

Survival Explorer

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Overview

The **Survival Explorer** add-in performs a time-to-event analysis using the JMP **Survival** platform, producing a Kaplan-Meier plot with a Number at Risk table using **Graph Builder**. There are options to modify and annotate the plot with statistical tests and confidence intervals. Most importantly, the add-in enables users to add covariates to the accompanying **Data Filter**, giving insight into how the analysis changes dynamically by subsetting to the observations of interest.

The dialog for Survival Explorer is presented in Figure 1.

Survival Explorer - JMP Clinical

Description

Produces a Kaplan-Meier plot in Graph Builder while allowing for dynamic filtering of data table.

Select Columns

- Patient
- ▲ Age
- Gender
- Primary Disease
- ▲ Time (Days)
- ▲ Failure
- Cause of Failure

Cast Selected Columns into Roles

Y, Time to Event: Time (Days)

Grouping: Primary Disease

Censor: Failure

Remove

Censor Code: 0

Number at Risk Interval: 365

Number at Risk Relative Size: 1

Number at Risk Offset: 0.35

Run

Figure 1. Dialog for Survival Explorer

Description of roles:

1. Y, Time to Event: A numeric column that indicates the time until an event or censoring for each observation.

2. Grouping: An optional character column that will be used to produce a separate time-to-event curve for each level of the Grouping column.
3. Censor: A numeric column that indicates whether an event or censoring outcome occurs for each observation.

Options include:

1. Censor Code: The value of the Censor column that indicates whether an observation is censored. Other values indicate the observation experienced an event.
2. Number at Risk Interval: The Number at Risk table is produced with values printed according to this interval. For example, if the interval is 25, the values in the Number at Risk table will be presented every 25 days (assuming the time column is measured in that unit). If the interval extends past the maximum time across all Grouping levels, the final entry will be presented at the maximum time.
3. Number at Risk Relative Size: This value modifies the size of the Number at Risk relative to the Kaplan-Meier plot. For a large number of Grouping levels, this value should be increased to provide sufficient room for the number of levels at the bottom of the figure.
4. Number at Risk Offset: This value modifies the position of the data presented in the Number at Risk to make it more aesthetically pleasing.

How to Use

We illustrate the use of this add-in using the dataset [Survival of Liver Transplant Recipients](#) from Collett (2023). This dataset has 1761 patients with data on time to graft failure in days, cause of the failure, age, gender, and primary disease (ALD: alcohol-induced liver disease, PSC: primary sclerosing cholangitis, PBC: primary biliary cholangitis).

The dialog listed in Figure 1 represents our analysis. The Failure column indicates whether patients are failures, so the Censor Code is set to 0. The maximum time is 4720 days (nearly 13 years!), so the Number at Risk Interval is set to 365. Defaults are used for the other options.

Figure 2 presents the results of the analysis from the **Survival** platform after adding gender and age to the **Data Filter**. The Add Simultaneous Intervals option was switched on.

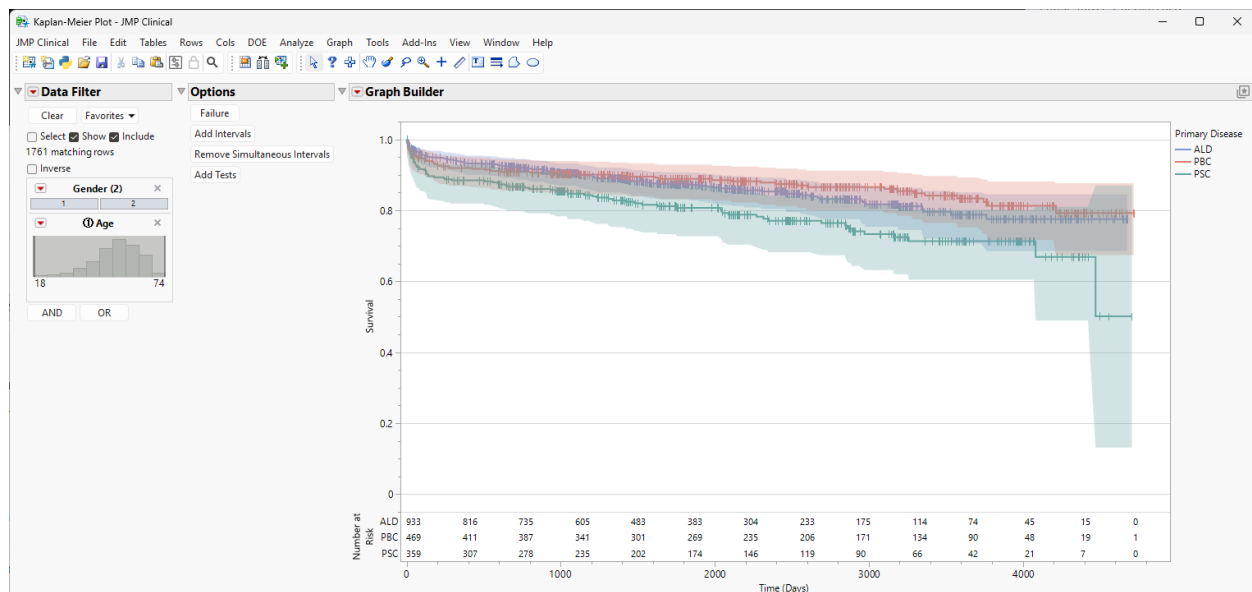


Figure 2. Analysis of liver transplant data

Up to 4 buttons will be summarized in the **Options** area of the output. The names of the buttons change upon selection.

1. Failure/Survival: This option switches the plot from a Survival configuration to a Failure configuration. In the Survival configuration, the y-axis begins at 1 and the probability decreases over time. The y-axis can be interpreted as the proportion of observations that survived (i.e., **did not** experience a failure). In the Failure configuration, the y-axis begins at 0 and the probability increases over time. The y-axis can be interpreted as the proportion of observations that experienced a failure (i.e., **did not** survive).
2. Add Intervals / Remove Intervals: This option adds or removes the pointwise 95% confidence intervals around each curve.
3. Add Simultaneous Intervals / Remove Simultaneous Intervals: This option adds or removes the simultaneous 95% confidence intervals around each curve.
4. Add Tests / Remove Tests: This option adds or removes the p-values for the log-rank and Wilcoxon tests for differences between the Grouping levels for the survival curves. Note that this button is only produced if a Grouping column is selected.

In the **Graph Builder** area of the output, three lines are produced summarizing the time until graft failure. Vertical pipe symbols indicate times where at least 1 patient was censored. The Number at Risk table indicates that the study started with 933, 469, and 359 patients for ALD, PBC, and PSC, respectively. Values are presented every 365 days, though the last set of values is presented at 4720 days since 4745 (13×365) extends past this maximum number of days.

Clicking Add Tests adds the log-rank and Wilcoxon p-values, 0.0004 and 0.0014, respectively.

Subsetting the Data Filter to Gender = 2 instantly updates the Graph Builder results to those presented in Figure 3.



Figure 3. Analysis of liver transplant data for gender = 2

Here, the Number at Risk table indicates that there are 200, 400, and 04 patients for ALD, PBC, and PSC, respectively. With this change in sample size, the time until graft failure is not considered significant (log-rank: 0.7094, Wilcoxon: 0.8926).

References

Collett D. (2023). *Modelling Survival Data in Medical Research, Fourth Edition*. Boca Raton, FL: CRC Press.