Sepsis Initiative Sampling Methodology for Determining Quality Measures

Hospital Quarterly Quality Measure Calculations

Step 1. Calculate the measure point estimate based on the sample data submitted by the hospital, \( \hat{p} \)

\[ \hat{p} = \frac{\text{sample numerator}}{\text{sample denominator}} \]

Step 2. Estimate the standard error associated with the point estimate, \( SE(\hat{p}) \)

\[ SE(\hat{p}) = \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}} \]

where \( \hat{p} \) is the measure point estimate from Step 1 and \( n \) is the number of cases submitted in the sample for the quarter.

Step 3. Calculate a 95% Confidence Interval (CI) for the measure point estimate:

\[ \hat{p} \pm 1.96 \times SE(\hat{p}) \]

where \( \hat{p} \) and \( SE(\hat{p}) \) are from Steps 1 and 2 above.

The 95% confidence interval should be included in the quarterly report to reflect the uncertainty associated with the quarterly measure point estimate.

Hospital Estimates Across Multiple Quarters

Step 4. Calculate the measure point estimate based on the sample data submitted by the hospital, \( \hat{p}_x \)

\[ \hat{p}_x = \sum_{i=1}^{Q} \frac{N_i}{N} (\hat{p}_i) = \frac{N_1}{N} (\hat{p}_1) + \frac{N_2}{N} (\hat{p}_2) + \ldots \]

where \( \hat{p}_x \) is the year-to-date measure point estimate for hospital \( x \); \( i \) from 1 to \( Q \) is summing over the total number of quarters for which data has been submitted for the year; \( N_i \) is the total number of sepsis cases submitted by the hospital to the sampling portal (i.e. the full case list) in a given quarter; \( N \) is the total number of sepsis cases submitted to the sampling portal for hospital \( x \) across all quarters for which data has been collected (\( Q \)); and \( \hat{p}_i \) is the measure point estimate for quarter \( i \) based on the sample data submitted to the clinical data portal.
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This formula accounts for the fact that the sepsis initiative is using stratified sampling and that each point estimate represents a proportion of the overall population of cases submitted by the hospital to the sampling portal.

Step 5. Estimate the standard error associated with the measure point estimate, \( SE(\hat{p}_x) \)

\[
SE(\hat{p}_x) = \sqrt{\sum_{i=1}^{Q} \left( 1 - \frac{n_i}{N_i} \right) \left( \frac{N_i}{N} \right)^2 \left( \frac{s_i^2}{n_i} \right)} = \sqrt{\sum_{i=1}^{Q} \left( 1 - \frac{n_1}{N_1} \right) \left( \frac{N_1}{N} \right)^2 \left( \frac{s_1^2}{n_1} \right) + \left( 1 - \frac{n_2}{N_2} \right) \left( \frac{N_2}{N} \right)^2 \left( \frac{s_2^2}{n_2} \right) + \cdots}
\]

where \( i \) from 1 to Q is summing over the total number of quarters for which data has been submitted for the year; \( n_i \) is the number of sepsis cases submitted in the sample (to the clinical data portal) for quarter I; \( N_i \) is the total number of sepsis cases submitted by the hospital to the sampling portal in a given quarter; \( N \) is the total number of sepsis cases submitted to the sampling portal for hospital \( x \) across all quarters for which data has been collected (Q); and \( s_i^2 \) is the variance for the quarter or \( [SE(\hat{p})]^2 \) for a given quarter as shown below:

\[
s_i^2 = \frac{\hat{p}_i (1 - \hat{p}_i)}{n_i}
\]

where \( \hat{p}_i = \frac{\text{sample numerator for quarter } i}{\text{sample denominator for quarter } i} \) and \( n_i = \text{number of cases in sample for quarter } i \)

Step 6. Calculate a 95% CI:

\[
\hat{p}_x \pm 1.96 * SE(\hat{p}_x)
\]

where \( \hat{p}_x \) and \( SE(\hat{p}_x) \) are from Steps 4 and 5 above.

The 95% confidence interval should be included in the quarterly reports starting with Quarter 2 to reflect the uncertainty associated with the year-to-date measure point estimate.

Statewide Quality Measure Estimates:

\[
\hat{p}_{STW} = \sum_{i=1}^{x} \frac{N_i}{N} (\hat{p}_i) = \frac{N_1}{N} (\hat{p}_1) + \frac{N_2}{N} (\hat{p}_2) + \frac{N_3}{N} (\hat{p}_3) + \frac{N_4}{N} (\hat{p}_4) + \frac{N_5}{N} (\hat{p}_5) + \cdots + \frac{N_x}{N} (\hat{p}_x)
\]

Where \( i \) from 1 to \( x \) sums over all hospitals that submit data for the sepsis initiative; \( N_i \) is the total number of sepsis cases at hospital \( i \); \( N \) is the total number of sepsis cases in the state; and \( \hat{p}_i \) is the measure estimate for hospital \( i \). This formula weights the statewide quality measure estimate based on the proportion of all sepsis cases in the state that are represented by the quality measurement value for a given hospital.