Before and After the Flood: Stability and Resilience of the Human Gut Microbiota

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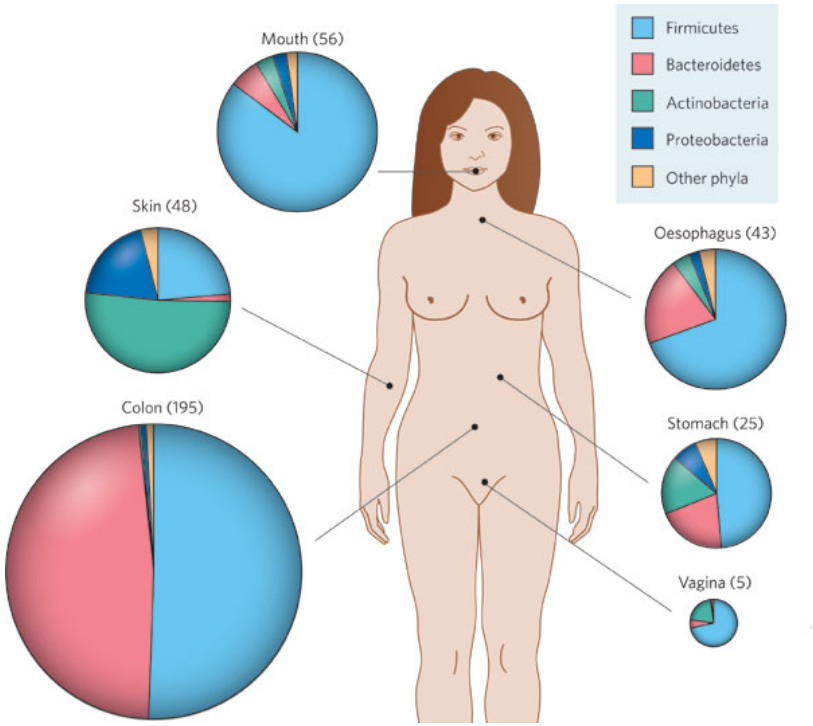
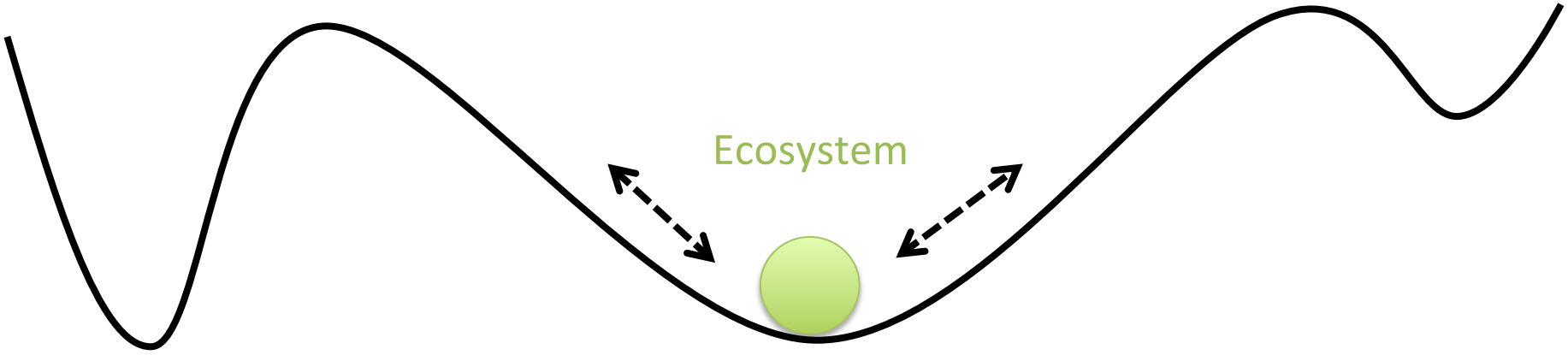
Microbiota and the Human Ecosystem



- > 100 trillion microbes, most in gut community
- Co-evolved with humans
- Host health benefits
- Disease associations
- Interest in fostering and maintaining health-promoting microbiota

Microbiota and the Human Ecosystem

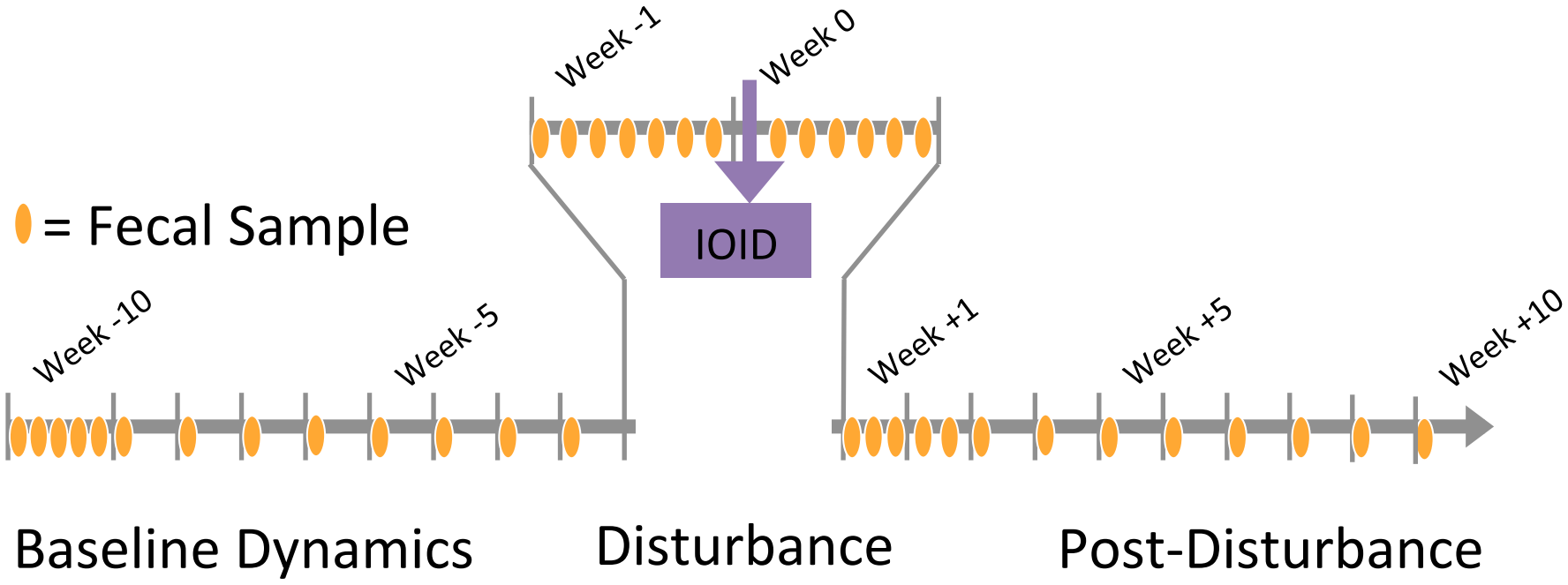
Ecological principles may govern microbial community dynamics, including stability and resilience after disturbance.



Possible sources of disturbance:
antibiotics, diet, isosmotic induced diarrhea (IOID)

Methods

20-Week Fecal Sampling in Five Healthy Volunteer Adults



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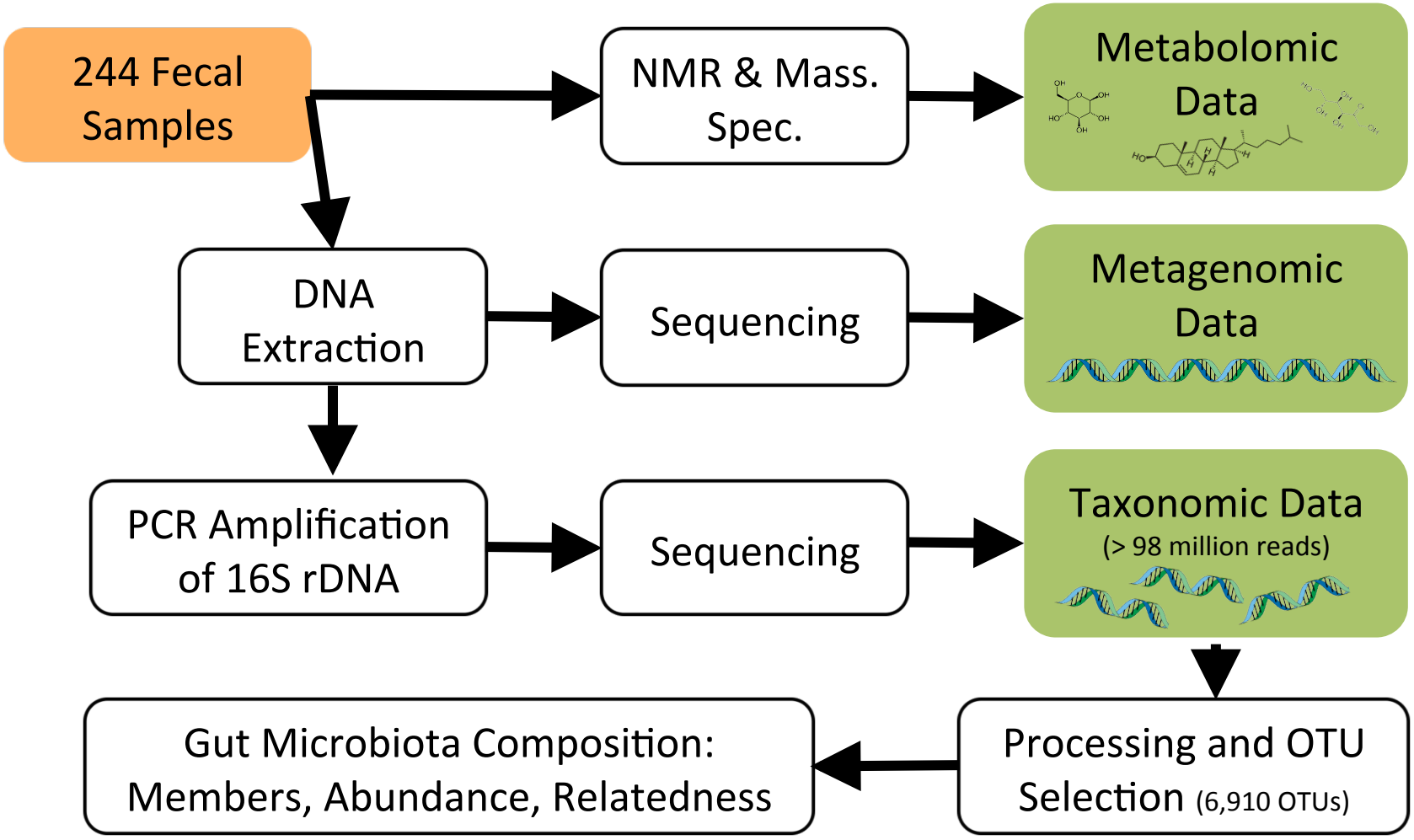
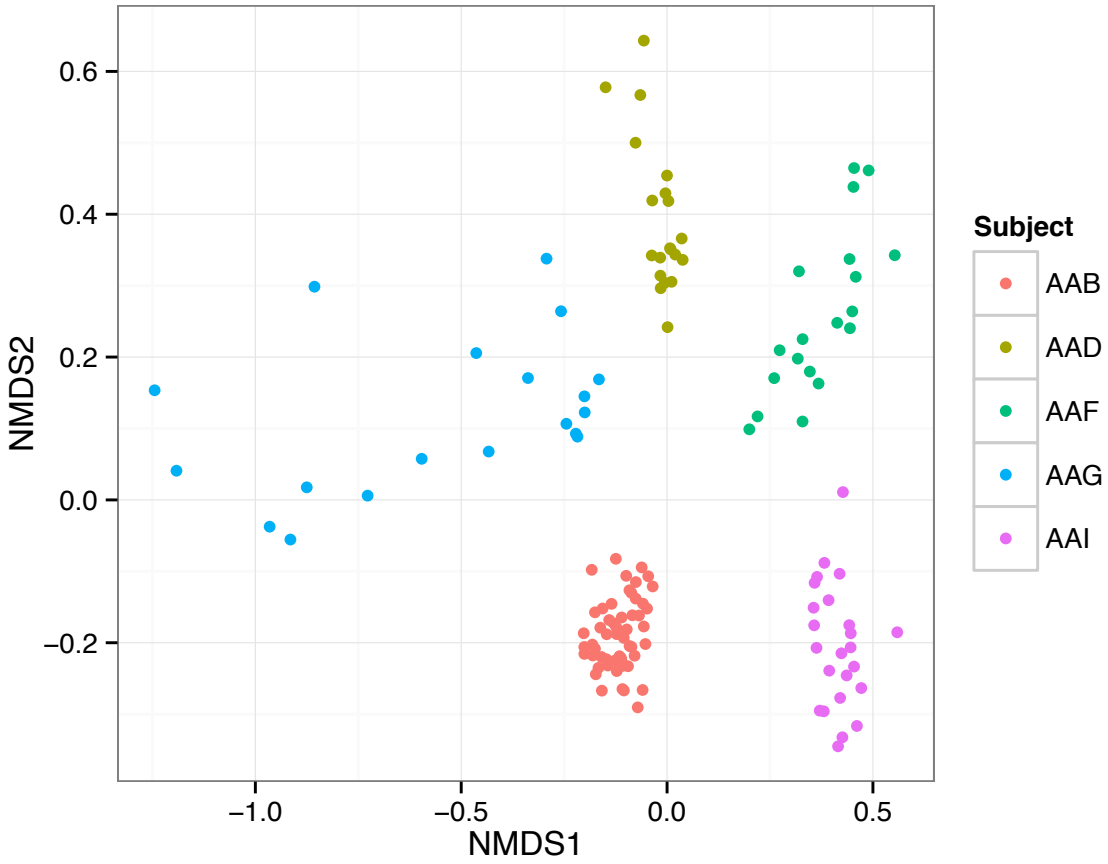

244 Fecal Samples
NMR & Mass. Spec.
Metabolomic Data
DNA Extraction
Sequencing
Metagenomic Data
PCR Amplification of 16S rDNA
Sequencing
Taxonomic Data
(> 98 million reads)
Processing and OTU Selection (6,910 OTUs)
Gut Microbiota Composition: Members, Abundance, Relatedness

Study Aims

1. Evaluate gut community stability prior to IOID
2. Characterize gut community response to IOID
3. Examine long-term effects of IOID on gut community

Results

Relative stability in absence of deliberate perturbation.



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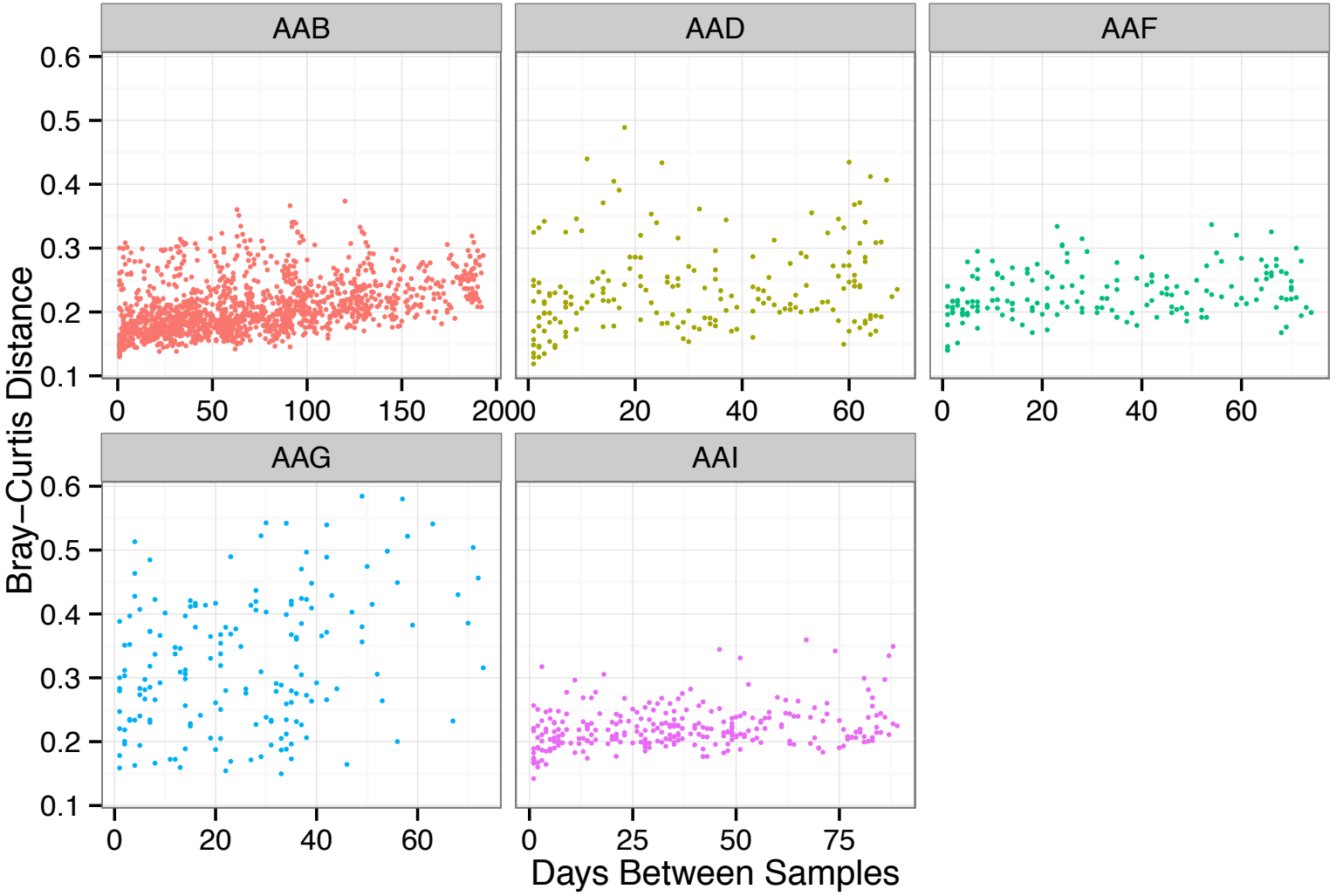
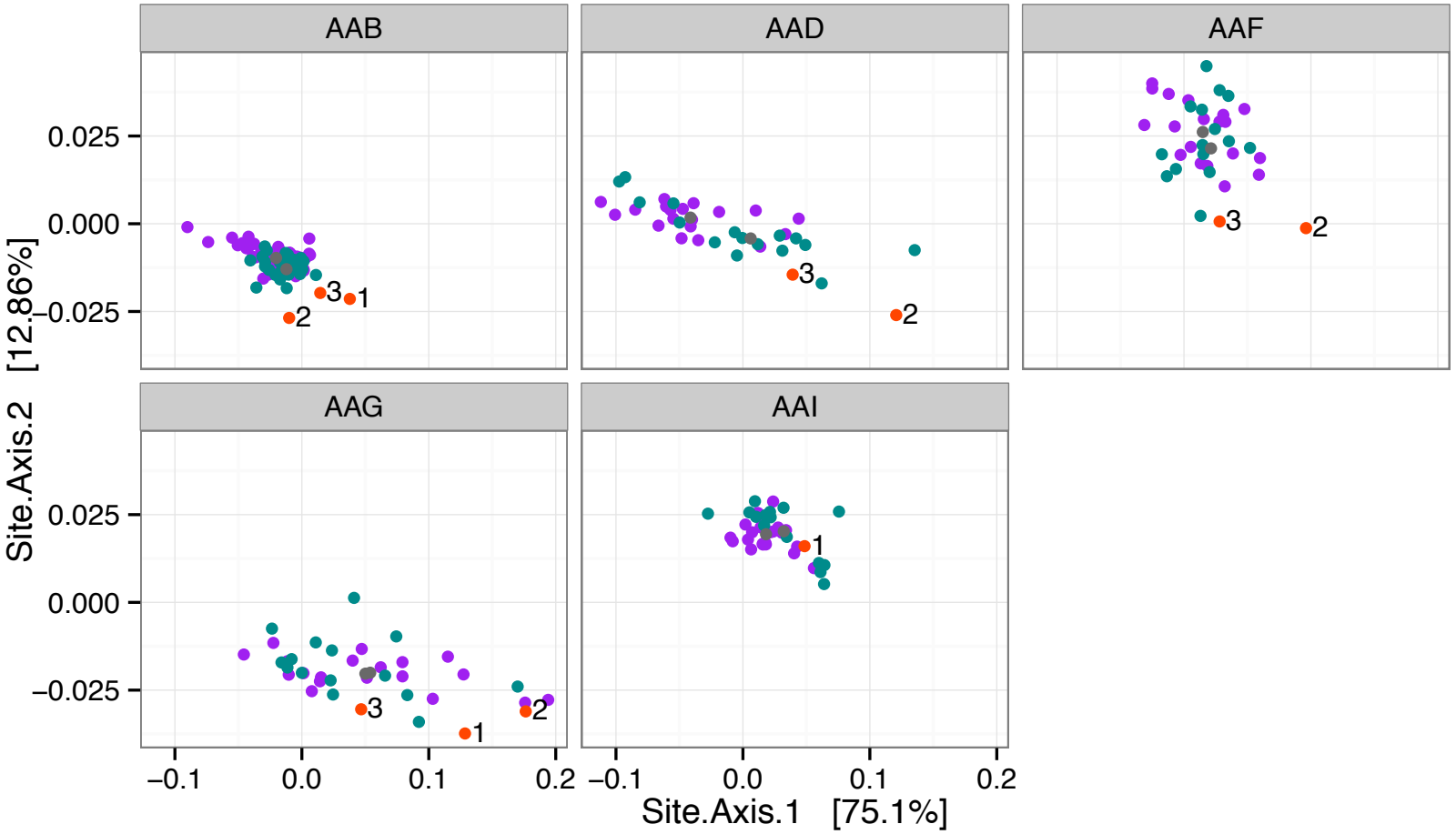


Results

Perturbation detected, elevated *Bacteroidetes* relative to *Firmicutes*, recovery in less than 3 days.



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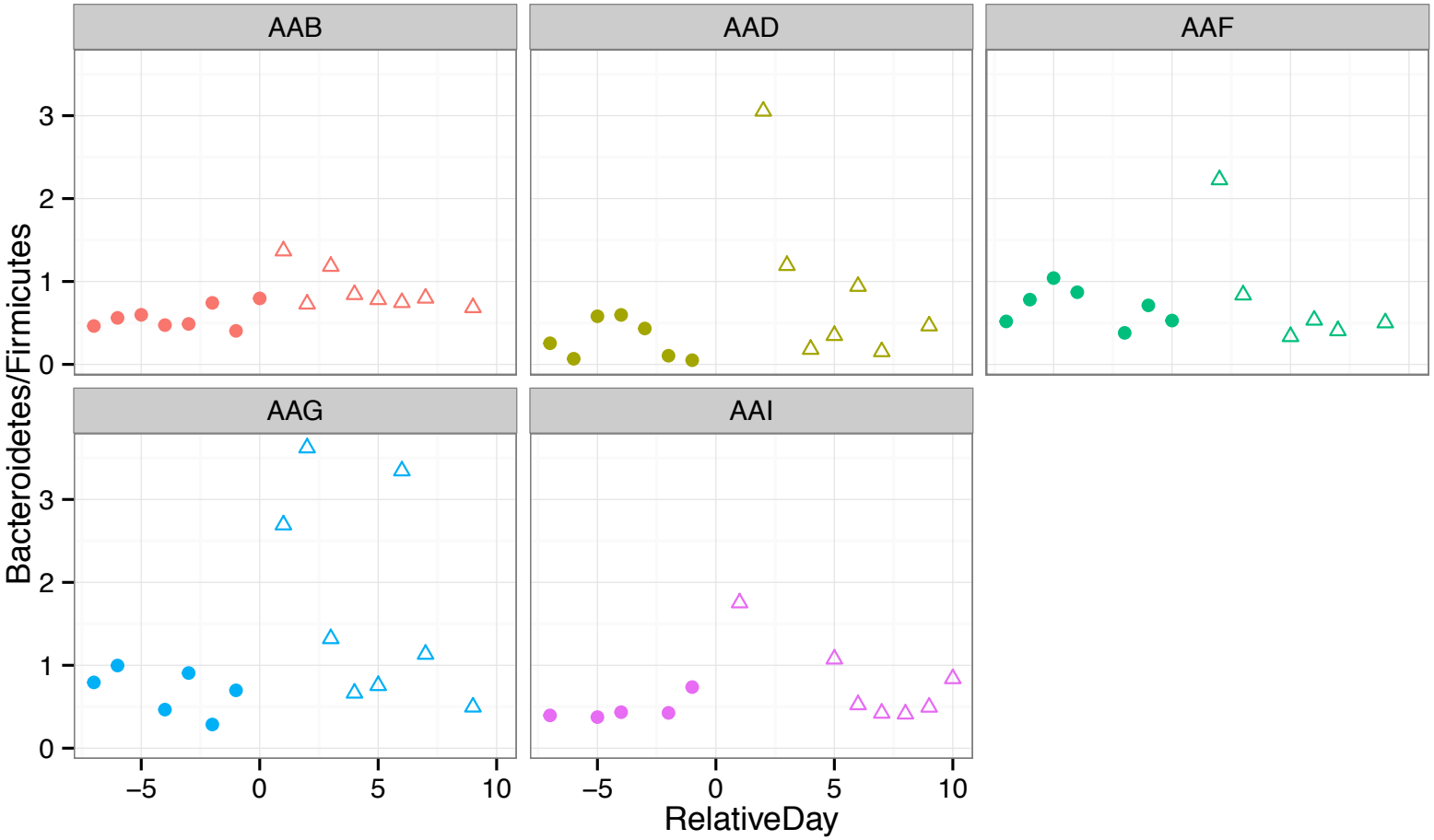

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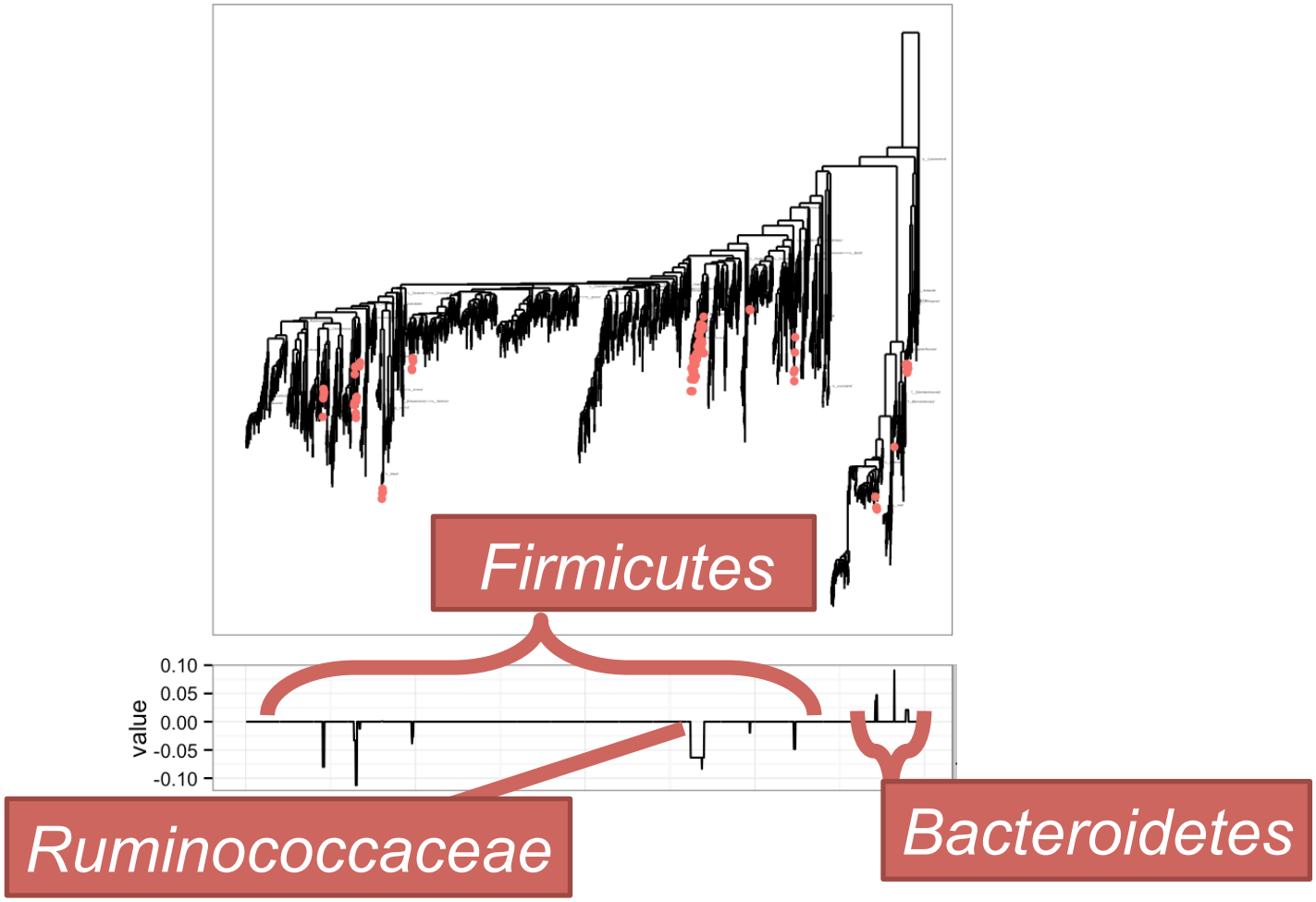
Community-level recovery precedes OTU-level recovery for some taxa.



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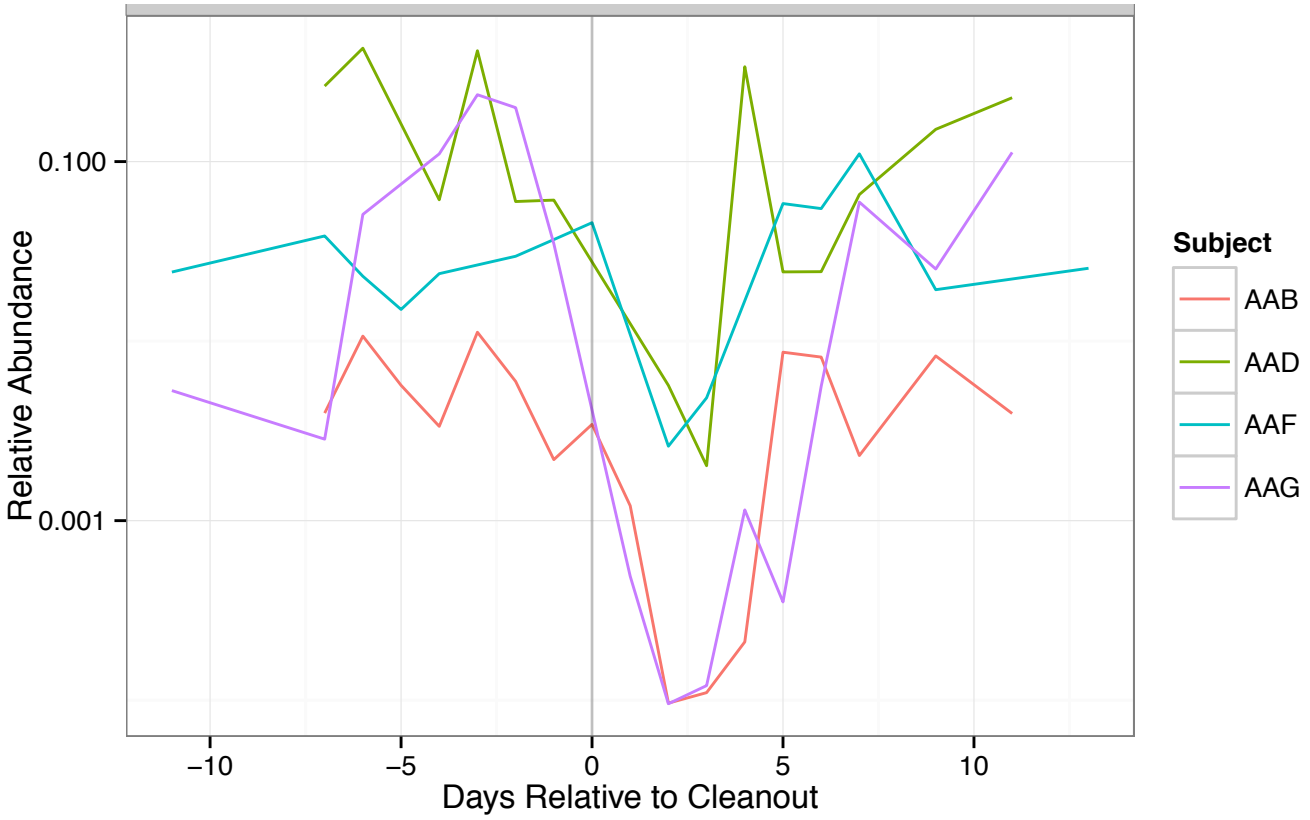

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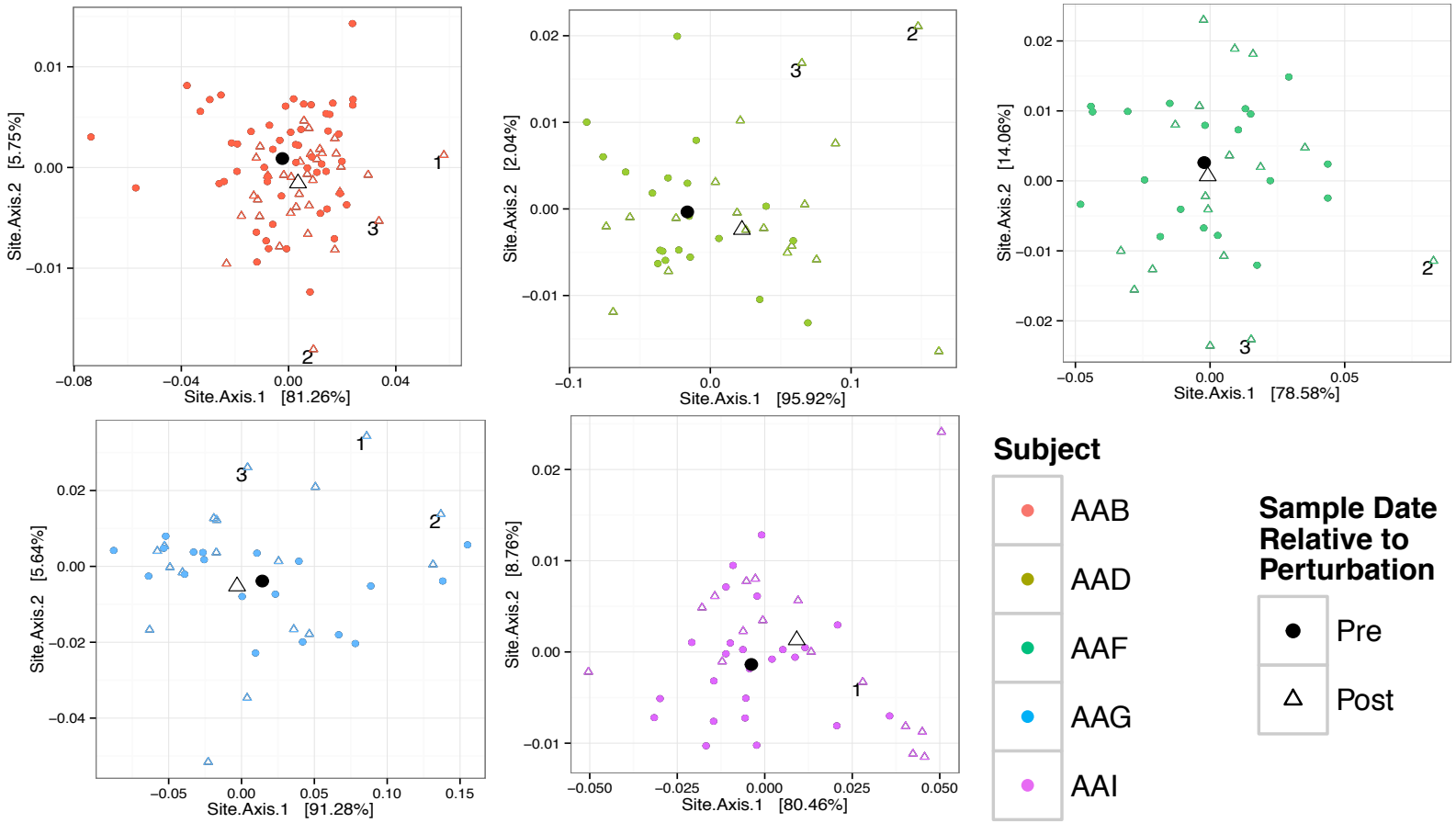
Pre-IOID and post-IOID communities are indistinguishable.
No long-term effects detected.



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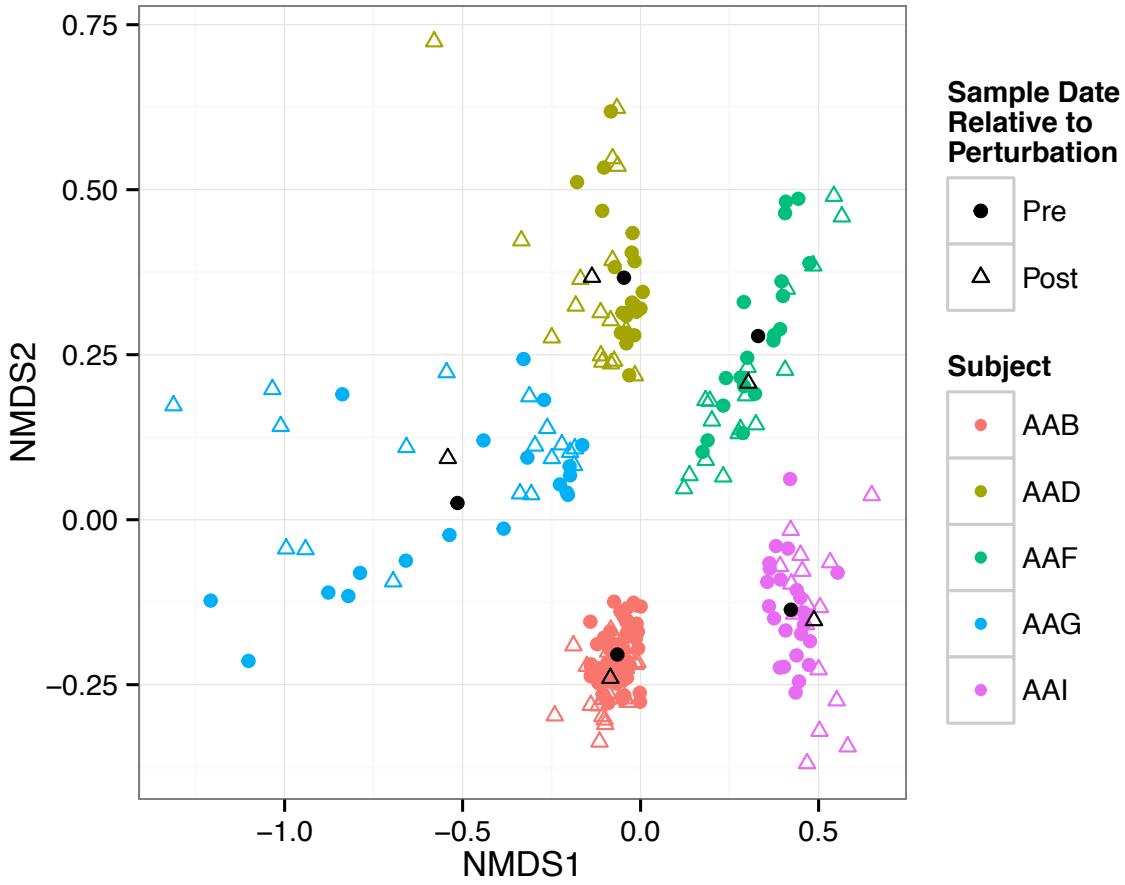

Implications

Application of Ecological Theory

Flash flood model of disturbance in traditional ecology found to be a useful framework for interpreting response of the gut community to IOID. Other findings from ecology may be used to identify community features predictive of greater stability or resilience.

Implications

Practical Clinical Contexts

Doctors prescribing and patients undertaking IOID for **colonoscopies** may be reassured the protocol is not likely to detrimentally affect patient health through alterations to the microbiota.

Response to IOID observed in present study will serve as baseline for comparison, upon which effects on the microbiota of pathogenic agents and inflammation that accompany diarrhea in **diarrheal disease** may be elucidated.

Current Project Developments

- Three additional participants
- Analysis of metagenomic data
- Generation of metabolomic data

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