**Material and Methods**

We have analysed more than 35000 time series of taxa from the gut microbiome of 97 individuals (sampling from three up to 332 time points), obtained from publicly available high throughput sequencing data on: healthy individuals over a long term span1, people with various degrees of obesity2, twin pairs discordant for kwashiorkor3, response to diet changes4 or to antibiotic perturbation5, and subjects diagnosed with irritable bowel syndrome (IBS)6. We engineered a complete software framework and a web platform, ComplexCruncher, ready to be implemented by other users. We summarize our dataset in ST1-6 (Tables 1-6 in supplemental material). The bacteria and archaea taxonomic assignations were obtained by analyzing 16S rRNA sequences, which were clustered into operational taxonomic units (OTUs) sharing 97 % sequence identity using QIIME7. WGS data3 were analyzed and assigned at strain level by the Livermore Metagenomic Analysis Toolkit (LMAT) 8, according to their default quality threshold. Genus, with best balance between error assignment and number of taxa, was chosen as our reference taxonomic level. We have verified that our conclusions are not significantly affected by selecting family or species as the reference taxonomic level (see Figure 1 in supplemental material).

### WC = 192

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# WC (total) = 792