***LP model***

The goal of an LP-based model is to minimize or maximize an objective function while following a set of constraints represented as linear relations. In our case, the objective function is the difference between each individual’s diet and the mean diet. We follow a similar formulation as the one described by Darmon, et al.[1] We define the objective function, f, as:

|  |  |
| --- | --- |
|  | (1) |

where to are the mean diet elements representing mean caloric intakes for each of the main food categories; to are the corresponding caloric intakes of the population under study. The absolute distance (|x|) is normalized by dividing by the mean values. The following constraints were defined for the model:

|  |  |
| --- | --- |
|  | (2) |
|  | (3) |
|  | (4) |

Here, the first constraint ensures that the set of s represent percentages of energy intake, EI, contributed by each food category. The second constraint, , refers to the price (price per calorie) of the ith food category. This constraint is needed to keep the total cost of the diet to be less than the food-budget. As for the proposed ABM, we avoid generation of unrealistic results by considering only s that are between the 15th and 85th percentiles of food consumption data.

**References:**

1. Darmon N, Ferguson EL, Briend A. A Cost Constraint Alone Has Adverse Effects on Food Selection and Nutrient Density: An Analysis of Human Diets by Linear Programming. J Nutr. 2002;132(12):3764-71.