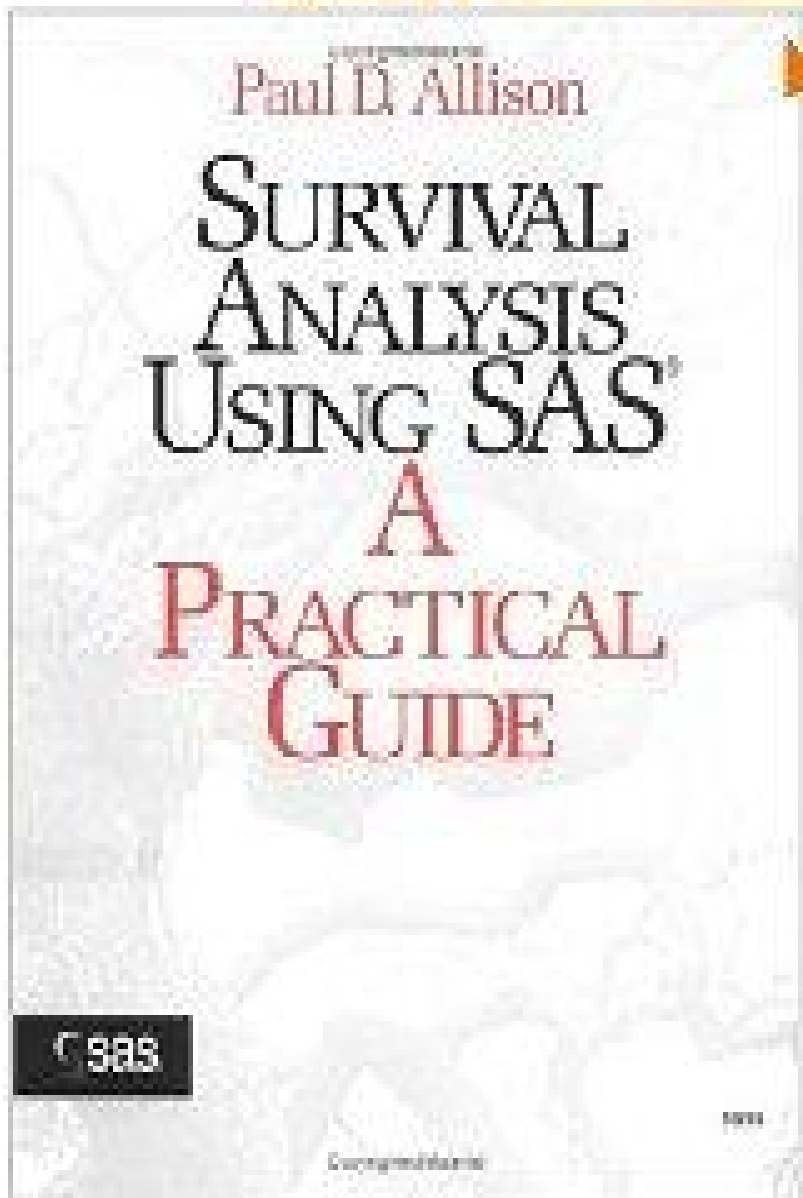


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# **Survival Analysis Using SAS: A Practical Guide**

By: Paul D. Allison

Reviewed by: Chad Tosevski

# What is Survival Analysis?

- *Survival analysis*- a type of statistical method used for studying the occurrence and timing of events (time-to-event data)
  - *Event*: change that can be situated in time (transition from one discrete state to another)
  - Most often applied to the study of death
  - Designed for longitudinal (prospective) data however can also be used with retrospective data

# Purpose

- Ideal for biomedical and social science researchers who want/need to analyze data using SAS
- Not necessary to have prior SAS background as this book is comprehensive enough to teach you the basics about survival analysis (how to input and manipulate your data)

# **About the Author- Paul D. Allison**

- Professor of Sociology at the University of Pennsylvania
- Teaches survival analysis and categorical data analysis at the graduate level
- Holds yearly workshops on survival analysis for Canadian and American researchers
- Has published numerous statistical papers and books
- <http://www.statisticalhorizons.com/gpage5.html>

# Strengths and Weaknesses

- Main topics include censoring, survival curves, Kaplan-Meier estimation, accelerated failure time models, Cox regression models and discrete time analysis
- Additionally, includes other topics not usually covered in such texts such as time-dependent covariates, competing risks and repeated events

- Informative and practical text- chapters are concise, well written and present a lot of real life examples to support their arguments
- Theories are presented accordingly in tables and diagrams
- Topics are applicable to both novice and advanced researchers
- Fluent and presents the features of SAS- coding is clearly presented and easy to follow
- Presents the material in an enjoyable and readable style- straightforward

# Recommendation

- Biomedical and social science researchers
- Specifically, those researchers who's research interests lie in Cancer Epidemiology
- For example, last semester I looked at: (1) a novel comorbidity assessment tool, which included functional status, based on evaluation of comorbidities, to predict cancer survival (lung and colorectal cancer) and (2) establish the predictive validity of the CAT and compare its predictive performance to the Charlson Index and ACE-27.

# Kaplan-Meier survival estimates, by ACEscoreTri

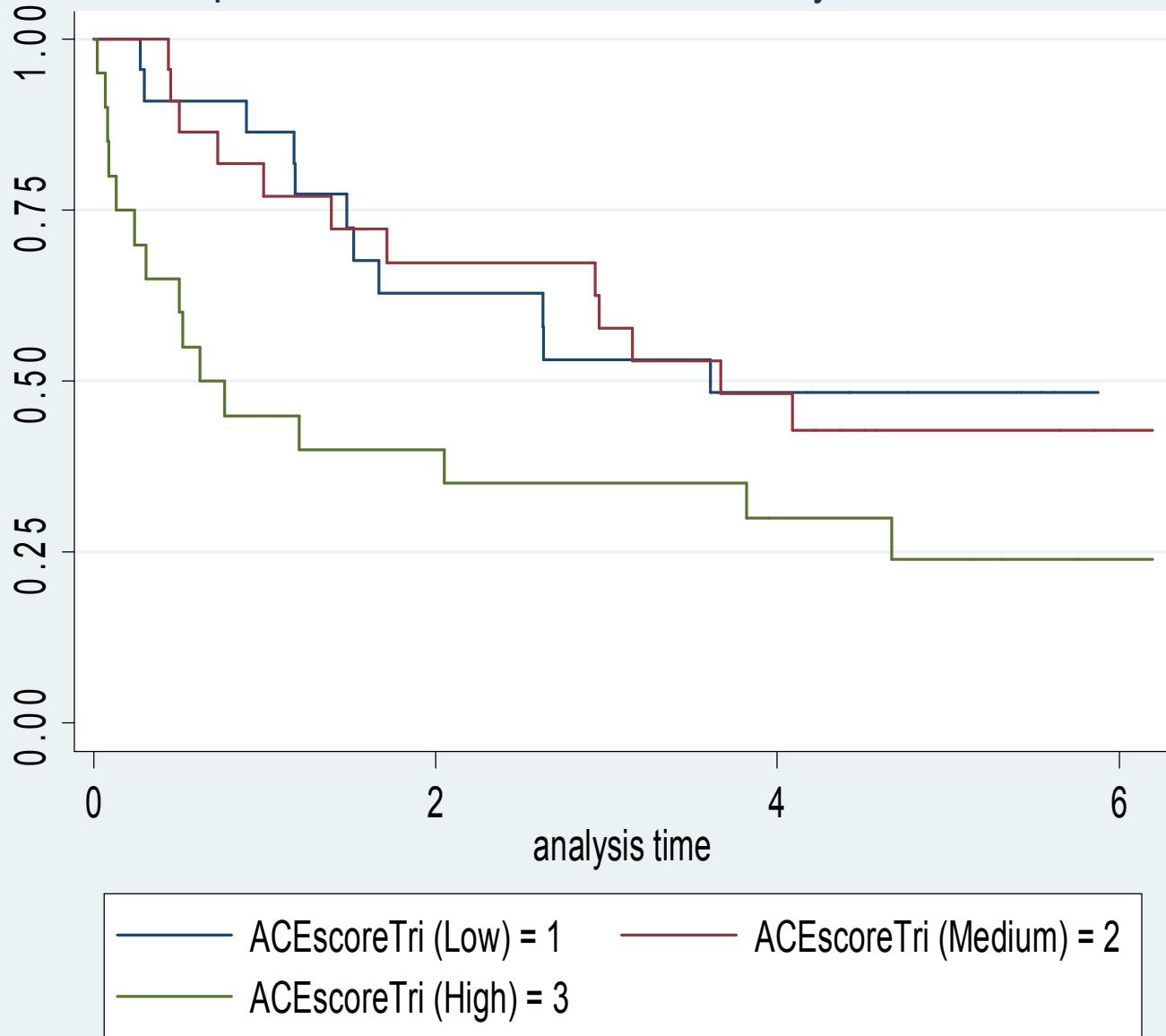


Figure 1. Kaplan-Meier survival estimates by tertiles of total ACE-27 comorbidity score



## Kaplan-Meier survival estimates, by CATscoreTri

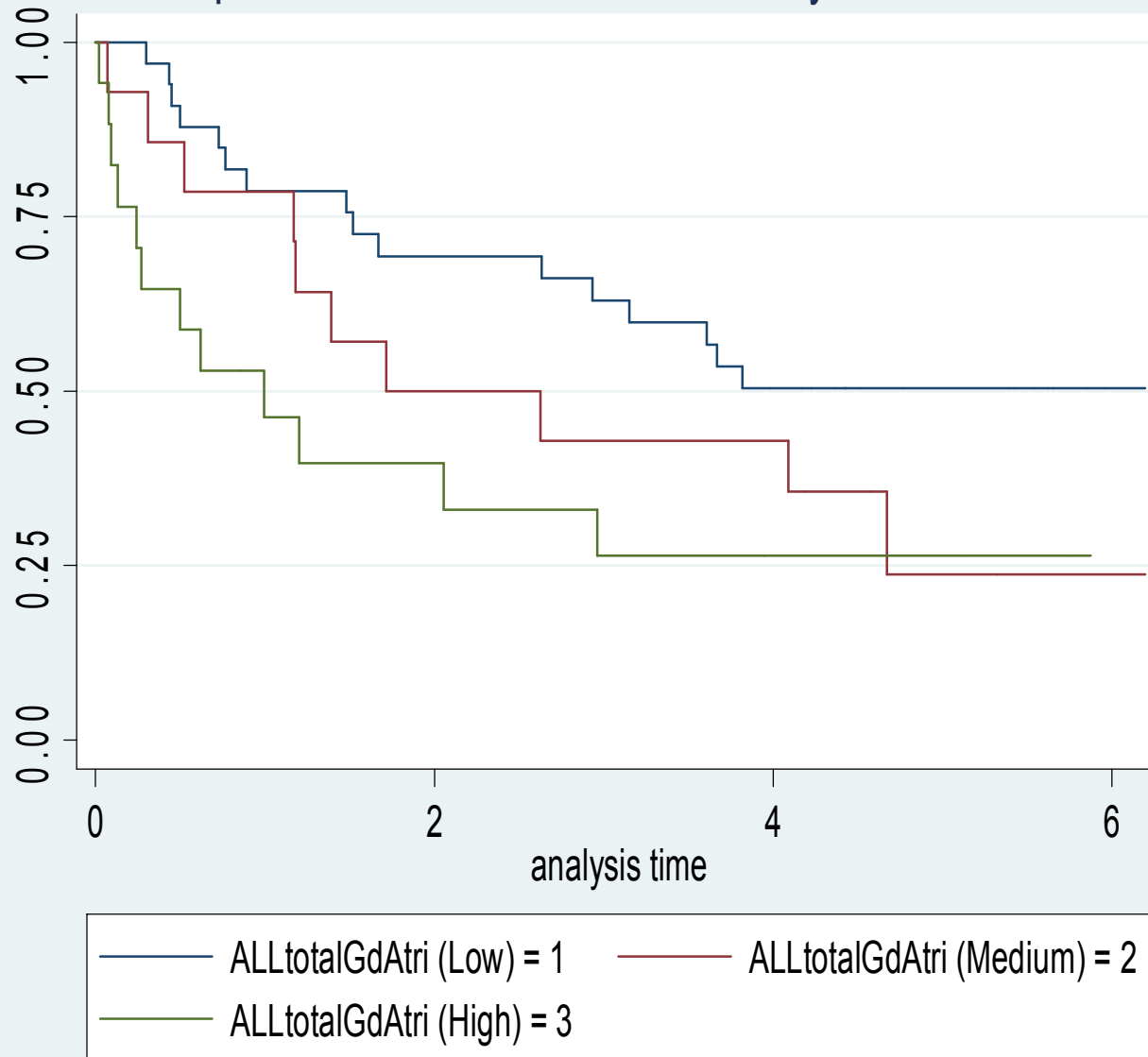


Figure 2. Kaplan-Meier survival estimates by tertiles of total CAT somorbidity score

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**Table 4-** Survival Analysis between Charlson, ACE-27 and CAT (n=64)

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Comorbidity Measure	Rater 1 HR (95% CIs, p value) and [c statistic]
CHARLSON score	1.28 (0.92-1.79, 0.146) [c= 0.572]
CHARLSON score ( <i>adjusted</i> )	1.13 (0.76-1.70, 0.549)
ACE-27 score	1.11 (1.01-1.23, 0.028*) [c= 0.610]
ACE-27 score ( <i>adjusted</i> )	1.16 (1.04-1.29, 0.007*)
CAT score	1.10 (1.05-1.15, 0.000*) [c= 0.646]
CAT score ( <i>adjusted</i> )	1.08 (1.03-1.14, 0.003*)

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*adjusted* for age, cancer type and cancer stage

# Relevance

- Great job of explaining the assumptions of the Cox model and how to test for it- graphically vs. statistically
  - HR constant over the time of follow-up using Schoenfeld residuals and the global test (follows a chi-square distribution)
- Use of Cox model for hypothesis testing, prediction and multivariate analysis
  - Looking at BMI as an independent predictor of breast cancer survival and recurrence/progresion

**The End**

**Thank You!**