

# Developing an Effective Feedback of Food Behavior Using Food Frequency Questionnaire

## Questionnaire

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### INTRODUCTION

Obesity has become an issue that is getting increasingly common. As of 2015, more than one-third (36.5%) of U.S. adults have obesity. It is also challenging to lose weight without the knowledge of nutritional values of consumed foods. We've used Food Frequency Questionnaire to assess the obtained nutrients by the weight loss trial participants and to give them effective feedback.

<https://www.cdc.gov/nchs/data/databriefs/db219.pdf>

### AIM

To evaluate the food patterns of the participants and summarize it to be used by them

### Method

- Food Frequency Questionnaire was used to obtain daily nutritional values of participants.
- The protein and fiber content of food items on the questionnaire were calculated and plotted with formulas:  $[\text{Protein(g)/Total Calorie(Cal)}] * 100$ ;  $[\text{Fiber(g)/Total Calorie(Cal)}] * 100$ .
- To compare the quality of food items on the questionnaire, we've divided the plot area into 3 groups; Green group (foods that have optimal amount of protein or fiber per 100kcal for effective weight loss), Yellow group (foods that have moderate amount of protein and fiber) and Red group (foods that don't have enough protein nor fiber).
- The percentage of food items in the Questionnaire was calculated for comparison using Microsoft Excel

### RESULTS

#### Participants Profile

- 14 participants: 3 males, 11 females
- BMI range: 28.8 – 49.3
- Past attempted diets: Jenny Craig, Weight Watchers, 21-day Fix Cabbage Soup, Etc.
- Many with hypertension or high cholesterol

#### Protein and Fiber Plot

Example of Individual FFQ plots based on percent of protein and fiber per calorie. The foods are categorized based on the content of protein and fiber.

For individual food items:

- Green (food to eat): protein > 7g/100kcal OR fiber > 1.8g/100kcal
- Yellow (food to limit): protein 4-7g/100kcal AND fiber < 1.8g/100kcal, OR protein < 7g/100kcal AND fiber 1.4 - 1.8g/100kcal
- Red (food to avoid) : protein < 4g/100kcal AND fiber < 1.4g/100kcal

Target box (green box): Protein from 7g/100kcal to 11g/100kcal and fiber from 1.8g/100kcal to 3.2g/100kcal



#### The first page of FFQ feedback:

After plotting an individual FFQ in excel form, the conversion into the word document was done for the participants to read and understand their protein and fiber intake status easily. All foods in FFQ are converted into the table with columns as calorie, protein (gram per day), fiber (gram per day), protein/100 kcal (per grams), and fiber/100 kcal (per grams). The foods are categorized as red, yellow, green group.

MEAT & FISH	Calories/day	Protein (gram)/day	Fiber (gram)/day	Protein/100 Kcal (grams)	Fiber/100 Kcal (grams)	BREAD & SAVOURY BISCUITS	Calories/day	Protein (gram)/day	Fiber (gram)/day	Protein/100 Kcal (grams)	Fiber/100 Kcal (grams)
Beef, roast, steak, mince stew or casserole (5oz)	25	3	0.0	10	0.0	White bread and rolls (2 slices)	395	14	4.0	3	1.0
Beef burgers (6oz)	36	3	0.1	8	0.4	Whole wheat bread and rolls (2 slices)	59	3	1.6	6	2.8
Pork, roast, chops, stew or slices (5 oz.)	29	3	0.0	9	0.0	Cream crackers, cheese biscuits (6 crackers)					
Lamb, roast, chops or stew (5 oz.)	340	38	0.0	11	0.0	Crispbread, e.g. Ryvita (4 oz.)					
Chicken or other poultry e.g. Turkey (5 oz.)											
Bacon (2 oz. or 4 slices)	21	0	0.0	7	0.0						
Ham (3 oz.)	9	2	0.0	21	0.0						
Cornd beef, Spam, luncheon meats (4 oz.)											
Sausages (5 oz.)											
Liver (5 oz.)											
Fried fish in butter, as in fish and chips (5 oz.)											
Fish fingers, fish cakes (5 oz.)											
Other white fish, fresh or frozen, e.g. cod, haddock, plaice, sole, halibut (5 oz.)	9	2	0.0	22	0.0						
Other fish, fresh or smoked, e.g. mackerel, kippers, hams, salmon, sardines, herring (5 oz.)	41	4	0.0	9	0.0						
Shellfish, e.g. crab, prawns, mussels (5 oz.)	126	17	0.0	14	0.0						
Fish rice, taramasalata (2 oz.)											

### RESULTS

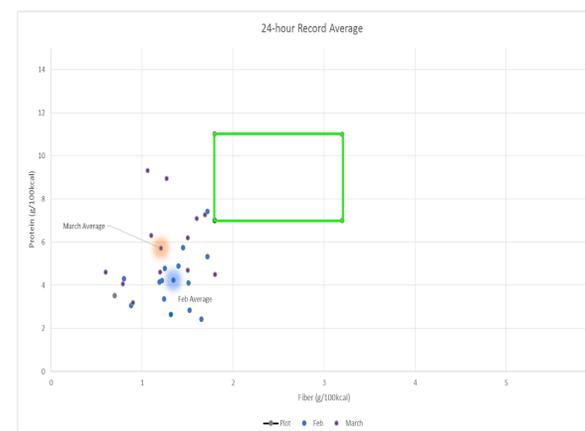
#### Red Zone Food Table

The condensed version also summarizes the another table with red zone food only. Red zone food list is for the participants to create weight loss diet by reducing calorie intake by ~ 500 kcal. The red zone foods act as a guidance for the participants what they need to in order to increase protein and fiber intake while reducing overall consumed calories. Reducing red group food can increase protein and fiber intake to reach the target box

Food	Calories/day	Protein (gram)/day	Fiber (gram)/day	Protein/100 Kcal (grams)	Fiber/100 Kcal (grams)
White bread and rolls	395	14	4.0	3.4	1.0
French fries	26	0	0.4	1.4	1.4
Cookies, eg plain, chocolate, ginger (one)	5	0	0.0	1.2	0.0
Cake home baked, ready made	36	1	0.1	1.5	0.4
Dinner home baked, ready made	14	0	0.1	1.1	0.4
Fruit pies, tarts, crumbles, home made, ready made	14	0	0.1	1.1	0.4
Milk pudding	9	0	0.0	1.1	0.0
Jam, marmalade, honey (teaspoon)	19	0	0.1	0.0	0.5
Beer (half pint)	45	0	0.0	0.8	0.0
Spirits, eg. gin, brandy, whiskey, vodka (shot glass)	4	0	0.0	0.0	0.0
Cigars (medium serving)	5	0	0.1	0.9	1.3
Dried fruit, eg. raisins, prunes (medium serving)	47	0	0.0	1.1	0.0
<b>Total</b>	<b>669</b>	<b>15</b>	<b>4.9</b>	<b>2.2</b>	<b>0.7</b>

#### 24hr Record Average

The unique part of this research is that participants are educated about the nutritional aspects of macro and micronutrients. Between the months of February and March the nutritional aspects of macronutrient "protein" has been taught. The importance of protein has been well recognized by the participants, which we can observe from the %74.1 increase of protein intake. This number has been extracted from 24hr records that are collected every week in order to observe participants' food intake and give feedback.



### RESULTS

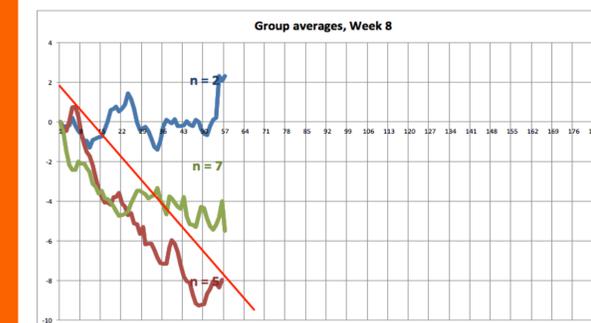
#### Individual Feedback with Wi-Fi Scale

Another method we use to keep track of our participants' weight loss process is by recording their weight everyday. This is done by a Wi-Fi scale and we receive their data every time they scale themselves at home. Below is an example of Individual Feedback:



#### Summary of Daily Weight Fluctuation

According to the data we have collected from all of the participants' daily weight fluctuations, we have separated the participant into three groups: one group of participants who are right on track with the targeted weight loss, one group of participants who were on track at first, but are recently struggling to continue to do so, and the last group of participants who are struggling to lose weight for the entire duration of the program. We can show the participants these different graphs to see their progress and motivate them or to encourage them to keep going with the weight loss.



Blue line: Average weight fluctuations of 2 participants who are struggling to lose weight.  
Green line: Average weight fluctuations of 7 participants who were effectively losing weight at first, but are struggling to continue to do so.  
Burgundy line: Average weight fluctuations of 5 participants who are effectively losing weight.  
Red line: the goal of losing 1 pound per week.  
In the graph above, the burgundy line is right on track, being beneath the red goal line, but the other two lines are lying above the red target line. This shows how these two groups are struggling to meet their goals, and need more assistance. Our ultimate goal is for all of the groups to show fluctuations like the burgundy line, being beneath the red target line.

### CONCLUSIONS

- Average daily protein consumption per 100kcal was 4.8 grams and average daily fiber consumption per 100kcal was 1.2 grams, based on the questionnaires we've received from 15 participants.
- Fiber consumption was the limiting nutrition in creating a diet for weight loss and even weight maintenance.
- Questionnaire should be regularly updated and checked for accuracy
- In the presence of abundant amount of weight loss programs, many people struggle to lose weight. With the use of Food Frequency Questionnaire and giving effective feedback to participants, we observe significant amount of weight loss. Giving feedback not only guides participants in the correct direction but also motivates them in their process of weight loss.

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