

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 proportion of your sample will be controls?	0.5

Two Arm Survival

Two Arm Survival is a program to calculate either estimates accrual or power for differences in survival times between two groups. The program allows for unequal sample size allocation between the two groups. The survival time estimates also allow for multiple strata or risk groups.

User Input

Program Output

Select Parameters

Type calculation	Type input	Sided	Number strata	Proportion in standard group	Alpha
<input checked="" type="radio"/> Sample Size	<input type="radio"/> Hazard Rates	<input type="radio"/> 1 Sided	1	.5	.05
<input type="radio"/> Power	<input checked="" type="radio"/> Survival Proportion	<input checked="" type="radio"/> 2 Sided			

Patients equally randomized between two groups

Years of accrual	Years of follow-up	Accrual rate	Hazard ratio	Total accrual	Power
3	0.5	120.01	1.46	360	0.8

36 months = 3 years

6 months = 0.5 years

You need to calculate the hazard ratio from median survival times in the control and intervention groups. See other side.

Median survival in years = 13 months/12 months

0.5 indicates median survival

Stratum	Proportion	Hazard rate, std.	Hazard rate, exp.	Proportion surviving	Survival time
1	1	0.64	0.438	0.5	1.083
2	NaN	NaN	NaN	NaN	NaN

A total sample size of at least 360 is necessary, meaning 180 participants in each group.

Example using the Southwest Oncology Group's Statistical Tools (<https://stattools.crab.org/>)

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Converting among survival parameters

Commonly survival times are assumed to follow an exponential distribution. With this assumption, converting between median survival times and hazard rates is easily accomplished with the following formulas.

The hazard rate (λ) is the number of events per unit time. Assuming an exponential distribution, the median survival time is related to the rate by the following formula:

$$\text{Median survival time} = \log_e(2)/\lambda$$

Thus, the hazard rate can be calculated from median survival time as

$$\lambda = \log_e(2)/\text{Median survival}$$

In our example, the control group has median survival in years of 1.083 (13 months/12 months) which using the above formula, yields a hazard rate of $\lambda_c = 0.64$. We want to detect an increase of 6 months in survival (i.e., 19 months/12 months). This yields a hazard rate of $\lambda_i = 0.438$. The desired detectable hazard ratio is $0.64/0.438 = 1.46$. The Southwest Oncology sample size calculator requires the hazard ratio to be > 1 ; thus, we divide 0.64 by 0.438.