Gut microbiome association with obesity differs by current CD4+ count

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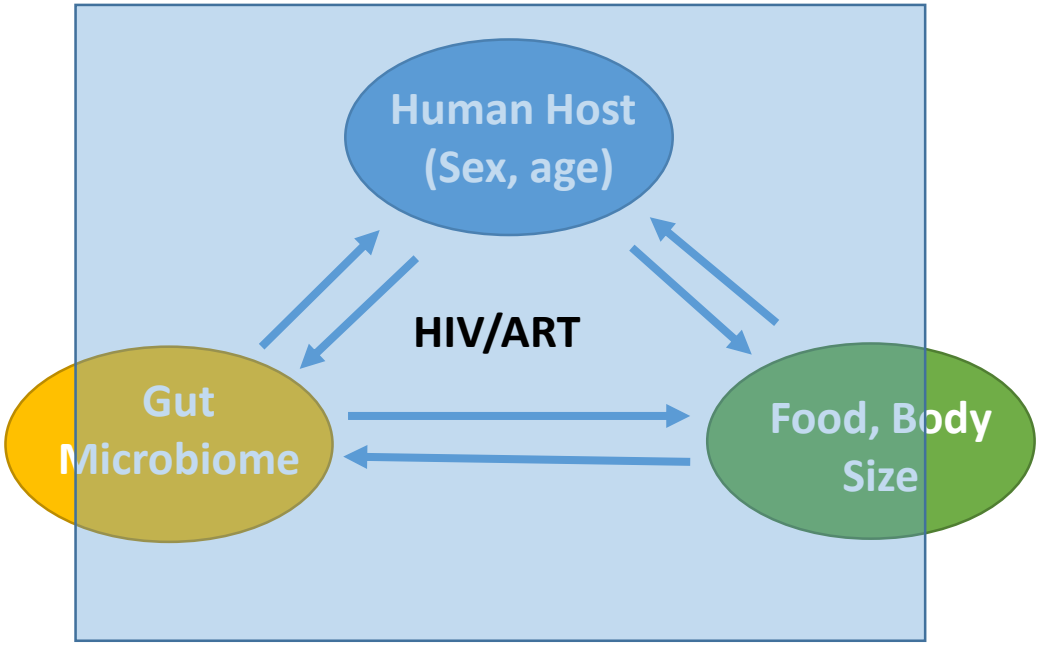
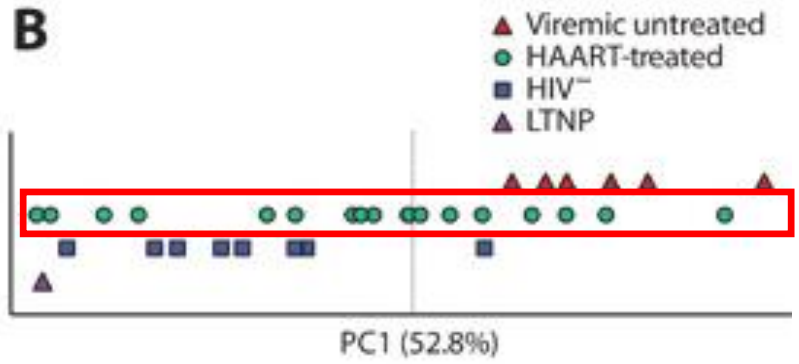
The Mary Fisher CARE Fund Clinical AIDS Research and Education

Microbiome, obesity, and HIV





What if you don't "respond"?

Vujkovic-Cvijin et al. 2013; Dillon et al. 2014; David et al. 2014; Parekh et al 2015

Objectives:

- How does HIV CD4+ impact gut microbiome in women and men?
  - CD4+ <350 vs. CD4+ >500
- How does body size impact gut microbiome in women and men?
  - 1917 Clinic: 30% of men, 49% women obese
  - Obese = more Firmicutes, less Bacteroidetes
- Does the association of body size with microbiota differ by CD4+ group?

Methods:

- Participants :
  - 59 men and women ≥ 50 years of age
  - Controlled viremia (viral load <200 copies/mL) for > 1 year
  - No underlying GI disease or antibiotic use 60 days before enrollment
  - Groups: (1) CD4+ T-cell count < 350; or (2) CD4+ T-cell count >500 c/mm^3

- Measurements:
  - BMI was calculated as weight (kg) / height (m^2). Obese = BMI ≥ 30
  - One fecal sample collected
  - Sample analyzed via 16S rRNA gene sequencing using MiSeq™ and QIIME bioinformatics.

Methods:

- Covariates and Demographics:
  - Patient self-report was used to determine 1) racial/ethnic group, 2) sex, 3) history of tobacco use..

- Statistical analysis (SAS v9.3):
  - Diversity: Shannon, Simpson indices; Number of observed species
  - Microbial group differences assessed via negative binomial regression (Bonferroni correction not applied due to sample size).

Results – Women vs. Men

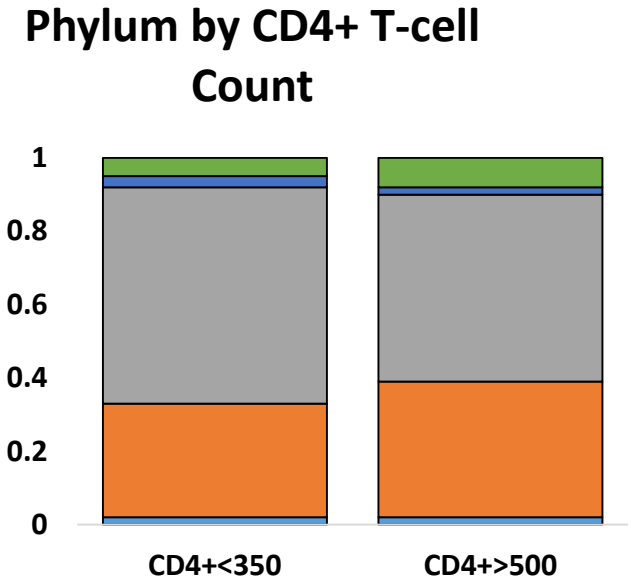
	Total (n=59)	Women (n=18)	Men (n=41)
Age (yrs)	55.0 (50-68)	57.0 (51-67)	54.0 (50-68)
Race (n,% Black)	47 (80)	17 (94)	30 (73)*
Height (cm)	169.6 (139.7-187.0)	161.4 (149.0-179.0)	172.2 (139.7-187.0)*
Weight (kg)	81.5 (51.2-125.0)	77.9 (51.2-125.0)	81.5 (55.5-123.4)
BMI	27.0 (18.0-47.7)	32.3 (18.0-42.5)	26.9 (18.9-47.7)
% Obese	23 (39)	10 (56)	13 (32)*
Diversity Index			
Shannon	4.6 (2.1-6.5)	4.9 (2.1-5.8)	4.6 (3.1-6.5)
Simpson	0.91 (0.49-0.98)	0.92 (0.49-0.97)	0.91 (0.77-0.98)
# Obs. Species	238 (126-357)	243 (154-318)	237 (126-357)

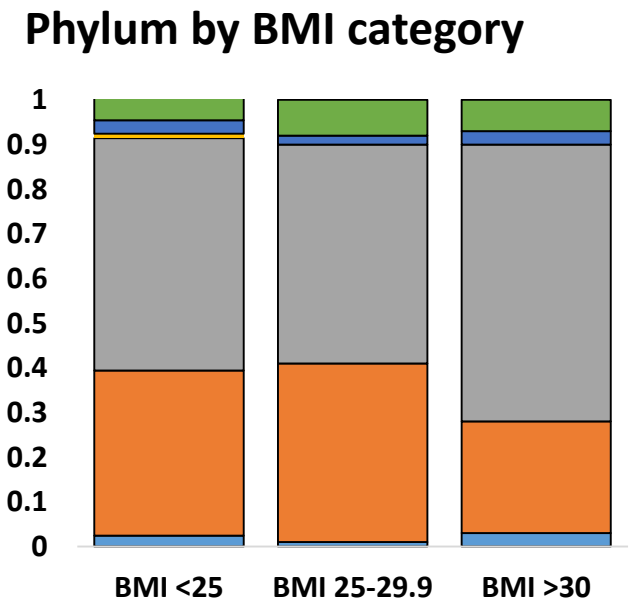
Results – CD4+ and Obesity

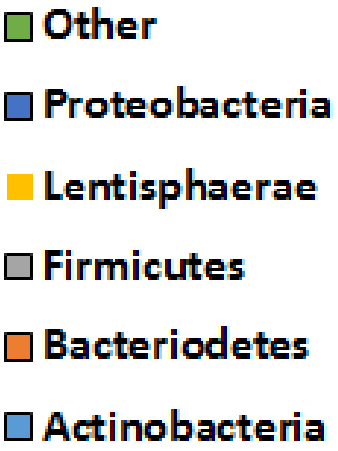
		CD4 < 350		CD4 > 500	
Variable	Total n = 59	Not Obese n = 20	Obese n = 10	Not Obese n = 16	Obese n = 13
Age (yrs)	55.0 (50-68)	55.0 (50-68)	53.0.0 (51-64)	53.5 (51-66)	55.0 (55-68)
Race (n,% Black)	47 (80)	15 (75)	6 (60)	13 (81)	13 (100)*
Sex (% female)	18 (31)	1 (5)*	4 (40)	7 (44)	6 (46)
Height (cm)	169.6 (139.7-187.0)	173.8 (163.2-185.0)	166.8 (154.9-187.0)	169.3 (151.5-180.5)	162.6 (139.7-184.8)
Weight (kg)	81.5 (51.2-125.0)	71.2 (56.4-100.3)	99.9 (83.9-125.0)*	64.8 (51.2-87.9)	93.2 (71.8-123.4)*
BMI	27.0 (18.0-47.7)	23.6 (18.0-29.3)*	36.2 (30.4-42.5)*	23.3 (18.8-28.2)*	34.8 (30.3-47.7)*
Diversity Index					
Shannon	4.6 (2.1-6.5)	4.8 (3.4-6.2)	4.2 (2.1-5.7)*	4.5 (3.7-6.5)	4.9 (2.4-5.7)
Simpson	0.91 (0.49-0.98)	0.92 (0.81-0.97)	0.87 (0.49-0.97)*	0.91 (0.79-0.98)	0.92 (0.61-0.96)
# Obs. Species	238 (126-357)	238 (182-355)	227 (168-281)	234 (126-357)	251 (172-331)

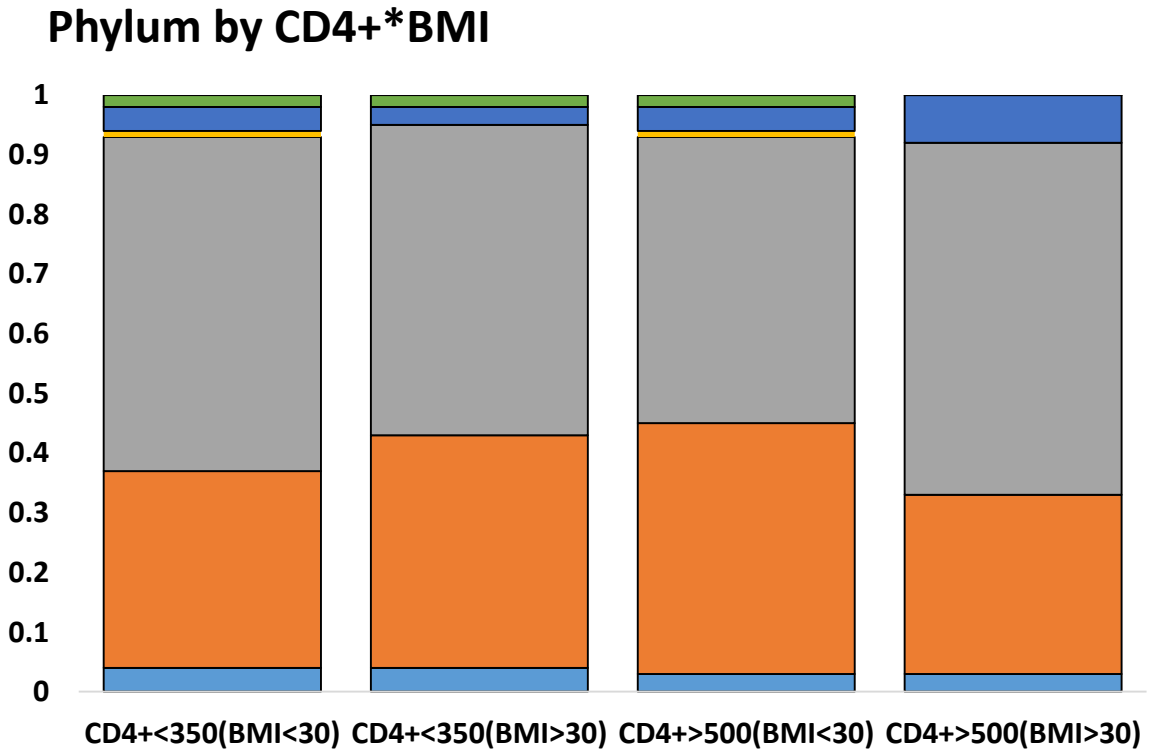
Total sample: A negative correlation was observed between BMI and diversity (Shannon r = -0.24, P=0.11; Simpson r = -0.23, P = 0.04), but not between CD4+ and diversity.

Results - Phylum



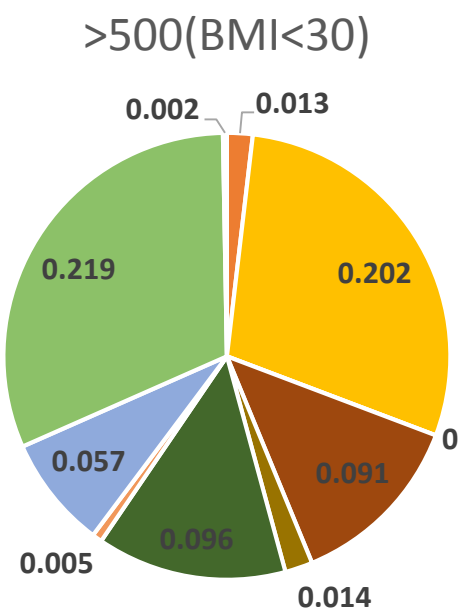


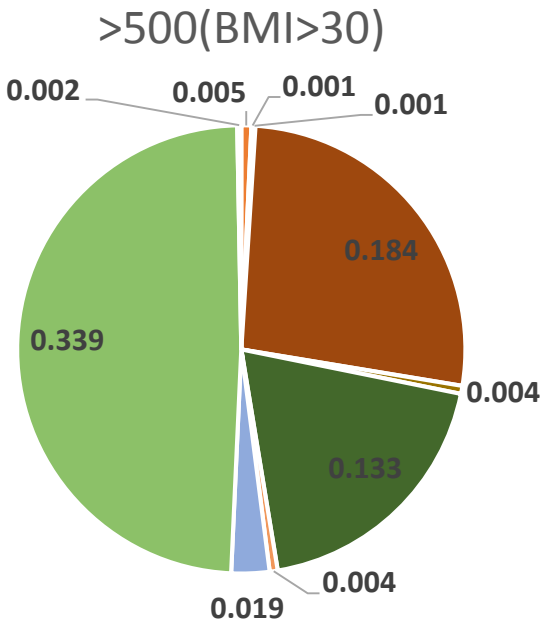


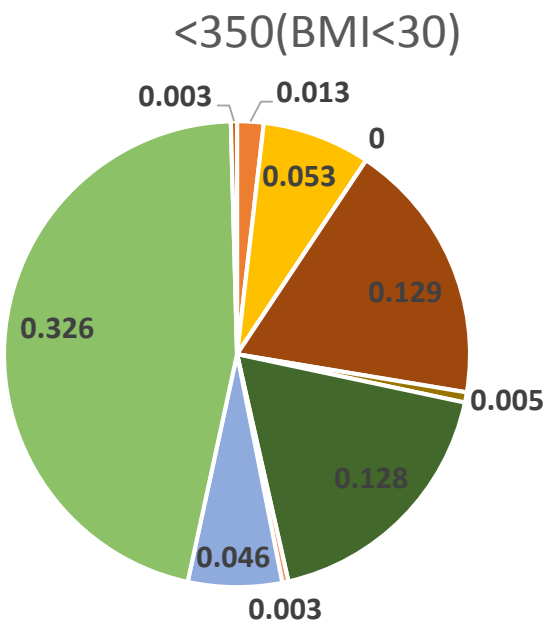


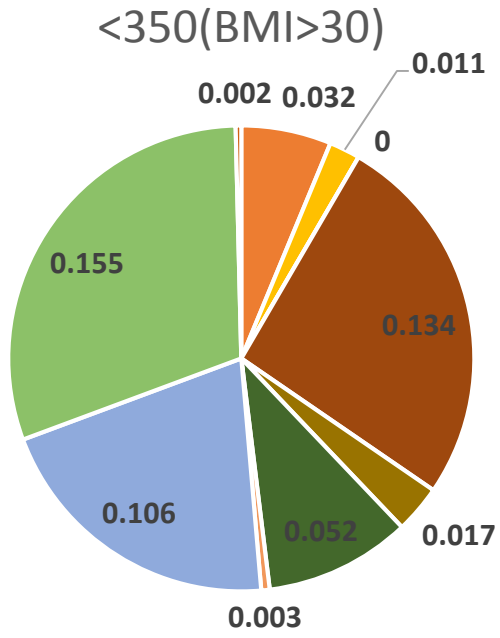
Results - Family

- Actinobacteria_Coriobacteriaceae
- Bacteroidetes_Prevotellaceae
- Bacteroidetes_Pararevotellaceae
- Bacteroidetes_Bacteroidaceae
- Firmicutes_Erysipelotrichaceae
- Firmicutes_Ruminococcaceae
- Firmicutes_Streptococcaceae
- Firmicutes_Veillonellaceae
- Firmicutes_Lachnospiraceae
- Proteobacteria_Enterobacteriaceae









Conclusions

- CD4+ alone did not contribute to differences in gut microbiota in people living with HIV.
- Obesity was associated with increased Firmicutes and lower Bacteroidetes.
  - Obesity played a greater role than sex in microbiota composition.
- CD4+ did impact the gut microbiome of those with BMI <30.
  - Normal weight participants at all levels also exhibited greater presence of Lentisphaerae.
- Future considerations: diet, comorbidities, SDH
  - Role of body size in impacting women's gut microbiome

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UAB The 1917 Clinic
a member of the UAB Health System

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