

# Predicting Incident Heart Failure from the Gut Microbiome: The DREAM FINRISK challenge

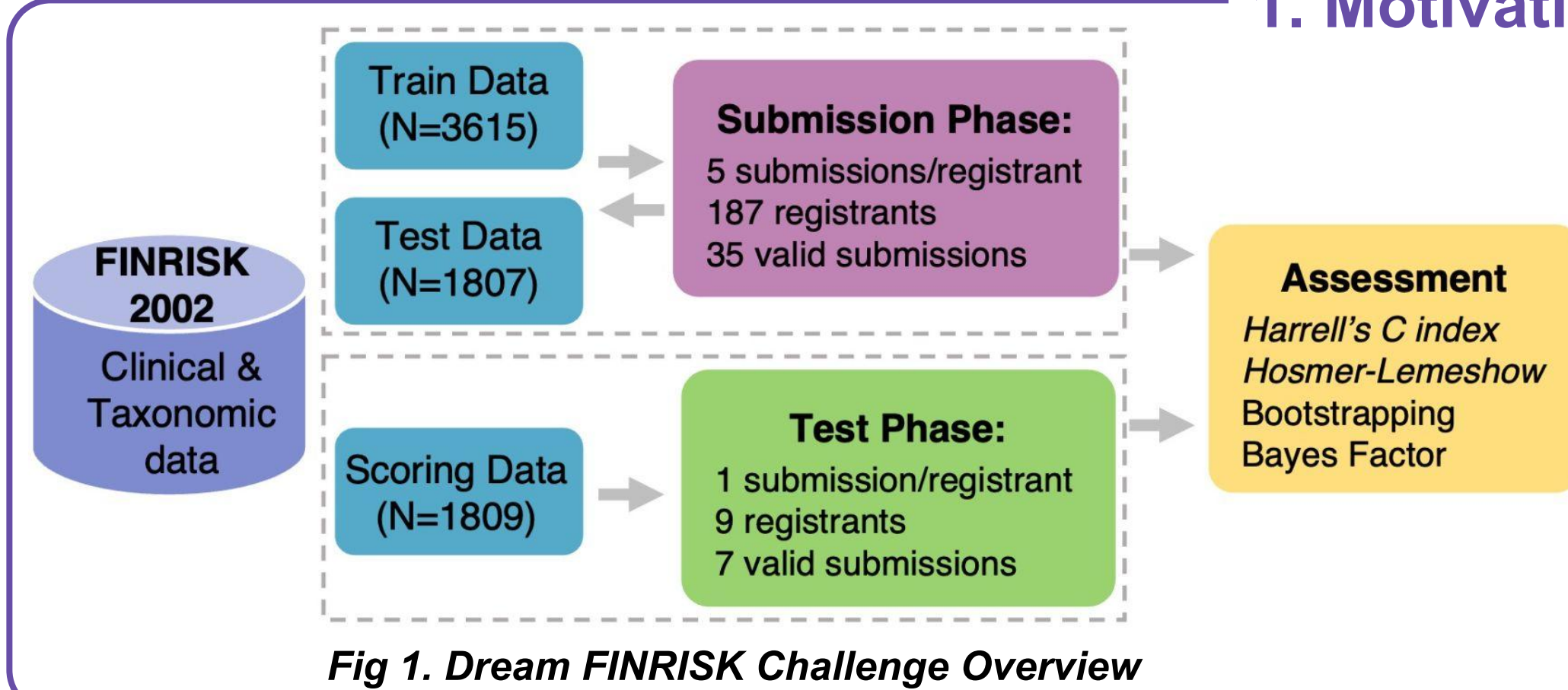


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## 1. Motivation and Aim

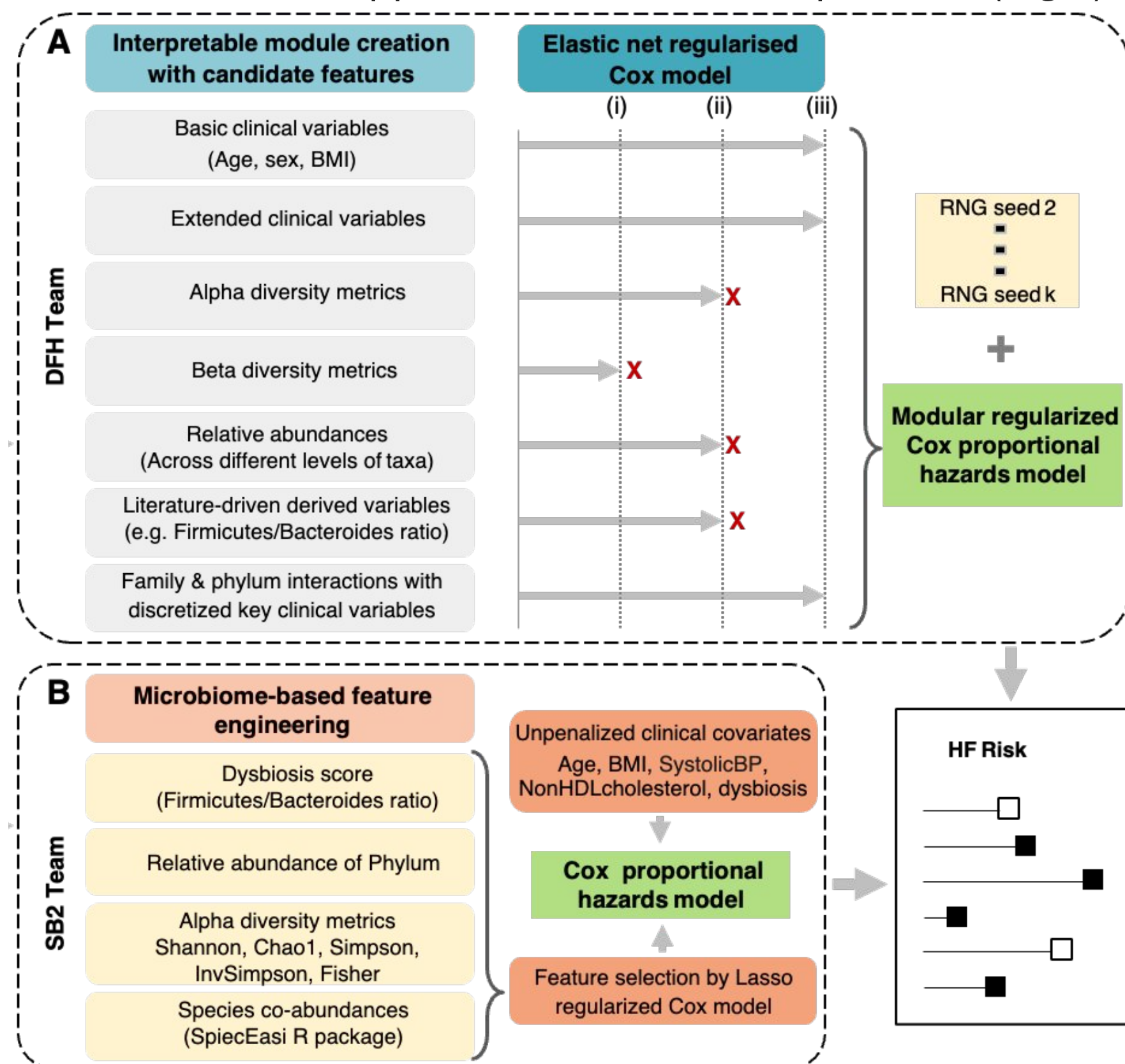


**Heart failure (HF)** is a complex clinical syndrome characterized by the heart's inability to meet the body's blood supply needs. Several studies have found differences in the microbiome composition of HF patients compared to controls.

The crowdsourced **FINRISK Microbiome DREAM challenge** (Fig 1) aimed to investigate the **gut microbiome compositions in predicting HF risk** in a large population of 7,231 Finnish adults<sup>1</sup> (FINRISK 2002, n = 559/7,231 HF). To protect the privacy of individuals, we provided synthetic data that closely mimics the real FINRISK data.

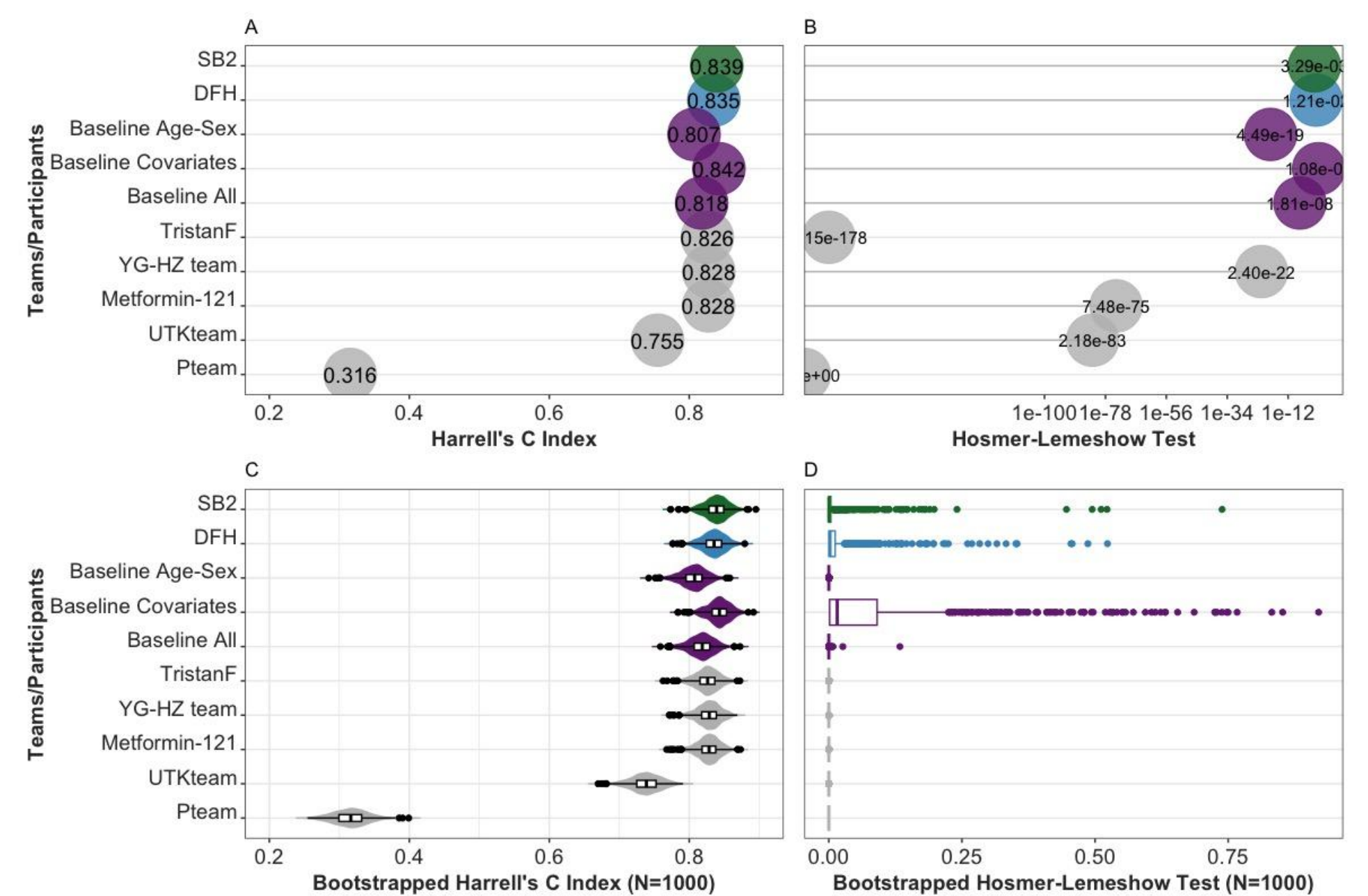
## 2. Modelling Workflow

Two teams (**SB2, DFH**) developed superior models that outperformed the baseline and other competing models using regression-based methods with different approaches for feature importance (Fig 2).



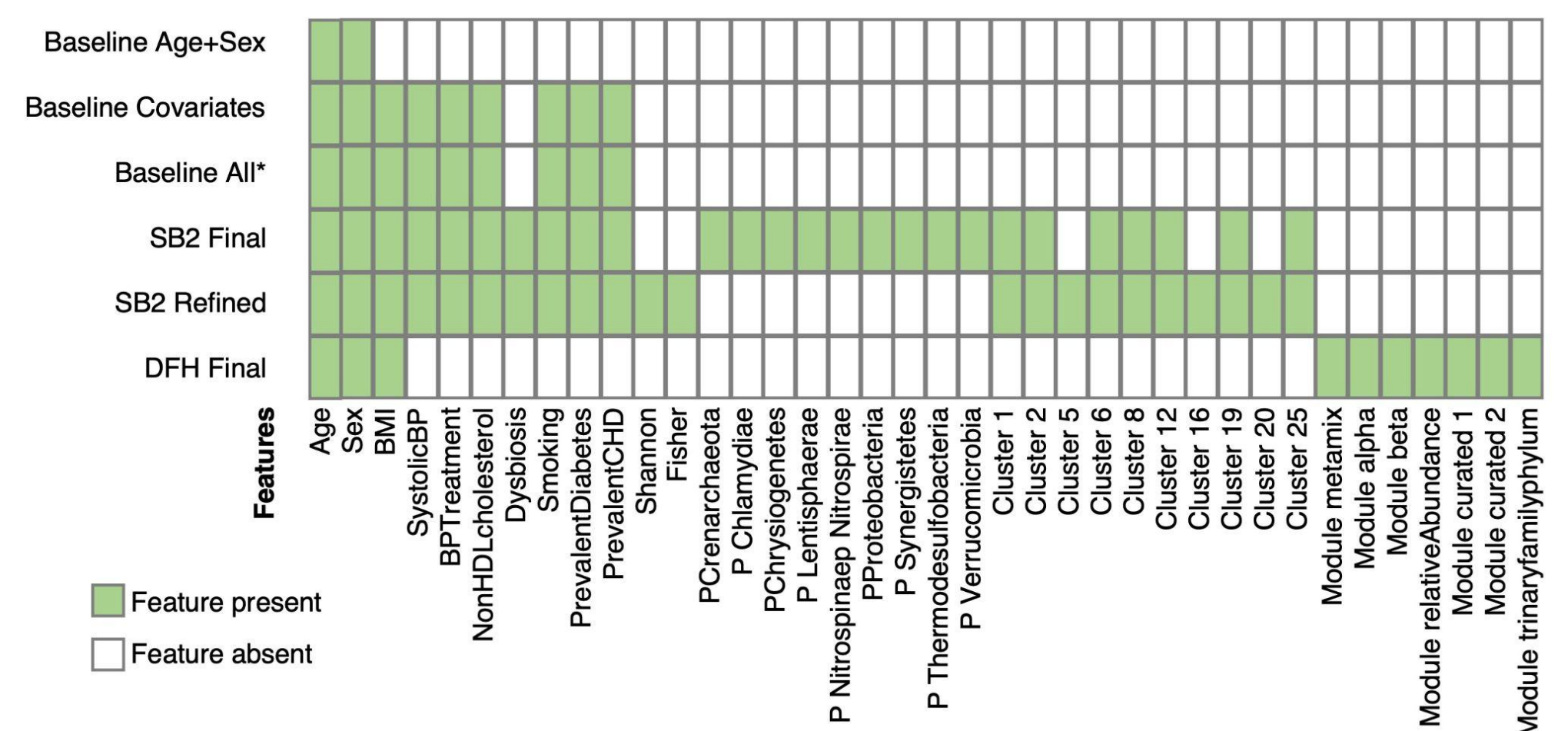
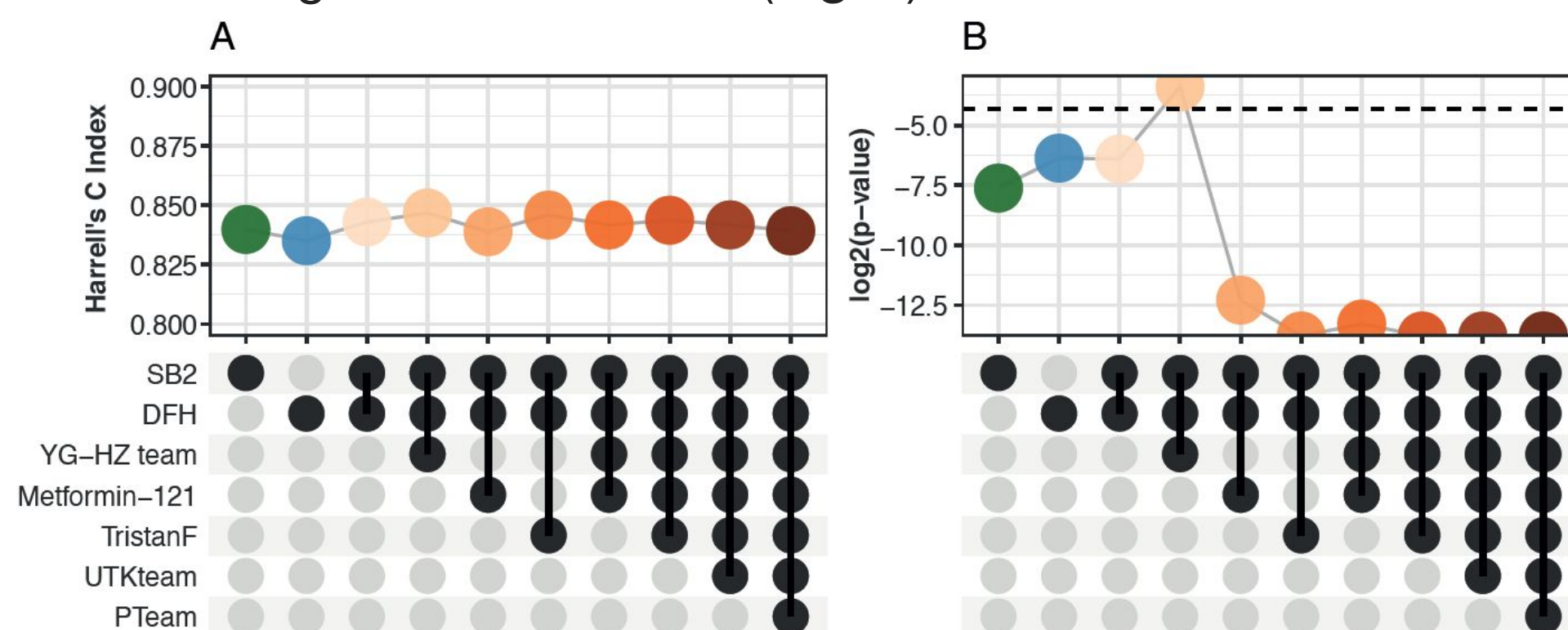
## 3. Model Results

- Baseline Age-Sex: Cox model with only Age + Sex as covariates
- Baseline Covariates: Cox model with all clinical covariates
- Baseline All: Cox model with all clinical covariates + microbiome



## 4. Model Refinement

Post-challenge enhancements included minimizing redundant taxonomic information through species and network analysis, along with combining the final methods (Fig. 5).



## 5. Conclusion

Microbiome species, particularly those **associated with inflammation**, were found to be valuable predictors of incident HF.

This challenge provides a ground for the scientific community to contribute and advance our current understanding of the **incidence of heart failure and its associations with the gut microbiome**.

## Learn More

The DREAM challenge main organizer:

**COST action network ML4microbiome (CA18131; ml4microbiome.eu)**

Challenge page > [synapse.org/finrisk](https://synapse.org/finrisk)

## References

Salosensaari A, Laitinen V, Havulinna AS et al., Taxonomic signatures of cause-specific mortality risk in human gut microbiome. Nat Commun 12, 2671 (2021). <https://doi.org/10.1038/s41467-021-22962-y>