

Supplementary Material for:  
Temporal microbiome road-maps guided by perturbations

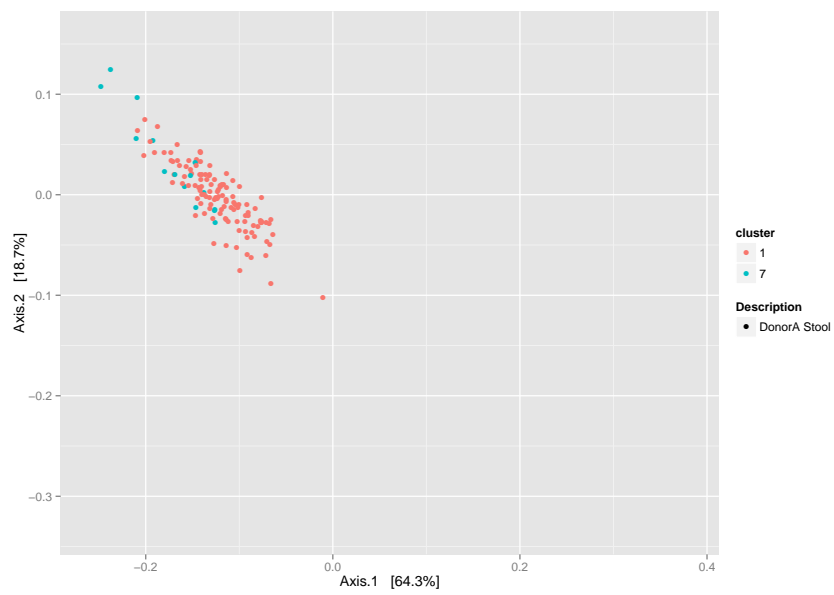
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# Figure S1: Human gut microbiome sample distribution



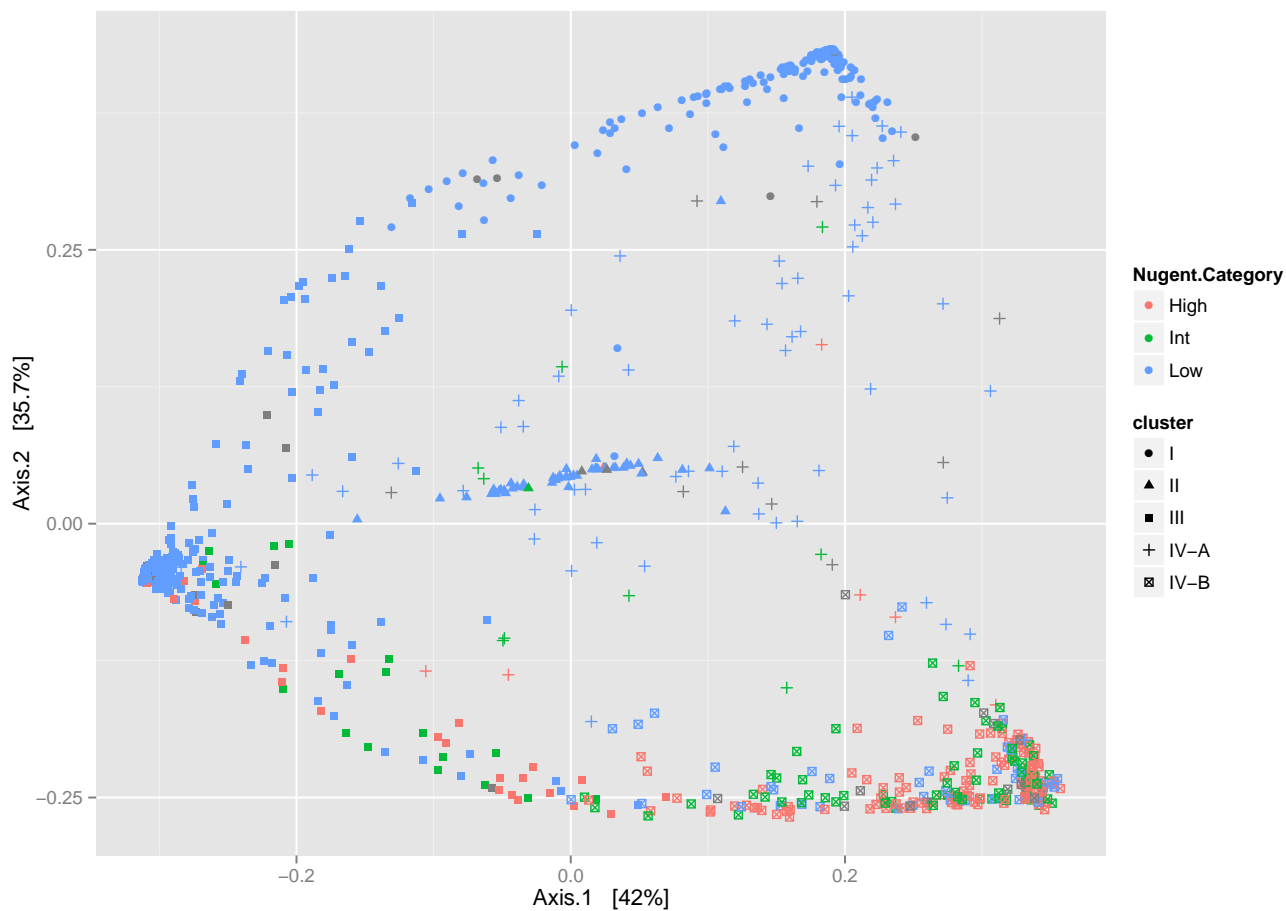
(a) All samples



(b) Samples with available perturbations

Figure S1: Sample distribution in clusters from human gut microbiome dataset. Before (a) and after (b) removing samples without perturbations.

**Figure S2: Vaginal flora microbiome sample distribution**



**Figure S2: Sample distribution in clusters from vaginal flora microbiome dataset.** Distribution of Nugent score per sample, being ‘High’ value which indicates the greatest risk for the Bacterial Vaginosis disease, concentrated mainly in cluster IV-B.

# Table S1: transition probabilities in Vaginal flora microbiome dataset

Table S1: Global relative transition probabilities in Vaginal flora microbiome dataset. Input state in rows, output state in columns. Each row sums 1.

States	I	II	III	IV-A	IV-B
I	0.8418	0.0000	0.0759	0.0696	0.0127
II	0.0000	0.8929	0.0357	0.0714	0.0000
III	0.0273	0.0055	0.8579	0.0437	0.0656
IV-A	0.1364	0.0341	0.1932	0.5568	0.0795
IV-B	0.0127	0.0000	0.0928	0.0169	0.8776

**Figure S3: Transition diagram vaginal flora microbiom**

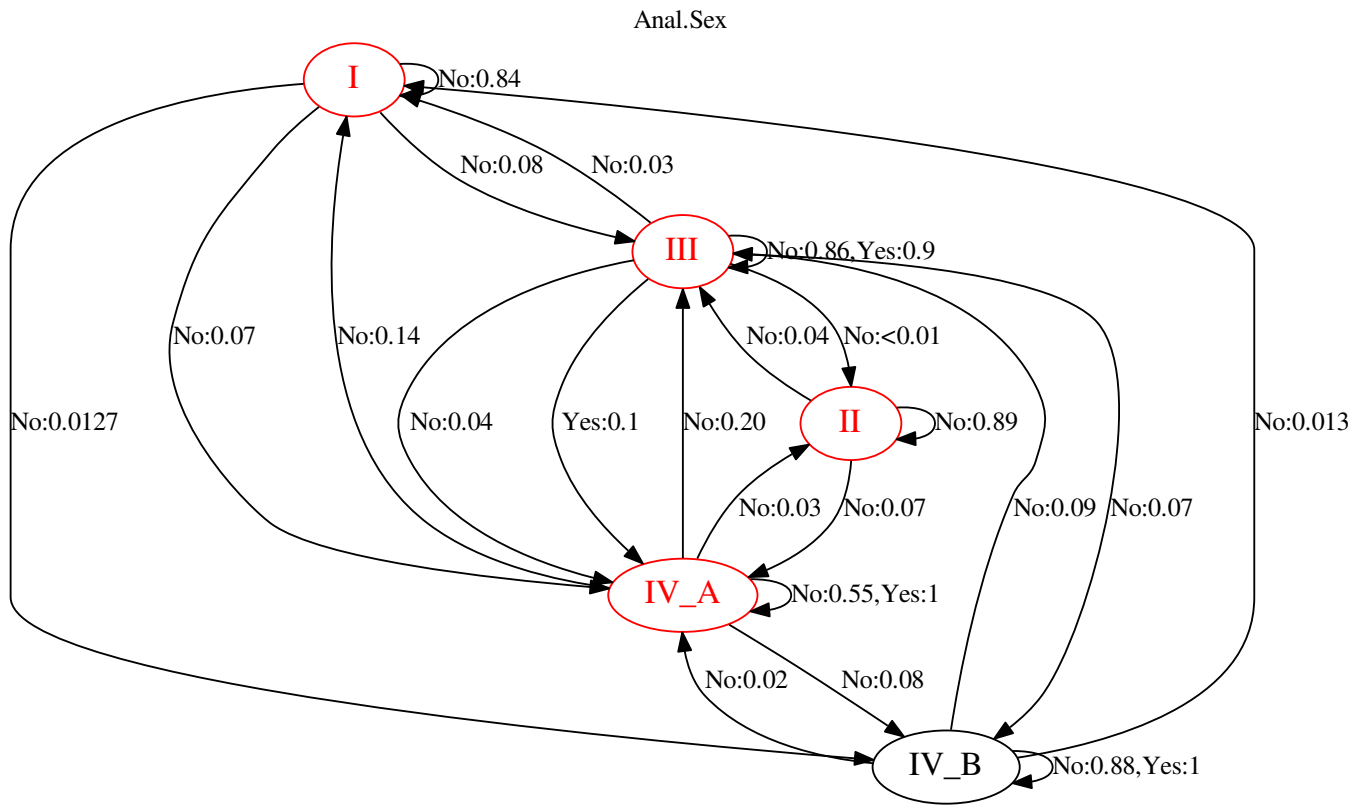


Figure S3: **Transition diagram of vaginal flora microbiome with anal sex as perturbation.** Goal (healthy) states highlighted in red.

## Table S2: Combined MDP policy in Human Gut

Table S2: **Quantity of nutritional intakes to reach *clus7* as the desired microbiome state.** Rows represent external perturbations that could influence the human gut microbiome. Columns represent the microbiome states. In each cell, the policy (low/medium/high) from all Markov systems, one per external perturbation.

<b>Perturbation \ State</b>	<b><i>clus1</i></b>	<b><i>clus7</i></b>
<b>Calcium</b>	Medium	Low
<b>Calorie</b>	Low	Medium
<b>Carbohydrates</b>	Medium	Low
<b>Cholesterol</b>	Low	Medium
<b>Fat</b>	Low	Medium
<b>Fiber</b>	High	Low
<b>Protein</b>	Low	Medium
<b>Saturated fat</b>	Low	Medium
<b>Sodium</b>	Low	Medium
<b>Sugar</b>	High	High