

Weight Loss Trajectory Patterns and Short-Term Prediction in a Weight Management Program

Bingjie Zhou,¹ Elena Naumova,² Sai Das,³ and Susan Roberts³

¹Friedman School of Nutrition Science and Policy, Tufts University;

²Tufts University Friedman School of Nutrition Science and Policy; and

³JM USDA HNRCA at Tufts University

Objectives: There is controversy over the extent to which initial weight loss in behavioral weight control interventions predicts long-term success. In this study, we aimed to identify typical weight trajectories, develop an algorithm to automatically classify participants' performance, and examine the capacity for long-term prediction of weight loss from weight records in the first 14 days.

Methods: A commercial weight loss program offering clinically impactful behavioral support provided weight data for unrestricted use to Tufts University (Instinct Health Science, www.theidiet.com). We analyzed 302,762 weight records for 2508 participants who enrolled in the program between 2012 and 2019 and were asked to self-report weight daily. For this analysis, we focused on 73,545 records from 747 participants who met the following criteria: weight records for a duration of 70–365 days with the interval between consecutive records <30 days and with a minimum of 5 records over the recorded duration.

We applied sequential polynomial regressions with linear, quadratic, and cubic terms to model the individual weight trajectory. Based on models' fit, coefficients, and estimated critical values, we classified individual weight trajectories into 7 distinct weight loss patterns. We applied a multinomial logistic regression to test the weight records in the first 14 days can predict the late outcomes of the individuals' trajectory.

Results: Among the selected participants, the average weight loss was 6.9 ± 5.1 kg over 163.1 ± 85.4 days. We identified 7 weight trajectory patterns: 1-Steady decrease over time (31%); 2-Decrease to a plateau with subsequent decline (11%); 3-Decrease to a plateau with subsequent increase (48%); 4-Prominent short-term increase at the start followed by decrease (2%); 5-Decrease with a prominent increase at the end (3%); 6-No detectable increase or decrease (4%); 7-Steady increase over time (1%). Participants with the shallower weight loss and less frequent recording in the first 14 days along with the longer duration are more likely to adhere to Pattern 3 as compared to Pattern 1 (52%: 0.48 [0.26,0.89]; 7%: 0.93 [0.87,0.99]; 0.9%: 1.009 [1.005,1.012], respectively).

Conclusions: Sequential predictive modeling of weight change patterns could help to inform personalized weight management programs.

Funding Sources: None.