Construction of confidence intervals in QILT reporting

Confidence intervals provide a range of values that reflect the uncertainty involved in estimating a population parameter from sample data. In our reports, we use **90 per cent confidence intervals**, which means that if we were to draw many samples from the population and calculate the interval each time, the true population value would fall within the interval **90 per cent of the time**.

The confidence intervals presented in the QILT National reports are calculated using the method described by **Agresti and Coull** (1998)[1]. This method is an improvement over the traditional **Wald method**, offering more reliable results across a wider range of sample sizes.

The Wald method

The Wald confidence interval is calculated using the formula:

$$p \pm z\sqrt{p(1-p)/n}$$

Where:

- p is the proportion of positive responses (n_1 / n)
- n is the total number of valid responses
- z is the z-score for the desired confidence level (1.645 for a 90%).

The Agresti-Coull adjustment

The Agresti-Coull method adjusts both the sample size and the proportion:

- Adjusted sample size: $\tilde{n} = n + z^2$
- Adjusted proportion: $\tilde{p} = \frac{1}{\tilde{n}}(n_1 + \frac{z^2}{2})$

The confidence interval is then calculated as:

$$\tilde{p} \pm z\sqrt{\tilde{p}(1-\tilde{p})/\tilde{n}}.$$

Finite population correction

When the sample size is large relative to the population—as is often the case in the **Student Experience Survey (SES)**—a **finite population correction** is applied to narrow the interval. This is done by multiplying the term to the right of the ± symbol by a finite population correction factor, given as $\left(1 - \frac{n}{N}\right)$ where N is the population size.

[1] Agresti, A., & Coull, B. A. (1998). Approximate Is Better than "Exact" for Interval Estimation of Binomial Proportions. The American Statistician, 52(2), 119–126. https://doi.org/10.2307/2685469.

Important notes

- The confidence intervals are calculated around the **adjusted proportion** ($\tilde{p}$), but the **raw proportions** (p) are reported in the results.
- Like other approximation methods, this approach may produce unreliable intervals when proportions are very close to **0% or 100%**. In such cases, the confidence intervals are **not shown** and are flagged in the reports.