

# UK Biobank

## Food preferences web questionnaire

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Version 1.1

<http://www.ukbiobank.ac.uk/>

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This document details the rationale and procedure for administration of the Food Preferences questionnaire for UK Biobank.

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### 1 Introduction - scientific rationale

Early in 2017 UK Biobank was approached by Nicola Pirastu and Jim Wilson from the University of Edinburgh who wished to enhance UK Biobank’s diet-related phenotyping. They worked with representatives from UK Biobank to devise and implement this questionnaire.

Food preferences are the primary factor leading to food choice and are the result of the complex interaction between one’s genetic background, environmental exposure and personal experiences. Identifying these factors is extremely important if we are to obtain the knowledge required to plan better interventions aimed at improving people’s food habits but also to stratify patients of food related disorders thus improving therapeutic approaches. Our current knowledge base is limited by the relatively small sample sizes of previous studies and by the diversity of populations or study aims. UK Biobank provides a uniquely large sample size coupled with highly detailed health, behavioural and genetic information.

It has been shown that measuring food choice through Food Frequency Questionnaires (FFQ) or 24 hour recall is extremely difficult; these questionnaires can suffer from biases due to cognitive issues like memory or health status which will alter participants’ perception and reporting<sup>1</sup>. In contrast, the food preferences questionnaire does not rely on memory, does not suffer from the health-related biases due to social pressure and has a much higher overall test-retest correlation

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<sup>1</sup> Schatzkin et al. “A comparison of a food frequency questionnaire with a 24-hour recall for use in an epidemiological cohort study: results from the biomarker-based Observing Protein and Energy Nutrition (OPEN) study.” Int J Epidemiol. 2003

compared to FFQ (0.8-0.9 vs 0.5-0.8)<sup>2 3</sup>. Another advantage is that food preferences are quite stable over time in adults. It is therefore possible to use the data alongside health and behavioural information collected at other time points (past, present or future).

The present questionnaire was developed to try to harmonise the various efforts conducted around the world to study food preferences. Items were chosen by consulting with scientist in the field from five different countries; the USA, the UK, Italy, the Netherlands and Australia in order to be able to choose a core set of items commonly found all over the world<sup>4</sup>. The questionnaire was then re-visited, considering the specific diet and terminologies used in the UK. Efforts have been made to try to cover most food groups while retaining simplicity and ensuring the questionnaire remains acceptable to respondents in terms of length.

## **2 List of main contributors**

Dr. Nicola Pirastu, Usher Institute, PHSI, University of Edinburgh.

Prof. Valerie Duffy, Department of Allied Health Sciences, University of Connecticut.

Prof. Edith Feskens, Department of Agrotechnology and Food Science, Wageningen University and Research.

Dr. Tess Pallister, Twin Research & Genetic Epidemiology, Kings College London.

Prof. Nicholas Martin, Queensland Institute of Medical Research.

## **3 Content**

The questionnaire incorporates a number of elements which have been previously used in population-base cohorts around the world (such as Italian Network of Genetic Isolates, the Italian Taste project, the Silk Road cohort, the Erasmus Rucphen Family study, Twins UK, and the Viking Health Study). Liking is measured using the 9-point hedonic scale which has been widely used since 1954 and has

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<sup>2</sup> Carbonneau et al. "Development and Validation of the Food Liking Questionnaire in a French-Canadian Population." *Nutrients*. 2017

<sup>3</sup> . Parr et al. "Test-retest reproducibility of a food frequency questionnaire (FFQ) and estimated effects on disease risk in the Norwegian Women and Cancer Study (NOWAC)." *Nutr J*. 2006

<sup>4</sup> Pallister T et al. "Food Preference Patterns in a UK Twin Cohort." *Twin Res Hum Genet*. 2015 Dec

good statistical properties, good discrimination between different points and linearity between each point in the scale<sup>5</sup>.

The questionnaire includes 150 items, which comprise food items that reflect both sensory preferences (bitter, sweet etc.) and foodstuff preferences (fruit, vegetables, meat, etc.). The items were chosen so that there were at least 5 items for each group considered. Other items related to health behaviour are included, such as physical activity, smoking and watching television. These items were chosen in order to directly compare these habits with food items on the same scale. It will also allow us to understand if food and behaviour preferences share a common biological pathway or if they are distinct.

Questionnaire items are randomised on a participant basis to reduce any bias that may occur due to tiredness.

## 4 Piloting

Prior to inviting all participants with a contact email address (approximately 330,000) to complete it, UK Biobank piloted this questionnaire with 10,000 participants to ensure the platform and procedures were adequate robust in terms of acceptability of content and length.

## 5 Administration

### 5.1 UK Biobank's re-contact approach for those participants with an email address as follows:

- an initial invitation email (which included a hyperlink to their personalised questionnaire);
- a reminder email to non-responders sent 2 weeks after the initial invite;
- a reminder to partial responders (i.e. who only completed part of the questionnaire) 2 weeks after they started the questionnaire;
- a final reminder sent to non-responders 3 months after the initial invite.

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<sup>5</sup> Moskowitz. "Psychometric evaluation of food preferences Foodservice 1980

- 5.2 81.1% of participants completed the questionnaire in less than 20 minutes.
- 5.3 Overall, 333,344 participants were sent an email invitation, of whom 181,224 (54.4%) fully completed the questionnaire (as of 16<sup>th</sup> January 2020). A further 996 participants accessed the questionnaire via the participant website without having received an email invite (because they have not provided UK Biobank with a valid email address or completed the questionnaire via the participant website prior to an invite being sent).
- 5.4 Participants for whom we do not have an email address were encouraged via the annual newsletter (sent Q4 2019) to complete the online questionnaire by logging directly onto the participant website.
- 5.5 Email invitations are also routinely sent to those participants who have recently updated their email address (and who have not yet completed the questionnaire). We therefore anticipate that data will continue to accrue for a small number of participants.
- 5.6 Please note that UK Biobank has identified a small number of possible mismatches in the linkage of the questionnaire (e.g., where participants who share an email address, or a computer/tablet may have completed their partner's questionnaire). These data have not been released.

## Appendix 1: Questions and format of the questionnaire

	<p>Food preferences are the main reason for choosing to eat what we do. Understanding the biological and environmental factors influence food preferences and how they are related with food intake and health outcomes may help to improve both dietary guidelines and interventions to help people embrace a healthier lifestyle.</p> <p>UK Biobank provides a unique opportunity to better understand food preferences. We hope to combine the results of this questionnaire with other information you have provided to gain a deeper understanding of the genetic determinants of food preferences, and their relationships with health and disease.</p> <p>To help you as you work your way through the questionnaire:  Click or tap the button to select it.  After selecting an answer, click the '+' button to expand the selection again. [statement only displays on narrow screen version]</p> <p>The progress bar at the bottom of each page (see below) will indicate how far you are through the questionnaire.</p>											
INTRO	<p>On a scale from <b>1 (extremely dislike)</b> to <b>9 (extremely like)</b>, please rate how much you <b>LIKE</b> each presented item.</p> <p>The more you like the item the higher you should rate it. The less you like the item, the lower you should rate it. If you are unfamiliar with any of the foods or haven't tried any of the activities please select "Never tried".</p> <p>You will notice that some of the items are not food related. It is very important to us that you respond to these items using the same parameters as you use for foods.</p> <p>Please remember that we would like you to report how much you like each food or activity <b>NOT</b> how many time you eat each food or undertake each activity.</p>											
Field ID	Item	1 Extremely dislike	2	3	4	5	6	7	8	9 Extremely like	Never tried	Prefer not to answer
20600	Adding salt to foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20601	Aniseed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20602	Apple juice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20603	Apples	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20604	Asparagus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20605	Aubergine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20606	Avocados	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20607	Bacon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20608	Baked/steamed fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20609	Bananas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20610	Barbequed or grilled meat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20611	Beef steak	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20612	Beetroot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20613	Bell pepper	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20614	Bicycling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20615	Biscuits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20616	Bitter foods	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20617	Bitter/ale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20618	Black olives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20619	Black pepper	<input type="radio"/>										
20620	Blue cheese	<input type="radio"/>										
20621	Bolognese sauce	<input type="radio"/>										
20622	Broad beans	<input type="radio"/>										
20623	Broccoli	<input type="radio"/>										
20624	Brown rice	<input type="radio"/>										
20625	Brussel sprouts	<input type="radio"/>										
20626	Burgers (meat)	<input type="radio"/>										
20627	Burn of spicy foods	<input type="radio"/>										
20628	Butter on bread	<input type="radio"/>										
20629	Butternut squash	<input type="radio"/>										
20630	Cabbage	<input type="radio"/>										
20631	Cake	<input type="radio"/>										
20632	Cake icing	<input type="radio"/>										
20633	Capers	<input type="radio"/>										
20634	Cauliflower	<input type="radio"/>										
20635	Cereal/granola bar	<input type="radio"/>										
20636	Cheesecake	<input type="radio"/>										
20637	Cherries	<input type="radio"/>										
20638	Chicken	<input type="radio"/>										
20639	Chilli pepper	<input type="radio"/>										
20640	Chips/French fries	<input type="radio"/>										
20641	Cigarette smoking	<input type="radio"/>										
20642	Cod	<input type="radio"/>										
20643	Coffee with sugar	<input type="radio"/>										
20644	Coffee without sugar	<input type="radio"/>										
20645	Coriander	<input type="radio"/>										
20646	Corn flakes	<input type="radio"/>										
20647	Cream	<input type="radio"/>										
20648	Croissant	<input type="radio"/>										
20649	Cucumber	<input type="radio"/>										
20650	Curry	<input type="radio"/>										
20651	Dairy products	<input type="radio"/>										
20652	Dark chocolate	<input type="radio"/>										
20653	Diet fizzy drinks	<input type="radio"/>										
20654	Dried fruit	<input type="radio"/>										
20655	Eggs	<input type="radio"/>										
20656	Exercising alone	<input type="radio"/>										
20657	Exercising with others	<input type="radio"/>										
20658	Extra virgin olive oil	<input type="radio"/>										

20659	Fatty foods	<input type="radio"/>										
20660	Fresh tomatoes	<input type="radio"/>										
20661	Fried chicken	<input type="radio"/>										
20662	Fried/battered fish	<input type="radio"/>										
20663	Fruit	<input type="radio"/>										
20664	Garlic	<input type="radio"/>										
20665	Gherkins	<input type="radio"/>										
20666	Globe artichoke	<input type="radio"/>										
20667	Goat's cheese	<input type="radio"/>										
20668	Going to a café	<input type="radio"/>										
20669	Going to the gym	<input type="radio"/>										
20670	Going to the pub	<input type="radio"/>										
20671	Grapefruit	<input type="radio"/>										
20672	Green olives	<input type="radio"/>										
20673	Haddock	<input type="radio"/>										
20674	Ham	<input type="radio"/>										
20675	Hard cheese	<input type="radio"/>										
20676	Herring	<input type="radio"/>										
20677	Honey	<input type="radio"/>										
20678	Horseradish/ wasabi	<input type="radio"/>										
20679	Ice cream	<input type="radio"/>										
20680	Jam	<input type="radio"/>										
20681	Kiwi fruit	<input type="radio"/>										
20682	Lager	<input type="radio"/>										
20683	Lamb	<input type="radio"/>										
20684	Lemons	<input type="radio"/>										
20685	Lentils/beans	<input type="radio"/>										
20686	Liver	<input type="radio"/>										
20687	Mackerel	<input type="radio"/>										
20688	Marzipan	<input type="radio"/>										
20689	Mayonnaise	<input type="radio"/>										
20690	Melon	<input type="radio"/>										
20691	Milk chocolate	<input type="radio"/>										
20692	Mushrooms	<input type="radio"/>										
20693	Onions	<input type="radio"/>										
20694	Orange juice	<input type="radio"/>										
20695	Oranges	<input type="radio"/>										
20696	Pasta	<input type="radio"/>										
20697	Pears	<input type="radio"/>										
20698	Pizza	<input type="radio"/>										
20699	Plain yogurt	<input type="radio"/>										
20700	Plums	<input type="radio"/>										
20701	Pollock	<input type="radio"/>										
20702	Pork chop	<input type="radio"/>										

20703	Porridge	<input type="radio"/>										
20704	Potato crisps	<input type="radio"/>										
20705	Potatoes	<input type="radio"/>										
20706	Prawns	<input type="radio"/>										
20707	Raw carrots	<input type="radio"/>										
20708	Red meat	<input type="radio"/>										
20709	Red wine	<input type="radio"/>										
20710	Regular (non-diet) fizzy drinks	<input type="radio"/>										
20711	Roast chicken	<input type="radio"/>										
20712	Salad dressing	<input type="radio"/>										
20713	Salad leaves	<input type="radio"/>										
20714	Salami	<input type="radio"/>										
20715	Salmon	<input type="radio"/>										
20716	Salty foods	<input type="radio"/>										
20717	Salty pretzels	<input type="radio"/>										
20718	Sardines	<input type="radio"/>										
20719	Sausages (meat)	<input type="radio"/>										
20720	Savoury biscuits	<input type="radio"/>										
20721	Shellfish (other than prawns)	<input type="radio"/>										
20722	Skimmed milk	<input type="radio"/>										
20723	Smoked fish	<input type="radio"/>										
20724	Soft cheese	<input type="radio"/>										
20725	Soy sauce	<input type="radio"/>										
20726	Soya milk	<input type="radio"/>										
20727	Spicy foods	<input type="radio"/>										
20728	Spinach	<input type="radio"/>										
20729	Spirits (e.g. vodka, gin, whisky etc.)	<input type="radio"/>										
20730	Strawberries	<input type="radio"/>										
20731	Sweet coffee house drinks (e.g. Mocha's, Frappucino's, flavoured Latte's)	<input type="radio"/>										
20732	Sweet foods	<input type="radio"/>										
20733	Taking the stairs	<input type="radio"/>										
20734	Tea with sugar	<input type="radio"/>										
20735	Tea without sugar	<input type="radio"/>										
20736	Tomato ketchup	<input type="radio"/>										
20737	Tinned tuna	<input type="radio"/>										
20738	Turnip (white)	<input type="radio"/>										
20739	Vegetables	<input type="radio"/>										
20740	Vinegar	<input type="radio"/>										
20741	Watching	<input type="radio"/>										

	television											
20742	Whisky	<input type="radio"/>										
20743	White bread	<input type="radio"/>										
20744	White rice	<input type="radio"/>										
20745	White wine	<input type="radio"/>										
20746	Whole grain breakfast cereal	<input type="radio"/>										
20747	Whole milk	<input type="radio"/>										
20748	Wholemeal bread	<input type="radio"/>										
20749	Working up a sweat	<input type="radio"/>										

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