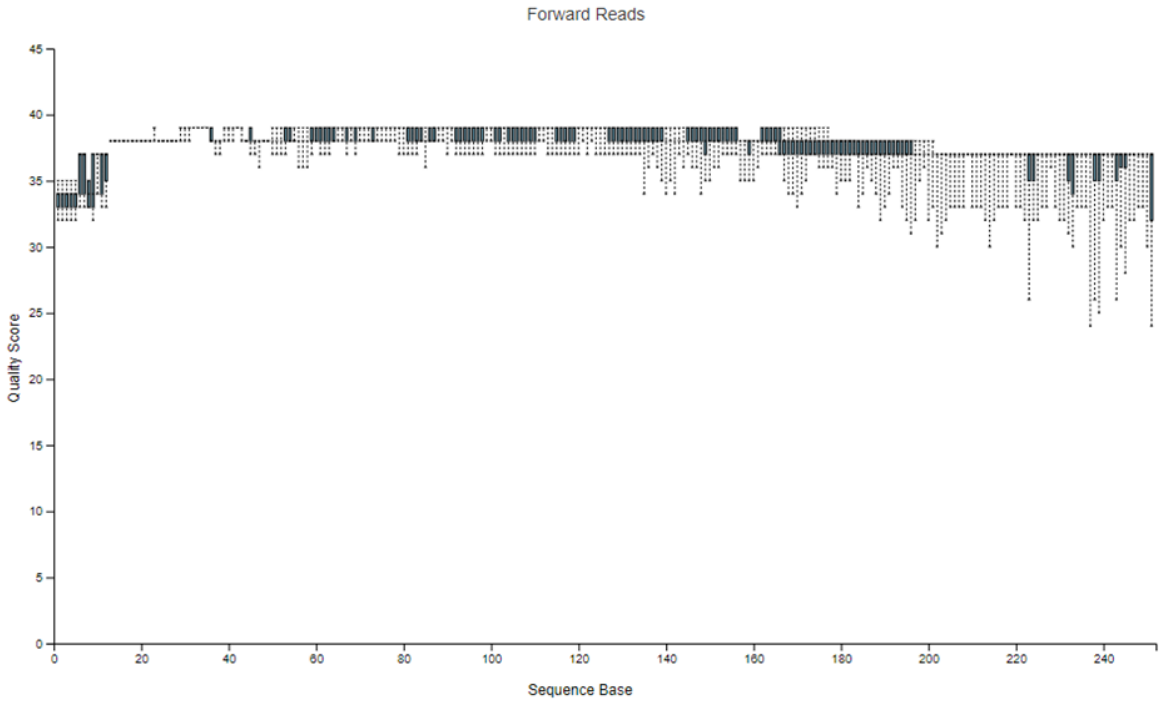
SUPPLEMENTAL MATERIAL

A



B

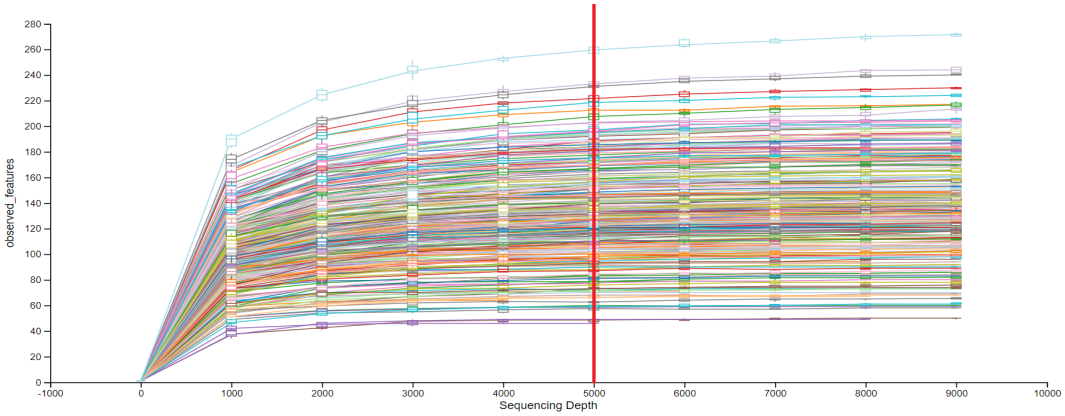


FIG. S1 (A) Boxplot graph for Phred Quality Scores of Cristea et al.(8) sample 16s rDNA sequences. Produced by QIIME2 viewer, generated by random sampling of 10000 sequences in 300 samples. X-axis represents position in DNA sequence, Y-axis represents Phred Quality score. **(B)** Rarefaction plot generated from QIIME2 viewer. Rarefaction depth of 5000 indicated by the red line.

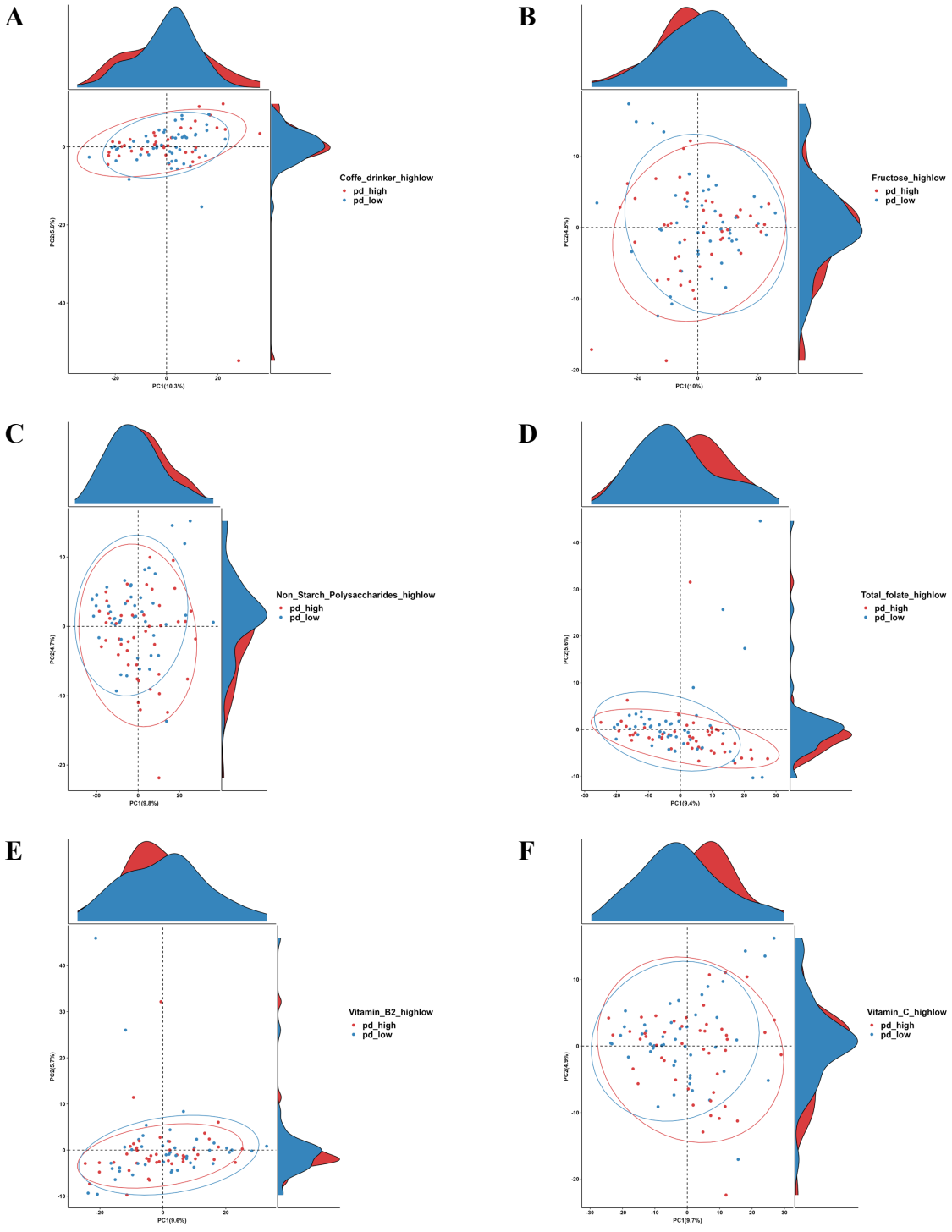


FIG. S2 PCA Plots of Functional Pathway Differential Abundance in PD Patients. Significant (p-adjust < 0.05) MetaCyc metabolic pathway abundance differences between low intake and high intake of Coffee **(A)**, Fructose **(B)**, NSP **(C)**, Folate **(D)**, Vitamin B2 **(E)** and Vitamin C **(F)** in PD patients.

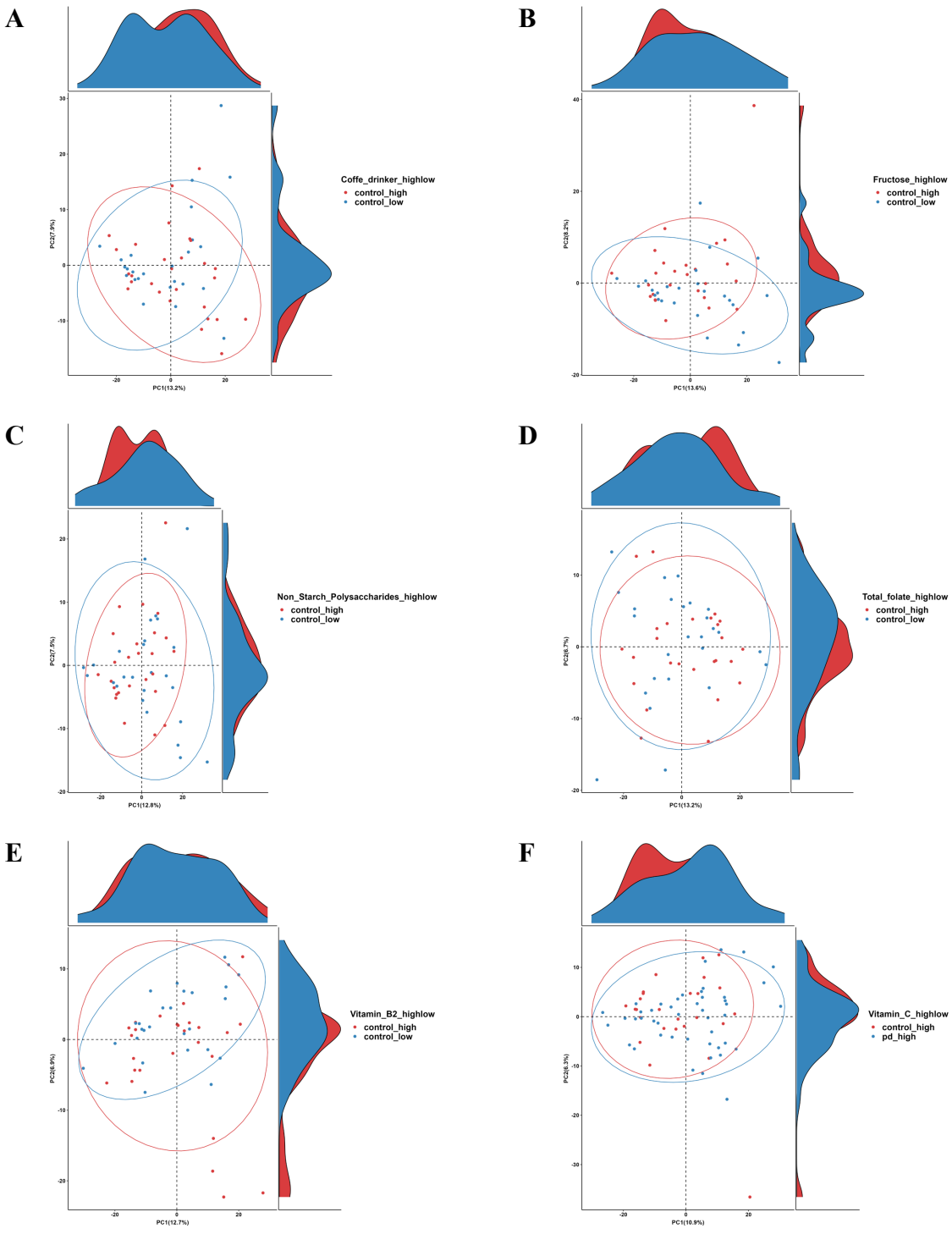


FIG. S3 PCA Plots of Functional Pathway Differential Abundance in Control Participants. Significant (p-adjust < 0.05) MetaCyc metabolic pathway abundance differences between low intake and high intake of Coffee **(A)**, Fructose **(B)**, NSP **(C)**, Folate **(D)**, Vitamin B2 **(E)** and Vitamin C **(F)** in Control Participants.

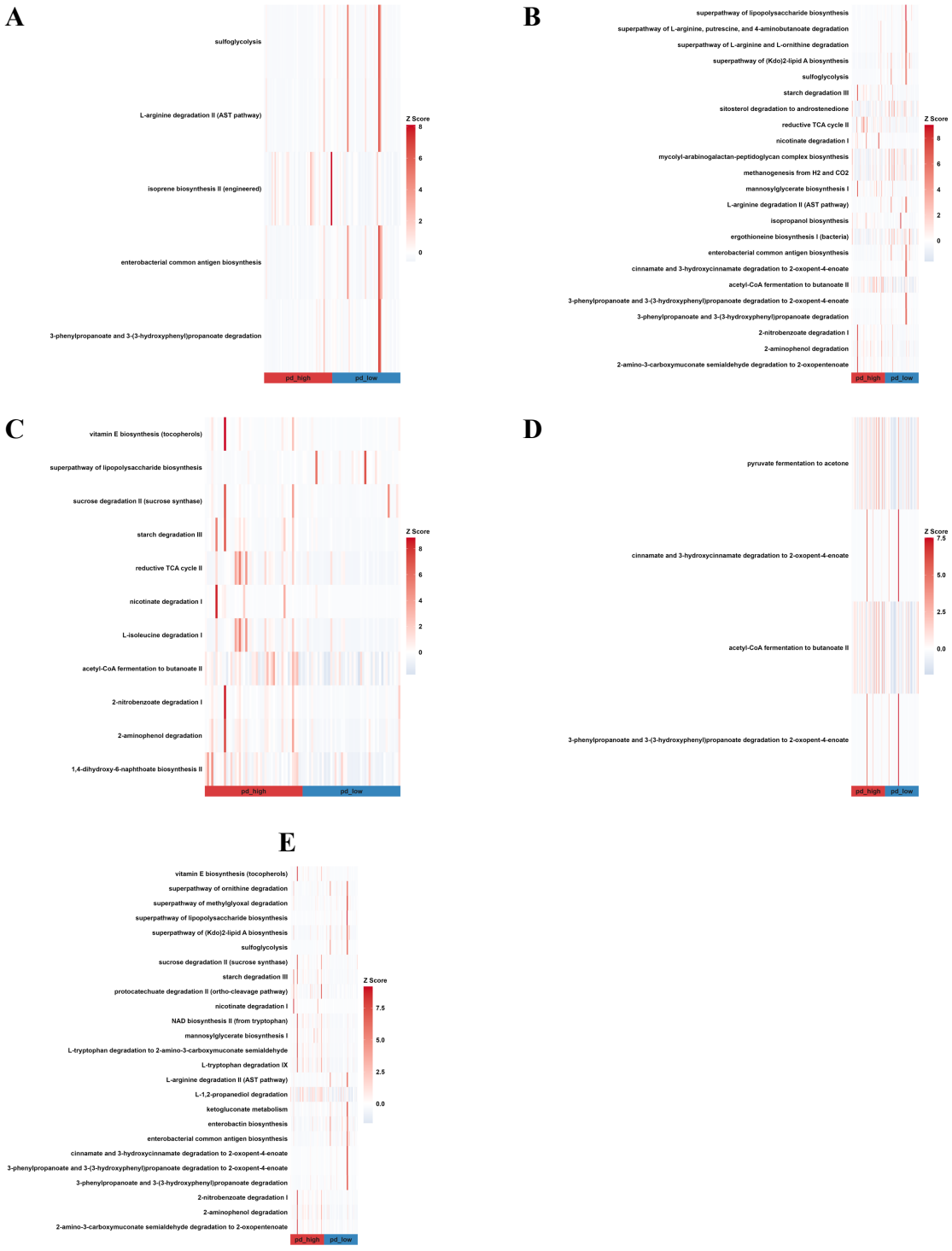


FIG. S4 Heatmaps of Functional Pathway Differential Abundance in PD Patients. MetaCyc metabolic pathways with a significant (p-adjust < 0.05) differences in abundance between low intake and high intake of Fructose **(A)**, NSP **(B)**, Folate **(C)**, Vitamin B2 **(D)** and Vitamin C **(D)** in PD Patients.

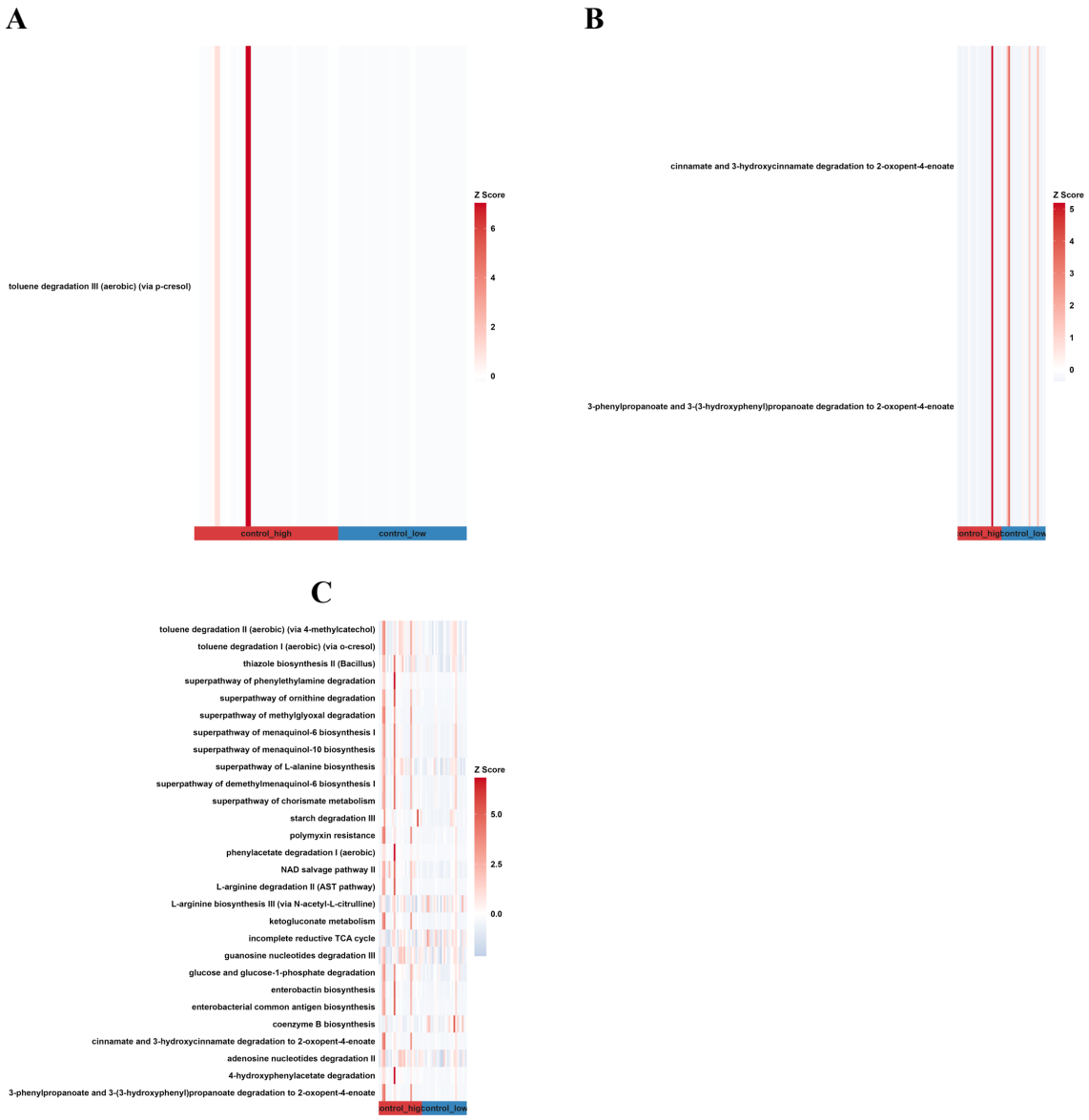


FIG. S5 Heatmaps of Functional Pathway Differential Abundance in Control Participants. MetaCyc metabolic pathways with significant (p-adjust < 0.05) differences in abundance between low intake and high intake of Coffee **(A)**, Folate **(B)** and Vitamin B2 **(C)** in Control Participants.

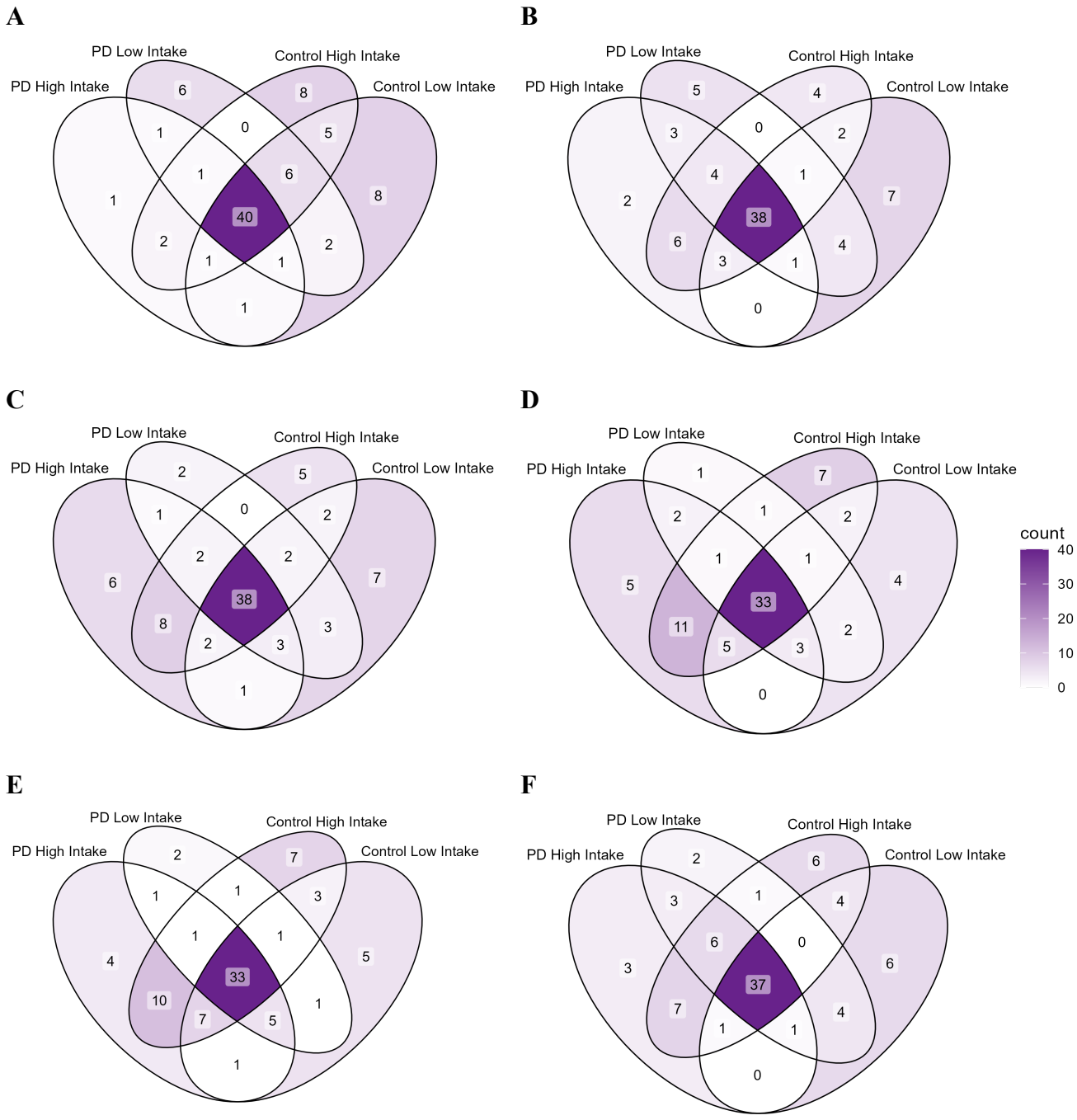


FIG. S6 In-depth core microbiome analysis highlights gut composition in control groups. Four-way Venn diagrams representing the number of unique species across high and low nutrient intake in PD (n =46), and control groups (n= 26) for Coffee (**A**), Fructose (**B**), NSP (**C**), Folate (**D**), Vitamin B2 (**E**), and Vitamin C (**F**). Core microbiome determined by absence/presence relative abundance (> 0%), present in 50% of individuals.

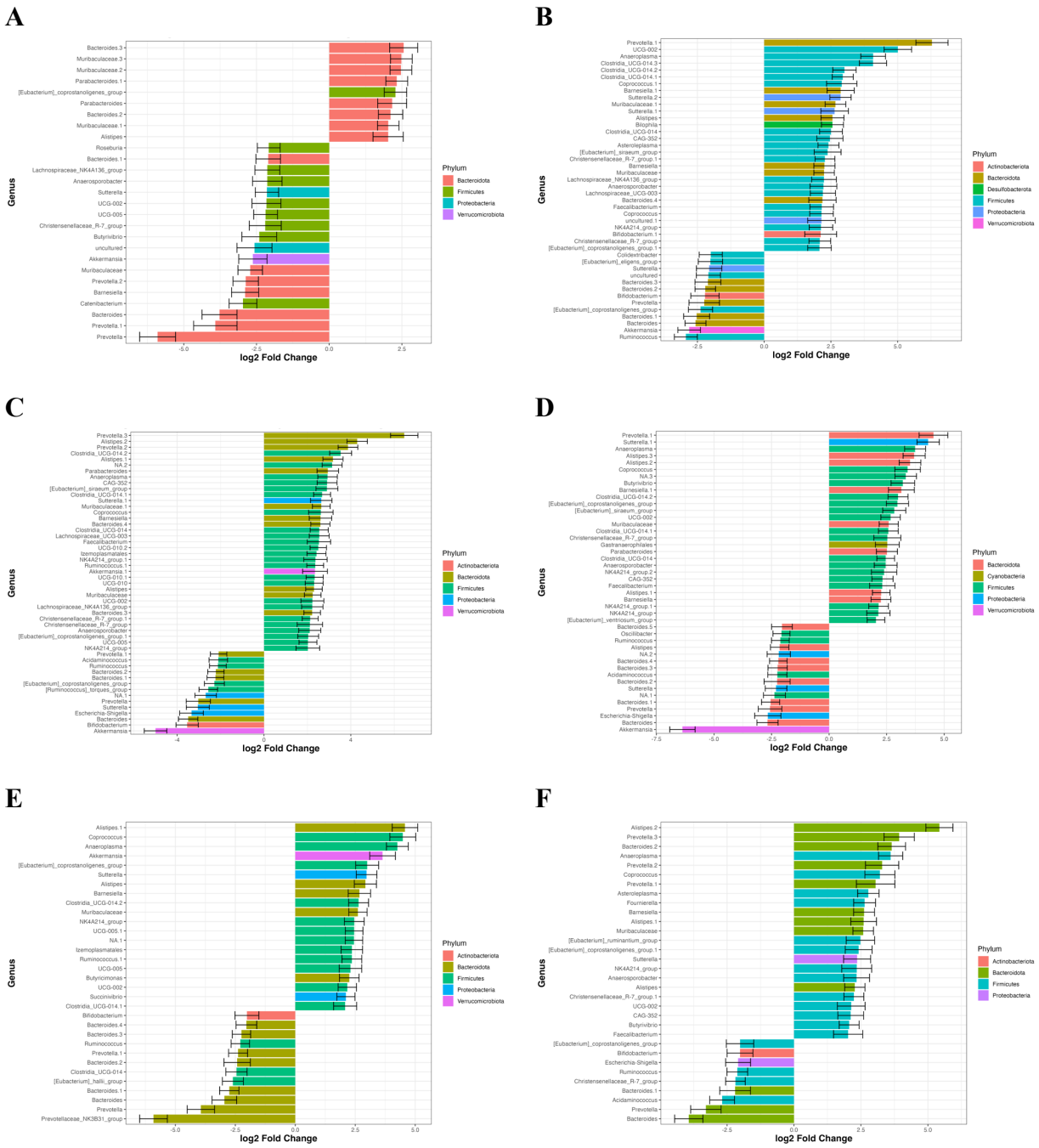


FIG. S7 Differentially abundant ASVs in PD high vs low nutrient intake. Significant ASVs bar plots from DESeq differential abundance analysis of high vs low Coffee (**A**), Fructose (**B**), NSP (**C**), Folate (**D**), Vitamin B2 (**E**), and Vitamin C (**F**) in PD patients. ASVs with log2FoldChange > 2 and adjusted p-value < 0.01 were mapped to respective genera and colour-matched to respective phyla.

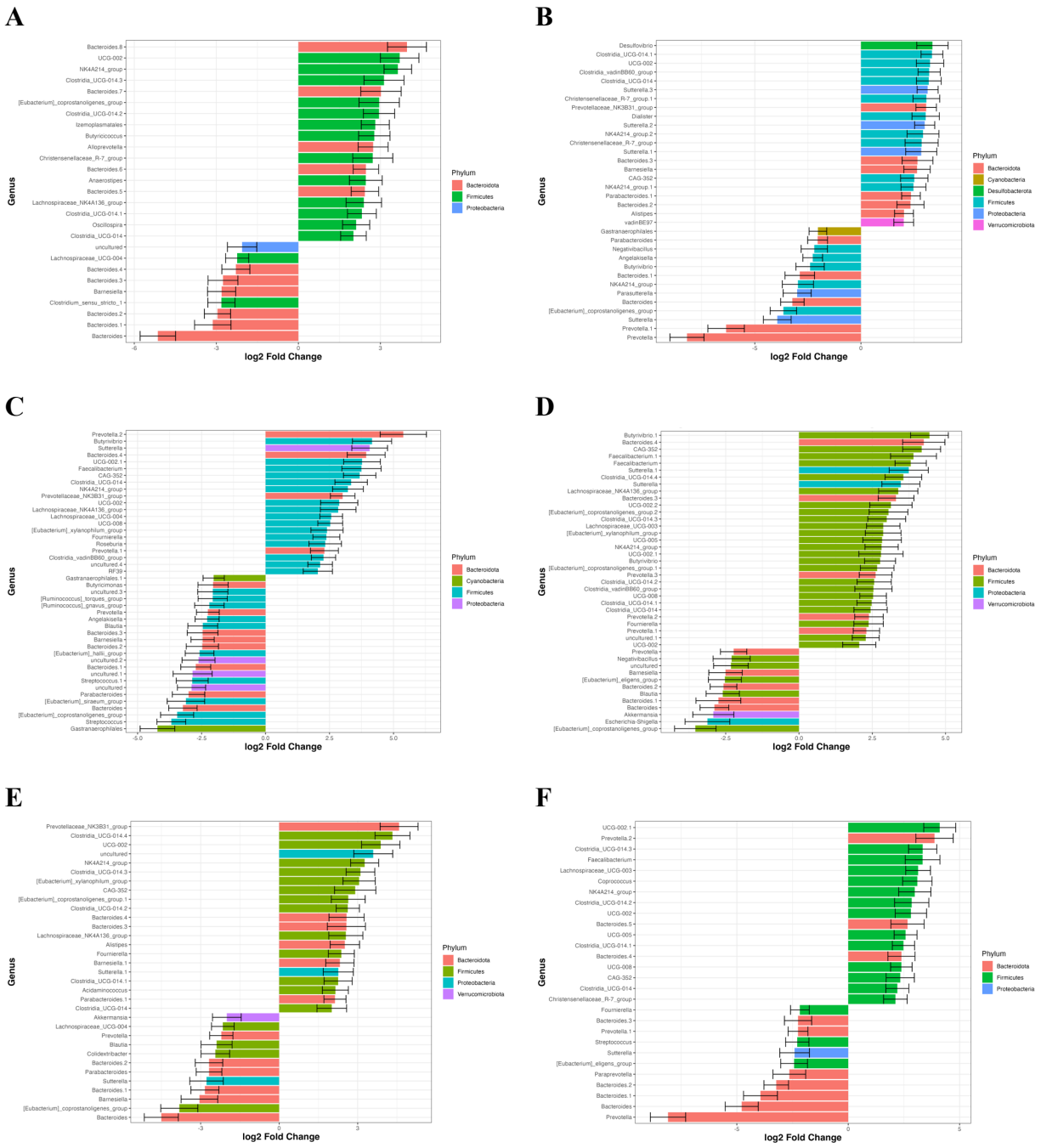


FIG. S8 Differentially abundant ASVs in non-PD control high vs low nutrient intake. Significant ASVs bar plots from DESeq differential abundance analysis of high vs low Coffee (**A**), Fructose (**B**), NSP (**C**), Folate (**D**), Vitamin B2 (**E**), and Vitamin C (**F**) in non-PD control patients. ASVs with log2FoldChange > 2 and adjusted p-value < 0.01 were mapped to respective genera and colour-matched to respective phyla.

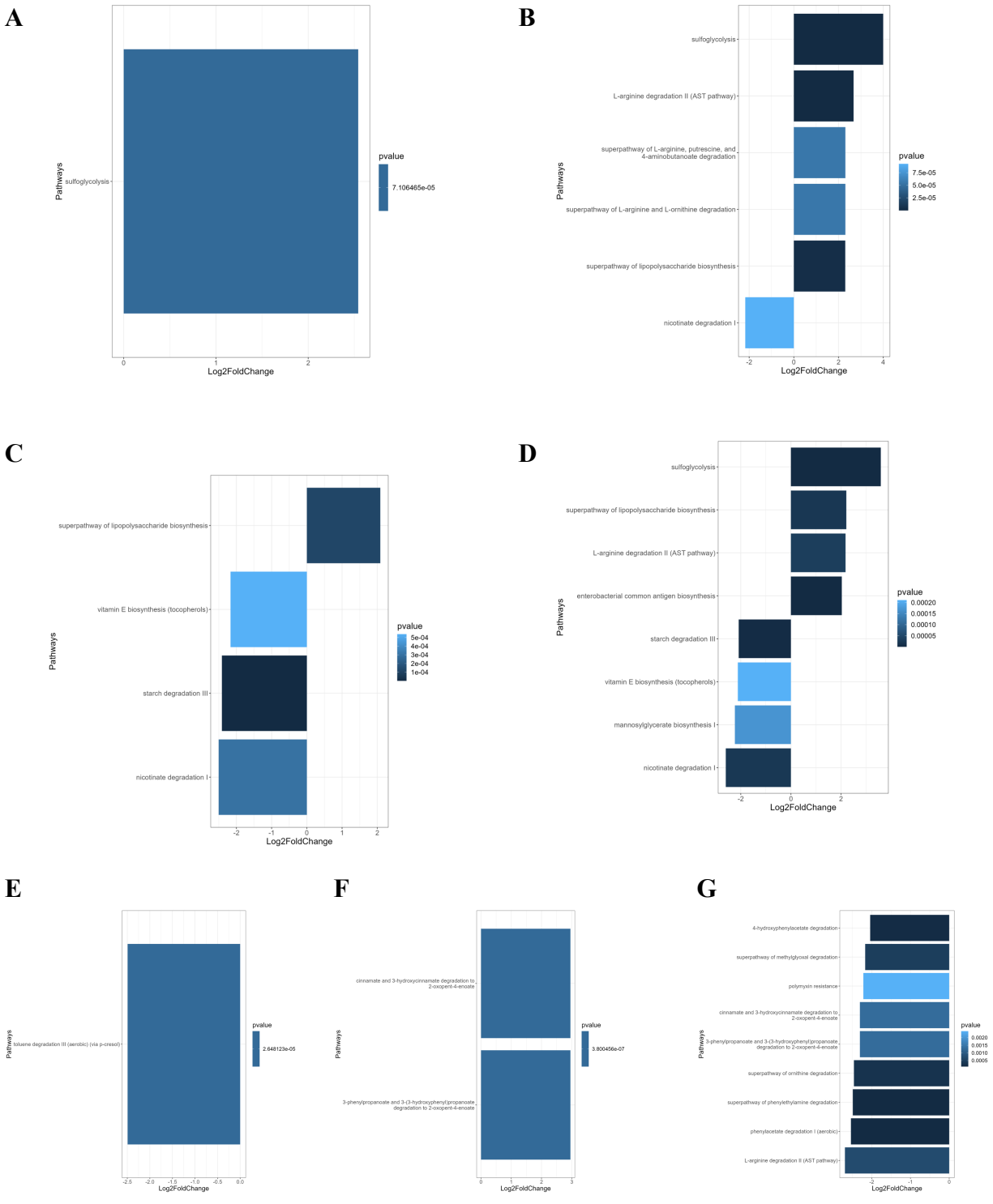


FIG. S9 Functional pathways up and downregulated by low vs high nutrient intake. Significant (p-adjust < 0.05) MetaCyc metabolic pathways filtered for a log two-fold change of +/- 2 showed up or down regulated pathways in low vs high intake of Fructose **(A)**, NSP **(B)**, Folate **(C)** and Vitamin C **(D)** in PD patients and low vs high intake of Coffee **(E)**, Folate **(F)** and Vitamin B2 **(G)** in Control participants**.**

TABLE. S1 MetaCyc Pathways up and downregulated by Specific Nutrients in PD Patients. Significant (p-adjust < 0.05) MetaCyc metabolic pathways filtered for a log two-fold change of +/- 2 showed up or down regulated pathways in low vs high intake of nutrients in PD patients.

Nutrient	Direction	Pathway
Folate	DOWN	nicotinate degradation I
Folate	DOWN	starch degradation III
Folate	DOWN	vitamin E biosynthesis (tocopherols)
Folate	UP	superpathway of liposaccharide biosynthesis
Fructose	UP	sulfoglycolysis
NSP	DOWN	nicotinate degradation I
NSP	UP	L-arginine degradation II (AST pathway)
NSP	UP	sulfoglycolysis
NSP	UP	superpathway of L-arginine, putrecine, and 4-aminobutanoate degradation
NSP	UP	superpathway of L-arginine, putrecine, and L-ornithine degradation
NSP	UP	superpathway of liposaccharide biosynthesis
Vit C	DOWN	mannosylglycerate biosynthesis I
Vit C	DOWN	nicotinate degradation I
Vit C	DOWN	starch degradation III
Vit C	DOWN	vitamin E biosynthesis (tocopherols)
Vit C	UP	enterobacterial common antigen biosynthesis
Vit C	UP	L-arginine degradation II (AST pathway)
Vit C	UP	sulfoglycolysis
Vit C	UP	superpathway of lipopolysaccharide biosynthesis

TABLE. S2 Nutrient Intake Levels. Mean and median nutrient intake values for each group, split by sex where recommendations are sex specific. EAR is the estimated average requirement and RDA is the recommended dietary allowance.

Group	Intake Level	Sex	Value	Fructose g / day	NSP g / day	Folate mg / day	Vitamin B2 mg / day	Vitamin C mg / day
PD	High		Mean	34.7	26.4	400.2	2.5	216.8
			Median	32.6	21.2	367.6	2.4	195.1
PD	High	Female	Mean		26.4		2.5	215.7
			Median		23.6		2.5	195.1
PD	High	Male	Mean		26.3		2.4	218.5
			Median		25.0		2.3	194.7
PD	Low		Mean	10.6	8.7	158.2	0.9	60.0
			Median	11.4	8.8	161.6	0.9	62.5
PD	Low	Female	Mean		8.6		1.0	57.6
			Median		9.1		1.0	56.6
PD	Low	Male	Mean		8.7		0.9	60.7
			Median		8.8		0.9	62.7
Control	High		Mean	35.3	26.9	400.6	2.4	221.6
			Median	33.1	24.6	355.6	2.3	209.4
Control	High	Female	Mean		26.0		2.4	213.3
			Median		23.5		2.3	187.6
Control	High	Male	Mean		28.9		2.5	249.3
			Median		27.6		2.3	240.2
Control	Low		Mean	10.3	9.4	173.5	0.9	61.2
			Median	10.9	9.5	176.8	1.0	62.5
Control	Low	Female	Mean		10.0		0.9	68.1
			Median		10.8		1.0	67.7
Control	Low	Male	Mean		9.1		0.9	58.2
			Median		8.9		0.9	58.7
Recommended		Female	EAR	NA	NA	320	0.9	60
		Male		NA	NA	320	1	75
		Female	RDA	NA	21	400	1.1	75
		Male		NA	30	400	1.3	90