# Formulation

**Let:**

$x_1, x_2...x_m$ = amount (in grams) of each food item in the USDA rolled-up list

$\alpha_{ij}$ = amount (in grams) of nutrient $j$ in food item $i$

$L_j$ = lower nutritional bound for all nutrients $j = 1...32$

$U_j$ = upper nutritional bound for all nutrients $j = 1...32$

**Linear Programming Model:**

*For low-carb diet:*

minimize: $z = \sum_{i=1}^{i=m} x_{ij_1}$ where $j_1$ = carbohydrates

*For low-carb, low-sodium, low-cholesterol diet:*

minimize: $z = \sum_{i=1}^{i=m} x_{ij_1} + x_{ij_2} + x_{ij_3}$ where $j_1$ = carbohydrates, $j_2$ = sodium, $j_3$ = cholesterol

**Subject to:**

$x_1, x_2...x_m \geq 0$ non-negativity constraint

$\sum_{i=1}^{i=m} \alpha_{ij} x_{ij} \geq L_{ij}$, $j = 1...32$ sum of nutrient j for all foods i must meet the minimum nutritional requirement $L$

$\sum_{i=1}^{i=m} \alpha_{ij} x_{ij} \leq U_{ij}$, $j = 1...32$ sum of nutrient j for all foods i must not exceed the maximum nutritional requirement $U$