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
```

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

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

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

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

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)
```
2  stptime — Calculate person-time, incidence rates, and SMR

Syntax

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

### options Description

<table>
<thead>
<tr>
<th>Main</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><code>at(numlist)</code></td>
<td>compute person-time at specified intervals; default is to compute overall person-time and incidence rates</td>
</tr>
<tr>
<td><code>trim</code></td>
<td>exclude observations ( \leq ) minimum or &gt; maximum of <code>at()</code></td>
</tr>
<tr>
<td><code>by(varname)</code></td>
<td>compute incidence rates or SMRs by <code>varname</code></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><code>per(#)</code></td>
<td>units to be used in reported rates</td>
</tr>
<tr>
<td><code>dd(#)</code></td>
<td>number of decimal digits to be displayed</td>
</tr>
<tr>
<td><code>smr(groupvar ratevar)</code></td>
<td>use <code>groupvar</code> and <code>ratevar</code> in <code>using()</code> dataset to calculate SMRs</td>
</tr>
<tr>
<td><code>using(filename)</code></td>
<td>specify filename to merge that contains <code>smr()</code> variables</td>
</tr>
<tr>
<td><code>level(#)</code></td>
<td>set confidence level; default is <code>level(95)</code></td>
</tr>
<tr>
<td><code>nosh</code></td>
<td>do not show st setting information</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advanced</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><code>jackknife</code></td>
<td>jackknife confidence intervals</td>
</tr>
<tr>
<td><code>title(string)</code></td>
<td>label output table with <code>string</code></td>
</tr>
<tr>
<td><code>output(filename[, replace])</code></td>
<td>save summary dataset as <code>filename</code>; use <code>replace</code> to overwrite existing <code>filename</code></td>
</tr>
</tbody>
</table>

You must `stset` your data before using `stptime`; see [ST] stset.
by is allowed; see [D] by.

`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

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.
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/r16/stptime
. list in 1/5
```

<table>
<thead>
<tr>
<th>id</th>
<th>year</th>
<th>fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19.6</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>10.8</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>14.1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>3.5</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>4.8</td>
<td>1</td>
</tr>
</tbody>
</table>

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)
```

```
| id: id
| failure event: fail != 0 & fail < .
| obs. 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)
```

```
<table>
<thead>
<tr>
<th>Cohort</th>
<th>Person-years</th>
<th>Failures</th>
<th>Rate</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>261.9</td>
<td>30</td>
<td>0.11454754</td>
<td>0.08009</td>
</tr>
</tbody>
</table>
```

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)
```

```
<table>
<thead>
<tr>
<th>Cohort</th>
<th>Person-years</th>
<th>Failures</th>
<th>Rate</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>261.9</td>
<td>30</td>
<td>114.54754</td>
<td>80.09001</td>
</tr>
</tbody>
</table>
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)
```

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Person-time</th>
<th>Failures</th>
<th>Rate</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0 - 10]</td>
<td>188.8000</td>
<td>18</td>
<td>95.3390</td>
<td>60.0676  151.3215</td>
</tr>
<tr>
<td>(10 - 20]</td>
<td>55.1000</td>
<td>10</td>
<td>181.4882</td>
<td>97.6506  337.3044</td>
</tr>
<tr>
<td>(20 - 30]</td>
<td>11.5000</td>
<td>1</td>
<td>86.9565</td>
<td>12.2490  617.3106</td>
</tr>
<tr>
<td>&gt; 30</td>
<td>6.5000</td>
<td>1</td>
<td>153.8462</td>
<td>21.6713  1092.1648</td>
</tr>
<tr>
<td>Total</td>
<td>261.9000</td>
<td>30</td>
<td>114.5475</td>
<td>80.0900  163.8299</td>
</tr>
</tbody>
</table>

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/r16/diet
   (Diet data with dates)
. stset dox, origin(time dob) enter(time doe) id(id) scale(365.25)
   > fail(fail==1 3 13)
```

```
    id: id
  failure event: fail == 1 3 13
obs. time interval: (dox[_n-1], dox]
enter on or after: time doe
exit on or before: failure
  t for analysis: (time-origin)/365.25
    origin: time dob
```

<table>
<thead>
<tr>
<th>Summary of <code>stset</code> command</th>
</tr>
</thead>
<tbody>
<tr>
<td>337 total observations</td>
</tr>
<tr>
<td>0 exclusions</td>
</tr>
</tbody>
</table>

```
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: id
  note: _group<=40 trimmed
```

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Person-time</th>
<th>Failures</th>
<th>Rate</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(40 - 50]</td>
<td>907.00616</td>
<td>6</td>
<td>6.6151701</td>
<td>2.971936  14.72457</td>
</tr>
<tr>
<td>(50 - 60]</td>
<td>2107.0418</td>
<td>18</td>
<td>8.5427828</td>
<td>5.382317  13.55906</td>
</tr>
<tr>
<td>(60 - 70]</td>
<td>1493.2923</td>
<td>22</td>
<td>14.732548</td>
<td>9.700656  22.37457</td>
</tr>
<tr>
<td>Total</td>
<td>4507.3402</td>
<td>46</td>
<td>10.205575</td>
<td>7.644246  13.62512</td>
</tr>
</tbody>
</table>

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/r16/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: id
  note: _group<=40 trimmed
```

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Person-time</th>
<th>Observed</th>
<th>Expected failures</th>
<th>SMR</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(40 - 50]</td>
<td>907.00616</td>
<td>6</td>
<td>5.62344</td>
<td>1.067</td>
<td>.4793445  2.374931</td>
</tr>
<tr>
<td>(50 - 60]</td>
<td>2107.0418</td>
<td>18</td>
<td>18.7527</td>
<td>.95986</td>
<td>.6047547  1.52349</td>
</tr>
<tr>
<td>(60 - 70]</td>
<td>1493.2923</td>
<td>22</td>
<td>22.8474</td>
<td>.96291</td>
<td>.6340298  1.46239</td>
</tr>
<tr>
<td>Total</td>
<td>4507.3402</td>
<td>46</td>
<td>47.2235</td>
<td>.97409</td>
<td>.7296205  1.300477</td>
</tr>
</tbody>
</table>

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: id

<table>
<thead>
<tr>
<th>hienergy</th>
<th>Person-time</th>
<th>Failures</th>
<th>Rate</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2059.4305</td>
<td>28</td>
<td>13.595992</td>
<td>9.387478 - 19.69123</td>
</tr>
<tr>
<td>1</td>
<td>2544.2382</td>
<td>18</td>
<td>7.0748093</td>
<td>4.457431 - 11.2291</td>
</tr>
<tr>
<td>Total</td>
<td>4603.6687</td>
<td>46</td>
<td>9.9920309</td>
<td>7.484296 - 13.34002</td>
</tr>
</tbody>
</table>

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: id

<table>
<thead>
<tr>
<th>hienergy</th>
<th>Person-time</th>
<th>Failures</th>
<th>Rate</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>346.87474</td>
<td>2</td>
<td>5.76577</td>
<td>1.442006 - 23.05407</td>
</tr>
<tr>
<td>(40 - 50)</td>
<td>979.34018</td>
<td>12</td>
<td>12.253148</td>
<td>6.958681 - 21.57587</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>699.13758</td>
<td>14</td>
<td>20.024671</td>
<td>11.85966 - 33.81104</td>
</tr>
<tr>
<td>1</td>
<td>560.13142</td>
<td>4</td>
<td>7.1411813</td>
<td>2.680213 - 19.02702</td>
</tr>
<tr>
<td>(40 - 50)</td>
<td>1127.7016</td>
<td>6</td>
<td>5.3205566</td>
<td>2.390317 - 11.84292</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>794.15469</td>
<td>8</td>
<td>10.073604</td>
<td>5.037786 - 20.14327</td>
</tr>
<tr>
<td>Total</td>
<td>4507.3402</td>
<td>46</td>
<td>10.205575</td>
<td>7.644246 - 13.62512</td>
</tr>
</tbody>
</table>

Or we can compute the corresponding SMR:

. stptime, smr(ageband rate) using(https://www.stata-press.com/data/r16/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: id

<table>
<thead>
<tr>
<th>hienergy</th>
<th>Person-time</th>
<th>Observed failures</th>
<th>Expected failures</th>
<th>SMR</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>346.87474</td>
<td>2</td>
<td>2.15062</td>
<td>1.442006</td>
<td>23.05407</td>
</tr>
<tr>
<td>(40 - 50)</td>
<td>979.34018</td>
<td>12</td>
<td>8.71613</td>
<td>1.376758</td>
<td>21.57587</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>699.13758</td>
<td>14</td>
<td>10.6968</td>
<td>1.308802</td>
<td>33.81104</td>
</tr>
<tr>
<td>1</td>
<td>560.13142</td>
<td>4</td>
<td>7.1411813</td>
<td>2.680213</td>
<td>19.02702</td>
</tr>
<tr>
<td>(40 - 50)</td>
<td>1127.7016</td>
<td>6</td>
<td>10.0365</td>
<td>.5978154</td>
<td>11.84292</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>794.15469</td>
<td>8</td>
<td>12.1506</td>
<td>.6584055</td>
<td>20.14327</td>
</tr>
<tr>
<td>Total</td>
<td>4507.3402</td>
<td>46</td>
<td>47.2235</td>
<td>.9740917</td>
<td>1.300477</td>
</tr>
</tbody>
</table>
Video example

How to calculate incidence rates and incidence-rate ratios

Stored results

stptime stores the following in r():

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

References


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