

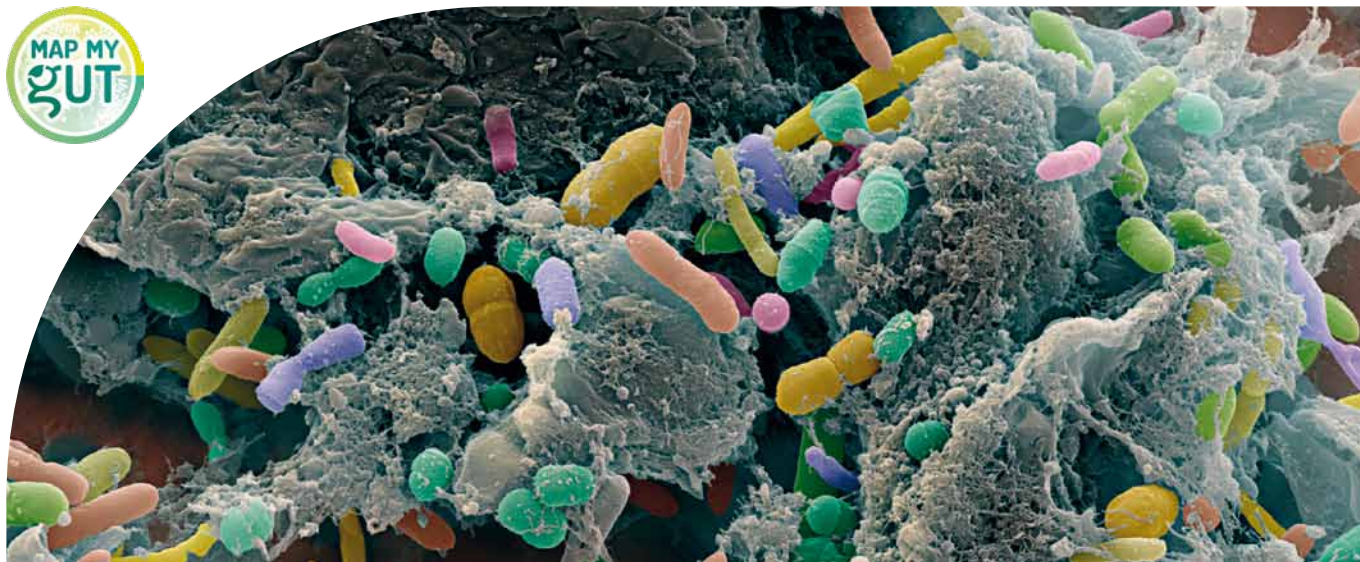
VERSION 2.5



Thank you for choosing Map My Gut. Please find herewith the results and interpretation of your stool test. We hope that by monitoring your gut microbiome, you will improve or maintain your health & wellbeing.

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MMGHL301



The human microbiome plays a key role in health. Thanks to recent technological advances and years of research, we can measure the hundreds of species present in your gut and start to understand how they affect you. This report will help you understand who lives within you.

The billions of microbes that call the human body home are named *the human microbiome*. This vast community is composed of mostly bacteria, but viruses, fungi and protists also live within this community.

While we can't see these microbes with our own eyes, collectively they weigh just over a kilogram and they are essential for human health.

Most of your microbes are acquired after birth by coming into contact with the environment around you. Until the age of 3 your microbes change, becoming more and more diverse then, at around 3 years of age, you have developed your "adult" microbiome. When healthy, this microbial community generally lives in a balanced symbiosis, helping to break down the foods you

can't digest, such as complex carbohydrates, protecting you from pathogens by competing with them for resources or training the immune system, altering mood and appetite and synthesizing vitamins that you can't get from your food such as vitamins K and B12.

A number of health conditions have been linked to an upset in this microbial balance, such as obesity, diabetes, IBS and IBD as well as mood disorders. Even response to certain therapies in cancer have been linked to the gut microbiome.

It is therefore important for your health and wellbeing that a good balance of microbes is maintained. A healthy gut microbiome supports your happiness and that of your microbes.



TwinsUK

TwinsUK was set up by Professor Tim Spector in London back in 1992. It currently comprises a total of 12,000 identical and non-identical twins from right across the UK and Ireland with ages between sixteen and ninety eight. Female twins predominate and overall the mean age is in the mid fifties. It is the UK's largest adult twin registry and the most clinically and lab tested group in the world. The breadth of research has expanded over the years to cover the study of the diet, lifestyle and genetic associations of a wide range of common complex traits. As of August 2016, nearly 3000 participants have had their gut microbiome analysed by

sequencing the 16s gene found in their stool (the same technique used to generate this report) and had completed a food & health questionnaire. These samples serve as a comparison basis to your results. In this report when you see the word "TwinsUK" it means that the graph gives you the summary information for that population of twins. The average BMI for these samples was 26. As it is overrepresented by middle-aged women, the data will be most accurate for this particular section of the population. Some individuals will be healthy, others will have a disease, comparable to the average general British population.

To find out more please visit: <http://www.twinsuk.ac.uk>

BritishGut

Tim Spector also recently launched, in collaboration with American Gut, British Gut. British Gut is a crowd-funded research project aimed at advancing our understanding of how the microbiome affects our health and wellbeing. As of August 2016, it comprises over 900 participants that come from all walks of life across Britain and numbers increasing. That population is roughly equally distributed

between women and men (56% Females and 44% Males), the average age is 47 years old and the average BMI is higher than average at 35. 61% of the participants report themselves as being healthy. These samples also serve as another comparison for your results. In this report when you see the word "BritishGut" it means that the graph gives you the summary information for that particular population.

To find out more please visit: <http://britishgut.org/>

Note: The two reference populations "TwinsUK" and "BritishGut" are references for your results. You will notice that they provide different values due to the fact that the samples were collected using slightly different methods and that they include different people.



“Diversity is about all of us, and about us having to figure out how to walk through this world together.”

Jacqueline Woodson

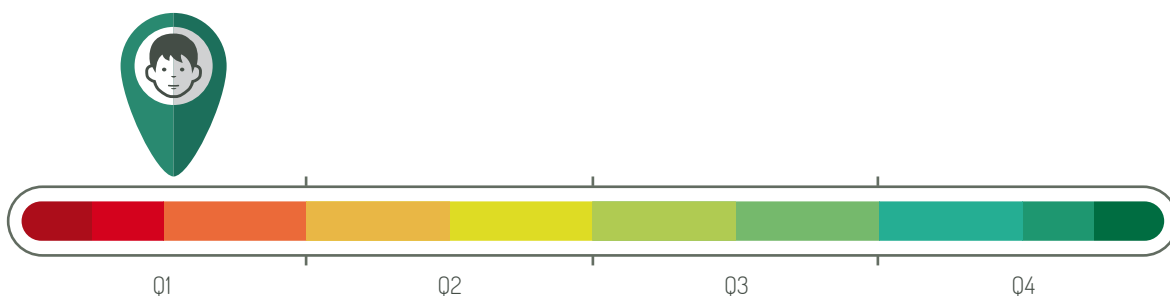
Microbial Diversity

Microbial diversity is an overall marker of the bacterial diversity found in your stool sample. The more we detect different types of bacteria in your stool, the greater the diversity score. The greater your diversity score, the better.

The human gut microbiome alone contains approximately 1000 different species of bacteria making it one of the most diverse microbial habitats in the human body. When we talk about measuring microbial diversity, we are actually measuring how many different species are living in a particular site, in this case, your gut. High microbial diversity in the gut is considered to be good for human health and low microbial diversity has been linked with increased risk of a number of conditions including obesity, diabetes, IBS, IBD, and even cancer. Microbial diversity may even be a marker of how varied

your diet is. Hunter-gatherer tribes in Africa have the highest microbial diversity of any population studied so far, which makes sense given the incredibly varied diet they eat. Their diets can be composed of a wide variety of different meats, insects, plants, roots and fruit that changes every day depending on what is available. Your microbes will shift composition on a daily basis, some more than others – although the basic profile remains unique to you. Like blood tests you may need several to get the best accuracy. The study is not designed to diagnose diseases or replace medical advice.

Your result:



Your microbial diversity is plotted compared to the TwinsUK population.

If you are in the third quartile (Q3), you are higher than over 50% of the population.

If you think your diversity can be improved, we recommend you discuss your diet with a nutritionist.

Bacterial Phyla

A phylum is a taxonomic rank. It can be thought of as a very high level grouping of bacteria. In the stool, there are generally seven such groups detected. Two of which, the Bacteroidetes and the Firmicutes are generally the most abundant.



Bacteroidetes

The Bacteroidetes often make up the largest proportion of bacteria in the Western human gut. They are typically a marker of the Western diet including meat-eating.



Firmicutes

The Firmicutes are the second largest phylum of bacteria in the healthy human gut. This group contains a large number of fibre degraders and can be a marker of a high fibre/vegetarian diet.



Proteobacteria

Proteobacteria are in low abundance in the human gut and comprise approximately 2-5% of the Western human gut. High levels of Proteobacteria are not generally considered to be good for the host and a number of links with a range of disorders has been found.



Actinobacteria

Actinobacteria are also present in low abundance in the typical Western human gut. Increased abundance of this phylum can indicate a high fat diet. Interesting members of this phyla include Bifidobacteria.



Your Results: Phylum Profile

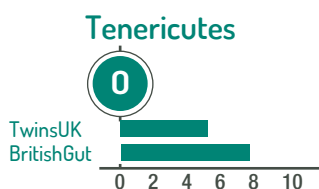
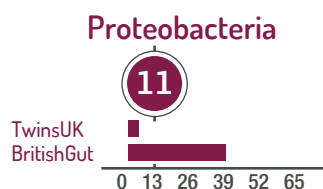
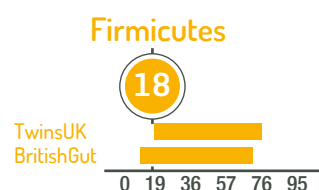
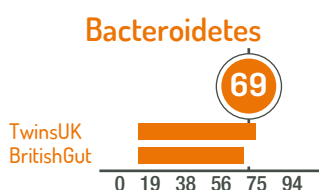
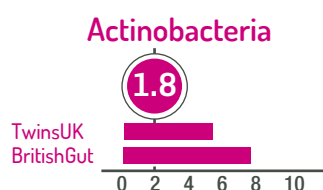


In the above phylum profile graph, you will find the percentage of eight common phyla detected in your stool sample. You can compare your profile to the average British profile or to the average profile from a subset of samples from people with the same gender or similar age, BMI or diet. You can also compare your gut microbiome to Tim Spector's profile. Tim is one of the founders of Map My Gut, the author of many papers and popular scientific books and a person with a very healthy life style (at least when he is not travelling the world to attend conferences).



Your Results:

The graphs below provide a closer look at six important phyla. Coloured areas represent common population ranges. If your sample falls out of these areas, it is considered to be an outlier. In that case refer to the interpretation section at the end of this report for help interpreting the results.



Bacterial Families

A family is a taxonomic rank that is lower than the phylum. This means that each family belongs to a phylum. It can be thought of as a very high level grouping of bacteria.

Below is a brief description of five usually common bacterial families.



Bacteroidaceae

A family of anaerobic, non-spore forming bacteria. Members of this family have often been linked to diet. When babies are first weaned onto solid food, these bacteria increase in number.



Lachnospiraceae

This is one of the largest families of microbes in the human gut microbiome. Members of this family have been linked to diet, obesity and gut disorders.



Prevotellaceae

Prevotellaceae has been linked to inflammation in mice when it is particularly enriched. In humans they can be a marker of a low-meat diet/ high carbohydrate diet.



Rikenellaceae

This family of bacteria are often found in lower numbers in lean individuals and may be a marker of a high fat diet. Studies in mice seem to support this theory.



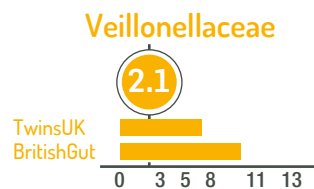
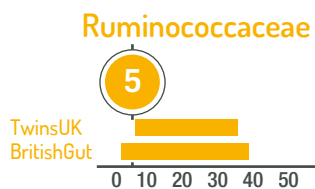
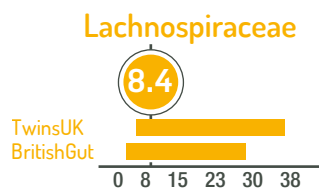
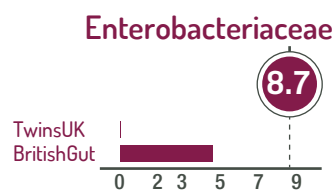
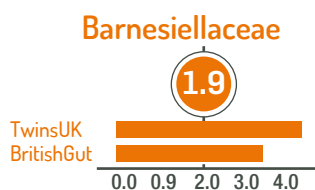
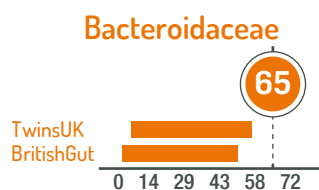
Ruminococcaceae

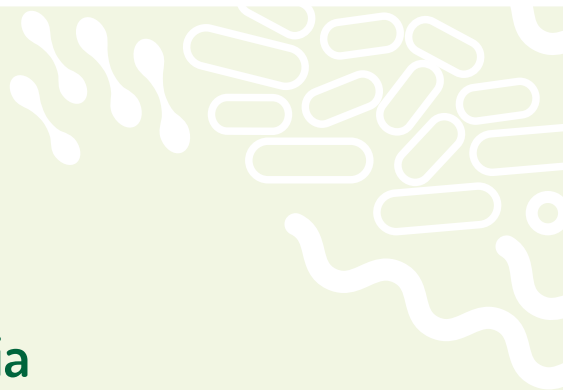
This is one of the largest families of microbes in the human gut microbiome. Members of this family have been linked to diet, obesity and gut disorders.



Your Results: Family Profile

Below are the family profiles of the six families that were found to be the most abundant in your sample. If one of them has a value outside of coloured areas, this means your level is uncommon. Please refer to the interpretation section at the end of the report for further explanations.





Diet & Health-Related Bacteria

The gut microbiome is an active area of research. We are only starting to understand how bacteria affect our dietary habits and our health. Based on today's knowledge, we selected six bacteria that we think are important for you.

Akkermansia muciniphila

Akkermansia has become an important microbe in recent years. Higher abundance of Akkermansia have been linked with lower rates of obesity and better insulin sensitivity.

Bifidobacterium

Bifidobacterium boosts the production of butyrate by other microbes by producing acetate that other microbes use for butyrate fermentation. Butyrate is an important molecule for human health, providing energy for the colon.

Christensenellaceae

Recent research has shown that members of Christensenellaceae can protect against weight gain. Not only that, but they are also highly heritable, meaning that your own genetics might decide whether you have this microbe or not.

Faecalibacterium prausnitzii

F. prausnitzii is an important marker of gastrointestinal health and in fact of microbial diversity. Higher abundance of F. prausnitzii has been linked with protection from IBS, Crohn's disease and ulcerative colitis as well as frailty in old age.

Methanobrevibacter

While not a bacteria, Methanobrevibacter is a microbe and plays an important role in reducing the hydrogen gas produced from SCFA fermentation. This is thought to help increase calorific yield from food.

Ruminococcus

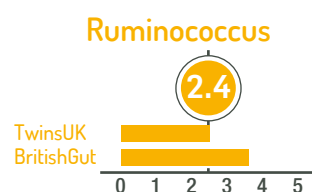
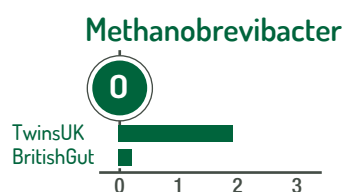
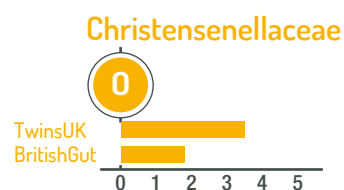
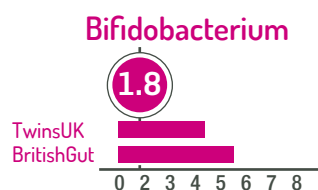
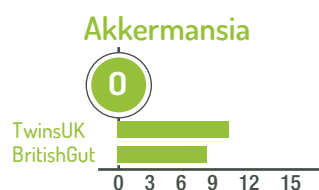
Ruminococci may be important for degradation of resistant starch and are generally considered to be beneficial microbes due to their production of butyrate. In our studies, individuals with higher Ruminococcus levels show decreased visceral fat levels.

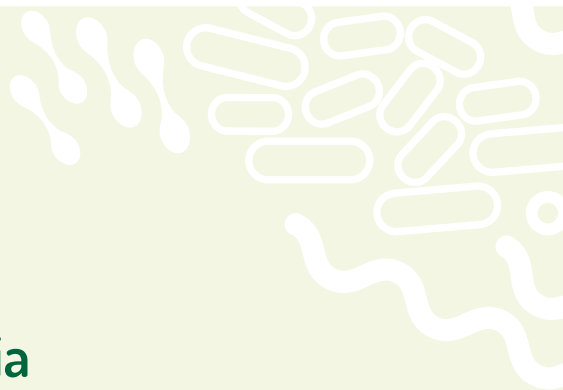


Your Results:

Diet & Health-Related Bacteria

The gut microbiome is an active area of research. We are only starting to understand how bacteria affect our dietary habits and our health. Based on today's knowledge, we selected six bacteria that we think are important for you.





Diet & Health-Related Bacteria

Bacteroides fragilis

Bacteroides fragilis There is compelling evidence to show that *B. fragilis* helps to ameliorate and improve autistic behaviours in mice. In addition to this it appears to have a profound effect on inflammation reduction through secretion of Polysaccharide A.

Coproccocus

Coproccocus is one of a group of bacteria significantly reduced in the guts of people on an animal-based diet. It also breaks down fermentable carbohydrates and produces butyrate.

Lachnobacterium

Lachnobacterium is one of a group of bacteria significantly reduced on average in the guts of people on an animal-based diet. Lower levels of this bacteria have been found in obese people also.

Oxalobacter

Oxalobacter performs an interesting role in the human gut microbiota. It helps to prevent the formation of kidney stones by degrading oxalate, the substance that kidney stones are formed from.

Prevotella

Prevotella is a highly diverse genus of bacteria. Presence of this genus has been linked with a diet high in fruit and veg however some *Prevotella* species have been linked with chronic inflammation.

Roseburia

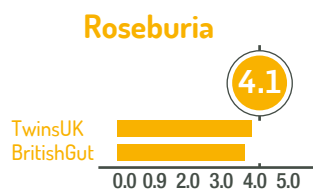
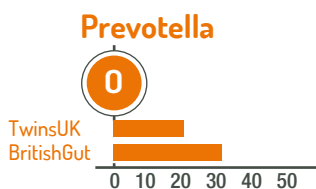
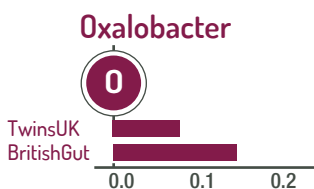
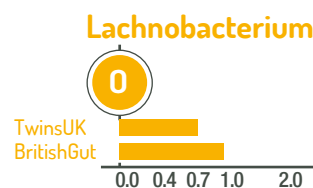
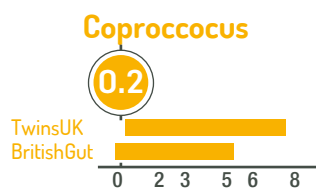
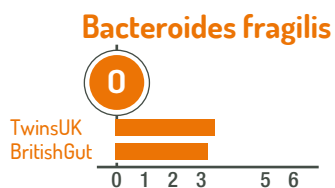
Roseburia is one of a group of bacteria significantly reduced on average in the guts of people on an animal-based diet. There is a number of studies showing an increase of *Roseburia* on high-fibre diets and a decrease of *Roseburia* on low-fibre diets.



Your Results:

Diet & Health-Related Bacteria

The gut microbiome is an active area of research. We are only starting to understand how bacteria affect our dietary habits and our health. Based on today's knowledge, we selected six bacteria that we think are important for you.





“Probiotics provide an extra layer of strength. (They behave like) soldiers in your intestinal tract to combat pathogens...”

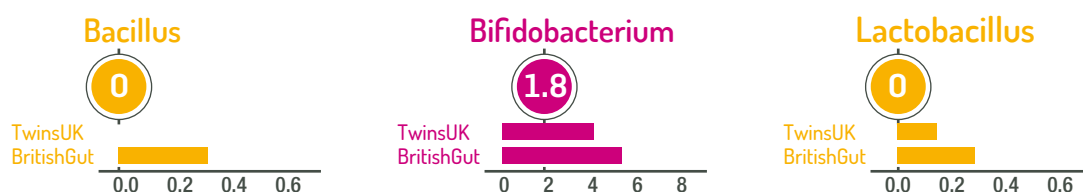
Dr. Mary Ellen Sanders

Probiotics

Probiotics are dietary supplements containing bacteria that are intended to help seed and promote a healthy gut microbiome. In individuals suffering from *Clostridium difficile* infection, or individuals that have gastrointestinal issues arising from a course of antibiotics or the very young or elderly, probiotics have been shown to help redress the balance of microbes. In healthy individuals however, there is little evidence as yet to show that probiotics tested so far have any clear effect, although many trials are ongoing.

Prebiotics act as a fertilizer for your microbes, promoting the growth of beneficial microbes. Fibre is a great prebiotic and can be increased in your diet simply by eating more fruit and vegetables. Increasing fibre has been shown to be healthy in a number of studies.

Your Results:



Probiotics usually fall into any of the three categories above : “Bacillus”, “Bifidobacterium” or “Lactobacillus”. These graphs help you to monitor the possible effect of ingesting probiotics. If you are using probiotics, make sure to check which families they belong to as this can help interpret your results.

Prebiotics

Prebiotics act as a fertilizer for your microbes, promoting the growth of beneficial microbes.

Fibre is a great prebiotic and can be increased in your diet simply by eating more fruit and vegetables. Increasing fibre has been shown to be healthy in a number of studies.

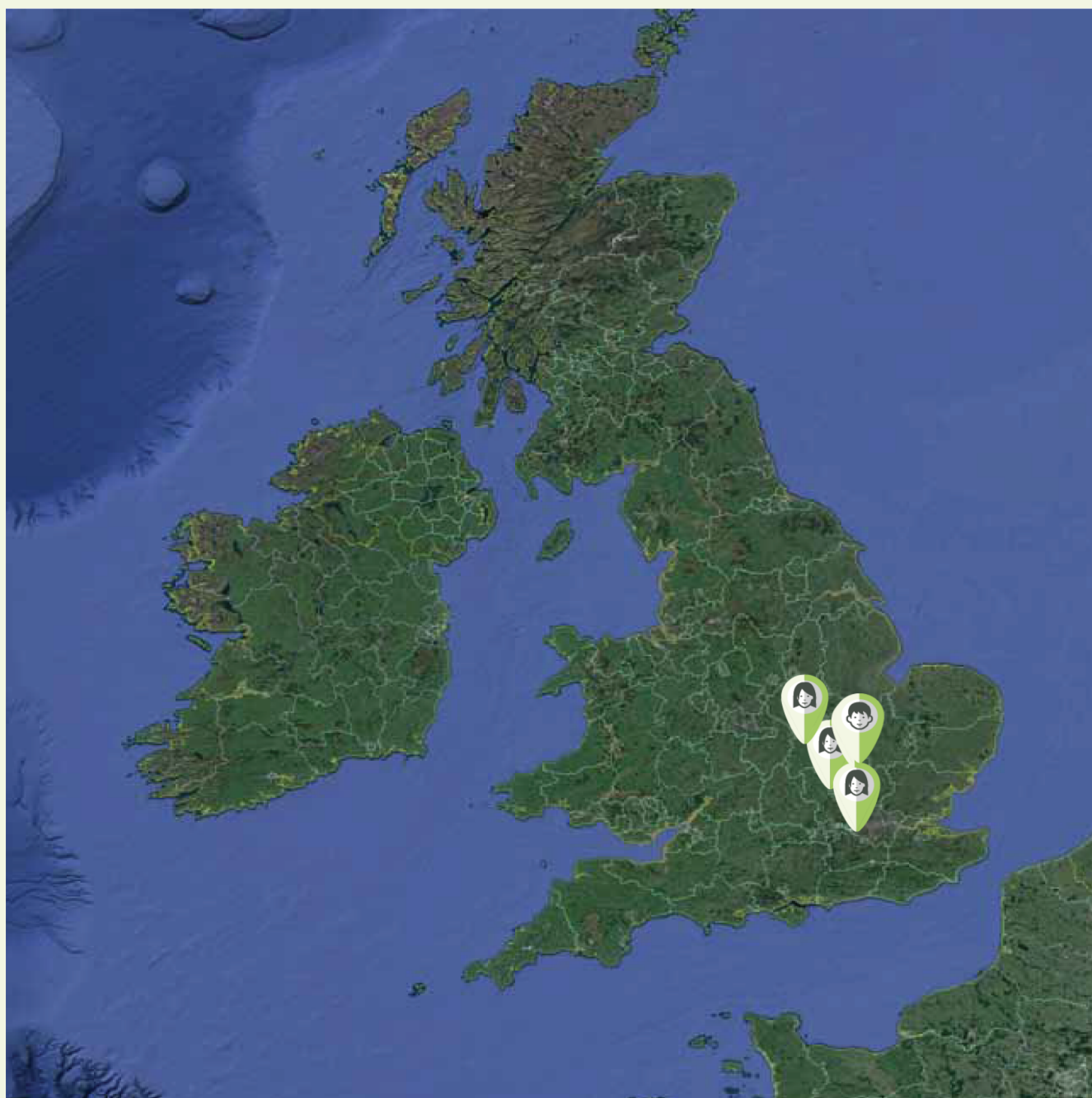
To help you choose the right prebiotic for you, we have prepared a table providing you with some foods that can help you increase the level of selected bacteria.

Food		Bacteria	Fibre (g/100g)	Reference
Garlic	↑	Bifidobacteria	2,1	Zhang (2013) Food Sci Hum Well
Jerusalem Artichoke	↑	Bifidobacteria	1,6	Ramnani (2010) Br J Nutr Kleessen (2007) Br J Nutr
	↓	Bacteroides/Prevotella		
Chicory	↑	Bifidobacteria	4	Kleessen (2007) Br J Nutr
	↓	Bacteroides/Prevotella		
Bananas	↓	Bifidobacteria (Not significant)	2,6	Mitsou (2011) Anaerobe
Whole-Grain Barley	↑	Roseburia	~ 4 - 8	Martinez (2011) ISME
	↑	Dialister		
	↑	Blautia		
Whole-Grain Oats	↑	Lactobacilli*	9,8	Zhou (2014). Of Nutrition
Whole-Grain Wheat	↑	Bifidobacteria	11	Costabile (2008) Br J Nutr
	↑	Lactobacilli		
Apples	↑	Bifidobacteria	2,4	Shinohara (2010) Anaerobe
	↑	Lactobacilli		
	↑	Streptococcus		
	↓	C. perfringens		
Blueberries	↓	Pseudomonas	2,4	Vendame (2011) Agric Food Chem
	↑	Bifidobacteria longum infantis		
Chickpeas	↓	Clostridium Cluster XI	17	Fernando (2010) Benef Microbes



How do you compare?

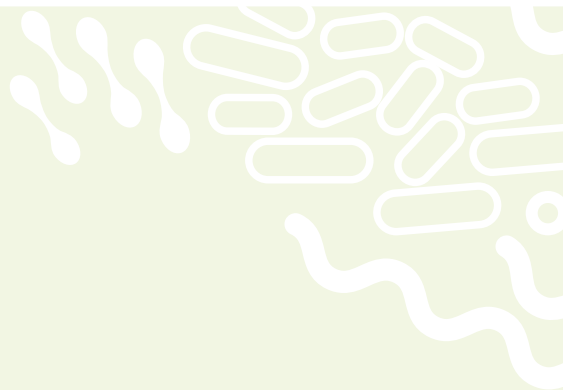
We compared your microbiome to thousands of others from the UK. Based on this comparison we identified five samples that resembled your sample the most. The map below shows the location of the people with the most similar microbiome to yours. Your neighbours' locations are highlighted by green symbols.





The table below provides information about the five persons who resemble you the most (based on your microbiome). You will find out which ethnic group they belong to, their BMI and the type of diet they consume. Diet is classified into three categories: meat , fish or vegetables based.

	Ethnicity	BMI	Diet
Person 1	Caucasian	29.7	
Person 2	Caucasian	21.9	
Person 3	Caucasian	25	
Person 4	Caucasian	28	
Person 5	Caucasian	26.2	



Results interpretation

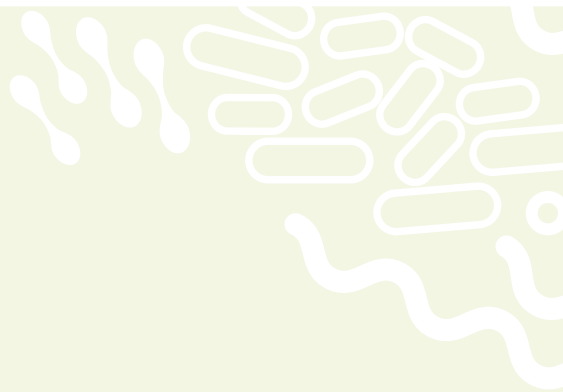
This microbiome looks unhealthy

Your diversity is within the 1st quartile. This means your diversity is lower than 75% of the population. your Bacteroidetes levels are 69% and towards the top end of the population range. Your levels of Proteobacteria are 11% and out of range.

Your levels of Bacteroidaceae are high while your levels of Prevotellaceae are zero, suggesting your diet is typical of a Western diet with animal products. You have moderate levels of Bifidobacterium and *F. prausnitzii*. You have high levels of Roseburia and Ruminococcus which indicates some consumption of fibre.

As mentioned, your levels of Bifidobacterium are moderate but your levels of other probiotic bacteria are low. If you are taking a probiotic and see none in the results, you may need to check the probiotic species to see if it is a species which persists in the gut and perhaps also recommend some prebiotic foods alongside the probiotic.

You have 65x more *Clostridium perfringens* than the average population. This is a known pathogen and may cause GI upset. You also have 25x more of an unknown member of the Enterobacteriaceae family which may also cause GI upset. You also have 211x more *E. coli* than the average population, another microbe that has been implicated in GI upset. These results indicate you have a very unhealthy microbiome.



Find out more in our recommended reading:

- ▶ *"Follow Your Gut" by Rob Knight*
- ▶ *"The Diet Myth" by Tim Spector*

