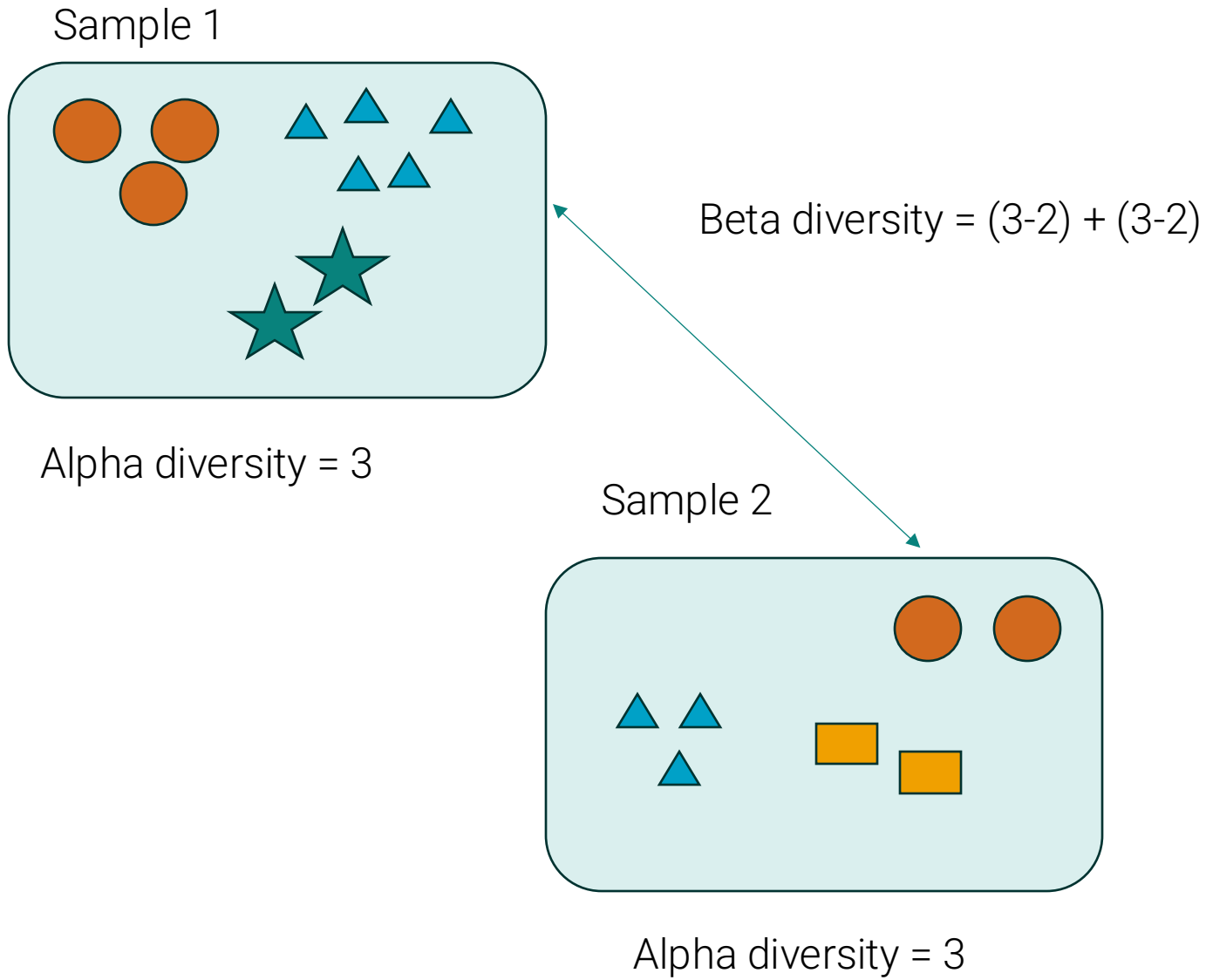
Microbiome workshop

September 2024

IKMB
Institute of Clinical Molecular Biology

Beta-diversity analysis. Introduction

Beta-diversity measures the variation in microbial community composition between different samples



Methods to measure beta-diversity

Bray-Curtis - Measures the compositional dissimilarity between two samples based on the counts of species or OTUs/ASVs

UniFrac - Incorporates phylogenetic information to measure the distance between microbial communities **Unweighted UniFrac** considers only the presence or absence of species, while **Weighted UniFrac** also accounts for the abundance of species.

Jaccard - Considers the presence or absence of species to measure similarity between samples

Data Requirements

OTU/ASV Tables

Essential for calculating metrics like Bray-Curtis, Jaccard, and UniFrac

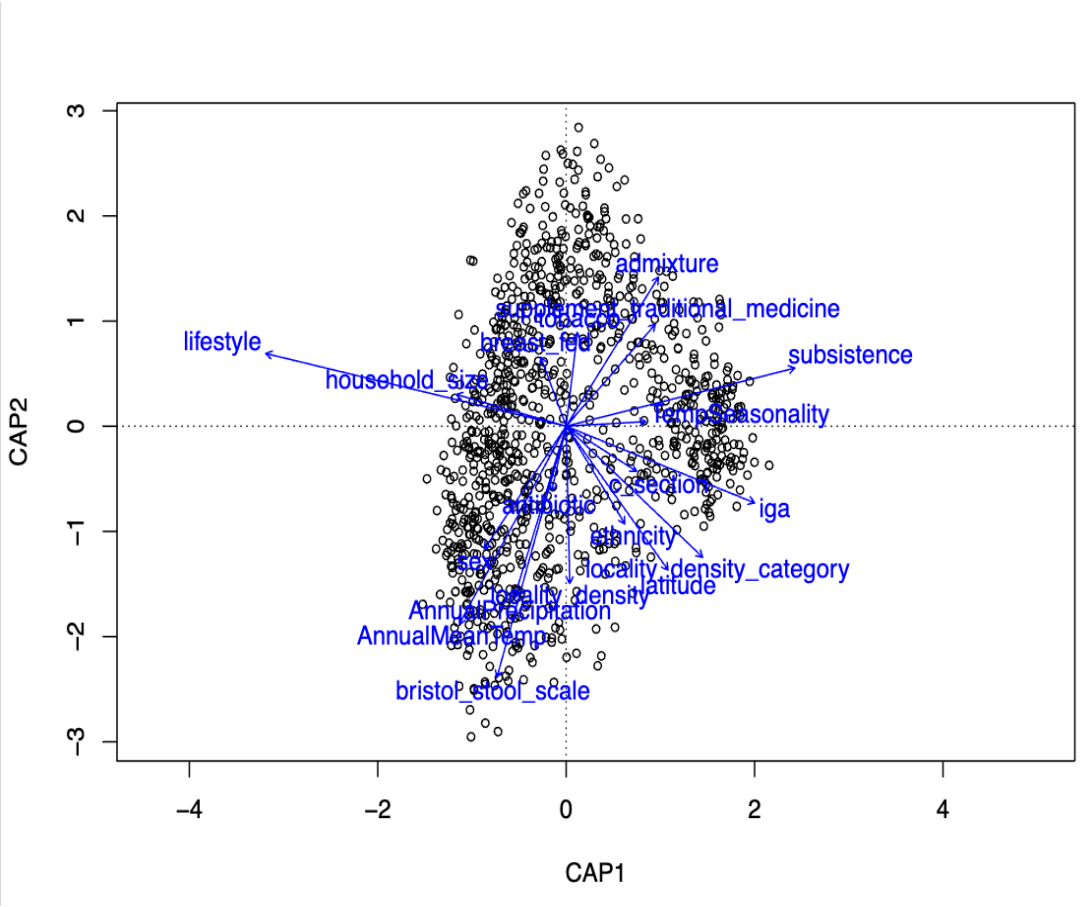
Phylogenetic Trees

important for UniFrac distance

How environmental variables influence the variation in community data ?

Capscale R package - Canonical Analysis of Principal Coordinates

- Distance-Based Redundancy Analysis
- Stepwise analysis - identify the most important variables in a multivariate model
- Biplot - a visual interpretation of the ordination results, showing both the samples and the influence of environmental variables



Test the significance of differences between groups

- **ADONIS/PERMANOVA** (Permutational Multivariate Analysis of Variance Using Distance Matrices)
- **ANOSIM**(Analysis of Similarities)

- Uses permutations (random reordering of the data) to test the null hypothesis that group differences are not significant.
- Ranks the distances and compares the ranks within groups to the ranks between groups

Final result for all countries