# How to Consider Health Factor of Users? &

# Filtration Approach

## ***User Inputs***

1. Age

2. Weight

3. Height

4. Gender

5. Activeness Level {Sedentary / Light Activity / Moderate Activity / Active / Very Active}

6. Health Issues {Diabetes / Hypertension / Hypotension / None}

7. Any Bad Habits {Smoking / Alcohol / Both / None}

8. Your Goal {Lose Weight / Maintain Weight / Gain Weight}

9. Allergic to any specified Food (If any) {Blank Space to type}

## ***BMR (Source - Wikipedia)***

By using Age, Weight, Height, Gender & Activeness Level we will be calculating the total calories the person requires to run his/her Vital Organs at rest. This will be done by calculating BMR (Basal Metabolic Rate) using **Mifflin-St Jeor Equation**. Calories will be used mainly for the recommender system based on which recipe recommendation will work.

Earlier we were using BMR formula of **Harris-Benedict equation,** it was published in 1919.

1. **For Men = 66.47 + (13.75 \* weight [kg]) + (5.003 \* height [cm]) − (6.755 \* age [years])**
2. **For Women = 655.1 + (9.563 \* weight [kg]) + (1.85 \* height [cm]) − (4.676 \* age [years])**

Later in 1984, the original **Harris-Benedict equations** were revised using new data. In comparisons with actual expenditure, the revised equations were found to be more accurate. Equations were:

1. **For Men: 88.362 + (13.397 \* weight [kg]) + (4.799 \* height [cm]) − (5.677 \* age [years])**
2. **For Women: 447.593 + (9.247 \* weight [kg]) + (3.098 \* height [cm]) − (4.33 \* age** **[years])**

It was the best BMR equation until 1990, when **Mifflin-St Jeor** introduced the equation.

**Mifflin-St Jeor equation:**

1. **For Men: 5 + (10 \* weight [kg]) + (6.25 \* height [cm]) − (5 \* age [years])**
2. **For Women: (9.247 \* weight [kg]) + (3.098 \* height [cm]) − (4.33 \* age** **[years]) - 161**

During the last 100 years, lifestyles have changed and Frankenfield showed it to be about 5% more accurate.

***Activeness Levels / Activity Multiplier:***

**1. Sedentary:** BMR x 1.2 (little or no exercise, desk job)

**2. Lightly active:** BMR x 1.375 (light exercise/ sports 1-3 days/week)

**3. Moderately active:** BMR x 1.55 (moderate exercise/ sports 6-7 days/week)

**4. Very active:** BMR x 1.725 (hard exercise every day, or exercising 2 hours/day)

**5. Extra active:** BMR x 1.9 (hard exercise 2 or more times per day, or training for marathon, or triathlon, etc.)

Multiplying BMR with Activity Multiplier values gives us **Total Daily Energy Expenditure (TDEE).**

## ***Health Factor***

For considering Health Issues, we need another dataset which would help us in deciding that which User should be given which recipe. We will use Carbs {Starch, Sugar, Fibre}, Lipids, Proteins, Cholesterol & Sodium. We need ranges of data which can show that for diabetes what should be the range of carbs, lipids, etc. Same for others as well.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *Carbs (Starch, Sugar & Fibre)* | *Fats* | *Proteins* | Cholesterol | Sodium |
| **Diabetic** | 45-60% of TDEE | 20-35% of TDEE | 15-20% of TDEE | 125 - 200mg | Less than 2300mg |
| **Hypertension** | 40-55% of TDEE & Minimum 30 g Fibre | 25-27% of TDEE & Saturated Fat Less than 6% | 12-18% of TDEE | 125 - 150mg | Less than 1500mg |
| **Hypotension** | 26-44% of TDEE | 25-27% of TDEE & Saturated Fat Less than 6% | 12-15% of TDEE | 125 - 200mg | Less than 2300mg |
| **None** | 50-60 % of TDEE | 25-30% of TDEE | 12-20% of TDEE | 125 - 300mg | Less than 2300mg |

**Fat Intake by Age Groups:**

|  |  |
| --- | --- |
| **2 - 3 Years** | 30 - 40 % of TDEE |
| **4 - 18 Years** | 25 - 35 % of TDEE |
| **19+ Years** | 20 - 35 % of TDEE |

***Example:***

Taking random values for User Inputs.

Age - 22,

Height – 174cm,

Weight - 75Kg,

Gender - Male,

Activeness - No Exercise / Sedentary,

Health Issues - Diabetes

Goal - Maintain Weight

***Calculating BMR -***

**Harris-Benedict equation**

**For Men**= 66.47 + (13.75 \* weight [kg]) + (5.003 \* height [cm]) − (6.755 \* age [years])

**TDEE =** BMR\*Activeness Level

**Calculations -** (66.47 + (13.75 \* 75) + (5.003 \* 174) - (6.755 \* 22)) \* 1.2 = **2183.5584** KCAL/Day

**Harris-Benedict Revised equation**

**For Men**= 88.362 + (13.397 \* weight [kg]) + (4.799 \* height [cm]) − (5.677 \* age [years])

**TDEE =** BMR\*Activeness Level

**Calculations - (**88.362 + (13.397 \* 75) + (4.799 \* 174) – (5.677 \* 22)) \* 1.2 = **2,163.9228** KCAL/Day

**Mifflin-St Jeor equation**

**For Men**= 5 + (10 \* weight [kg]) + (6.25 \* height [cm]) − (5 \* age [years])

**TDEE =** BMR\*Activeness Level

**Calculations - (**5 + (10 \* 75) + (6.25 \* 174) - (5 \* 22)) \* 1.2 = **2079** KCAL/Day

**Mifflin-St Jeor Equation** is considered most accurate as of now & therefore is being used in many online Calorie / BMR Calculators as well.

Now it’s time to use Goal Input which was provided by User. From various studies I found that if a person wants to Lose Weight then a very sustainable way to do that is reducing your daily calories by 500 & to gain weight add 500. So, by this we will be getting Final TDEE for a User.

Now, as we have got **TDEE** using **BMR**. It’s time to calculate the range of Carbs, Protein, Fat, Cholesterol & Sodium contents.

Calories (KCAL) - Grams (g): 1 KCAL = 0.129598 g

Grams (g) - Calories (KCAL): 1 g = 7.716179 kcal

Milligrams (mg) - Grams (g): 1mg / 1000

* A **gram** of carbohydrate contains 4 **calories**.
* A **gram** of protein also contains 4 **calories**.
* A **gram** of fat contains 9 **calories**.

As user wants to maintain weight therefore TDEE value won’t change also the User is a Diabetic Patient. So, the contents for all above listed Nutrients are:

***Carbohydrates:*** 40-50% of Total Calories

**Calculations** -> [(2079 \* 0.4) / 4] to [(2079 \* 0.5) / 4] = ***208g to 260g***

***Fats:*** 25-30% of Total Calories

**Calculations** -> [(2079 \* 0.25) / 9] to [(2079 \* 0.3) / 9] = ***57.75g to 69.3g***

***Proteins:*** 15-20% of Total Calories

**Calculations** -> [(2079 \* 0.15) / 4] to [(2079 \* 0.2) / 4] = ***78g to 104.85g***

***Cholesterol:*** Less Than ***200mg or 0.2g***

***Sodium:*** Less Than ***2300mg or 2.3g***

*After getting the Ranges. I came across a problem when I was trying to Filter out recipes based on Whole Day Nutritional Ranges. The Problem is, as our User in this Example is a Diabetic Patient. So, our priority should be not to recommend him most of the sweet dish recipes. But as the Carbs & Fat ranges are for a whole day and not for a specific meal. So, even those recipes may get selected which have high amount of carbs & fats in them but still are less than the total daily carb & fat limit of User.*

*In a Whole Day, User needs to have 208g to 260g of Carbs & 57.75g to 69.3g of Fats. This much amount is for a whole day not for a single meal. So, I decided to Filter Out Recipes based on the maximum amount of each nutrient for a particular meal. Percentage of Calories to be taken in a Meal is also an input but it will be assumed by the developers of the Recommendation System & not by Users. This will reduce the maximum amount of any Nutritional Value from whole day to a desirable level/Meal.*

***For Example -*** *Here, Percentage of Calories to be taken in a Meal is taken as 35%.*

Maximum Ranges of Nutrients under which all recipes should come:

Maximum Carbohydrates for a Meal - 90.96g

Maximum Fats for a Meal - 24.25g

Maximum Proteins for a Meal - 36.38g

Maximum Cholesterol for a Meal - 70.0mg

Maximum Sodium for a Meal - 805.0mg

To do all above tasks, I made functions which will directly do all this & will return the maximum value for each Nutrient for a given meal. Percentage of Calories to be taken in a Meal is taken as 35% because from some sources which I have listed below, I found that the Lunch forms biggest part of our total daily calories. Out of Total Daily Calories, Lunch should be 30% - 40%. So, I took the mean of it & got 35%.

## ***Filtration***

In Filtration Process, the system will pick one by one each recipe from Recipe Dataset & will select only those recipes which have less than the maximum amounts per meal for each nutrient.

By doing this, for above example I got 23,400 Recipes which were suitable for User according to his inputs out of 50,000 Recipe Data.

## ***Reference***

1. https://diabetesstrong.com/how-to-find-your-daily-calorie-need/

If a person wants to lose weight, then he/she needs to reduce their 400-500 calories out of total calories a day to reduce 1 Pound or 0.5 kg weight in a week. Which is a very healthy & sustainable rate.

If a person wants to gain weight, then he/she needs to add 500 calories in their total calories a day.

1. https://inbodyusa.com/blogs/inbodyblog/49311425-how-to-use-bmr-to-hack-your-diet/

Theoretically, any amount that is less than your normal TDEE can cause you to lose weight; it just depends on how quickly you want to see results.

If a person wants to lose weight & is having TDEE above 1800 Calories a day, then only he/she needs to reduce their 400-500 calories out of TDEE to reduce 1 Pound or 0.5 kg weight in a week. Which is a very healthy & sustainable rate.

But if person is having below 1800 Calories TDEE, in that case person should only reduce 200-300 calories.

If a person wants to gain weight it is recommended that, you need to consume approximately 15% more calories per day than what is required to maintain your body weight (that’s the TDEE).

1. **Carbohydrates Calculator -** <https://www.calculator.net/carbohydrate-calculator.html>
2. **Fat Calculator** - <https://www.calculator.net/fat-intake-calculator.html>
3. **Protein Calculator** - https://www.calculator.net/protein-calculator.html
4. **Macro Calculator -** https://www.calculator.net/macro-calculator.html
5. **Amount of calories a Diabetic should eat daily -**

https://www.livestrong.com/article/464032-how-many-calories-should-a-diabetic-eat-daily/

1. **How to calculate nutritional value in grams out of Total Calories** https://www.cnet.com/health/nutrition/ultimate-guide-to-counting-and-tracking-macros/
2. **Cholesterol Levels -** <https://medlineplus.gov/cholesterollevelswhatyouneedtoknow.html>
3. **Activity Multiplier -** https://www.leighpeele.com/mifflin-st-jeor-calculator
4. **Sources:**

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| --- | --- | --- | --- | --- | --- |
|  | *Carbs (Starch, Sugar & Fibre)* | *Fats* | *Proteins* | Cholesterol | Sodium |
| **Diabetic** | https://www.healthline.com/nutrition/diabetes-carbs-per-day | https://health.usnews.com/health-news/blogs/eat-run/articles/2017-05-18/how-much-fat-should-people-with-diabetes-eat | https://diatribe.org/protein-and-diabetes-what-you-need-know | https://www.everydayhealth.com/type-2-diabetes/diet/targeting-fats/ | https://my.clevelandclinic.org/health/articles/11653-diabetes-tips-for-lowering-sodium |
| **Hypertension** | https://medlineplus.gov/ency/article/007483.htm | https://medlineplus.gov/ency/article/007483.htm | https://medlineplus.gov/ency/article/007483.htm | https://medlineplus.gov/ency/article/007483.htm | https://medlineplus.gov/ency/article/007483.htm |
| **Hypotension** | https://manhattancardiology.com/what-to-eat-to-help-raise-low-blood-pressure/ | Fat tends to increase BP. So, it is recommended to intake adequate amount of fat in Hypotension. | https://www.healthline.com/nutrition/how-much-protein-per-day#:~:text=The%20DRI%20(Dietary%20Reference%20Intake,for%20the%20average%20sedentary%20woman. | <https://www.ucsfhealth.org/education/cholesterol-content-of-foods> | As User already having Low BP, to increase it Sodium is good. The Max value of sodium for a day is 2300mg |
| **None** | https://wa.kaiserpermanente.org/healthAndWellness/index.jhtml?item=%2Fcommon%2FhealthAndWellness%2Fconditions%2Fdiabetes%2FfoodBalancing.html | https://wa.kaiserpermanente.org/healthAndWellness/index.jhtml?item=%2Fcommon%2FhealthAndWellness%2Fconditions%2Fdiabetes%2FfoodBalancing.html | https://wa.kaiserpermanente.org/healthAndWellness/index.jhtml?item=%2Fcommon%2FhealthAndWellness%2Fconditions%2Fdiabetes%2FfoodBalancing.html | https://www.ucsfhealth.org/education/cholesterol-content-of-foods | Lhttps://www.webmd.com/food-recipes/features/cholesterol-food |