Statistical Resource

# Stepwise Cox regression analysis in SPSS

**ABSTRACT**

This article is a beginners' guide for performing Cox regression analysis in SPSS. The article provides practical steps toward performing Cox analysis and interpreting the output of SPSS for Cox regression analysis. Along with it, the article touches on the test to be performed before performing a Cox regression analysis and its interpretation.

**Keywords:** Cox proportional hazard model, Cox regression, survival analysis

## INTRODUCTION

Survival or time to event is an important endpoint (or primary endpoint) in multiple phase III randomized studies.[1,2] Performing and interpreting survival analysis using the Kaplan–Meier method and comparing the estimated survival with log-rank test were discussed in the previous issue.[3] The current article is in continuation in the series of statistical resources. After performing log-rank test, a *P* value is obtained, and based on the interpretation of the *P* value, a decision is made whether there exists a statistical difference between the comparator arms. Log-rank test, however, does not allow taking into account the other variables which may have an impact on the survival or outcome of interest. Cox proportional hazard model or regression analysis allows an investigator to adjust for other variables.

## METHODOLOGY FOR PERFORMING COX REGRESSION ANALYSIS

### Example

For illustrating how to perform Cox regression analysis, we assume a hypothetical data set of 10 patients in whom we have disease stage, exon mutation data, age, gender, survival in months, and the event (in this case, it is death) entered in SPSS [Figure 1]. Figure 1 shows the data view of these variables entered. Please note that all variables are entered as numerical values. A value label is provided in the variable view for each numerical value. For example, label "Event," 1

is a value label for the occurrence of the event and 2 is value label for non-occurrence of the event. Such numerical entries are required for performing Cox analysis.

### Step-1

To start performing Cox regression, click on analyze, then go to survival, and then go to Cox regression analysis and click [Figure 2].

### Step-2

A window will open as shown in Figure 3. In the space of time, put survival in months. In space for event, put the status. As soon as status is entered in this place, a question mark is seen next to the event. It is an indication to inform the software what numerical value is considered as event. Hence, now, click on define event and enter the value which is considered as event (1 in our example).

### Step-3

In the space labeled as covariates, enter the covariates which need to be considered as influencing the survival. The type

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**Figure 1: Data view in SPSS showing the data entered**



**Figure 2: Data view in SPSS showing initial steps of Cox regression analysis**

of covariate has to be specified as categorical or continuous, by clicking on the categorical button, if required.

### Step-4
SPSS gives the option of plotting graphs if required. These options can be seen by clicking on the plot button. However, very rarely are these plots provided in manuscripts.

### Step-5
Click on "option" button. This opens up an additional window as shown in Figure 4. Click on button next to 95% confidence Interval (CI) of exp(B) and click continue.

### Step-6
Now, click OK on the main screen, and SPSS output will be seen as shown in Figures 5 and 6. Figure 5 provides the details of patients with events, censored, and missing data. These need to be examined as a high level of missing data nullifies the scientific validity of the test.

### Step-7
Variables in the equation as shown in Figure 6 provide the most important information. Under the column Sig., the *P* value is provided for each variable, and under the column exp(B), the hazard ratio is provided for each variable.
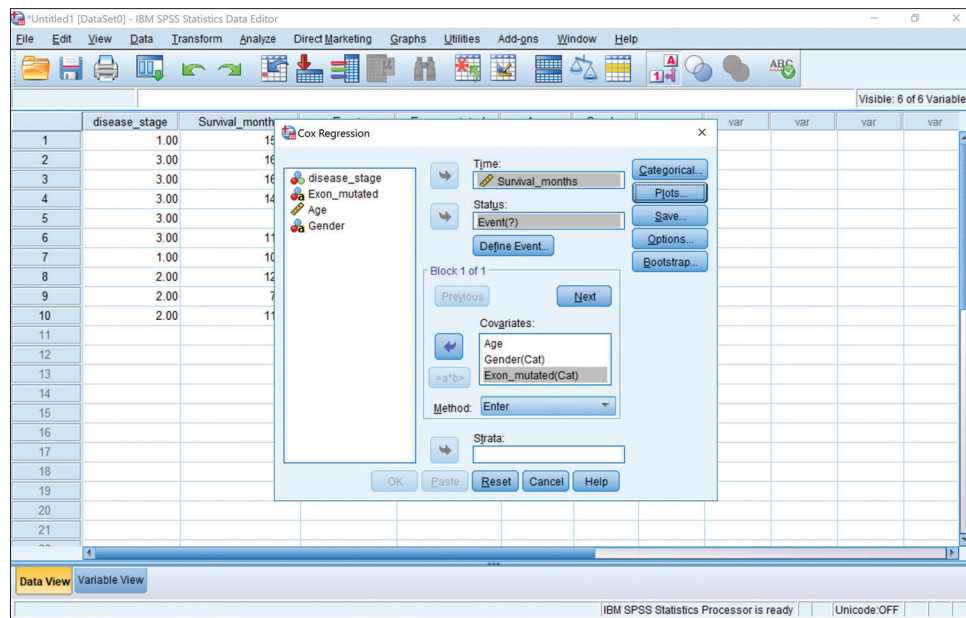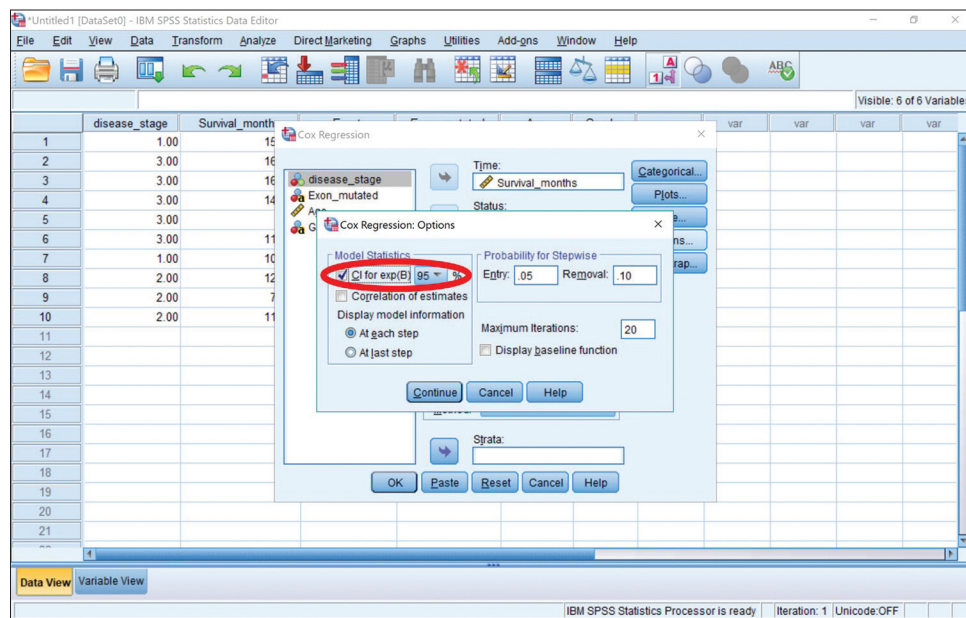
**Figure 3: Cox regression window in SPSS**



**Figure 4: The window seen after clicking the options button. The red mark shows where a click has to be placed to obtain 95% CI for hazard ratio**

### Step-8

The interpretation of *P* value is in accordance with the type 1 error set by the investigator. A *P* value below that type 1 error suggests significance. Commonly, a *P* value of 0.05 or below is considered statistically significant. The hazard ratio needs to be interpreted in accordance with the reference.

### Caution

The performance of Cox regression analysis in SPSS is simple, and interpretation is relatively easy. However, the assumptions of Cox regression analysis need to be tested

before performing such an analysis.[4] The assumption of proportional hazard model needs to be tested, especially if your Kaplan–Meier curves are crisscrossing each other. The test used is not available in SPSS and will be taught in the next issue.

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Nil.

### Conflicts of interest
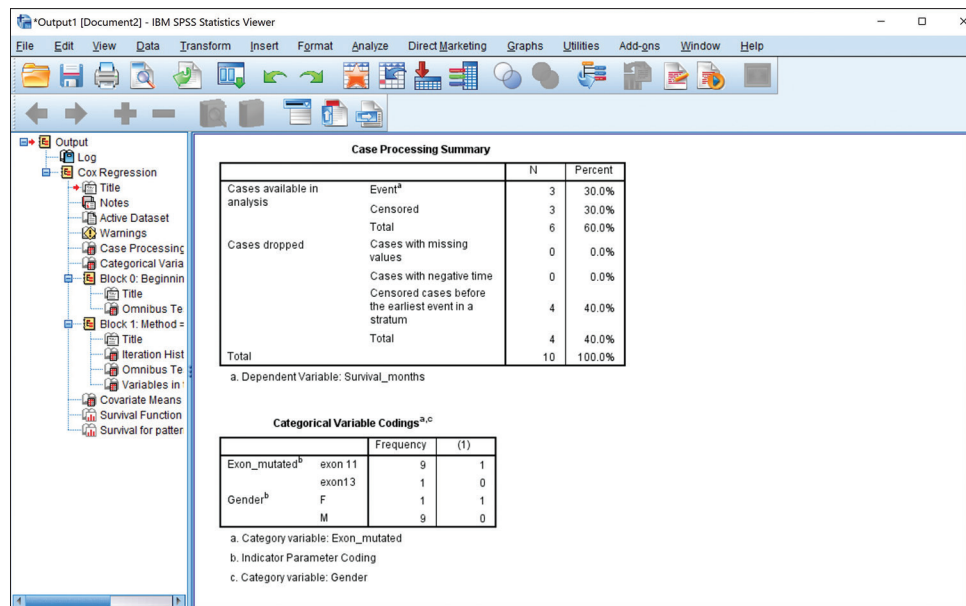
There are no conflicts of interest.

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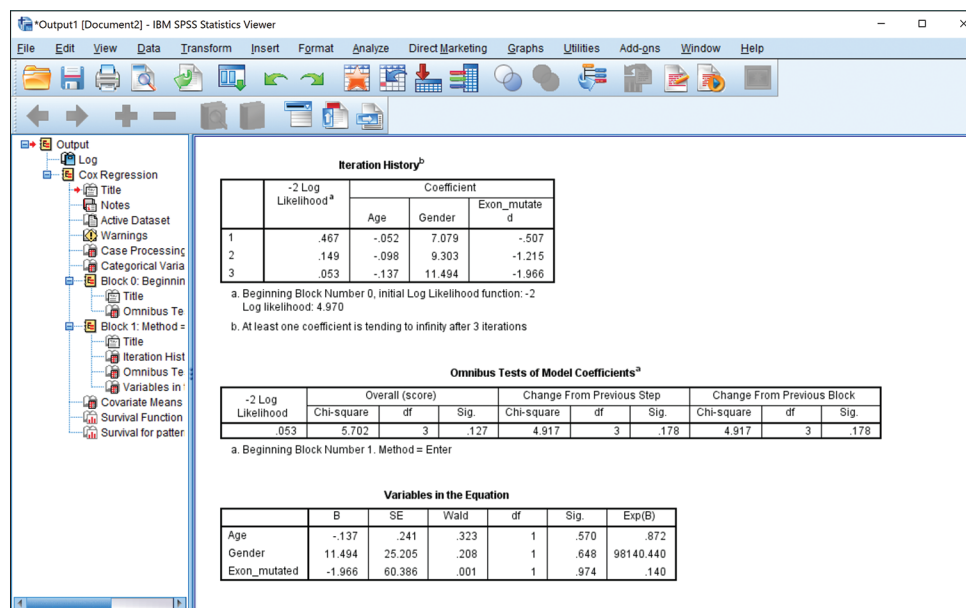**Figure 5: Initial part of SPSS output after doing regression analysis**



**Figure 6: Table "variables in equation" where P value and hazard ratio is obtained**

## REFERENCES

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