

FORMULA FOR WEIGHT CONTROL

It is well known that most Americans have an overweight problem as reflected by a BMI index reading above 25. A good fraction even fall into the obese category above BMI=30. The cause for this overweight dilemma and its potential future health problems, especially in adults involved in sedentary occupations such as computer work, is that too much high calorie junk food is being eaten at the expense of more nutritious items such as low calorie vegetables leading to a food surplus and undesired fat storage.

We want here to present a simple mathematical formula which can be used to approximate an individual's weight W (in lbs) as a function of time t (in days). The formula reads-

$$\frac{dW}{dt} = \alpha[I - E]$$

, where I is the daily food intake in kilocalories C and E the energy expenditure per day also in kilocalories. Alpha(α) is a constant which varies for individuals, their age, gender, height and weight. One has the approximate value that one pound of body fat equals 3500 C . In my case the equilibrium intake is 2100 C /day meaning a weight gain if E is less than this and a weight loss if E is more than this number. Adjusting the constant α for a food deficit of 500 C /day, the formula predicts-

$$\frac{dW}{dt} = 0.0003[-500 C] \approx -1 \text{ lb/week}$$

This is seen to be a rather small number. It does, however, predict a weight loss of 12 lbs in three month provided that one sticks with a 500 C daily food deficit over that time. To increase this weight loss one could increase one's expenditure level E through the addition of more exercise. However, even without this, weight loss of the above predicted amounts should occur no matter what food one eats within the 500 C restricted low calorie diet. I initiated this diet plan for myself two days ago at constant urging by my wife. The first two days yielded the result $I(\text{June}3)=1570 C$ and $I(\text{June}4)=1525 C$. I will report on the total weight loss three month from now. Hopefully I will be successful in maintaining the diet over this time range. An earlier weight discussion article by us was written about a decade ago (see <https://www2.mae.ufl.edu/~uhk/WEIGHT.pdf>). It gives values of I and E for several different foods and activities.

U.H.Kurzweg
June 5, 2021
Gainesville, Florida