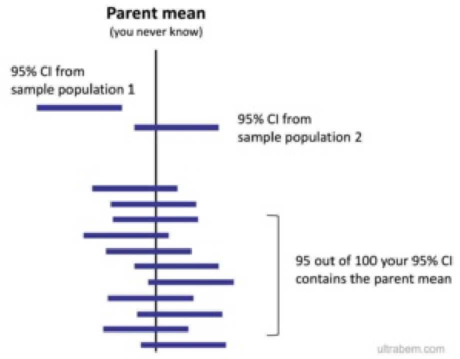
Confidence intervals

Confidence intervals, are ranges of estimates for an unknown parameter that contain an associated confidence level. The **95% confidence level** is most commonly used, but we can encounter 90% or 99% values. These levels represent the long-run frequency of the confidence intervals containing the **true value** of the unknown population parameter.

Several factors influence the resulting range of the confidence interval itself. First of all, it is the level of reliability, then the size of the monitored population (sample) and, among other things, its variability. The greater the variability of the observed population, the less reliable the confidence interval will be. On the contrary, the more homogeneous the population is, the more reliable the confidence interval will be and, overall, a better estimate of the investigated parameter.

In medical practice, we encounter confidence intervals mainly in statistical analyses, e.g. in meta-analyses, the results of which are interpreted using both p-values and these intervals. Their size is a clear indicator of the reliability of the results of the analysis itself (note – the confidence interval does not interpret statistical significance, unlike the p-value).



Confidence intervals in practice. This example illustrates the following situation: if we were to repeat the calculation of 95% confidence intervals in a given population (on a specific sample) a hundred times, 95 out of 100 95% confidence intervals would fall within the defined "parent mean", i.e. the parent - normally distributed population.

Calculation

Confidence interval is mathematically defined as $100 \cdot (1-\alpha)\%$, where α is a reliability coefficient, typically acquiring values of α=0,01 (thus 99% confidence interval) or α=0,05 (95% confidenceinterval). This formulation is defined as a pair of statistics (θ^1,θ^2), where $\theta^1(X_1,\ldots,X_n)$ and $\theta^2(X_1,\ldots,X_n)$.We want to ensure that the result holds that the given confidence interval contains the true value of the parameter (P) with the specified probability level: $P[\theta^1(X_1,\ldots,X_n) \leq \theta \leq \theta^2(X_1,\ldots,X_n)] \geq 1-\alpha$.

In practice, we want to find out the so-called **lower and upper limits** of the confidence interval, i.e. define the interval itself. We set these limits as follows:

$P[\theta^1(X_1,\ldots,X_n)] \geq \alpha$ or $P[\theta^2(X_1,\ldots,X_n)] \geq \alpha$.

These bounds are random as they depend on the particular sample selection, but the parameter is a fixed number, even though it is unknown.

Odkazy

Související články

- Median error
- Basic sample
- Statistical interference
- Meta-analysis

Externí odkazy

- Příklad jednoduchého výpočtu konfidenčního intervalu (https://www.mathsisfun.com/data/confidence-interval.html)
- O konfidenčních intervalech více v různých modelech (https://www.statisticshowto.com/probability-and-statistics/confidence-interval/)

Použitá literatura

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