

Survival Analysis of Lung Cancer Patients in Sweden

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Introduction

- Focus on lung cancer patients in Sweden and investigate factors associated with survival time.
- Main interest: whether different treatment types are associated with different survival experiences over time.
- Not all patients experience the event during follow-up, so survival analysis methods are required.

Data Description

- A random sample of 500 lung cancer patients from Sweden was selected from the Kaggle Lung Cancer Dataset (33,161 patients in total).
- During treatment, 386 patients died, while 114 were still alive when the observation period ended.

Data Description

Survival (Death / Alive)

Age

Gender (Female/Male)

BMI

Cholesterol level

Treatment (radiation / Chemotherapy / Surgery / Combined)

Cancer stage (I - IV)

Smoking status (Never / Passive / Former / Current)

Hypertension (No / Yes)

Asthma (No / Yes)

Cirrhosis (No / Yes)

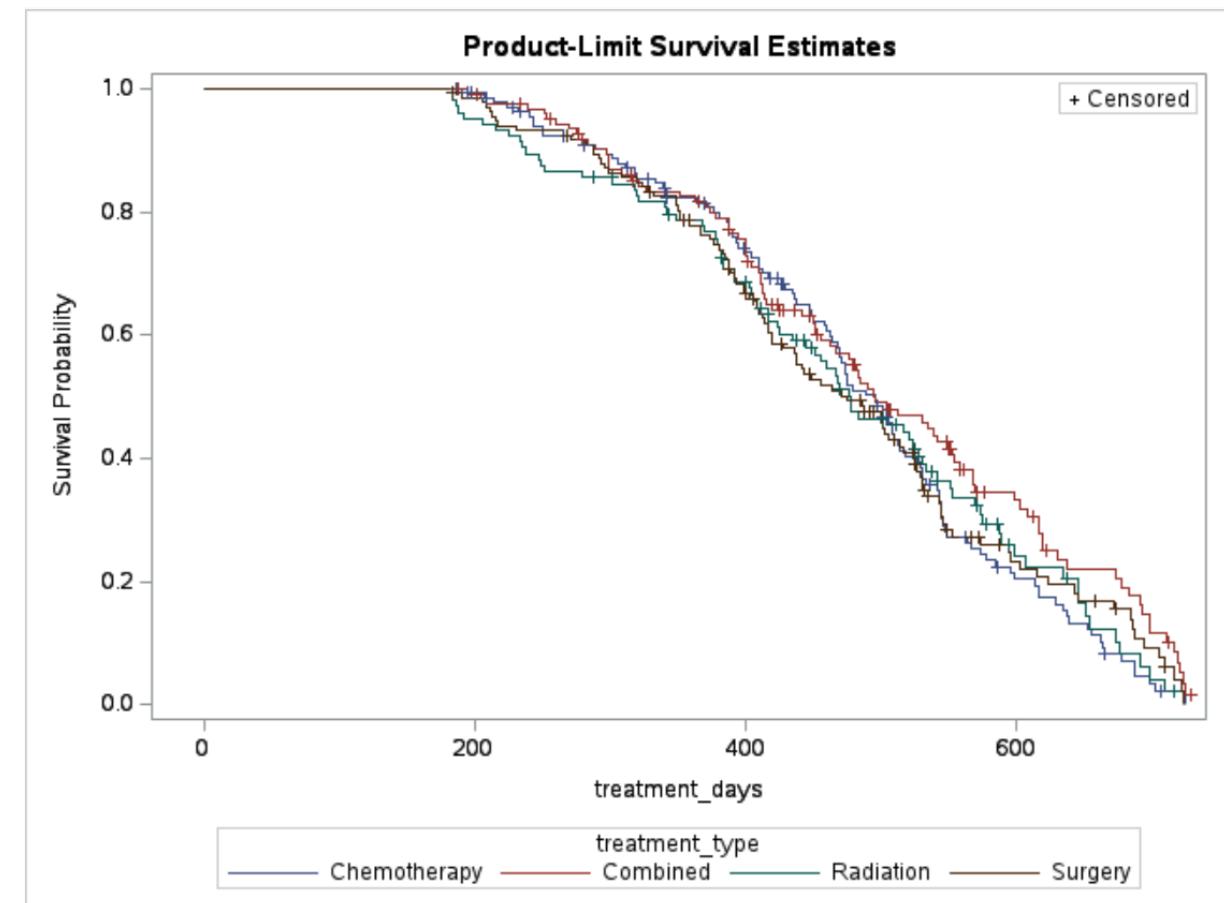
Other cancer (No / Yes)

Family history of cancer (No / Yes)

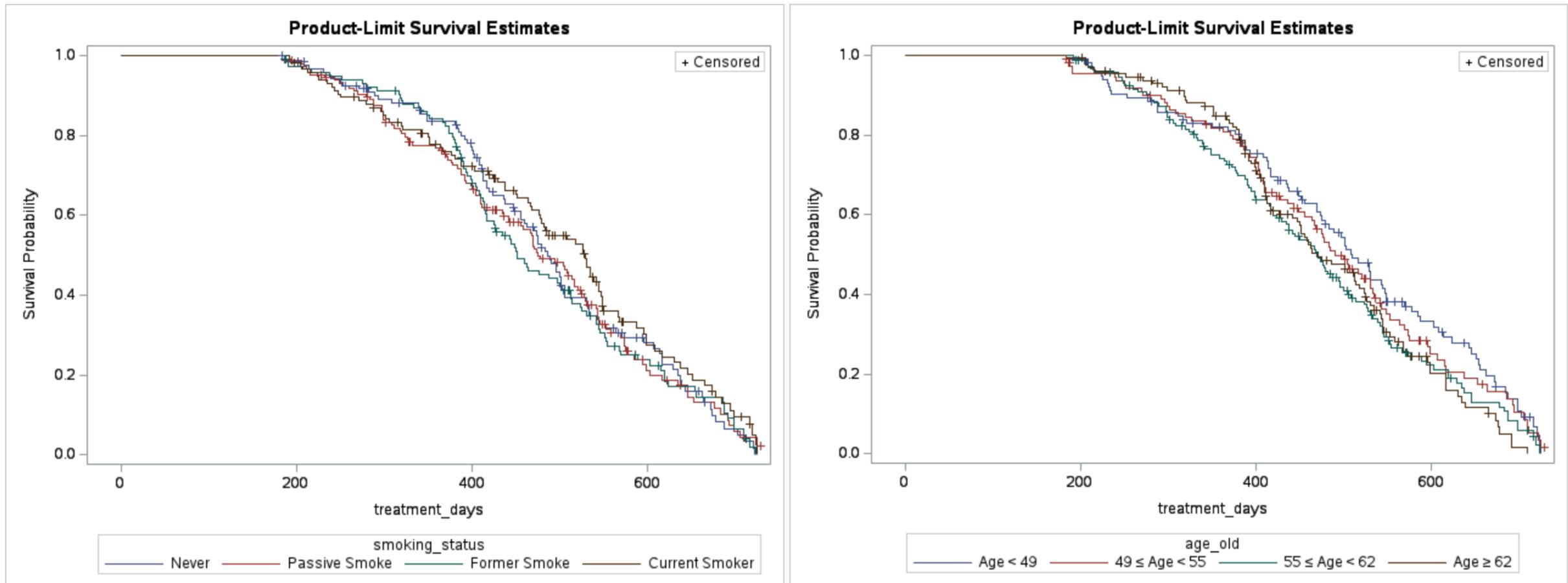
Treatment Days

Survival Curves by Treatment Type

- No clear treatment differences are observed early in time.
- **Combined treatment** shows higher survival at later times.



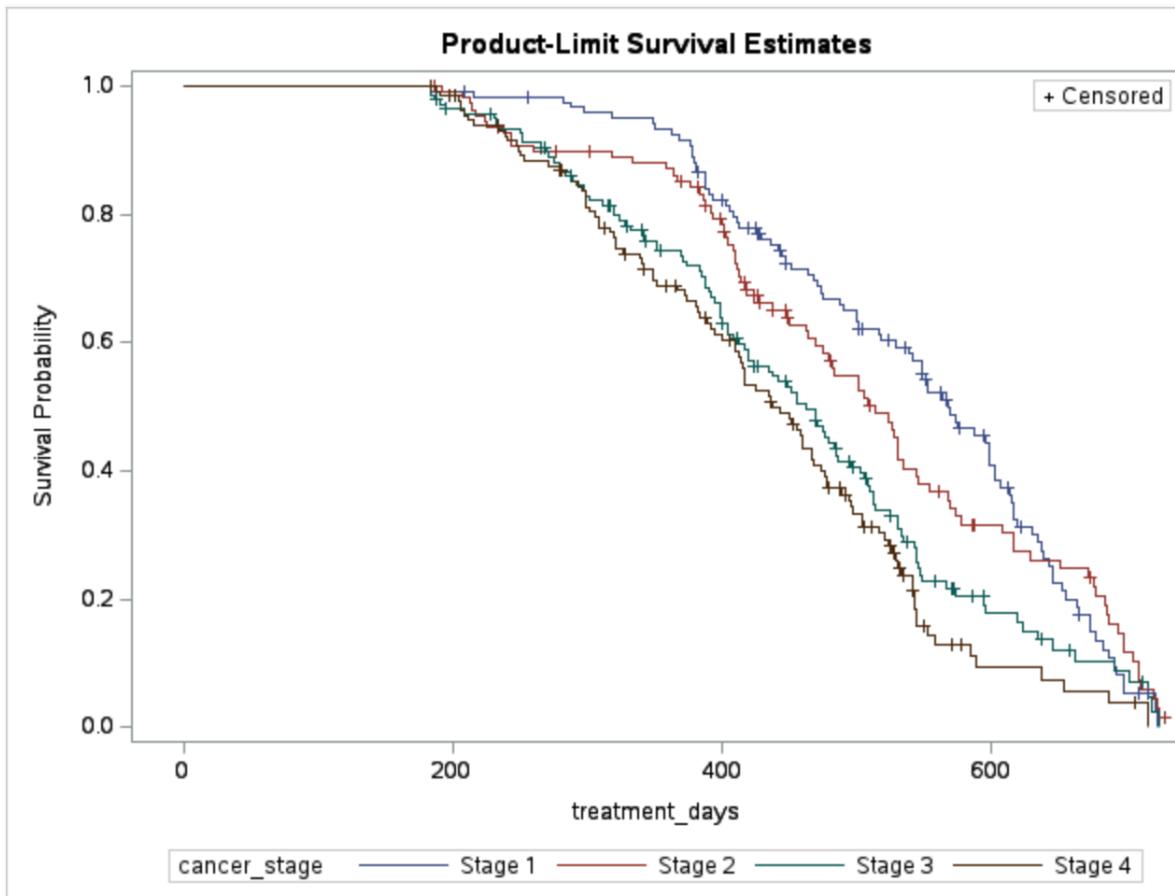
Survival Curves by Patient Characteristics



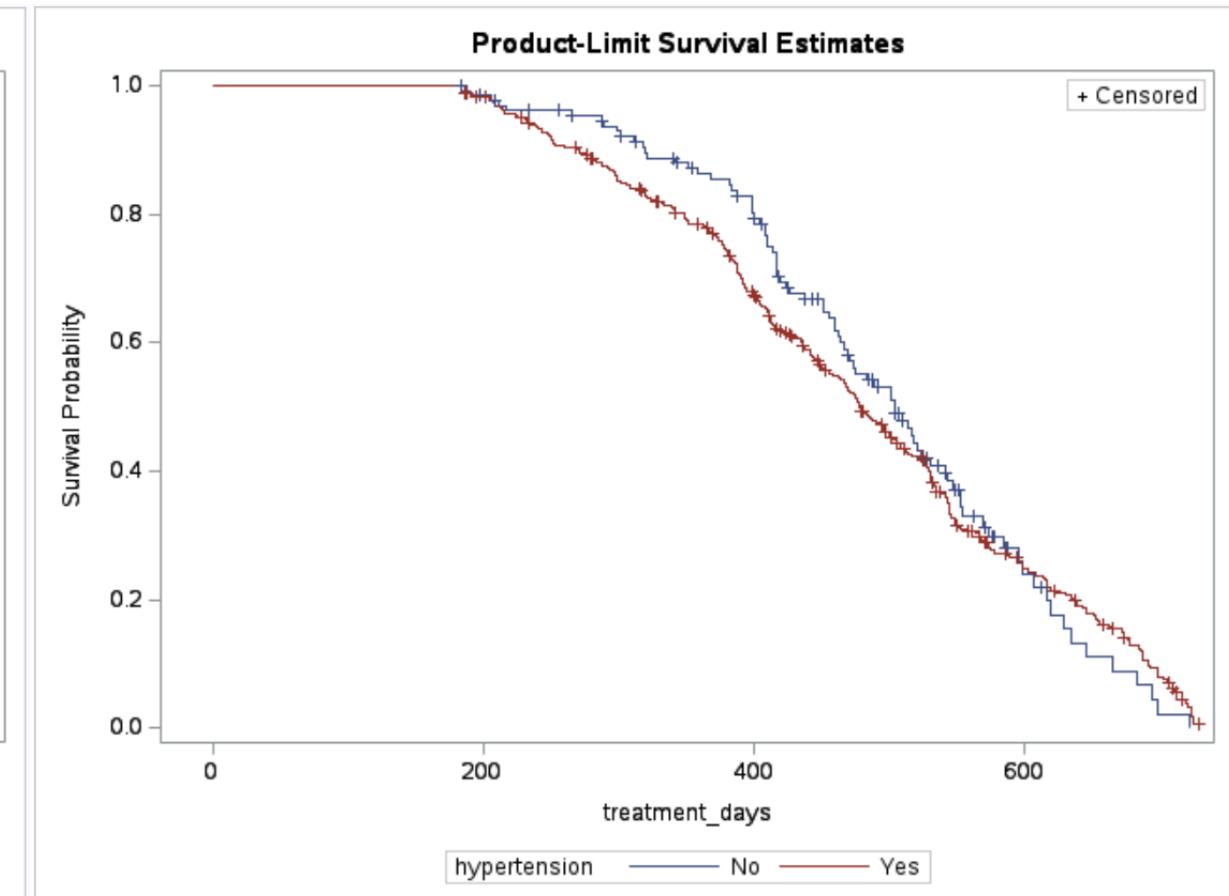
Smoking status: No clear survival differences

Age: Younger patients (<49) show higher survival.

Survival Curves by Patient Characteristics

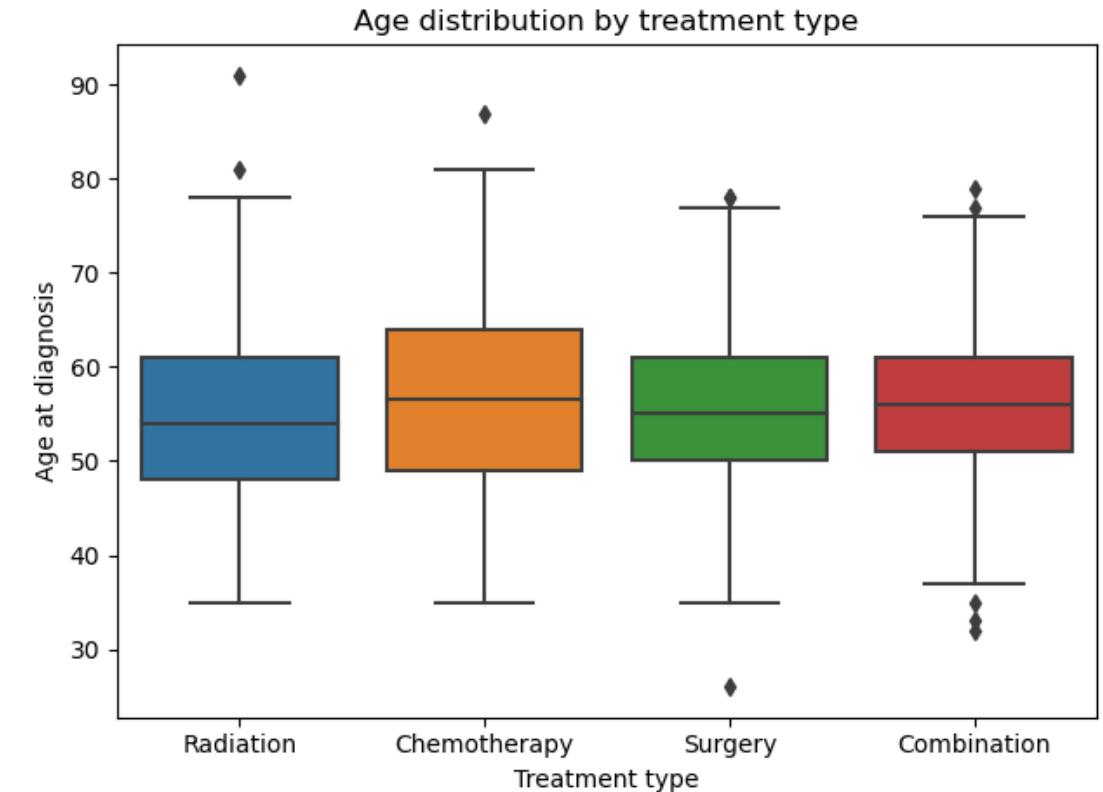
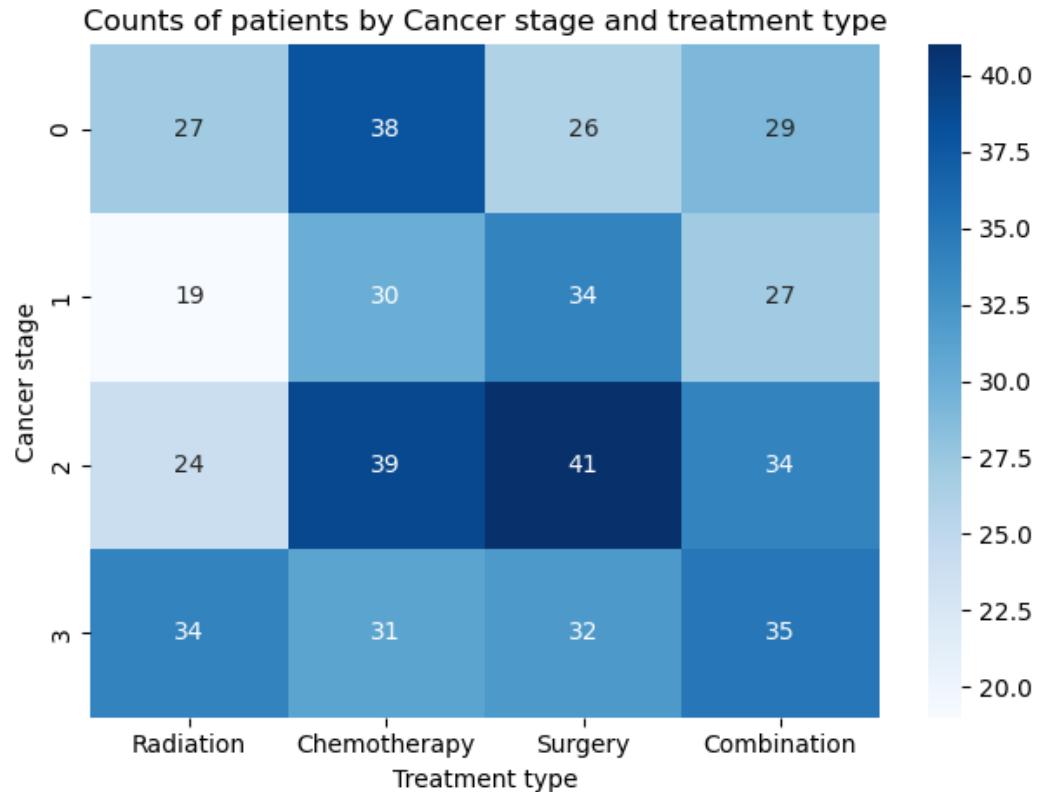


Cancer stage: Clear survival differences



Hypertension: Survival rates cross over time

Descriptive Analysis of Patient Characteristics



Treatment groups differ in patient characteristics, so patient characteristics must be considered together when analyzing survival.

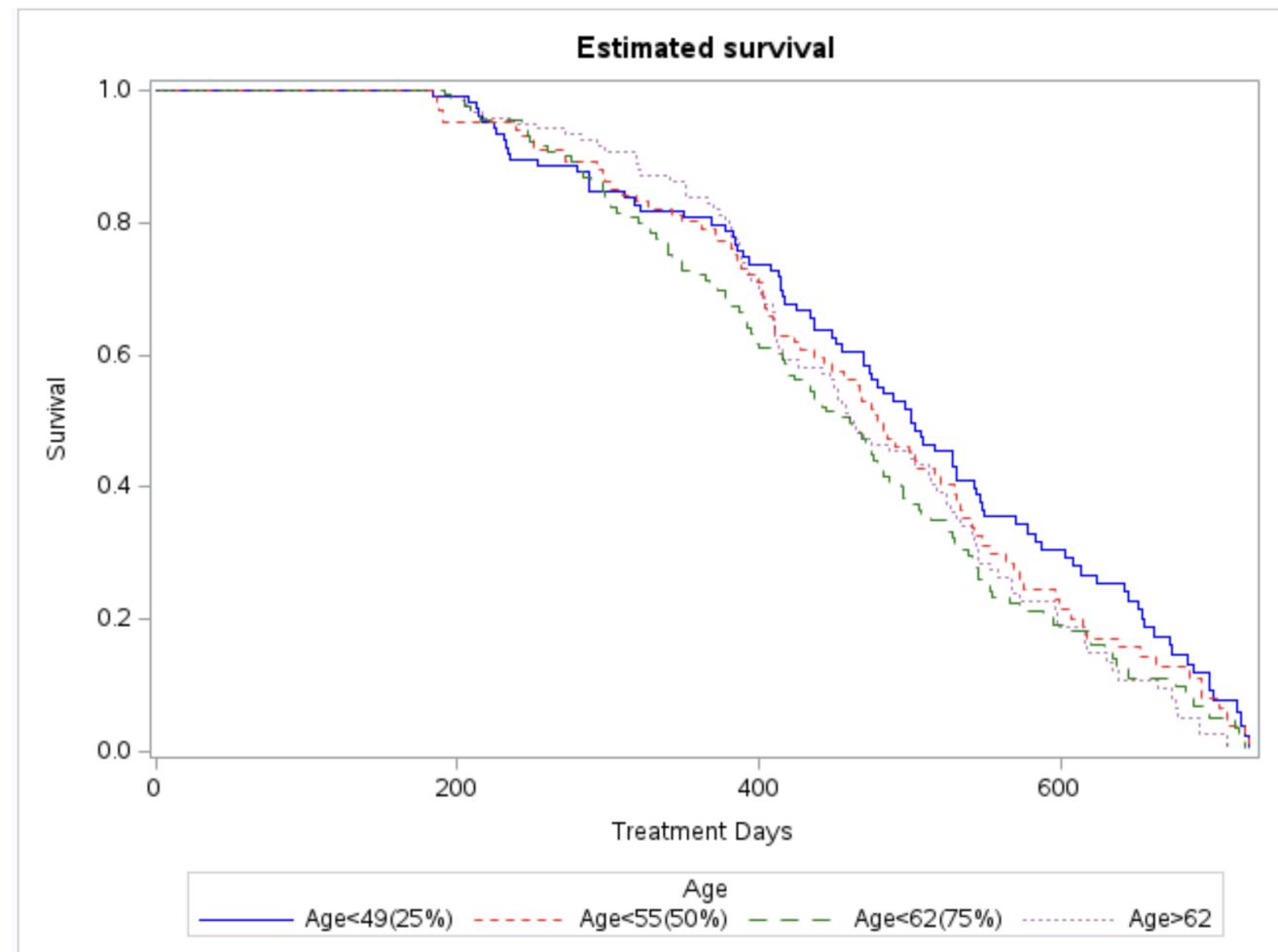
Analysis Result

- This analysis was based on comparing patients within the same cancer stage.

Parameter	P-value	Hazard ratio
Age	0.03	1.01
Cirrhosis	0.23	1.16
Chemotherapy v.s Radiation	0.88	1.02
Surgery v.s Radiation	0.84	1.03
Combined v.s Radiation	0.13	0.79
Hypertension	<0.01	Strong time-dependent effect

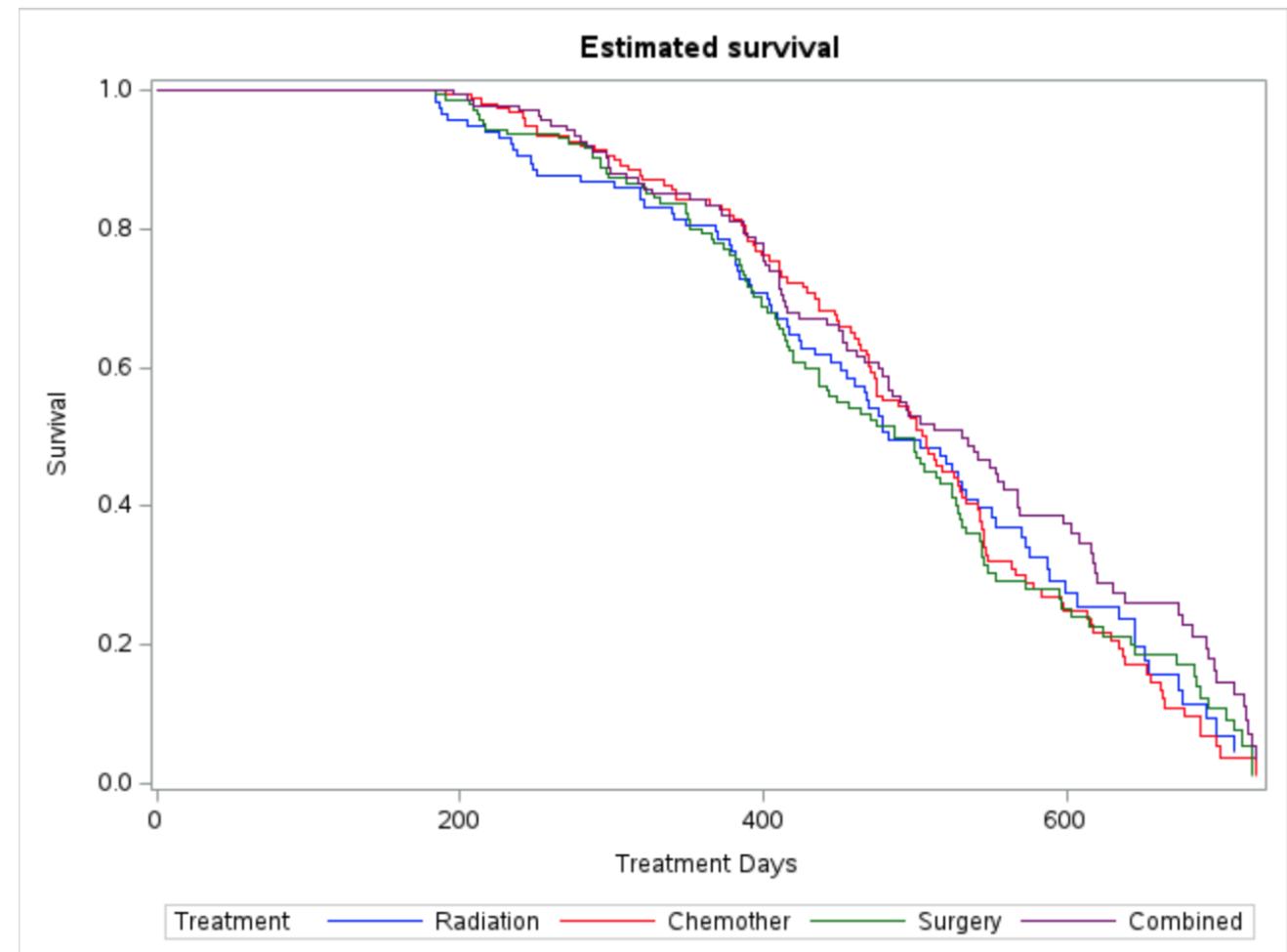
Estimated Survival by Age

- Older patients are associated with a slightly higher risk.
- Each additional year of age increases the risk by around 1.2%.



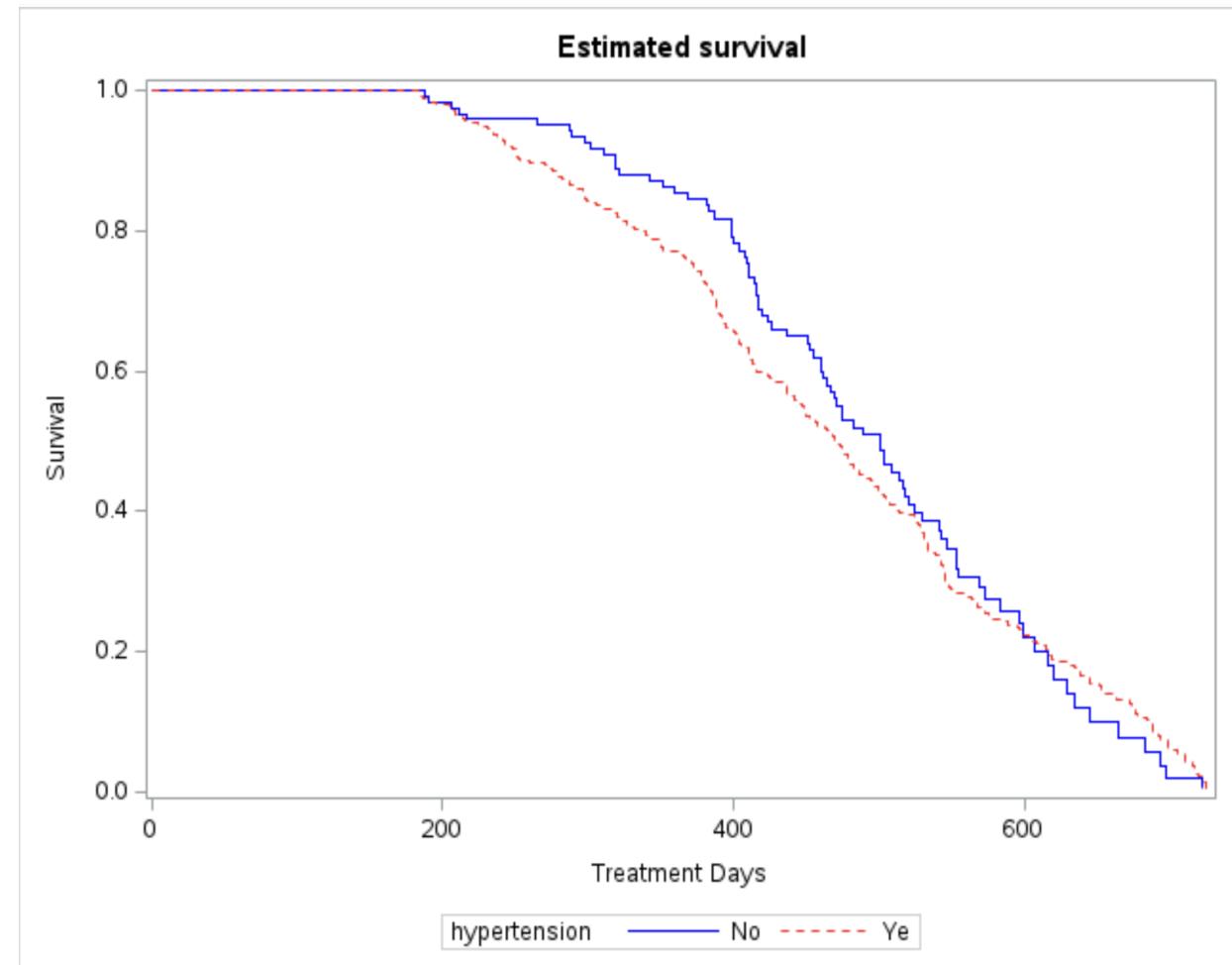
Estimated Survival by Treatment Type

- After accounting for patient differences, survival is similar across treatments groups.



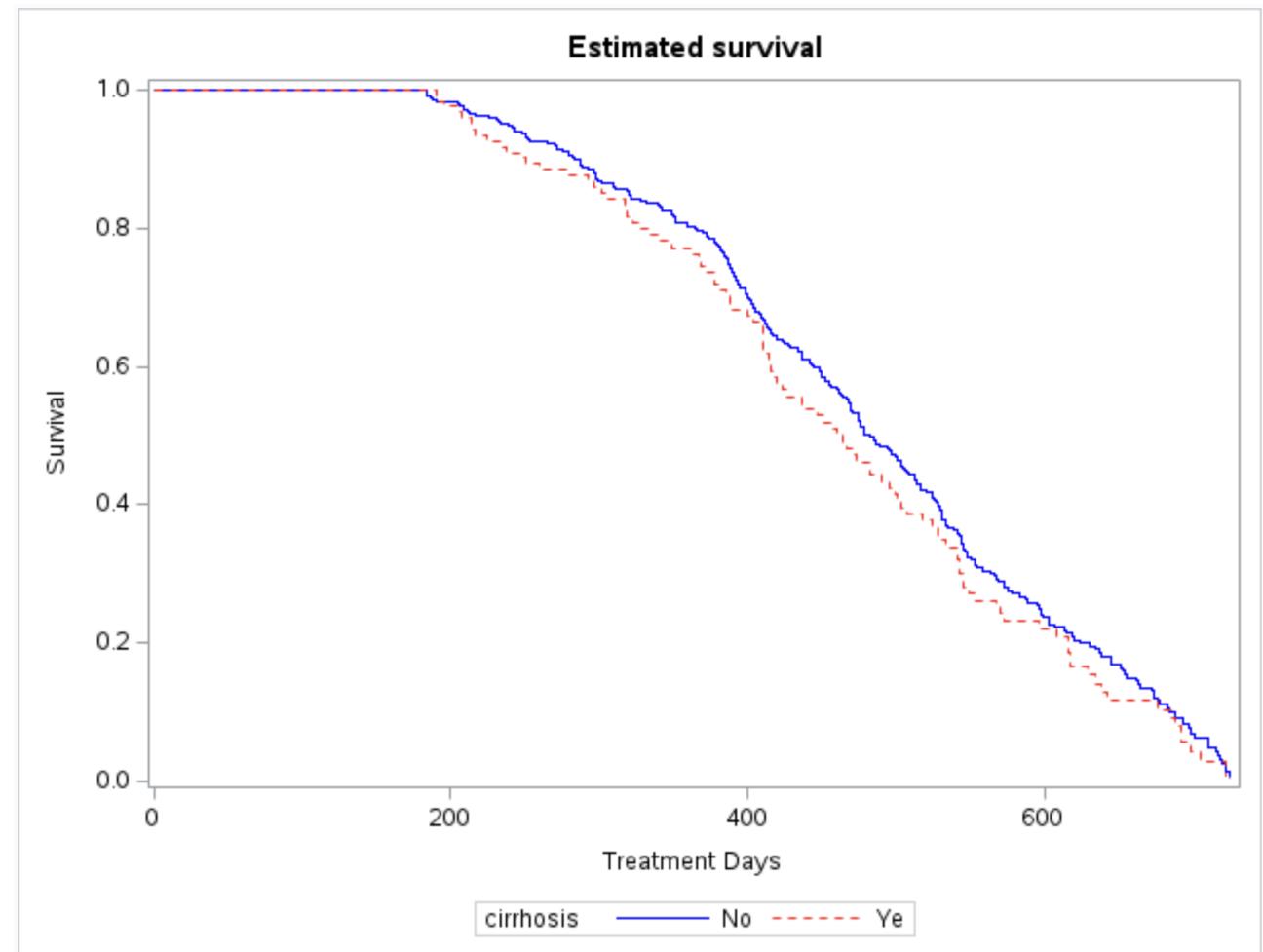
Estimated Survival by Hypertension Status

- Higher risk early on, weaker effect later.
- Hypertension is strongly associated with survival.



Estimated survival by Cirrhosis

- Although patients with cirrhosis appeared to have higher risk, the evidence was weak.



(Fix age at 55, with no cirrhosis and Radiation treatment)

Conclusion

- After accounting for patient characteristics and cancer stage, no strong evidence of meaningful survival differences between treatments was found.
- Patient characteristics played a more key role in survival outcomes. In particular:
 - **Age** was associated with higher risk.
 - **High blood pressure** showed a clear effect that changed over time.

Appendix- Arjas Plot

