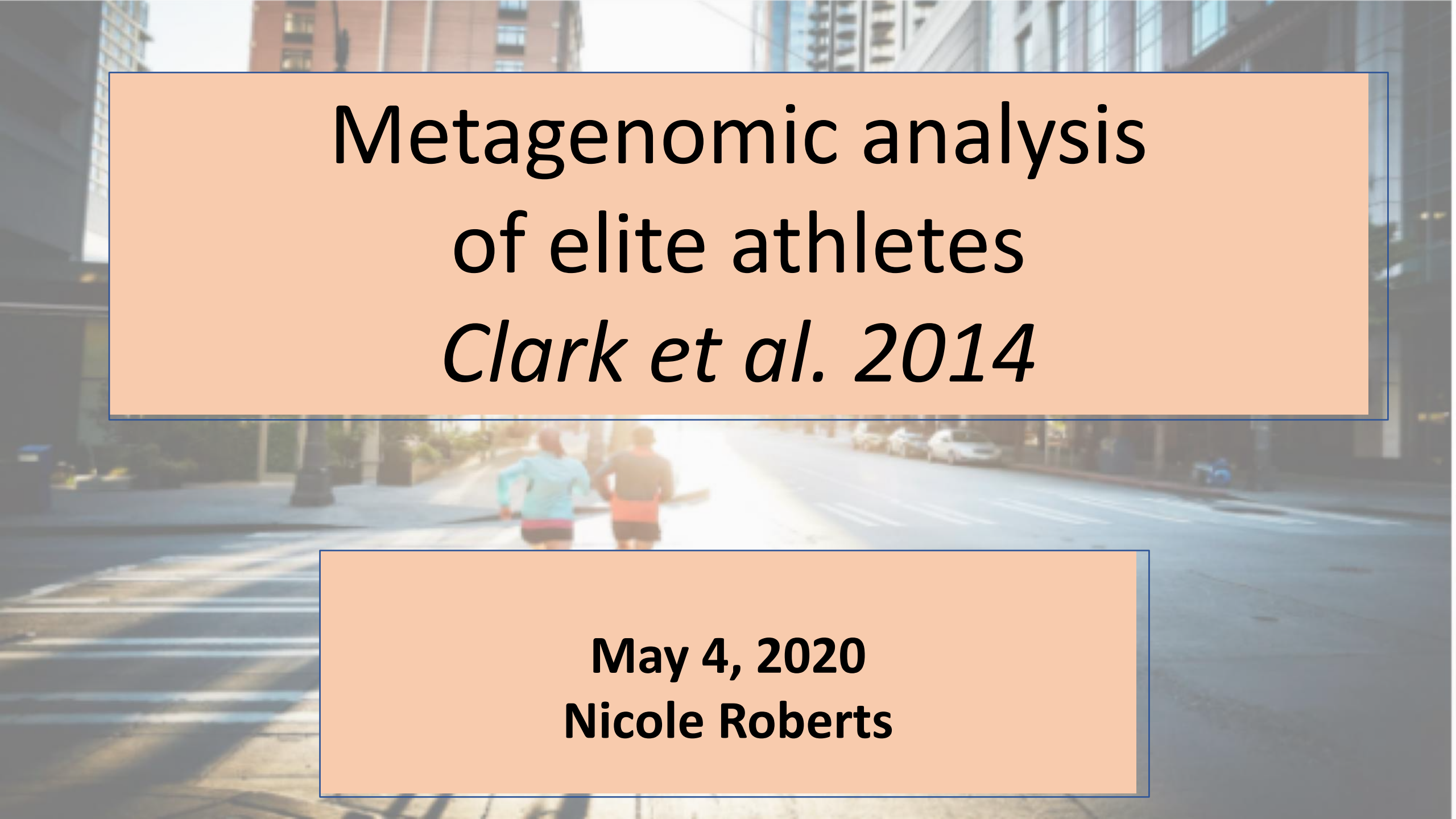


Metagenomic analysis of elite athletes *Clark et al. 2014*

May 4, 2020

Nicole Roberts

What constitutes a healthy gut microbiota?

- High Microbial Diversity

- **High abundance** of beneficial metabolites:

✓Butyrate

✓Short Chain Fatty Acids

- **Low abundance** of toxic metabolites:

✓Lipopolysaccharides

Why is exercise important for the gut microbiome?

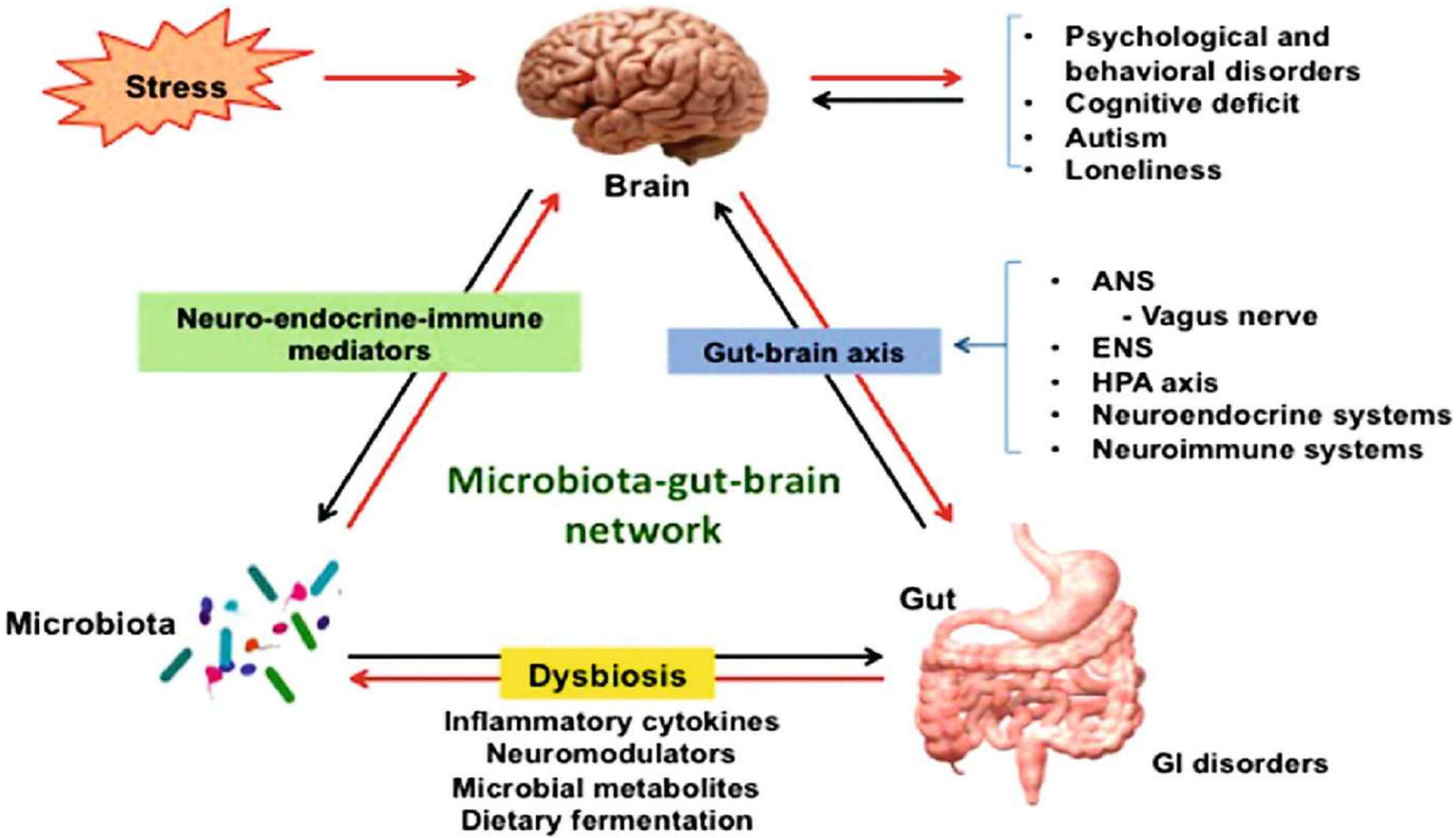
- ✓Gut Associated Lymphoid Tissue (GALT)
- ✓Increasing Tight Junctions
- ✓Decreasing Bile salts
- ✓Oxidative and inflammatory reactions in steady state

Why study the link between exercise and high microbial diversity?

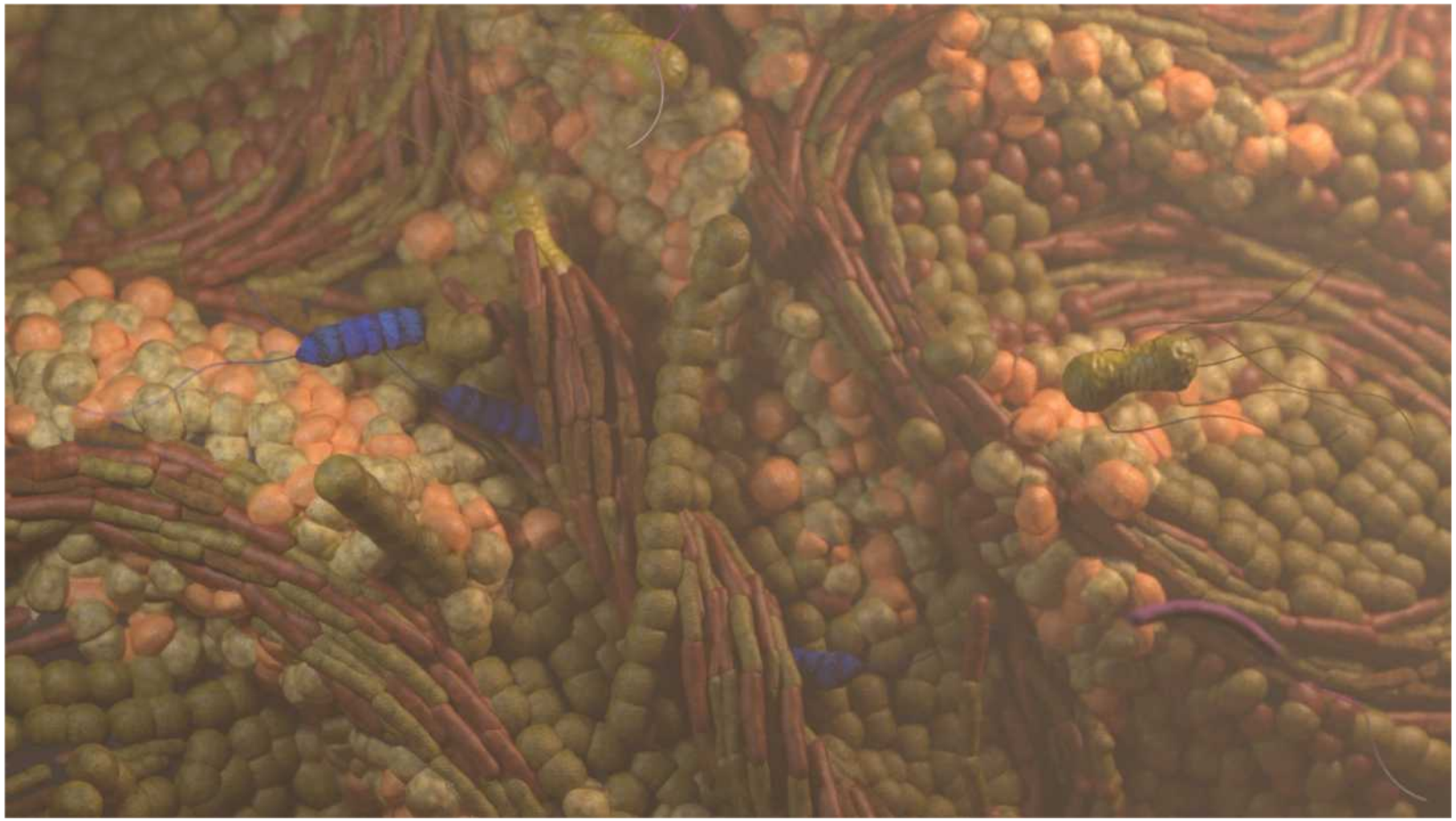
Obesity is on the rise

Diet and exercise is something we can control

The gut signaling network triad



Microbial Diversity visual



What is the research question?

Diet
&
Exercise

Human
Gut
Microbiome

What is the research strategy?

Elite (n=40)
Low BMI (n=23)
High BMI (n=23)

Fecal samples

Fasting Blood samples

Diet – 4 weeks

Exercise – low BMI and high BMI only

Creatine Kinase

Protein and Macronutrient Intake

Dietary Patterns

Sample size

Data

Analyzing Nutrition profile

How to identify microbiomes? Workflow

Microbial DNA extraction

Sequence Microbial DNA

16s rRNA V4 "barcode" region -> HTAS

Bioinformatics

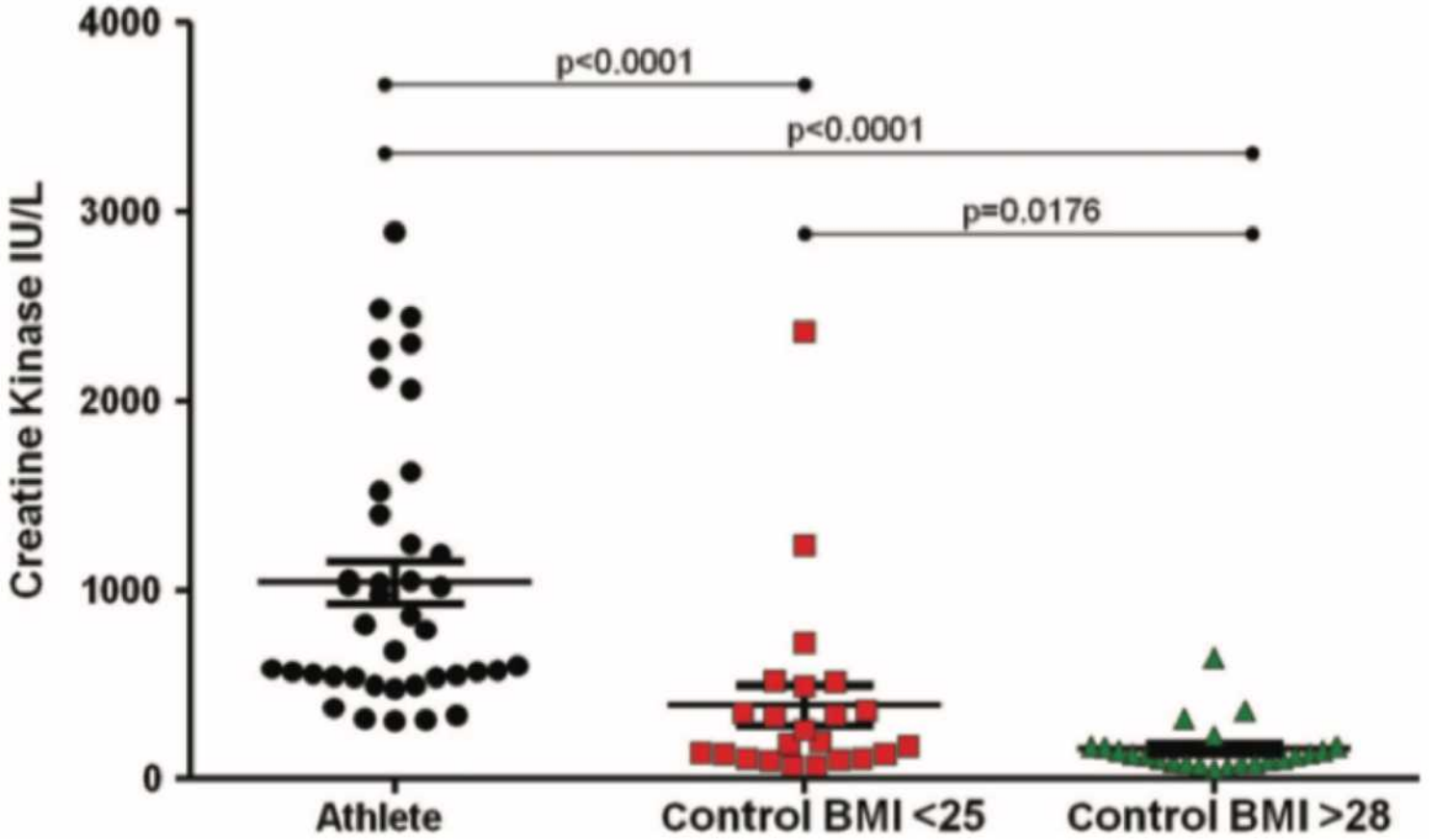
OTUs -> Phylum

Metrics

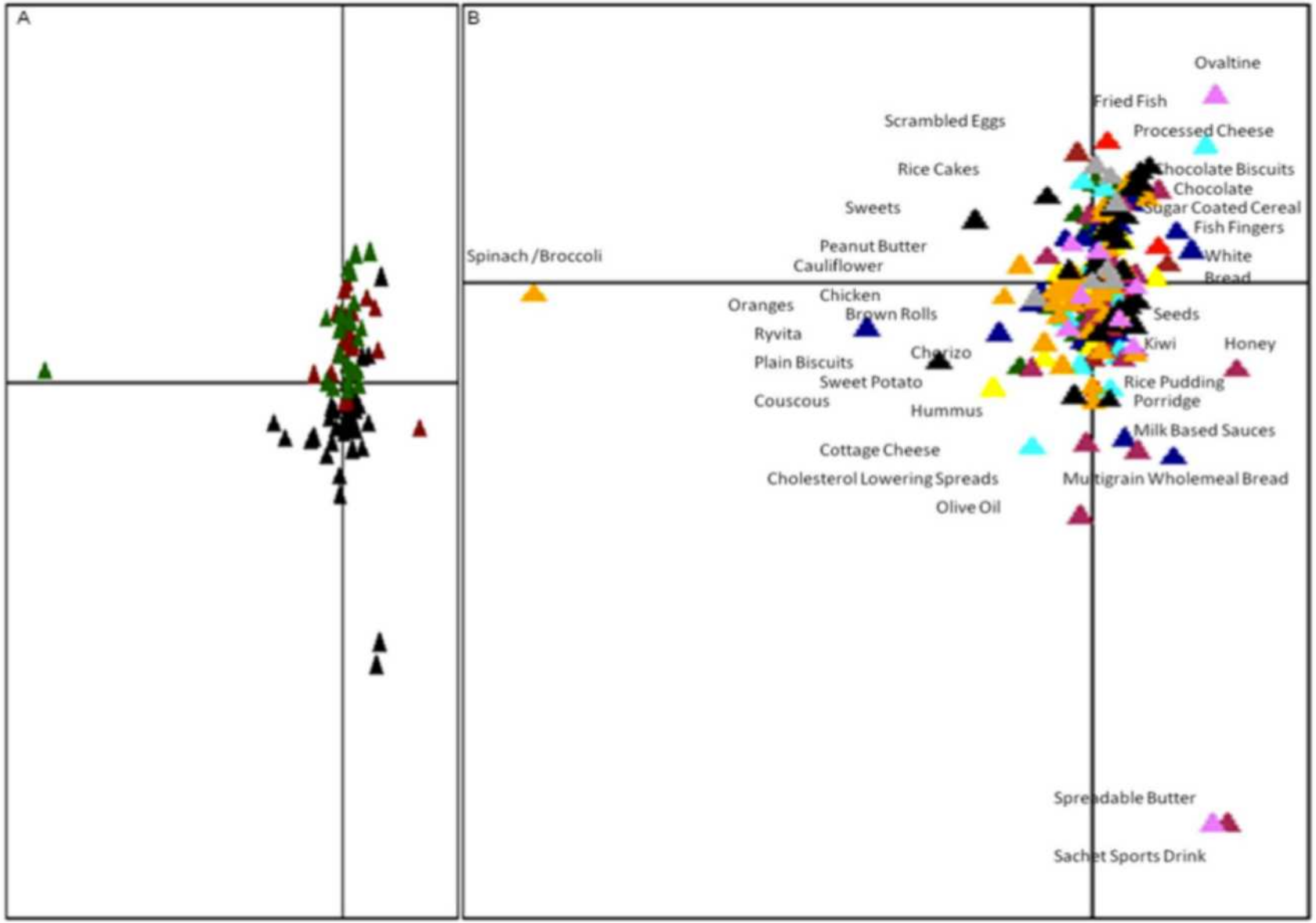
Alpha Diversity
Beta Diversity

Identify Microbiome

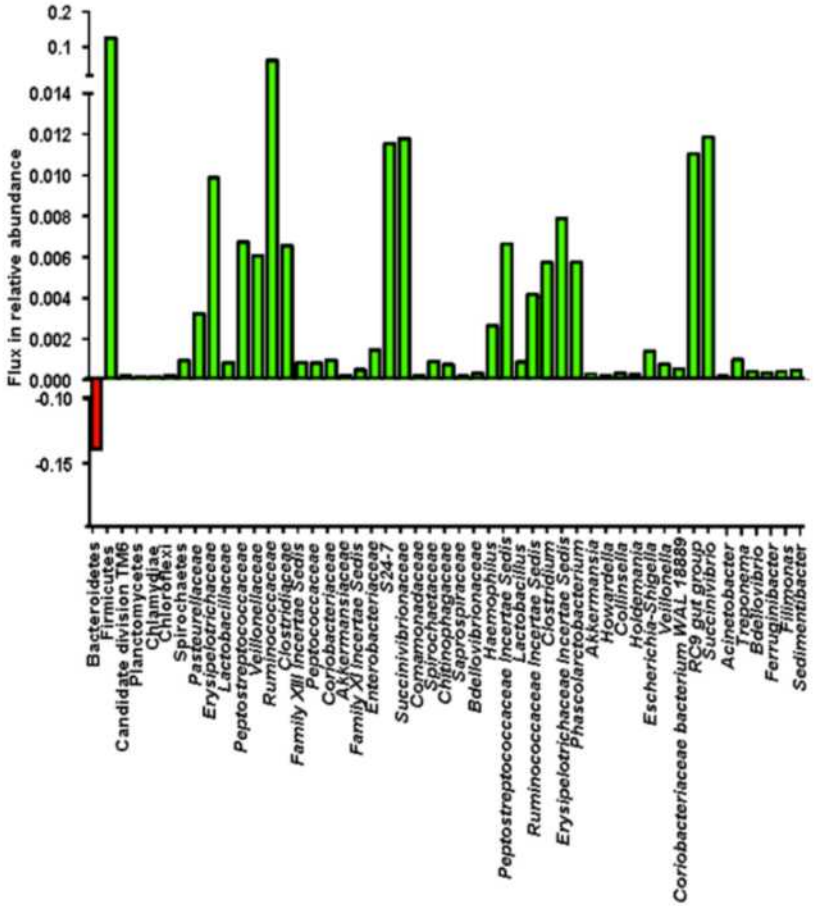
What did they see in the nutrition profile?



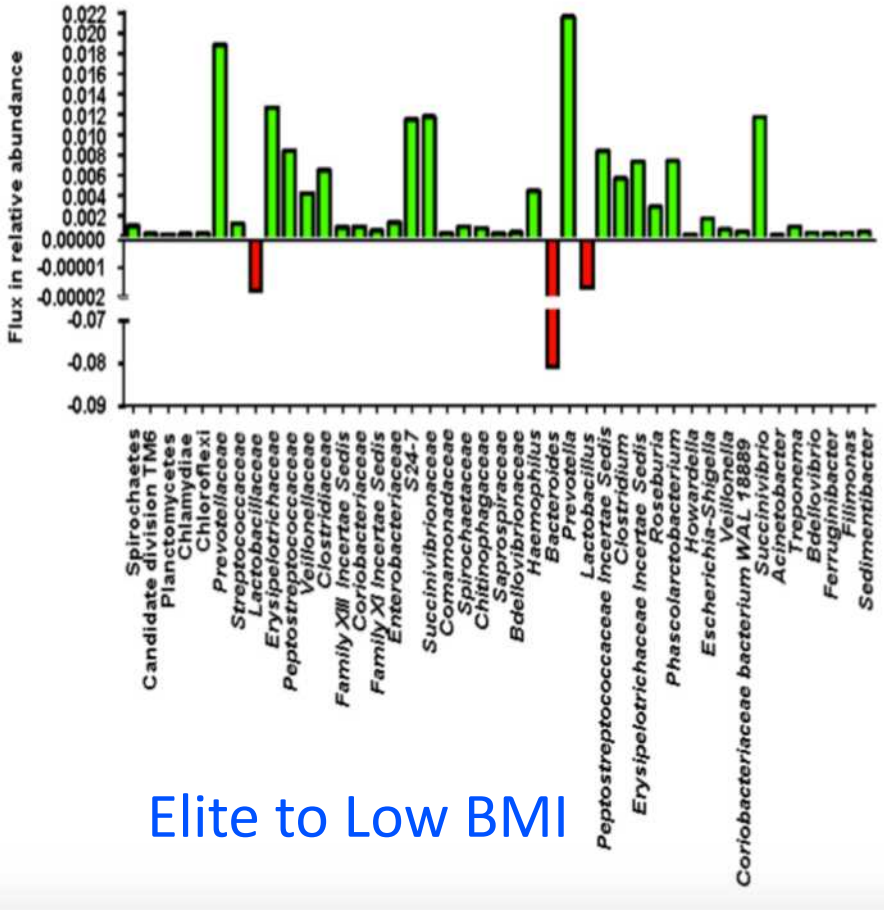
Food Correspondence Analysis



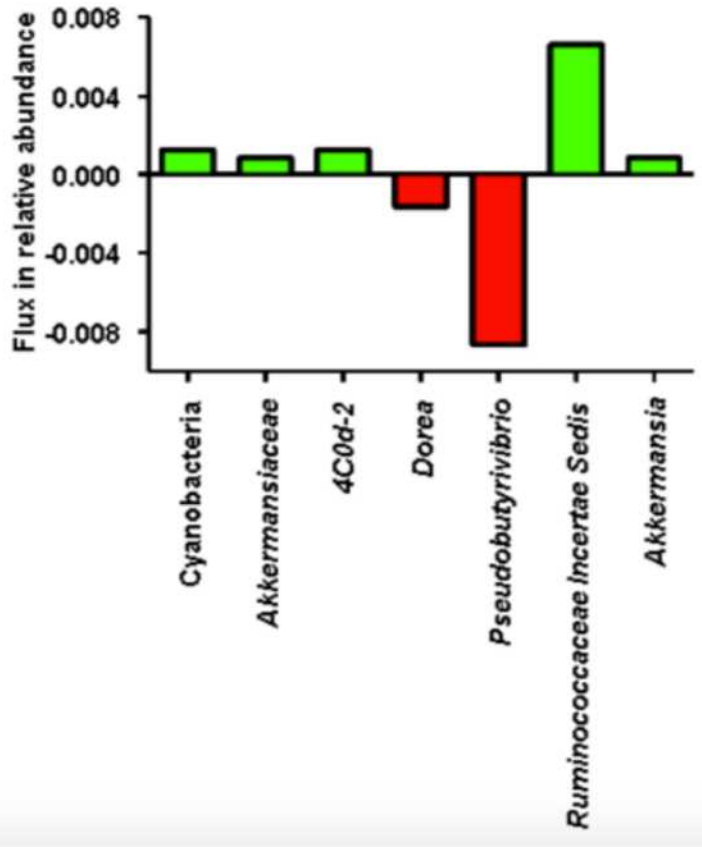
What did they see in the bioinformatics? S7-9



Elite to High BMI

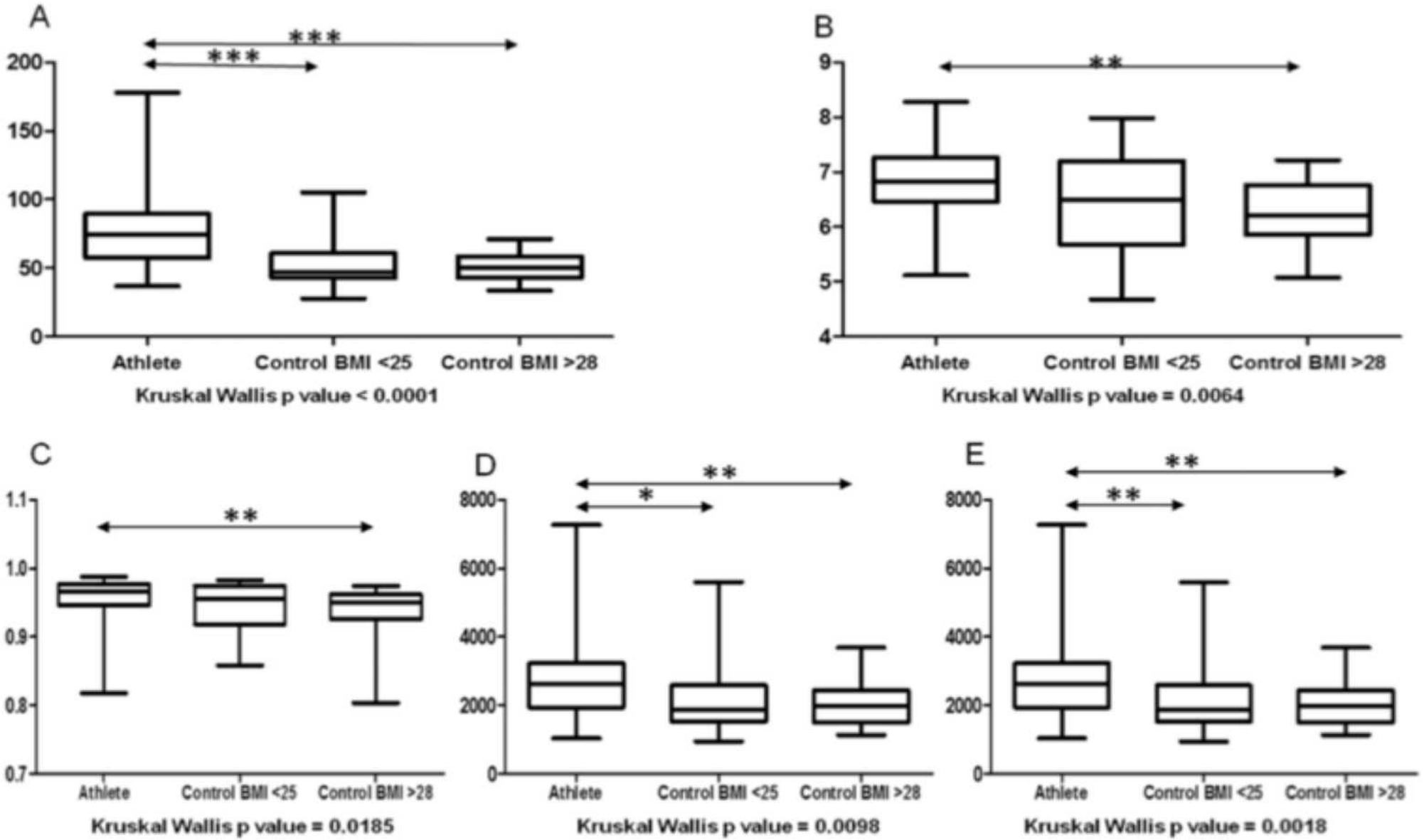


Elite to Low BMI

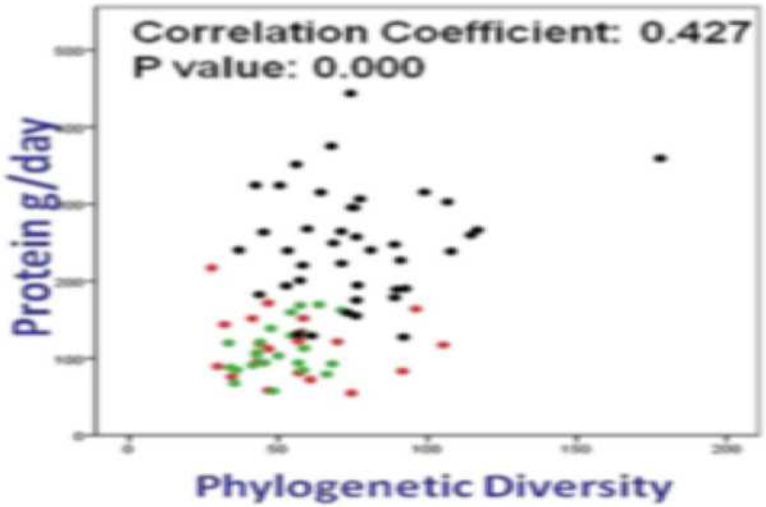


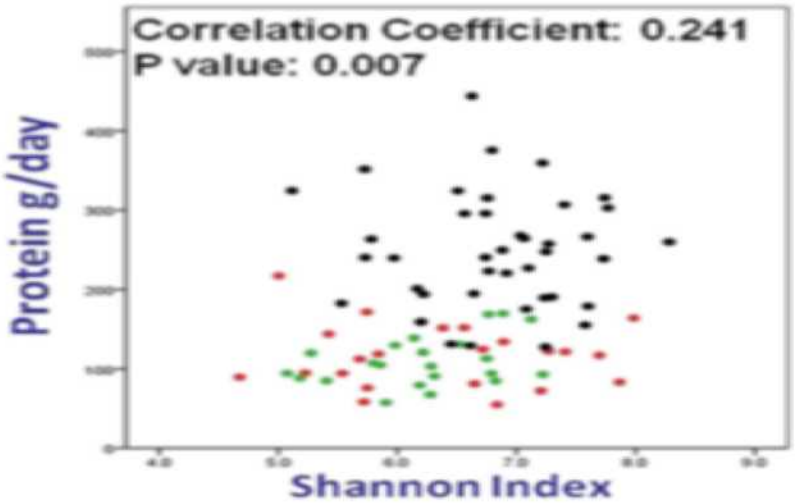
Low to High BMI

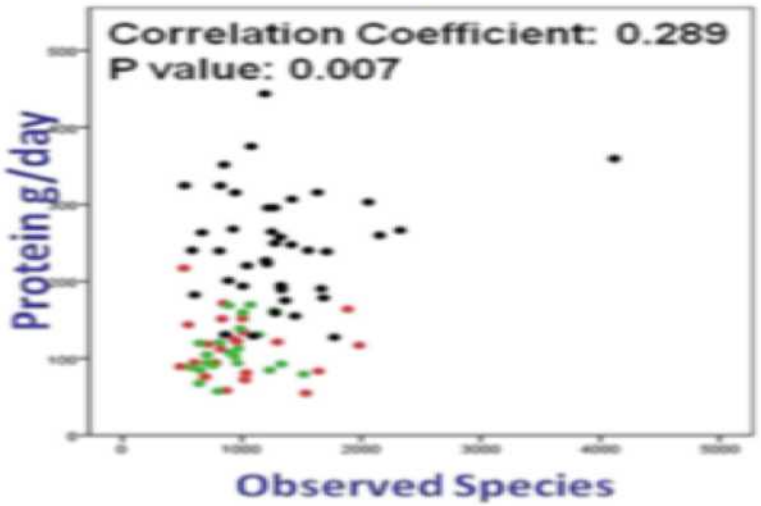
Did diet and exercise affect alpha diversity?

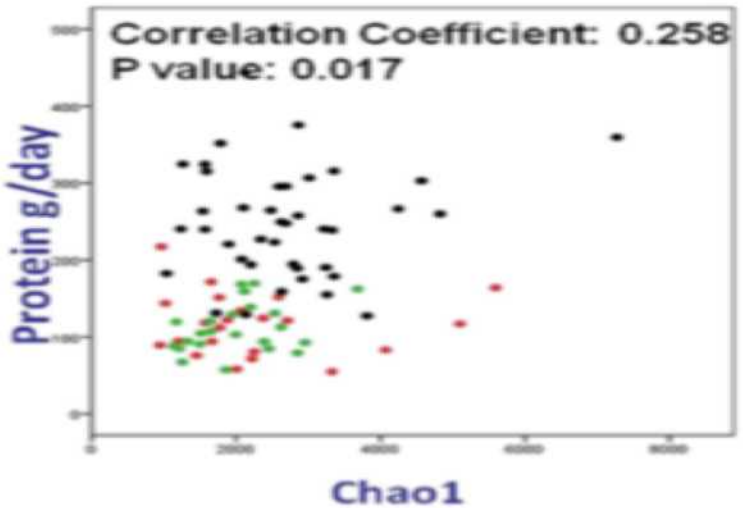


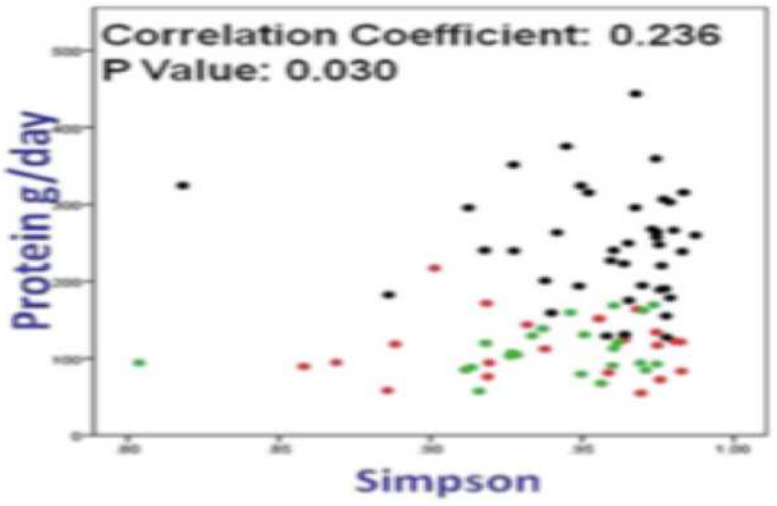
What about protein intake and alpha diversity?



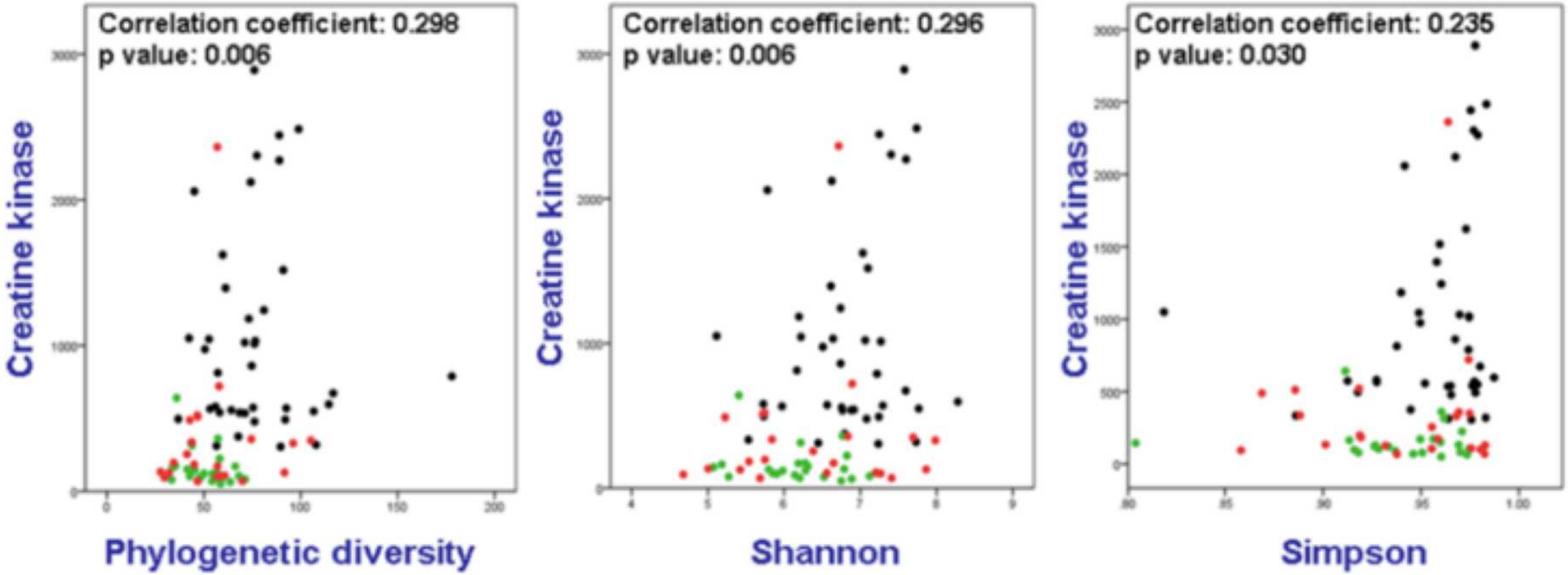




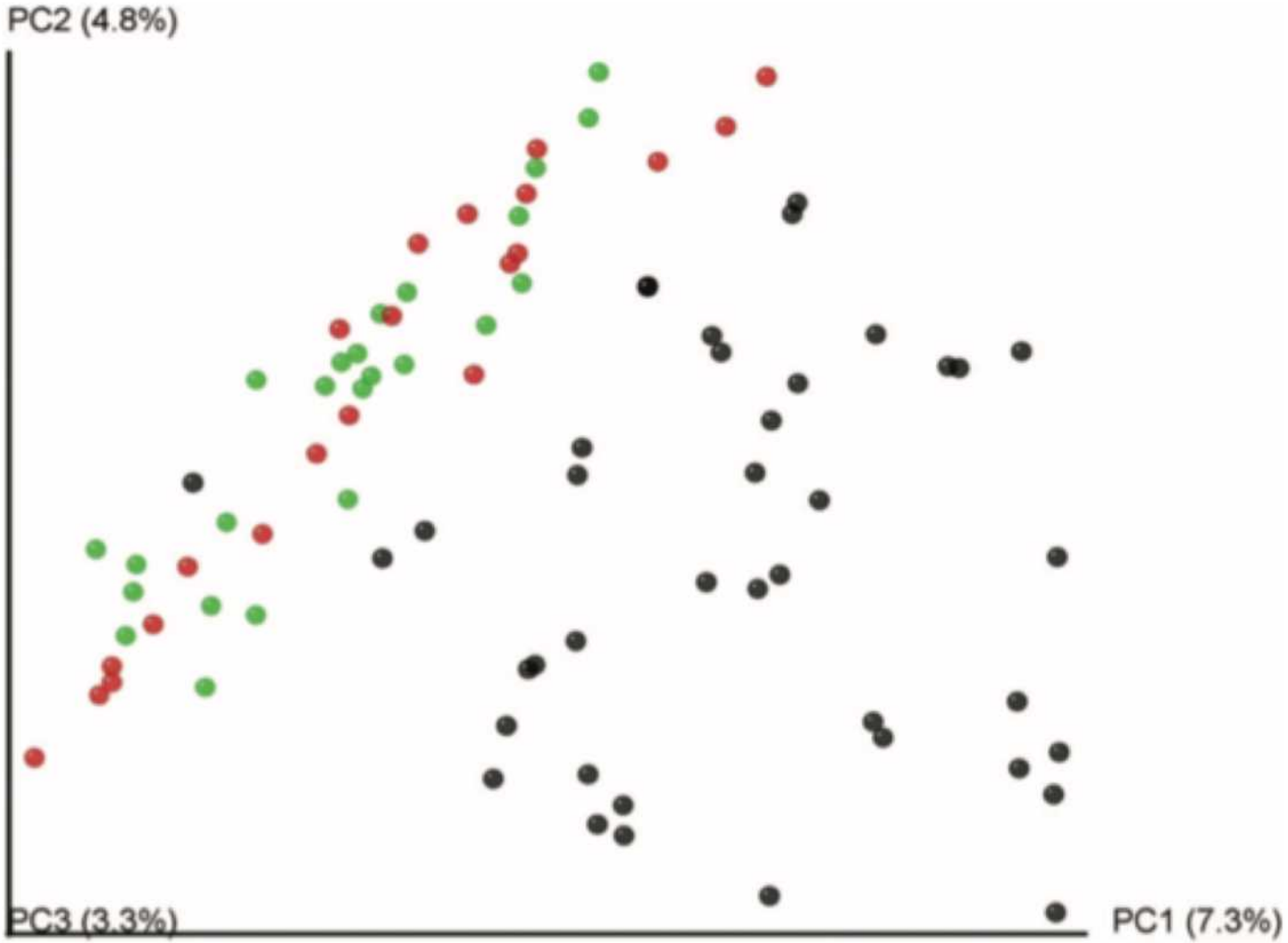




What about CK and alpha diversity?



What did they see in beta diversity?



Is it beneficial to the gut microbiome to prioritize diet and exercise?

- ✓Significantly lower inflammation markers (S1)
- ✓Significantly higher levels of urea and creatinine—maintains gut homeostasis (S2), contributes to greater alpha diversity (Figure 6)
- ✓Significantly higher levels of HDL (good cholesterol) (S3)
- ✓Significantly higher lean body mass and significantly low leptin (hunger) levels
- ✓Significantly higher lean body mass and significantly higher adiponectin (fatty acid breakdown) protein
- ✓Higher Total Energy comes from protein (Table 2), contributes to greater alpha diversity (Figure 5)
- ✓Lower total energy comes from fat (Table 2)

Discussion Questions

1. **How would this study be different if they used all females, or a mixed group?**
2. **Is BMI a good metric for health?**
3. **Is it possible that diet was misrepresented on the questionnaire?**
4. **What is the health benefit of keeping a low BMI vs. a high BMI?**
5. **Does it matter what kinds of proteins are consumed? (S10)**

Any more questions?

Thank you!!