Cost-Efficacy Ratio for Comparing Two Lymphoma Treatments

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The cost-efficacy ratio was used to compare two types of lymphoma treatments in a study with respect to the risk of mortality after 3 years follow up and the costs of all health care costs incurred by the patient. Patient numbers, total cost, treatment group and event (dead/alive) were supplied in a dataset of 409 patients with no missing data. Descriptive statistics of the treatment groups are reported in table 1 below.

Table 1: Descriptive statistics of the two treatment groups.

	Treatment 1	**Treatment 2**
# of patients	206	203
alive [%] (SE)	**74.8** (2.1)	**63.5** (2.4)
mean cost [€] (SE)	**996** (211)	**40** (8)

The standard errors of the event proportions and mean costs are calculated using the standard deviation using formula (1).

$$SE = \frac{1}{n}\sum_{n}^{i=0}[x_i] \pm 1.96 \cdot \frac{\sigma}{\sqrt{n}}$$

(1)

Incremental Cost-Efficacy Ratio

The incremental cost-effectiveness ratio (ICER): which speaks for the additional costs of one unit of outcome achieved by specific action compared with another. The formula for it is given in formula (2).

$$ICER = \frac{C}{E} = \frac{(mean\ costs\ in\ treatment\ 1) - (mean\ costs\ in\ treatment\ 2)}{(\%\ alive\ treatment\ 1) - (\%\ alive\ treatment\ 2)}$$

(2)

The CE ratio is calculated using formula (2) and the values given in table one:

$$ICER = \frac{996 - 40}{0.74757 - 0.63546} = \frac{956}{0.11210} \approx 8528$$

Bootstrapping the ICER

It is not possible to calculate the confidence interval of the CE ratio directly, instead the calculation of the CE ratio was bootstrapped such that the confidence interval can be derived from the iterations. Bootstrapping was done by sampling the dataset for 409 samples with replacement, and this was done for 10,000 iterations, calculating the CE with formula (2) in each iteration..

CE ratio	95% CI
11641	3863 - 37073

Simulating the distribution

To confirm that the distribution of the results is comparable to that of the full dataset, a simulation is done by generating data points that are distributed equally to the dataset and then using formula (2) again to obtain the CE ratio. The values obtained from this simulation are as follows.

CE ratio	95% CI
13172	3509 - 35388

These values are fairly similar to the values obtained by our own bootstrapping implementation, so we can conclude that the bootstrapping was fairly accurate.

Histograms of CE Distributions

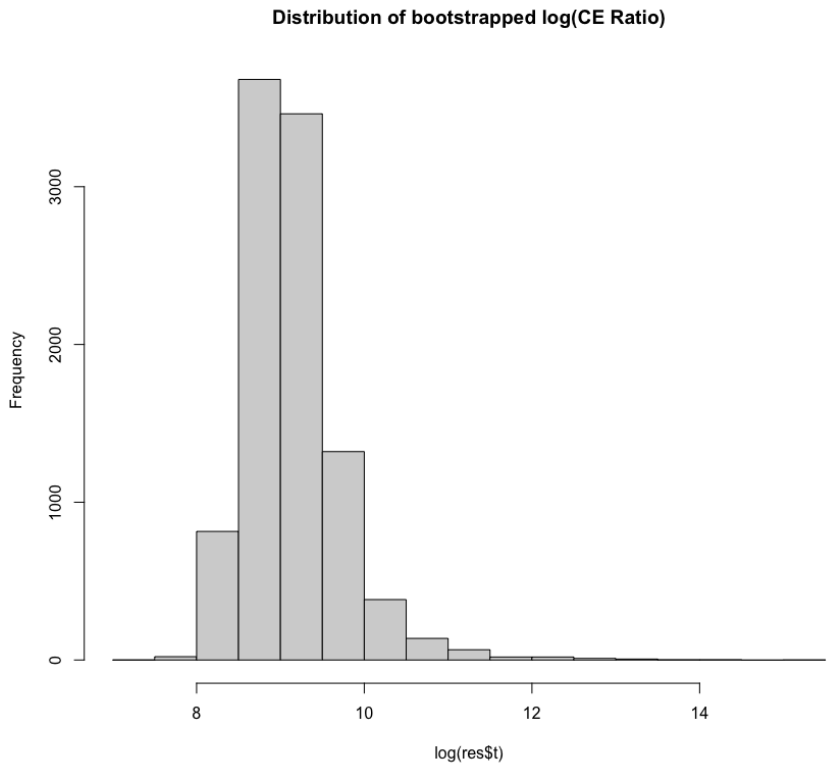

Figure 1: Histogram of the distribution of the CE values obtained by the bootstrapping method.

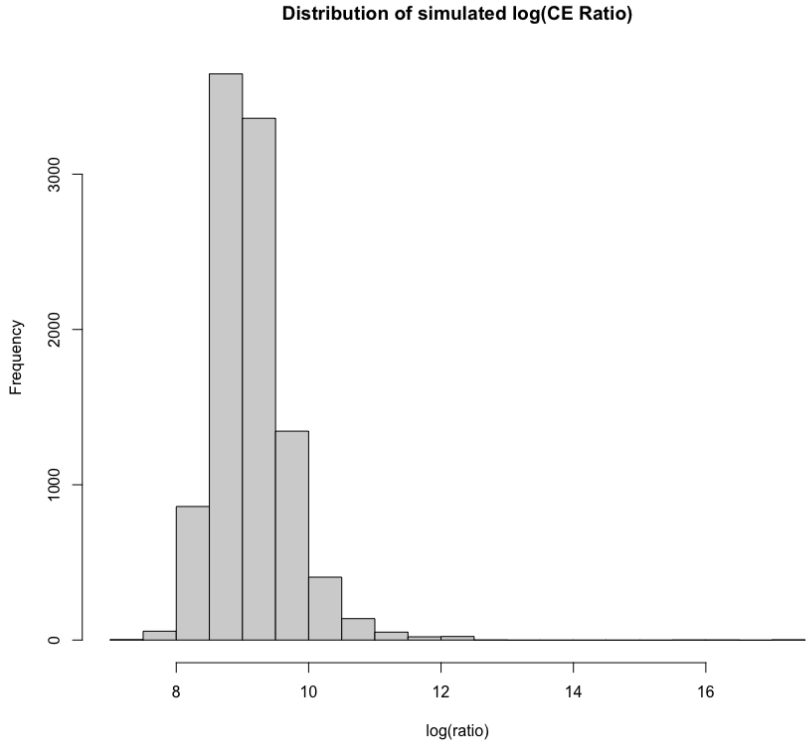

Figure 2: Histogram of the distribution of the CE values obtained from the simulation.