Estimated Annual Percent Change tool methodology

1. Estimated Annual Percent Change (EAPC) of rates during a time period

The EAPC is calculated using a Generalized Linear Model (GLM)[1] considering a Gaussian distribution for the Age-Standardized Rate (ASR)[1,2] . Under the assumption of linearity on the log scale, which is equivalent to a constant change assumption, the EAPC is calculated[2].

Let us consider:

ASR_t = the Age Standardized Rate for a set of years, where t= 0, 1, … , n.

(Refer to Descriptive tool methodology for ASR calculation).

The GLM assumes that the expected value of the response is time related by a logarithm expression:

$$\log(E[ASR_t]) = \gamma + \beta \cdot t + \varepsilon$$

With the estimated parameters, it provides that:

$$\log\left(\widehat{E}\,[ASR_t]\right) = \hat{\gamma} + \hat{\beta} \cdot t \Leftrightarrow \widehat{E}\,[ASR_t] = e^{\hat{\gamma} + \hat{\beta} \cdot t}$$

So, the EAPC is calculated as:

$$EAPC = \left(\frac{\widehat{ASR}_{t+1} - \widehat{ASR}_t}{\widehat{ASR}_t}\right) \cdot 100 = \left(\frac{\widehat{ASR}_{t+1}}{\widehat{ASR}_t} - 1\right) \cdot 100 = \left(\frac{e^{\hat{\gamma} + \hat{\beta}(t+1)}}{e^{\hat{\gamma} + \hat{\beta} \cdot t}} - 1\right) \cdot 100 = \left(e^{\hat{\beta}} - 1\right) \cdot 100$$

2. Confidence interval of EAPC

The confidence interval (CI) of EAPC is calculated as:

$$CI(EAPC) = \beta \pm \left(Z_{\frac{1-\alpha}{2}}\right) \cdot S_{\hat{\beta}}$$

Where:

α = confidence level

$S_{\hat{\beta}}$ = standard error of $\hat{\beta}$

And finally, the last step would be to apply exponential.

3. Smoothing the trends graph

The trends graph of the ASRs is represented by smooth curves which are obtained with *loess* function of the R statistic software[3]. This function fits a local polynomial regression[4] for the ASRs.

Groups having more than 1/4 of the age-adjusted rates equal to zero will not be plotted.

REFERENCES

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