

pksumm — Summarize pharmacokinetic data[Description](#)
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Description

`pksumm` obtains summary measures based on the first four moments from the empirical distribution of each pharmacokinetic measurement and tests the null hypothesis that the distribution of that measurement is normally distributed.

`pksumm` is one of the `pk` commands. Please read [\[R\] pk](#) before reading this entry.

Quick start

Table of pharmacokinetic measures for concentrations `y` at times `tvar` for patients identified by `idvar`

```
pksumm idvar tvar y
```

Add a histogram of $AUC_{0,t_{\max}}$ values

```
pksumm idvar tvar y, graph
```

Same as above

```
pksumm idvar tvar y, graph stat(auc)
```

As above, but plot AUC calculated from 0 to ∞ using a linear extension

```
pksumm idvar tvar y, graph stat(aucline)
```

As above, but use 10 bins for the histogram

```
pksumm idvar tvar y, graph stat(aucline) bin(10)
```

Menu

Statistics > Epidemiology and related > Other > Summarize pharmacokinetic data

Syntax

```
pksumm id time concentration [if] [in] [, options]
```

| <i>options</i> | Description |
|-------------------------------------|--|
| Main | |
| <code>trapezoid</code> | use trapezoidal rule to calculate AUC; default is cubic splines |
| <code>fit(#)</code> | use # points to estimate AUC; default is <code>fit(3)</code> |
| <code>notimechk</code> | do not check whether follow-up time for all subjects is the same |
| <code>nodots</code> | suppress the dots during calculation |
| <code>graph</code> | graph the distribution of <i>statistic</i> |
| <code>stat(<i>statistic</i>)</code> | graph the specified statistic; default is <code>stat(auc)</code> |

Histogram, Density plots, Y axis, X axis, Titles, Legend, Overall

| | |
|--------------------------------|---|
| <code>histogram_options</code> | any option other than <code>by()</code> documented in [R] histogram |
|--------------------------------|---|

| <i>statistic</i> | Description |
|----------------------|---|
| <code>auc</code> | area under the concentration-time curve ($AUC_{0,\infty}$); the default |
| <code>aucline</code> | area under the concentration-time curve from 0 to ∞ using a linear extension |
| <code>aucexp</code> | area under the concentration-time curve from 0 to ∞ using an exponential extension |
| <code>auclog</code> | area under the log-concentration-time curve extended with a linear fit |
| <code>half</code> | half-life of the drug |
| <code>ke</code> | elimination rate |
| <code>cmax</code> | maximum concentration |
| <code>tmax</code> | time at last concentration |
| <code>tomc</code> | time of maximum concentration |

Options

Main

`trapezoid` specifies that the trapezoidal rule be used to calculate the AUC. The default is cubic splines, which give better results for most situations. When the curve is irregular, the trapezoidal rule may give better results.

`fit(#)` specifies the number of points, counting back from the last time measurement, to use in fitting the extension to estimate the $AUC_{0,\infty}$. The default is `fit(3)`, the last three points. This default should be viewed as a minimum; the appropriate number of points will depend on the data.

`notimechk` suppresses the check that the follow-up time for all subjects is the same. By default, `pksumm` expects the maximum follow-up time to be equal for all subjects.

`nodots` suppresses the progress dots during calculation. By default, a period is displayed for every call to calculate the pharmacokinetic measures.

`graph` requests a graph of the distribution of the statistic specified with `stat()`.

`stat(statistic)` specifies the statistic that `pksumm` should graph. The default is `stat(auc)`. If the `graph` option is not specified, this option is ignored.

Histogram, Density plots, Y axis, X axis, Titles, Legend, Overall

`histogram_options` are any of the options documented in [R] [histogram](#), excluding `by()`. For `pksumm`, `fraction` is the default, not density.

Remarks and examples

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

`pksumm` produces summary statistics for the distribution of nine common pharmacokinetic measurements. If there are more than eight subjects, `pksumm` also computes a test for normality on each measurement. The nine measurements summarized by `pksumm` are listed [above](#) and are described in [Methods and formulas](#) of [R] [pkexamine](#).

► Example 1

We demonstrate the use of `pksumm` on a variation of the data described in [R] [pk](#). We have drug concentration data on 15 subjects, each measured at 13 time points over a 32-hour period. A few of the records are

```
. use http://www.stata-press.com/data/r14/pksumm
. list, sep(0)
```

| | id | time | conc |
|-------------------------|----|------|----------|
| 1. | 1 | 0 | 0 |
| 2. | 1 | .5 | 3.073403 |
| 3. | 1 | 1 | 5.188444 |
| 4. | 1 | 1.5 | 5.898577 |
| 5. | 1 | 2 | 5.096378 |
| 6. | 1 | 3 | 6.094085 |
| <i>(output omitted)</i> | | | |
| 183. | 15 | 0 | 0 |
| 184. | 15 | .5 | 3.86493 |
| 185. | 15 | 1 | 6.432444 |
| 186. | 15 | 1.5 | 6.969195 |
| 187. | 15 | 2 | 6.307024 |
| 188. | 15 | 3 | 6.509584 |
| 189. | 15 | 4 | 6.555091 |
| 190. | 15 | 6 | 7.318319 |
| 191. | 15 | 8 | 5.329813 |
| 192. | 15 | 12 | 5.411624 |
| 193. | 15 | 16 | 3.891397 |
| 194. | 15 | 24 | 5.167516 |
| 195. | 15 | 32 | 2.649686 |

We can use `pksumm` to view the summary statistics for all the pharmacokinetic parameters.

```
. pksumm id time conc
.....
Summary statistics for the pharmacokinetic measures
                                     Number of observations = 15
```

| Measure | Mean | Median | Variance | Skewness | Kurtosis | p-value |
|---------|--------|--------|-----------|----------|----------|---------|
| auc | 150.74 | 150.96 | 123.07 | -0.26 | 2.10 | 0.69 |
| aucline | 408.30 | 214.17 | 188856.87 | 2.57 | 8.93 | 0.00 |
| aucexp | 691.68 | 297.08 | 762679.94 | 2.56 | 8.87 | 0.00 |
| auclog | 688.98 | 297.67 | 797237.24 | 2.59 | 9.02 | 0.00 |
| half | 94.84 | 29.39 | 18722.13 | 2.26 | 7.37 | 0.00 |
| ke | 0.02 | 0.02 | 0.00 | 0.89 | 3.70 | 0.09 |
| cmax | 7.36 | 7.42 | 0.42 | -0.60 | 2.56 | 0.44 |
| tomc | 3.47 | 3.00 | 7.62 | 2.17 | 7.18 | 0.00 |
| tmax | 32.00 | 32.00 | 0.00 | . | . | . |

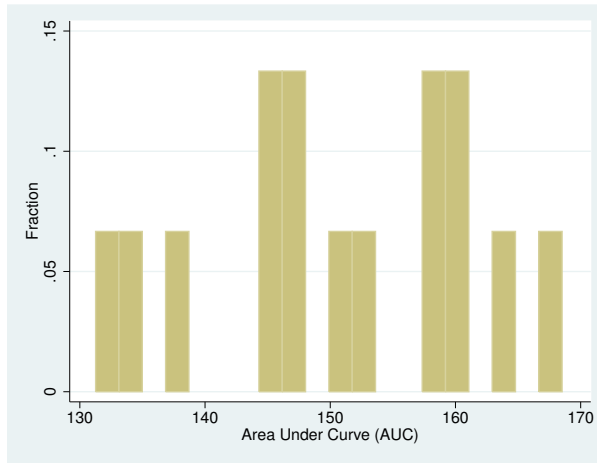
For the 15 subjects, the mean $AUC_{0,t_{\max}}$ is 150.74, and $\sigma^2 = 123.07$. The skewness of -0.26 indicates that the distribution is slightly skewed left. The p -value of 0.69 for the χ^2 test of normality indicates that we cannot reject the null hypothesis that the distribution is normal.

If we were to consider any of the three variants of the $AUC_{0,\infty}$, we would see that there is huge variability and that the distribution is heavily skewed. A skewness different from 0 and a kurtosis different from 3 are expected because the distribution of the $AUC_{0,\infty}$ is not normal.

We now graph the distribution of $AUC_{0,t_{\max}}$ by specifying the `graph` option.

```
. pksumm id time conc, graph bin(20)
.....
Summary statistics for the pharmacokinetic measures
                                     Number of observations = 15
```

| Measure | Mean | Median | Variance | Skewness | Kurtosis | p-value |
|---------|--------|--------|-----------|----------|----------|---------|
| auc | 150.74 | 150.96 | 123.07 | -0.26 | 2.10 | 0.69 |
| aucline | 408.30 | 214.17 | 188856.87 | 2.57 | 8.93 | 0.00 |
| aucexp | 691.68 | 297.08 | 762679.94 | 2.56 | 8.87 | 0.00 |
| auclog | 688.98 | 297.67 | 797237.24 | 2.59 | 9.02 | 0.00 |
| half | 94.84 | 29.39 | 18722.13 | 2.26 | 7.37 | 0.00 |
| ke | 0.02 | 0.02 | 0.00 | 0.89 | 3.70 | 0.09 |
| cmax | 7.36 | 7.42 | 0.42 | -0.60 | 2.56 | 0.44 |
| tomc | 3.47 | 3.00 | 7.62 | 2.17 | 7.18 | 0.00 |
| tmax | 32.00 | 32.00 | 0.00 | . | . | . |



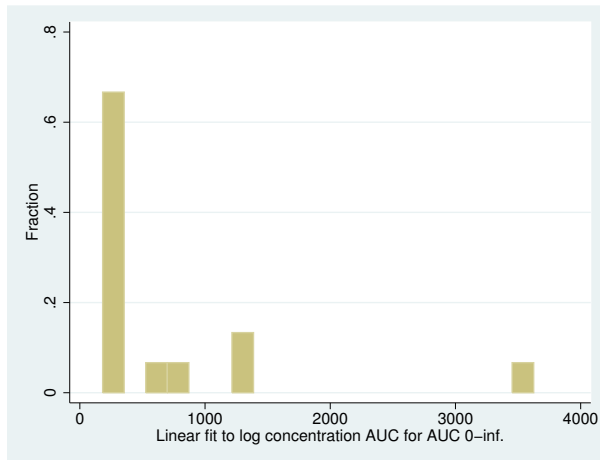
graph, by default, plots $AUC_{0,t_{max}}$. To plot a graph of one of the other pharmacokinetic measurements, we need to specify the `stat()` option. For example, we can ask Stata to produce a plot of the $AUC_{0,\infty}$ using the `log` extension:

```
. pksumm id time conc, stat(auclog) graph bin(20)
```

```
.....
```

```
Summary statistics for the pharmacokinetic measures
```

| Measure | Number of observations = 15 | | | | | |
|---------|-----------------------------|--------|-----------|----------|----------|---------|
| | Mean | Median | Variance | Skewness | Kurtosis | p-value |
| auc | 150.74 | 150.96 | 123.07 | -0.26 | 2.10 | 0.69 |
| aucline | 408.30 | 214.17 | 188856.87 | 2.57 | 8.93 | 0.00 |
| aucexp | 691.68 | 297.08 | 762679.94 | 2.56 | 8.87 | 0.00 |
| auclog | 688.98 | 297.67 | 797237.24 | 2.59 | 9.02 | 0.00 |
| half | 94.84 | 29.39 | 18722.13 | 2.26 | 7.37 | 0.00 |
| ke | 0.02 | 0.02 | 0.00 | 0.89 | 3.70 | 0.09 |
| cmax | 7.36 | 7.42 | 0.42 | -0.60 | 2.56 | 0.44 |
| tomc | 3.47 | 3.00 | 7.62 | 2.17 | 7.18 | 0.00 |
| tmax | 32.00 | 32.00 | 0.00 | . | . | . |



Methods and formulas

The χ^2 test for normality is conducted with `sktest`; see [\[R\] `sktest`](#) for more information on the test of normality.

The statistics reported by `pksumm` are identical to those reported by `summarize` and `sktest`; see [\[R\] `summarize`](#) and [\[R\] `sktest`](#).

Also see

[\[R\] `pk`](#) — Pharmacokinetic (biopharmaceutical) data