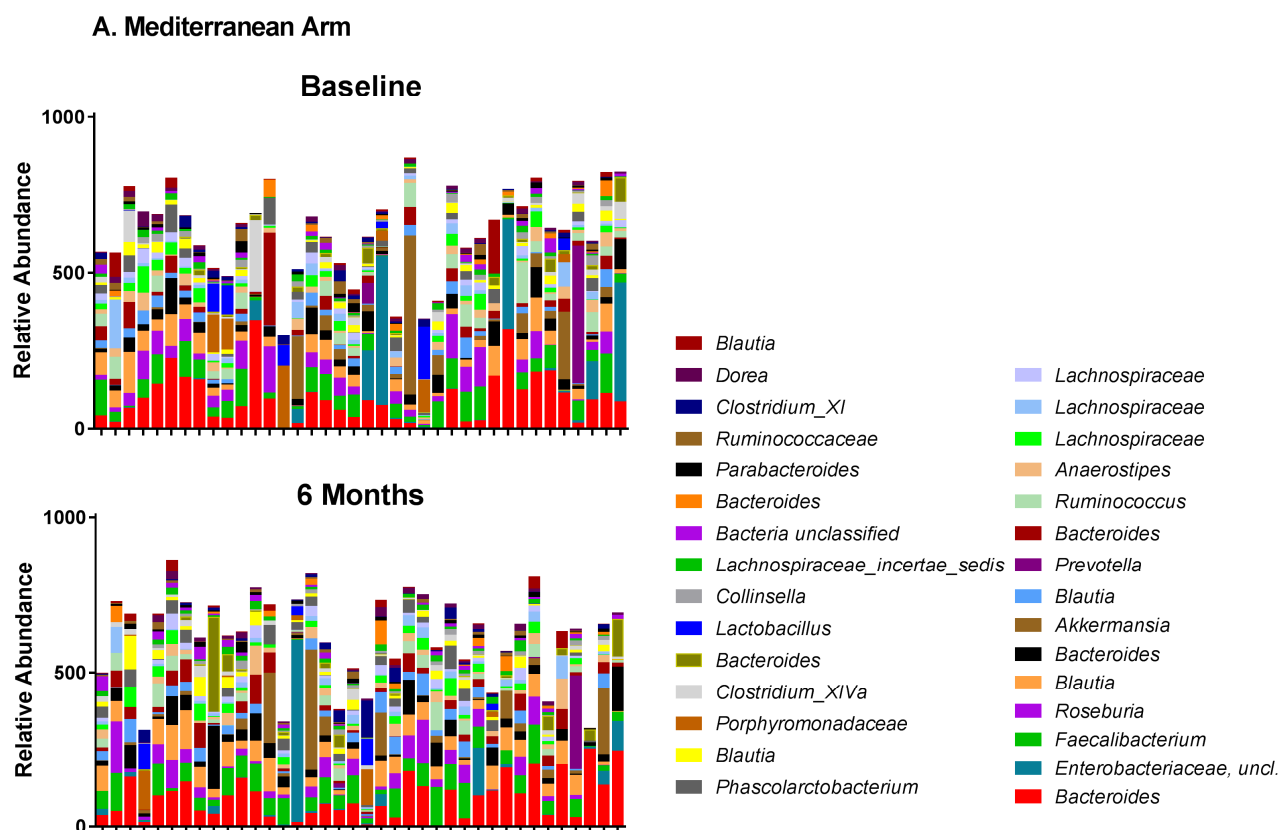
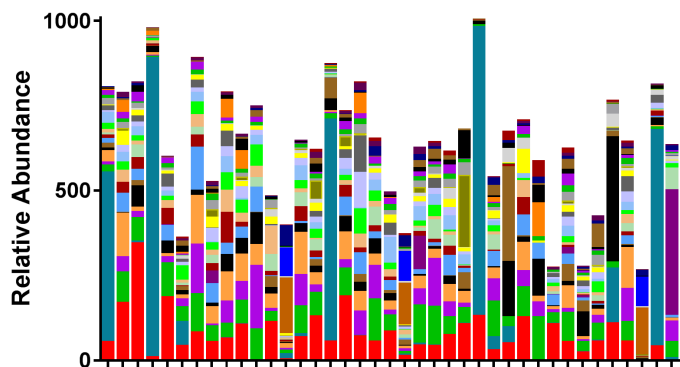


Supplemental Figure 1. Relative abundance of the 30 most abundant operational taxonomic units (OTUs) before and after dietary intervention in subjects with paired baseline and 6-month samples.

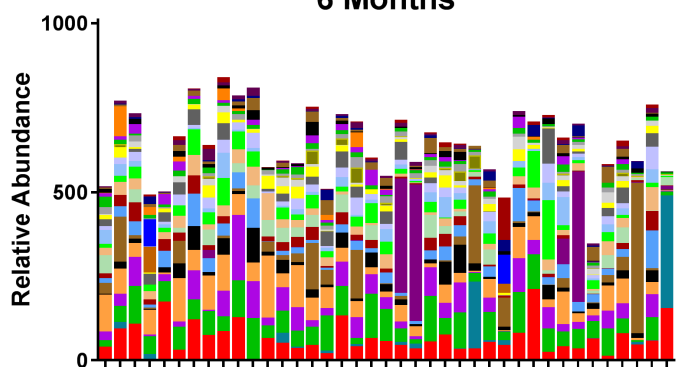


B. Healthy Eating Arm

Baseline



6 Months



Supplemental Table 1. Spearman correlation coefficients of the relative abundance of bacteria from colonic mucosa with BMI, serum measures of metabolic health and serum carotenoids at baseline in 88 subjects. Significant associations, after correction for false discovery rates (FDR) using the Benjamini-Hochberg method ($p \leq 0.015$), are starred. There were no significant correlations of bacterial variables with age after FDR correction. The phyla, families and genera shown are from summing appropriate operational taxonomic units (OTUs) after subsampling data to 1047 sequences per sample.

Bacterial Taxa	BMI (kg/m ²)	Triglycerides	CRP	HOMA2-IR	LPS binding protein	LDL	HDL	Total Carotenoids
Indices								
Shannon Diversity, <i>H</i>	0.174	-0.113	-0.013	0.018	-0.141	-0.054	0.046	0.022
Inverse Simpson	0.177	-0.063	0.012	0.014	-0.091	-0.075	-0.003	-0.018
θ_{VC} Inter-individual Distances	-0.224	-0.251	-0.216	-0.285	-0.214	0.191	0.323*	0.409*
Phyla								
Actinobacteria	0.057	-0.113	0.082	-0.009	0.020	0.090	0.040	0.066
Bacteroidetes	-0.015	0.155	0.087	0.114	0.067	0.003	0.104	0.002
Firmicutes	0.311*	0.117	0.121	0.246	0.099	-0.152	-0.272*	-0.353*
Proteobacteria	-0.272*	-0.357*	-0.102	-0.280*	-0.095	0.076	0.196	0.269*
Verrucomicrobia	-0.122	-0.281*	-0.041	-0.115	-0.076	-0.037	0.265*	0.135
Families								
<i>Lachnospiraceae</i>	0.248	0.280*	0.250	0.306*	0.232	-0.154	-0.283*	-0.480*
<i>Ruminocaceae</i>	0.215	0.034	0.033	0.146	0.003	-0.078	-0.184	-0.146
Genera								
<i>Bacteroides</i> (23 OTUs)	-0.094	0.192	0.192	0.126	0.158	-0.060	-0.080	-0.162
<i>Prevotella</i> (19 OTUs)	0.027	-0.178	-0.007	0.021	-0.122	0.082	0.008	0.352*
<i>Blautia</i> (11 OTUs)	0.229	0.169	0.363*	0.278*	0.293*	-0.119	-0.331*	-0.347*
<i>Roseburia</i> (2 OTUs)	0.345*	0.291*	0.070	0.353*	0.135	-0.172	-0.398*	-0.445*
<i>Akkermansia</i> (1 OTU)	-0.121	-0.281*	-0.041	-0.115	-0.076	-0.036	0.264	0.135
Individual OTUs identified from linear discriminant analysis effect size (LEfSE) to Differ by Total Carotenoid Tertile, with taxonomic classification								
OTU24; <i>Coriobacteriaceae</i> , <i>Collinsella</i>	0.168	0.069	0.192	0.129	0.029	0.055	-0.039	-0.181
OTU1; <i>Bacteroidaceae</i> <i>Bacteroides</i>	0.015	0.226	0.213	0.154	0.275*	-0.051	-0.183	-0.286*

OTU102; <i>Porphyromonadaceae</i> <i>Odoribacter</i>	0.073	0.084	0.181	0.211	0.180	-0.011	-0.145	-0.216
OTU3; <i>Lachnospiraceae</i> <i>Blautia</i>	0.227	0.111	0.340*	0.276*	0.344*	-0.166	-0.321*	-0.352*
OTU4; <i>Lachnospiraceae</i> <i>Roseburia</i>	0.369*	0.288*	0.065	0.349*	0.156	-0.151	-0.404*	-0.438*
OTU75; Firmicutes unclassified	0.008	-0.256	0.039	0.016	0.025	0.087	0.005	0.149
OTU20; <i>Lachnospiraceae</i> <i>incertae sedis</i>	0.276*	0.138	0.325*	0.266*	0.156	-0.062	-0.266*	-0.315*
OTU12; <i>Lachnospiraceae</i> unclassified	0.379*	0.192	0.168	0.380*	0.228	-0.190	-0.348*	-0.402*
OTU45; <i>Lachnospiraceae</i> unclassified	0.443*	0.431*	0.309*	0.437*	0.333*	-0.024	-0.425*	-0.339*
OTU118; <i>Lachnospiraceae</i> unclassified	0.173	0.110	0.074	0.110	-0.012	0.080	-0.145	-0.261
OTU63; <i>Sutterellaceae</i> <i>Parasuttrella</i>	0.189	-0.003	0.107	0.140	0.127	-0.028	-0.154	-0.087

Supplemental Table 2. Spearman correlation coefficients for carotenoid concentrations in A. serum and B. colonic mucosal biopsies with relative bacterial abundance in colon mucosal biopsies. Shown are diversity indices, major phyla, families, genera, and operational taxonomic units (OTUs) identified from linear discriminant analysis effect size (LEfSE) analyses to differ across serum carotenoid tertiles.

A. Serum

	total carotenoids	lycopene	α -carotene	β -carotene	lutein	zeaxanthin	β -cryptoxanthin
Shannon H	0.022	0.023	-0.078	0.002	0.056	0.225	0.157
Inverse Simpson	-0.018	0.031	-0.092	-0.023	-0.012	0.171	0.124
θ -YC Distance	0.409	0.207	0.115	0.378	0.335	0.204	0.206
Actinobacteria	0.066	0.033	-0.14	-0.014	0.179	0.313	0.18
Bacteroidetes	0.002	-0.12	-0.009	-0.011	0.032	0.092	0.119
Firmicutes	-0.353	-0.182	-0.122	-0.31	-0.176	-0.178	-0.143
Proteobacteria	0.269	0.215	0.157	0.256	0.05	0.012	0.038
Verrucomicrobia	0.135	0.146	-0.053	0.187	0.079	0.111	0.049
<i>Lachnospiraceae</i>	-0.48	-0.298	-0.047	-0.387	-0.291	-0.31	-0.251
<i>Ruminococcaceae</i>	-0.146	-0.072	-0.16	-0.213	-0.017	0.042	-0.035
<i>Bacteroides</i>	-0.162	-0.064	0.055	-0.095	-0.308	-0.239	-0.153
<i>Prevotella</i>	0.352	0.353	-0.074	0.228	0.104	0.177	0.211
<i>Blautia</i>	-0.347	-0.148	-0.035	-0.28	-0.38	-0.314	-0.194
<i>Roseburia</i>	-0.445	-0.203	-0.183	-0.452	-0.293	-0.181	-0.316
<i>Akkermansia</i>	0.135	0.147	-0.053	0.187	0.079	0.112	0.049
OTU24; <i>Collinsella</i>	-0.181	-0.175	-0.174	-0.264	0.122	0.132	0.008
OTU1; <i>Bacteroides</i>	-0.286	-0.21	0.014	-0.224	-0.266	-0.148	-0.19
OTU102; <i>Odoribacter</i>	-0.216	-0.158	-0.064	-0.202	-0.093	0.028	-0.079
OTU3; <i>Blautia</i>	-0.352	-0.19	-0.075	-0.302	-0.352	-0.312	-0.19
OTU4; <i>Roseburia</i>	-0.438	-0.222	-0.178	-0.452	-0.287	-0.159	-0.314
OTU75; Firmicutes unclassified	0.149	0.152	0.046	0.027	0.161	0.157	0.118
OTU20; <i>Lachnospiraceae incertae sedis</i>	-0.315	-0.206	-0.111	-0.329	-0.264	-0.296	-0.16
OTU12; <i>Lachnospiraceae unclassified</i>	-0.402	-0.189	-0.072	-0.403	-0.285	-0.148	-0.256
OTU45; <i>Lachnospiraceae unclassified</i>	-0.339	-0.186	-0.092	-0.365	-0.272	-0.185	-0.1
OTU118; <i>Lachnospiraceae unclassified</i>	-0.261	-0.221	-0.046	-0.251	-0.036	-0.016	-0.031
OTU63; <i>Parasutrella</i>	-0.087	0.094	0.037	-0.014	-0.197	-0.191	-0.251

B. Colonic mucosa

	total carotenoids	lycopene	α -carotene	β -carotene	lutein	zeaxanthin	β -cryptoxanthin
Shannon	0.029	-0.008	-0.085	0.051	-0.014	0.05	0.052
Inverse Simpson	0.019	0.021	-0.09	0.057	-0.031	0.01	0.027
θ -YC Distance	0.071	-0.088	-0.068	0.029	0.164	0.126	0.173
Actinobacteria	0.085	0.066	0.062	0.082	0.11	0.132	0.063
Bacteroidetes	-0.138	-0.13	-0.033	-0.123	-0.107	-0.011	-0.072
Firmicutes	0.013	0.044	0.002	0.046	-0.055	-0.006	-0.082
Proteobacteria	-0.164	-0.087	-0.138	-0.181	-0.157	-0.227	-0.179
Verrucomicrobia	0.175	0.281	0.122	0.143	0.136	0.162	0.103
<i>Lachnospiraceae</i>	-0.043	0.024	0.062	0.007	-0.103	-0.067	-0.159
<i>Ruminococcaceae</i>	0.051	0.104	0.109	0.139	-0.051	0.035	0.016
<i>Bacteroides</i>	-0.104	0.065	0.08	-0.1	-0.123	-0.152	-0.152
<i>Prevotella</i>	-0.073	0.043	-0.183	-0.097	-0.091	-0.058	-0.109
<i>Blautia</i>	-0.083	0.075	0.054	0.028	-0.196	-0.11	-0.159
<i>Roseburia</i>	0.047	0.137	0.082	0.007	-0.053	0.042	-0.111
<i>Akkermansia</i>	0.176	0.281	0.123	0.143	0.135	0.163	0.104
OTU24; <i>Collinsella</i>	0.041	0.057	0.093	-0.002	0.029	0.015	-0.082
OTU1; <i>Bacteroides</i>	-0.209	-0.019	-0.009	-0.184	-0.207	-0.215	-0.251
OTU102; <i>Odoribacter</i>	-0.071	0.022	0.002	0.137	-0.112	0.026	-0.102
OTU3; <i>Blautia</i>	-0.133	0.029	-0.016	-0.009	-0.218	-0.116	-0.187
OTU4; <i>Roseburia</i>	0.023	0.1	0.067	0.02	-0.076	0.019	-0.106
OTU75; Firmicutes unclassified	0.138	0.129	0.099	0.197	0.065	0.105	0.053
OTU20; <i>Lachnospiraceae incertae sedis</i>	0.041	0.175	0.106	0.103	-0.036	-0.012	-0.026
OTU12; <i>Lachnospiraceae unclassified</i>	0.017	0.081	0.066	0.116	-0.02	0.063	-0.062
OTU45; <i>Lachnospiraceae unclassified</i>	-0.243	-0.057	-0.106	-0.152	-0.321	-0.261	-0.171
OTU118; <i>Lachnospiraceae unclassified</i>	0.067	0.089	0.132	0.122	0	0.024	0.029
OTU63; <i>Parasutrella</i>	0.062	0.132	0.038	0.048	0.048	0.04	-0.073