Two Sample Survival Test

Objective: Compare survival between two groups of independent samples

A researcher wants to determine if surgery followed by systemic therapy increases survival over systemic surgery alone for patients with colorectal cancer. Study participants will be equally randomized between the treatment groups. The median survival of patients receiving systemic therapy alone is 13 months. The investigator believes that increasing median survival by at least 6 months is necessary to justify surgery. Patients will be recruited over 3 years (36 months) with at least 6 months of follow up.

Required Information	Inputs
What is the desired power for the test?	80%
At what significance level do you want to test your hypothesis?	5%
What is median survival in the control group?	13 Months
What difference in median survival do you want to detect?	6 Months
For how long do you plan to recruit patients?	36 Months
For how long after the last recruitment will you follow patients?	6 Months
Is your hypothesis one-sided or two-sided?	Two-sided
What will the ratio of samples be in the intervention group to the control group?	1:1

Relative Hazard (RH) will need to be calculated from the median survival of the control and intervention group. This can be done by first converting months to years and using the equation:

13 Months / 12 Months = 1.083
(13 Months + 6 Months) / 12 Months = 1.583

And using the equation for Relative Hazard:

$$RH = (\ln(2)/(Median\ Survival\ of\ Control\ Group))/(\ln(2)/(Median\ Survival\ of\ Intervention\ Group))$$

Therefore, our RH is:

$$RH = (\ln(2)/1.083) / (\ln(2) / 1.583) = 1.46$$

Let us now input these numbers into our sample size calculator

Calculator 1: Number of events, given relative hazard.

Instructions: Enter parameters in the **green** cells. Answers will appear in the **blue** box below.
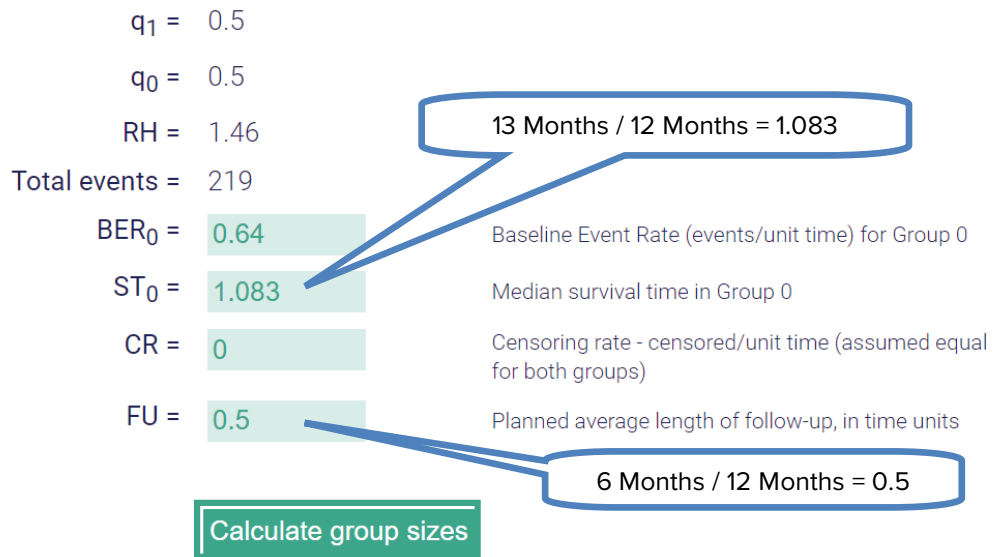
α (two-tailed) = 0.05 — Threshold probability for rejecting the null hypothesis. Type I error rate.

β = 0.2 — Probability of failing to reject the null hypothesis under the alternative hypothesis. Type II error rate.

q_1 = 0.5 — Proportion of subjects that are in Group 1 (exposed)

q_0 = 0.5 — Proportion of subjects that are in Group 0 (unexposed); $1 - q_1$

RH = 1.46 — Relative hazard (Group 1/Group 0)

Patients equally randomized between two groups

Calculate events

First need to convert months to years:
13 months / 12 months = 1.083
19 months / 12 months = 1.583
Relative Hazard: (ln(2)/1.083) / (ln(2)/1.583) = 1.46.

A total of number of 219 events will be needed for this study. We can use this information for the next part of the calculation:

q_1 = 0.5

q_0 = 0.5

RH = 1.46

Total events = 219

BER$_0$ = 0.64   Baseline Event Rate (events/unit time) for Group 0

ST$_0$ = 1.083   Median survival time in Group 0

13 Months / 12 Months = 1.083

CR = 0   Censoring rate - censored/unit time (assumed equal for both groups)

FU = 0.5   Planned average length of follow-up, in time units

6 Months / 12 Months = 0.5

Calculate group sizes

Sample size (with continuity correction)			
	N	Events	Cumulative Event Rate
Group 1	339	127	0.373
Group 0	338	92	0.274
Total	677	219	0.324

Therefore, we need a total of 677 (339 per group) patients to detect at least a 6 month increase in median survival.

Example using the UCSF Sample Size Calculators for Designing Clinical Research (https://sample-size.net/sample-size-survival-analysis/)