ATTACHMENT 100-A: Calculating Medicaid and CHIP Eligibility Error Rates

Calculating the Active Case Payment Error Rates

The active case sample includes a specified number of cases each month for each of the three strata. The method of estimated the error rate is called the combined ratio estimator. The payment amounts and amounts of payments in error associated with a case consists of all the fee-for-service claims incurred by the case with a date of service in the sample month, the review month or the first 30 days of eligibility, as appropriate, and that were paid through that month and the following four-month period. Managed care payments consist of all managed care payments made on behalf of the case for coverage of services in the applicable month the case was sampled. The basic strategy of the combine ratio estimator is to estimate total errors and total payments based on the sample information. The sampling frequencies are used to project errors and payments observed in the sample to the State population values. This strategy, then, provides appropriate payments to combine the errors across each of the three strata into a single error rate for the universe.

Note that the formulas require States to identify the number of strata. Depending on whether or not a State chooses to stratify the active case universe, the number of strata will be either 12 (one stratum per month for the 12 month cycle) or 36 (three strata per month for the 12 month cycle).

The payment error rate for the combined ratio estimator is given by

$$\hat{R} = f(\hat{t}_e, \hat{t}_p) = \frac{\hat{t}_e}{\hat{t}_p} = \frac{\sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} e_{kl}}{\sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} p_{kl}}$$

Where

$$\hat{t}_e = \sum_{k=1}^{a} \frac{M_k}{m_k} \sum_{l=1}^{m_k} e_{kl} = \sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} e_{kl}$$

$$\hat{t}_p = \sum_{k=1}^{a} \frac{M_k}{m_k} \sum_{l=1}^{m_k} p_{kl} = \sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} p_{kl}$$

m_k is the number of cases sampled from stratum k,

M_k is the number of cases in the universe from stratum k,

e_{kl} represents the dollar value of error on the lth case in the kth stratum,

p_{kl} represents the payment on the lth case in the kth stratum, and

"a" represents the number of strata; for actives (3 strata x 12 months = 36 strata).

Alternatively, using the same combined ratio estimator, we could consider three components to the error rate, one for each of the case types. For example,

$$E_S = \sum_{i=1}^{12} \frac{M_{S,i}}{m_{S,i}} \sum_{j=1}^{m_{S,i}} e_{S.i,\mathrm{j}}$$

And

$$P_S = \sum_{i=1}^{12} \frac{M_{S,i}}{m_{S,i}} \sum_{j=1}^{m_{S,i}} p_{S.i,j}$$

where

S is the major case stratum type (S=1 [application], S=2[redetermination], S=3[all other]),

E_s are the total projected errors from major strata S, and

P_s are the total projected payments from major strata S.

Then,

$$\hat{R} = \frac{E_1 + E_2 + E_3}{P_1 + P_2 + P_3} = f(\hat{t}_e, \hat{t}_p) = \frac{\hat{t}_e}{\hat{t}_p} = \frac{\sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} e_{kl}}{\sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} p_{kl}}$$

The sample of cases is drawn over a twelve month period.

Then, estimated variance is given by

$$\hat{V}ar(\hat{R}) = \frac{1}{\hat{t}_p^2} \sum_{k=1}^{a} W_k^2 n_k \hat{V}ar(e_{kl} - \hat{R}p_{kl}) = \frac{1}{\hat{t}_p^2} \sum_{k=1}^{a} W_k^2 n_k \left(\frac{\sum_{l=1}^{n_i} (e_{kl} - \hat{R}p_{kl} - (\bar{e}_k - \hat{R}\bar{p}_k))^2}{n_k - 1} \right)$$

A 95 percent confidence interval is constructed around the point estimate of the active case payment error rate as

$$\text{Confidence Interval } = \hat{R} \pm 1.96 \sqrt{\hat{V}ar(\hat{R})}$$

Calculating Active and Negative Case Error Rates

For the active and negative case error rates, the errors are not dollar weighted. However, the combined error rate estimator is repeated here, with changes made because the two case error rates will have no dollar weights associated with them.

The error rate for the combined ratio estimator for the case error rate is given by

$$\hat{R} = f(\hat{t}_e, \hat{t}_p) = \frac{\hat{t}_e}{\hat{t}_p} = \frac{\sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} e_{kl}}{\sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} p_{kl}}$$

Where

$$\hat{t}_e = \sum_{k=1}^{a} \frac{M_k}{m_k} \sum_{l=1}^{m_k} e_{kl} = \sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} e_{kl}$$

$$\hat{t}_p = \sum_{k=1}^{a} \frac{M_k}{m_k} \sum_{l=1}^{m_k} p_{kl} = \sum_{k=1}^{a} W_k \sum_{l=1}^{m_k} p_{kl}$$

m_k is the number of cases sampled from stratum k;

M_k is the number of cases in the universe from stratum k;

e_{kl} is a 1 if the lth case in the kth stratum is in error, 0 otherwise;

p_{kl} is a 1 for the lth case in the kth stratum; and

"a" represents the number of strata; for actives there are 36 strata and for negatives, 1 stratum.

The variance is exactly the same as the variance for the combined ratio estimator given in the previous section.

Note: If one were to ignore the strata and assume that all cases over the year are drawn from the same population and that sampling by month was merely an administrative convenience, a simpler estimator could be applied. In this instance, we are estimating a sample proportion. The point estimate of the error rate is

$$\hat{\Pi} = \frac{\sum_{i=1}^{m} q_i}{m}$$

Where

$\hat{\Pi}$ is the estimated error rate;

q_i is equal to 1 if the sampled case, i, is in error and equal to 0 if sampled case was correctly determined; and

m is the sample size.

The sampling variance of this estimator is

$$\hat{Var}(\hat{\Pi}) = \frac{\hat{\Pi}(1 - \hat{\Pi})}{m}$$

A 95 percent confidence interval around the point estimate is given by

$$\text{Confidence Interval } = \hat{\Pi} \pm 1.96\sqrt{\hat{Var}(\hat{\Pi})}$$