

REALISTIC WEIGHT LOSS PREDICTION

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LOSE 30 lbs in THREE WEEKS! What nonsense! Of course the ad does not mention any of the important weight loss variables such as age, gender, initial weight, dietary intake or activity level. The advertisement is just one of many outrageous and misleading weight loss claims that seem to appear daily.

In this article we examine the evolution of the first scientific weight loss predictive model, a recent important update to the model, and point you to a NoPaperPress eBook that illustrates how the updated model can be used in practical situations to realistically predict weight loss.

Background

By the beginning of the twentieth century the observations of Atwater and Benedict [1] demonstrated that the conservation of energy principle (also called the first law of thermodynamics) applied to humans. Eventually researchers understood that weight loss was dependent on the difference between the calories needed by an individual to maintain their weight and the individual's caloric intake when dieting. This difference was called the calorie deficit. But even as late as 1970 no comprehensive weight loss predictive model existed, that is an equation that could be used to predict weight loss, an equation that accounted for an individual's weight, gender, age, activity level, caloric intake and time on a diet. Why was this? Sure predicting weight loss in human beings was a

difficult problem, but the most likely reason was that at that time most researchers working in the field did not have the math background required to tackle the problem.

About 1970, Vincent Antonetti, then an IBM engineer, recognized that as an individual loses weight, the calories needed to maintain the individual's lower weight must also decrease. Therefore, if the individual's restricted food intake and physical activity does not change over the course of a diet the individual's calorie deficit must decrease as weight is lost. The result is that over time the individual's weight loss must slow and eventually plateau.

Applying the preceding thought experiment, the first law of thermodynamics, and the appropriate mathematics (calculus and differential equations), in 1973 Antonetti constructed the first thermodynamic weight loss predictive model [3]. His model related the time to lose weight as a function of an individual's dietary intake, initial weight, gender, age, height, activity level and time on a diet.

Recent Developments

At the time that Antonetti's weight-loss model was developed, the basal metabolic rate or the energy required to maintain the human body at rest was believed to best be represented by presuming it was dependent on body surface area [3]. But this assumption made the resulting weight loss predictive differential equation non-linear that required a relatively complex numerical solution using programmed software [4].

Then in 2016, professor Diana Thomas suggested the Antonetti model be updated by replacing the resting metabolic rate portion of the model with the much newer, validated and widely used Mifflin-St. Jeor regression equations [5]. As a bonus the update also eliminated the non-linearity in the Antonetti's original model and resulted in a differential equation with a much simpler closed-form solution, now called the Antonetti-Thomas weight loss model [6].

By about 1995 other predictive models, most with more complex weight loss mechanisms, started to appear, i.e., Westerterp, et al. [7], Hall [8], Thomas et al. [9] but they do not significantly differ from the Antonetti-Thomas model in

their ability to predict weight change over time [10]. Again the most important advantage of the new Antonetti-Thomas model is that its solution is a relatively simple closed-form equation that can be used to directly solve practical weight loss prediction situations. (In fact, high-school algebra is all that is needed to use the Antonetti-Thomas model.)

New Antonetti-Thomas Weight-Loss Model

The derivation of the Antonetti-Thomas weight loss model is not covered in this paper. (If interested in the details see [6].) The Antonetti-Thomas model can be rearranged into three different versions to address the following types of problems:

- 1) Time to Lose Weight: How long will it take an individual to lose (or gain) a certain amount of weight while on a fixed dietary intake diet?**
- 2) Required Dietary Intake: What must the dietary intake of an individual be in order to lose (or gain) a certain amount of weight in a given amount of time?**
- 3) Amount of Weight Lost: And still another way of thinking about the problem is: How much weight will an individual lose (or gain) on a specified dietary intake in a given amount of time?**

Summary

The new Antonetti-Thomas weight loss predictive model provides a simple, straight-forward method to calculate realistic weight loss for an individual or at a population-wide level. For more information, including practical examples illustrating how to use of the different versions of the Antonetti-Thomas model, see NoPaperPress eBooks "Realistic Weight Loss Prediction - U.S. Edition" and "Realistic Weight Loss Prediction - Metric Edition."

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