing *filename*

You must `stset` your data before using `stptime`; see [ST] `stset`.

`by` and `collect` are allowed; see [U] 11.1.10 **Prefix commands**.

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

Options

Main

`at(numlist)` specifies intervals at which person-time is to be computed. The intervals are specified in analysis time t units. If `at()` is not specified, overall person-time and incidence rates are computed.

If, for example, you specify `at(5(5)20)` and the `trim` option is not specified, person-time is reported for the intervals $t = (0 - 5]$, $t = (5 - 10]$, $t = (10 - 15]$, and $t = (15 - 20]$.

`trim` specifies that observations less than or equal to the minimum or greater than the maximum value listed in `at()` be excluded from the computations.

`by(varname)` specifies a categorical variable by which incidence rates or SMRs are to be computed.

Options

`per(#)` specifies the units to be used in reported rates. For example, if the analysis time is in years, specifying `per(1000)` results in rates per 1,000 person-years.

`dd(#)` specifies the maximum number of decimal digits to be reported for rates, ratios, and confidence intervals. This option affects only how values are displayed, not how they are calculated.

`smr(groupvar ratevar)` specifies two variables in the `using()` dataset. The *groupvar* identifies the age-group or calendar-period variable used to match the data in memory and the `using()` dataset. The *ratevar* variable contains the appropriate reference rates. `stptime` then calculates SMRs rather than incidence rates.

`using(filename)` specifies the filename that contains a file of standard rates that is to be merged with the data so that SMRs can be calculated.

`level(#)` specifies the confidence level, as a percentage, for confidence intervals. The default is `level(95)` or as set by `set level`; see [U] 20.8 Specifying the width of confidence intervals.

`noshow` prevents `stptime` 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`.

Advanced

`jackknife` specifies that jackknife confidence intervals be produced. This is the default if `pweights` or `iweights` were specified when the dataset was `stset`.

`title(string)` replaces the default “Person-time” label on the output table with *string*.

`output(filename [, replace])` saves a summary dataset in *filename*. The file contains counts of failures and person-time, incidence rates (or SMRs), confidence limits, and categorical variables identifying the time intervals. This dataset could be used for further calculations or simply as input to the `table` command.

`replace` specifies that *filename* be overwritten if it exists. This option is not shown in the dialog box.

Remarks and examples

[stata.com](http://www.stata.com)

`stptime` computes and tabulates the person-time and incidence rate (formed from the number of failures divided by the person-time). If you use the `by()` option, this will be calculated by different levels of one or more categorical explanatory variables specified by *varname*. Confidence intervals for the rate are also given. By default, the confidence intervals are calculated using the quadratic approximation to the Poisson log likelihood for the log-rate parameter. However, whenever the Poisson assumption is questionable, such as when `pweights` or `iweights` are used, jackknife confidence intervals can also be calculated.

`stptime` can also calculate and report SMRs if the data have been merged with a suitable file of reference rates.

If `pweights` or `iweights` were specified when the dataset was `stset`, `stptime` calculates jackknife confidence intervals by default.

The summary dataset can be saved to a file specified with the `output()` option for further analysis or a more elaborate graphical display.

▷ Example 1

We begin with a simple fictitious example from Clayton and Hills (1993, 42). Thirty subjects were monitored until the development of a particular disease. Here are the data for the first five subjects:

```
. use https://www.stata-press.com/data/r18/stptime
. list in 1/5
```

	id	year	fail
1.	1	19.6	1
2.	2	10.8	1
3.	3	14.1	1
4.	4	3.5	1
5.	5	4.8	1

The `id` variable identifies the subject, `year` records the time to failure in years, and `fail` is the failure indicator, which is 1 for all 30 subjects in the data. To use `stptime`, we must first `stset` the data.

```
. stset year, fail(fail) id(id)
Survival-time data settings
      ID variable: id
      Failure event: fail!=0 & fail<.
Observed time interval: (year[_n-1], year]
      Exit on or before: failure
```

```
      30 total observations
      0 exclusions
```

```
      30 observations remaining, representing
      30 subjects
      30 failures in single-failure-per-subject data
261.9 total analysis time at risk and under observation
              At risk from t =          0
      Earliest observed entry t =          0
              Last observed exit t =      36.5
```

We can use `stptime` to obtain the overall person-time of observation and disease incidence rate.

```
. stptime, title(Person-years)
      Failure _d: fail
      Analysis time _t: year
      ID variable: id
Estimated person-time and incidence rate
```

Cohort	Person-years	Failures	Rate	[95% conf. interval]
Total	261.9	30	.11454754	.08009 .1638299

The total 261.9 person-years reported by `stptime` matches what `stset` reported as total analysis time at risk. `stptime` computed an incidence rate of 0.11454754 per person-year. In epidemiology, incidence rates are often presented per 1,000 person-years. We can do this by specifying `per(1000)`.

```
. stptime, title(Person-years) per(1000)
      Failure _d: fail
      Analysis time _t: year
      ID variable: id
```

Estimated person-time and incidence rate

Cohort	Person-years	Failures	Rate	[95% conf. interval]	
Total	261.9	30	114.54754	80.09001	163.8299

More interesting would be to compare incidence rates at 10-year intervals. We will specify `dd(4)` to display rates to four decimal places.

```
. stptime, per(1000) at(0(10)40) dd(4)
      Failure _d: fail
      Analysis time _t: year
      ID variable: id
```

Estimated person-time and incidence rates

Cohort	Person-time	Failures	Rate	[95% conf. interval]	
(0 - 10]	188.8000	18	95.3390	60.0676	151.3215
(10 - 20]	55.1000	10	181.4882	97.6506	337.3044
(20 - 30]	11.5000	1	86.9565	12.2490	617.3106
> 30	6.5000	1	153.8462	21.6713	1092.1648
Total	261.9000	30	114.5475	80.0900	163.8299

◀

▷ Example 2

Using the diet data (Clayton and Hills 1993) described in [example 1](#) of [\[ST\] stsplit](#), we will use `stptime` to tabulate age-specific person-years and coronary heart disease (CHD) incidence rates. In this dataset, CHD has been coded as `fail = 1, 3, or 13`.

We first `stset` the data: failure codes for CHD are specified; origin is set to date of birth, making age the analysis time; and the scale is set to 365.25, so analysis time is measured in years.

```
. use https://www.stata-press.com/data/r18/diet
(Diet data with dates)
. stset dox, origin(time dob) enter(time doe) id(id) scale(365.25)
> fail(fail==1 3 13)
Survival-time data settings
      ID variable: id
      Failure event: fail==1 3 13
Observed time interval: (dox[_n-1], dox]
      Enter on or after: time doe
      Exit on or before: failure
      Time for analysis: (time-origin)/365.25
      Origin: time dob
```

```
337 total observations
  0 exclusions
```

```
337 observations remaining, representing
337 subjects
  46 failures in single-failure-per-subject data
4,603.669 total analysis time at risk and under observation
      At risk from t = 0
      Earliest observed entry t = 30.07529
      Last observed exit t = 69.99863
```

The incidence of CHD per 1,000 person-years can be tabulated in 10-year intervals.

```
. stptime, per(1000) at(40(10)70) trim
      Failure _d: fail==1 3 13
      Analysis time _t: (dox-origin)/365.25
      Origin: time dob
      Enter on or after: time doe
      ID variable: id
      Note: _group<=40 trimmed
```

Estimated person-time and incidence rates

Cohort	Person-time	Failures	Rate	[95% conf. interval]	
(40 - 50]	907.00616	6	6.6151701	2.971936	14.72457
(50 - 60]	2107.0418	18	8.5427828	5.382317	13.55906
(60 - 70]	1493.2923	22	14.732548	9.700656	22.37457
Total	4507.3402	46	10.205575	7.644246	13.62512

The SMR for a cohort is the ratio of the total number of observed deaths to the number expected from age-specific reference rates. This expected number can be found by multiplying the person-time in each cohort by the reference rate for that cohort. Using the `smr` option to define the cohort variable and reference rate variable in the `using()` dataset, `stptime` calculates SMRs and confidence intervals. You must specify the `per()` option. For example, if the reference rates were per 100,000, you would specify `per(100000)`.

► Example 3

In `smrchd.dta`, we have age-specific CHD rates per 1,000 person-years for a reference population. We can merge these data with our current data and use `stptime` to obtain SMRs and confidence intervals.

```
. stptime, smr(ageband rate) using(https://www.stata-press.com/data/r18/smrchd)
> per(1000) at(40(10)70) trim

      Failure _d: fail==1 3 13
      Analysis time _t: (dox-origin)/365.25
                Origin: time dob
      Enter on or after: time doe
      ID variable: id
      Note: _group<=40 trimmed
```

Estimated person-time and standardized mortality ratios

Cohort	Person-time	Observed failures	Expected failures	SMR	[95% conf. interval]	
(40 - 50]	907.00616	6	5.62344	1.067	.4793445	2.374931
(50 - 60]	2107.0418	18	18.7527	.95986	.6047547	1.52349
(60 - 70]	1493.2923	22	22.8474	.96291	.6340298	1.46239
Total	4507.3402	46	47.2235	.97409	.7296205	1.300477

The `stptime` command can also calculate person-time and incidence rates or SMRs by categories of the explanatory variable. In our diet data, the variable `hienergy` is coded 1 if the total energy consumption is more than 2.75 Mcal and 0 otherwise. We want to compute the person-years and incidence rates for these two levels of `hienergy`.

```
. stptime, by(hienergy) per(1000)

      Failure _d: fail==1 3 13
      Analysis time _t: (dox-origin)/365.25
                Origin: time dob
      Enter on or after: time doe
      ID variable: id
```

Estimated person-time and incidence rates

hienergy	Person-time	Failures	Rate	[95% conf. interval]	
0	2059.4305	28	13.595992	9.387478	19.69123
1	2544.2382	18	7.0748093	4.457431	11.2291
Total	4603.6687	46	9.9920309	7.484296	13.34002

We can also compute the incidence rate for the two levels of `hienergy` and the three previously defined age cohorts:

```
. stptime, by(hienergy) per(1000) at(40(10)70) trim
      Failure _d: fail==1 3 13
      Analysis time _t: (dox-origin)/365.25
                Origin: time dob
      Enter on or after: time doe
                ID variable: id
```

Estimated person-time and incidence rates

hienergy	Person-time	Failures	Rate	[95% conf. interval]	
0					
(40 - 50]	346.87474	2	5.76577	1.442006	23.05407
(50 - 60]	979.34018	12	12.253148	6.958681	21.57587
> 60	699.13758	14	20.024671	11.85966	33.81104
1					
(40 - 50]	560.13142	4	7.1411813	2.680213	19.02702
(50 - 60]	1127.7016	6	5.3205566	2.390317	11.84292
> 60	794.15469	8	10.073604	5.037786	20.14327
Total	4507.3402	46	10.205575	7.644246	13.62512

Or we can compute the corresponding SMR:

```
. stptime, smr(ageband rate) using(https://www.stata-press.com/data/r18/smrchd)
> by(hienergy) per(1000) at(40(10)70) trim
      Failure _d: fail==1 3 13
      Analysis time _t: (dox-origin)/365.25
                Origin: time dob
      Enter on or after: time doe
                ID variable: id
```

Estimated person-time and standardized mortality ratios

hienergy	Person-time	Observed failures	Expected failures	SMR	[95% conf. interval]	
0						
(40 - 50]	346.87474	2	2.15062	.9299629	.2325815	3.718399
(50 - 60]	979.34018	12	8.71613	1.376758	.7818743	2.424256
> 60	699.13758	14	10.6968	1.308802	.7751411	2.209872
1						
(40 - 50]	560.13142	4	3.47281	1.151803	.4322924	3.068875
(50 - 60]	1127.7016	6	10.0365	.5978154	.2685749	1.330665
> 60	794.15469	8	12.1506	.6584055	.329267	1.316554
Total	4507.3402	46	47.2235	.9740917	.7296205	1.300477

◀

Video example

[How to calculate incidence rates and incidence-rate ratios](#)

Stored results

stptime stores the following in `r()`:

Scalars

<code>r(ptime)</code>	person-time
<code>r(failures)</code>	observed failures
<code>r(rate)</code>	failure rate
<code>r(expected)</code>	expected number of failures
<code>r(smr)</code>	standardized mortality ratio
<code>r(lb)</code>	lower bound for SMR
<code>r(ub)</code>	upper bound for SMR

References

- Clayton, D. G., and M. Hills. 1993. *Statistical Models in Epidemiology*. Oxford: Oxford University Press.
- Rutherford, M. J., P. C. Lambert, and J. Thompson. 2010. [Age-period-cohort modeling](#). *Stata Journal* 10: 606–627.

Also see

- [ST] [stci](#) — Confidence intervals for means and percentiles of survival time
- [ST] [stir](#) — Report incidence-rate comparison
- [ST] [strate](#) — Tabulate failure rates and rate ratios
- [ST] [stset](#) — Declare data to be survival-time data
- [ST] [stsplit](#) — Split and join time-span records
- [R] [Epitab](#) — Tables for epidemiologists

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