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How is error handling done in *Sherpa* as opposed to XSPEC?

PHA files have a column called STAT_ERR. In CIAO this is calculated using the chi gehrels statistic:

```
STAT_ERR = 1.0 + sqrt(n_i + 0.75)
```

That is, if COUNTS=0:

```
STAT_ERR = 1.0 + sqrt(COUNTS + 0.75) = 1.86603
```

In Sherpa: the STAT_ERR column is *not* used by default. If *Sherpa* detects that it exists, it returns a message like:

```
WARNING: statistical errors specified in the PHA file.
         These are currently IGNORED. To use them, type:
         READ ERRORS "<filename>[cols CHANNEL,STAT_ERR]" fitsbin
```

If the data are grouped, *Sherpa* calculates the GRP_STAT_ERR based on

1. the counts in the group (i.e. GRP_DATA)
2. the chosen statistic

In XSPEC: the STAT_ERR column *is* used by default.

If the data are grouped then XSPEC calculates the GRP_STAT_ERR = sqrt(SUM STAT_ERR**2) over the group. This gives an error which is much larger than the correct one calculated from the counts in the group.

In order to ignore the STAT_ERR column in XSPEC, the following workaround needs to be applied. From the "Points to Note & Conventions" in the documentation on the OGIP standard format for spectral files:

```
In the case of Data in units of Counts per channel (only),
if appropriate the Stat_err column can be deleted from the
data table & POISSERR=T specified as a keyword within the
extension header. XSPEC will then assume Poissonian errors
are appropriate to the data stored in Data.
```

Goodness of Fit

Note also that *Sherpa* has chi gehrels as the default statistic, while XSPEC has chi dvar as the default. When comparing chi square results from both packages, the same statistic should be applied, e.g.

```
sherpa> statistic chi dvar
```

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