

# Analysis of transplantation effectiveness and its optimal timing in patients affected by Myelodysplastic Syndrome

**Applied Statistics** | 22 april 2021

Tutors:  
Prof. F. Ieva  
Dr. M. Spreafico  
Dr. C. Gregorio



Luca Caivano  
Taguhi Mesropyan  
Manfred Nesti  
Michele Precuzzi

# Myelodysplastic Syndrome (MDS)

- rare disease
- can progress into **Acute Myeloid Leukemia (AML)**
- very high mortality **in acute phase**
- transplantation is the only cure



# OUR GOALS



## Transplantation effectiveness

Investigate the differences between 2 cohorts of the data: transplanted and not transplanted

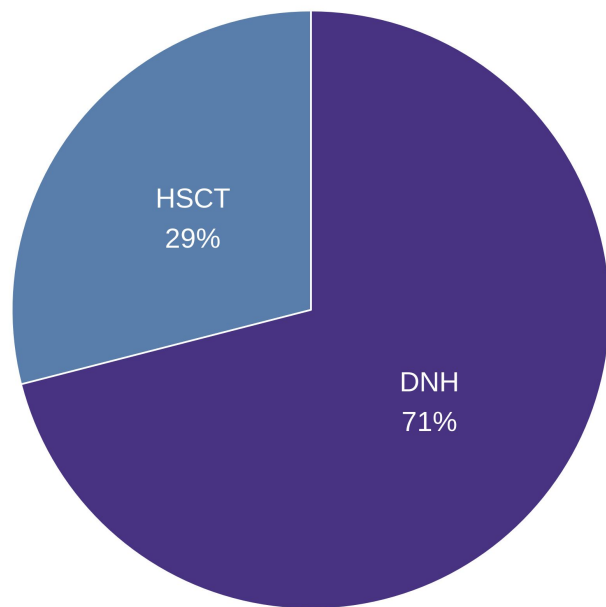
## Optimal timing

Build a model that optimizes the transplantation time for optimal survival

- **early** transplantation: risk of relapse (the disease reappears)
- **late** transplantation: risk of ineffectiveness

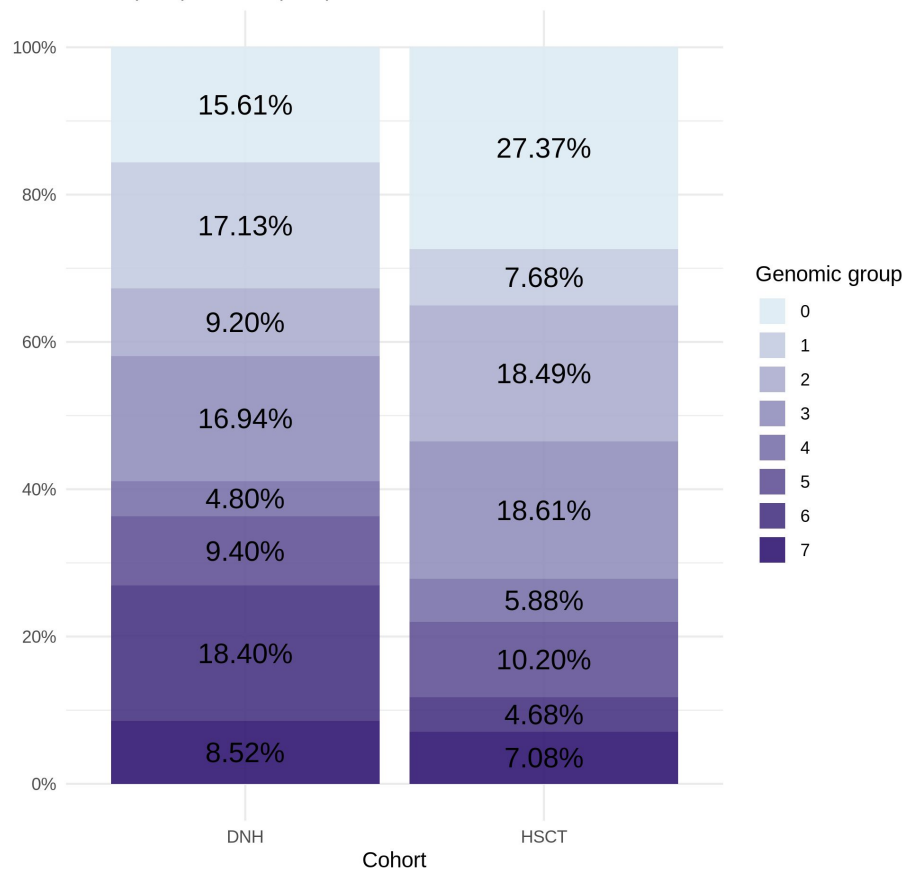
# Data Exploration

Number of patients: 2876

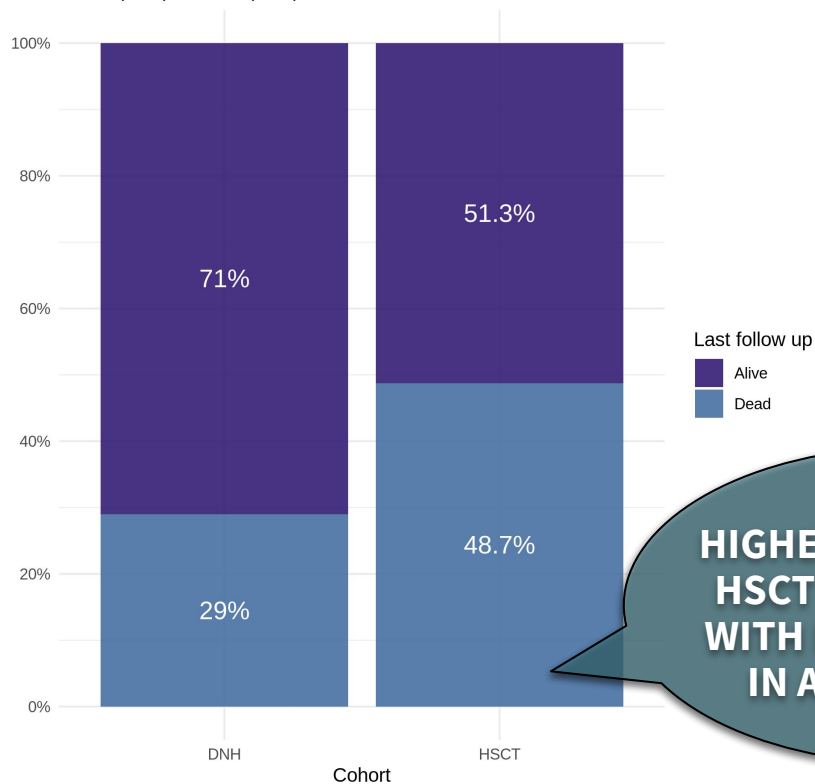


**HSCT = “Transplanted”**  
**DNH = “Not Transplanted”**

Patients by cohort and genomic group  
HSCT (29%) vs DNH (71%)

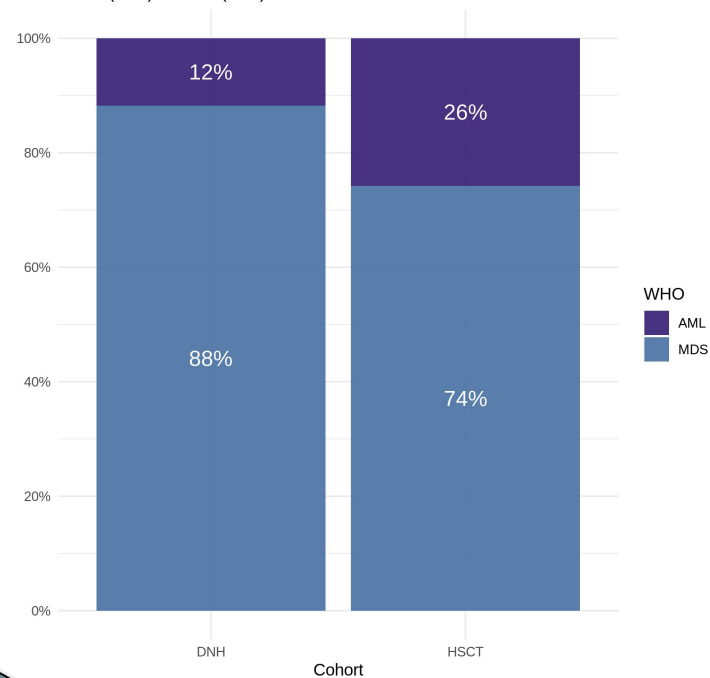


Patients by follow up status and cohort  
HSCT (29%) vs DNH (71%)

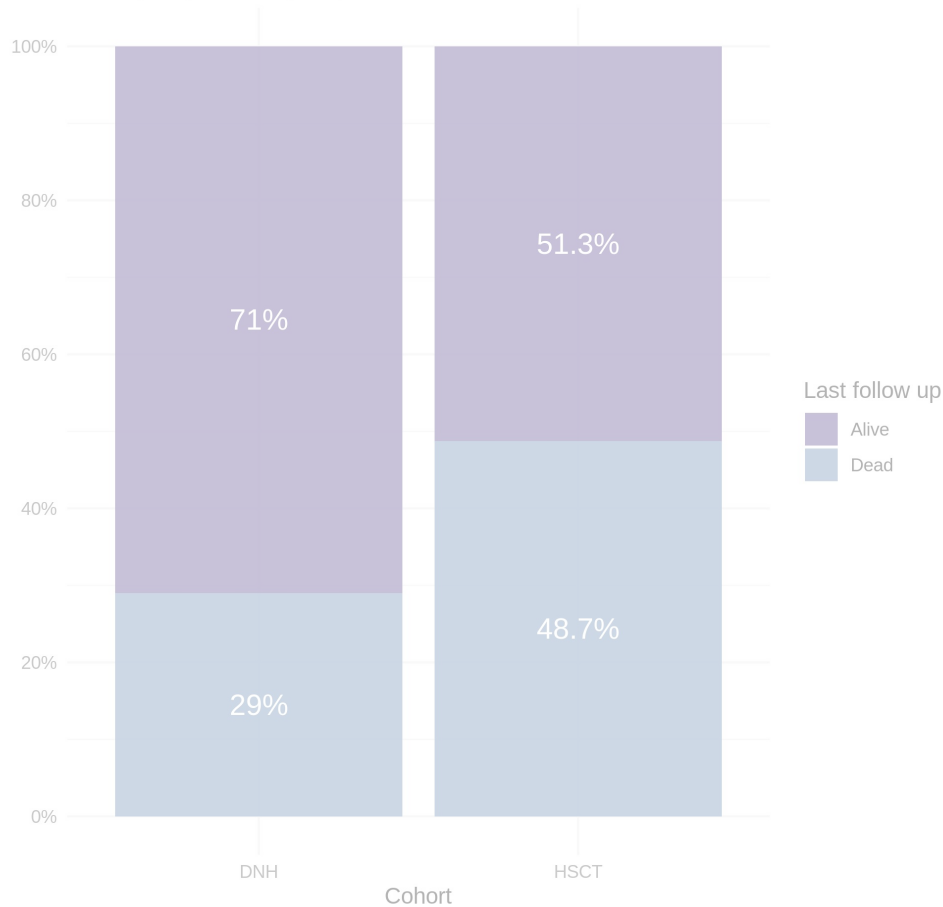


**HIGHER MORTALITY IN  
HSCT IS ASSOCIATED  
WITH MORE PATIENTS  
IN ACUTE PHASE!**

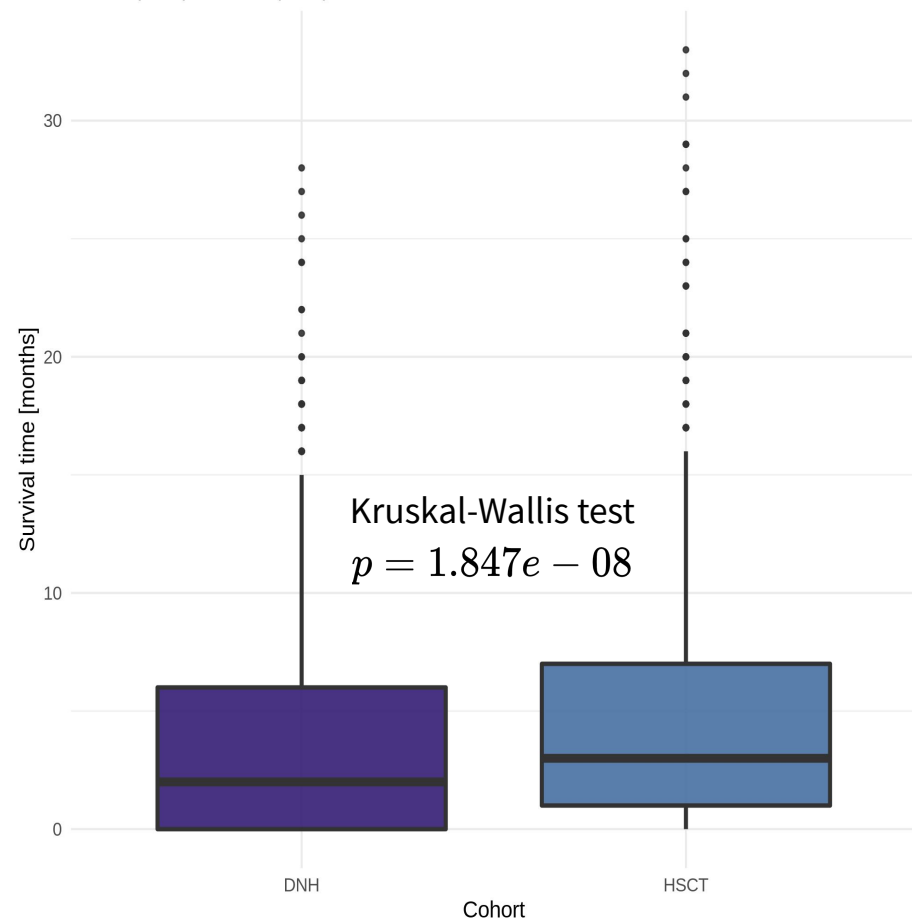
Patients by WHO and cohort  
HSCT (29%) vs DNH (71%)



Patients by follow up status and cohort  
HSCT (29%) vs DNH (71%)

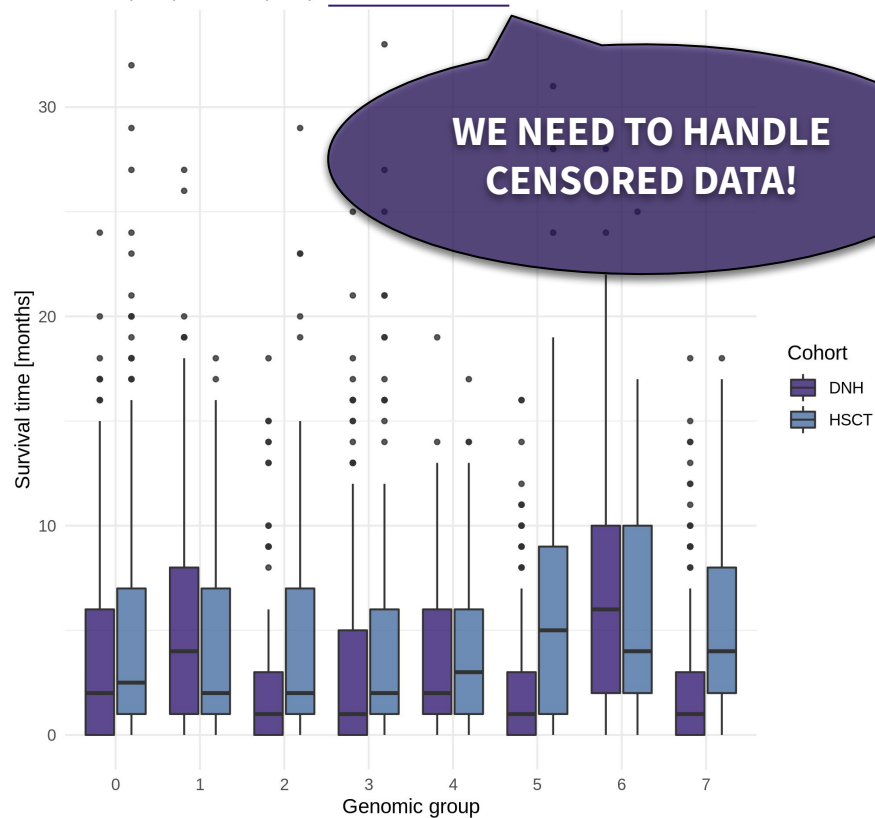


Survival time distribution by cohort  
HSCT (29%) vs DNH (71%), Censored data: 65%



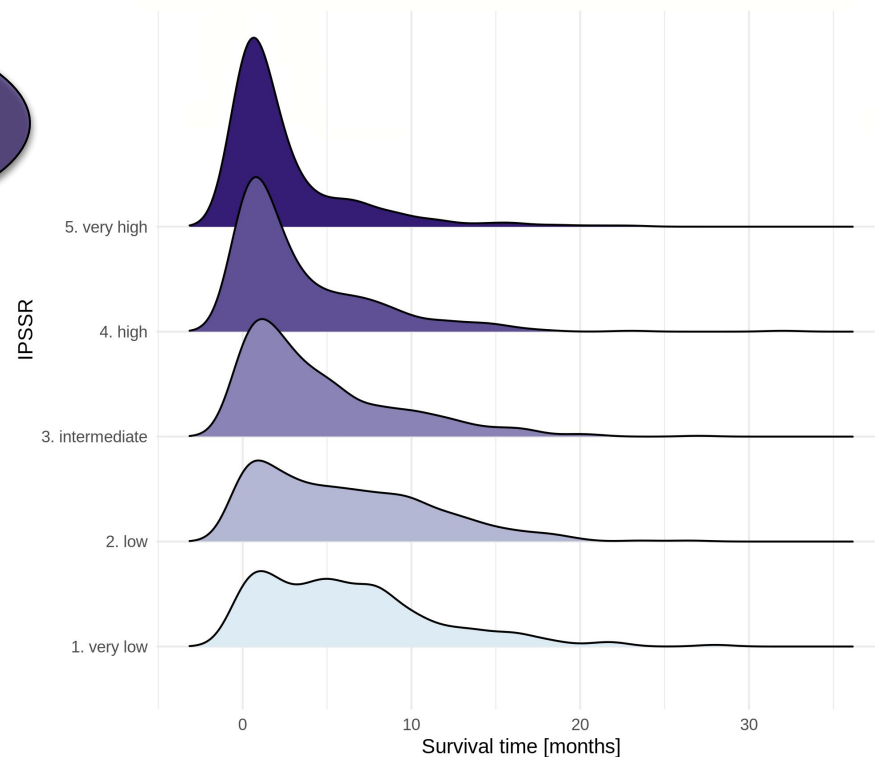
## Survival time distribution by cohort and genomic group

HSCT (29%) vs DNH (71%), Censored data: 65%



## Survival time distribution by IPSSR

HSCT (29%) vs DNH (71%), Censored data: 65%



# What's next?

## Survival Analysis

- Transplanted vs Not Transplanted
- Genomic Groups
- New Clusters

## Transplantation Timing Optimization Model

- PCA
  - feature importances
  - uncertainty reduction
- Clustering





# References



M. Bersanelli et al. - Journal of Clinical Oncology, 2021  
*“Classification and Personalized Prognostic Assessment on the Basis of Clinical and Genomic Features in Myelodysplastic Syndromes”*



M. Cazzola et al. - American Society of Hematology, 2013  
*“The genetic basis of myelodysplasia and its clinical relevance”*



R. C. Lindsley et al. - The New England Journal of Medicine, 2017  
*“Prognostic Mutations in Myelodysplastic Syndrome after Stem-Cell Transplantation”*

