

Temporal Follow-Up Visit Patterns and Their Differential Effects on Bariatric Surgery Outcomes Across Four Years

Haneen Kamran MBBS, Asem Saefan MD, Asra tus Saleha Siddiqui MBBS , Naela Ashraf MBBS, Anila Punjwani MD, Jorge Juaquito MD

Key Messages:

- We analyzed follow-up intensity in two ways: total visits over time (cumulative) and visits occurring within each specific year (annual).
- Cumulative visit counts may mask disengagement: total visits alone underestimate the importance of ongoing, active follow-up in later years.
- Later follow-up appears increasingly important. Year-specific analyses show a progressively stronger association between visits and TBWL% in Years 2-4.
- Follow-up intensity in the second postoperative year shows the strongest association with sustained TBWL and BMI reduction.

INTRODUCTION

The American Society for Metabolic and Bariatric Surgery (ASMBS) endorses lifelong follow-up after bariatric surgery; however, the optimal frequency and timing of visits for sustained weight loss remain undefined. Prior studies report modest associations between visit count and total body weight loss (TBWL), yet often rely on cumulative visit models that may obscure lapses in year-specific engagement. Patients with front-loaded visit patterns may appear adherent despite subsequent disengagement. Few studies have assessed how the timing of follow-up influences long-term outcomes beyond the first postoperative year, a critical period for weight maintenance. This study evaluates the distinct effects of cumulative versus annual follow-up visit frequency on TBWL and BMI reduction over four years.

METHODS

This retrospective cohort study included adult patients who underwent bariatric surgery between January 2019 and December 2023. Patients were included if they had at least one year of documented postoperative follow-up. Those with incomplete or unavailable follow-up data and those who initiated pharmacologic weight loss therapy (e.g., GLP-1 receptor agonists) during the observation period were excluded beyond the time of medication initiation. Follow-up intensity was quantified using two exposure metrics: cumulative visits (total visits from baseline to each follow-up year) and annual visits (visits occurring exclusively within a given year). A linear mixed-effects model with a random intercept per patient was used to estimate year-specific associations, including visit frequency-by-year interaction terms. Models were adjusted for age, baseline BMI, race (reference = White), procedure type (reference = RYGB), Medicaid status, diabetes, mobility-impairing conditions, and other metabolic comorbidities. Adjusted slopes (β -estimates, 95% CI) were visualized using forest plots and predicted response curves.

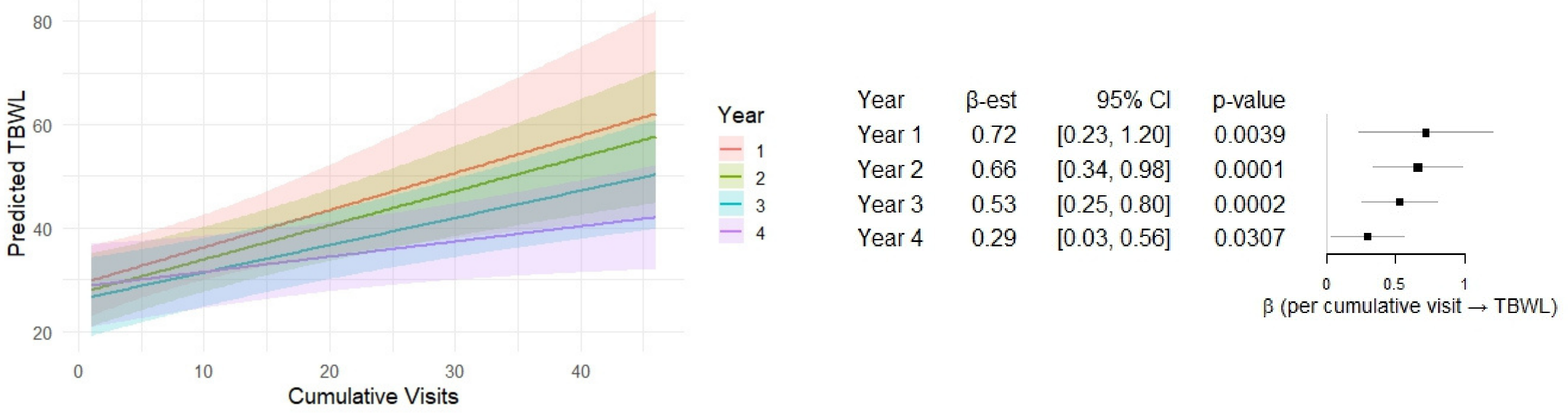
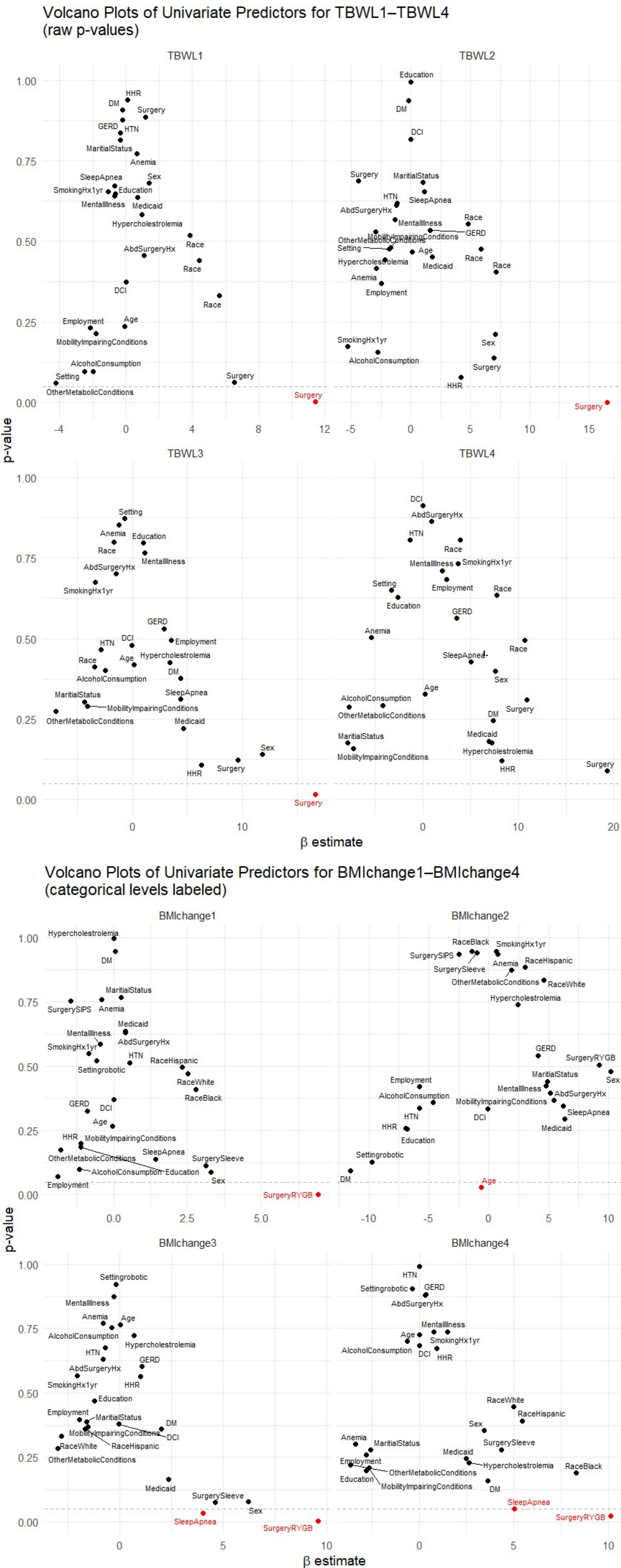


Fig 4. Adjusted Response Curves and Forest Plot for **Cumulative Visits** within follow up duration and TBWL%

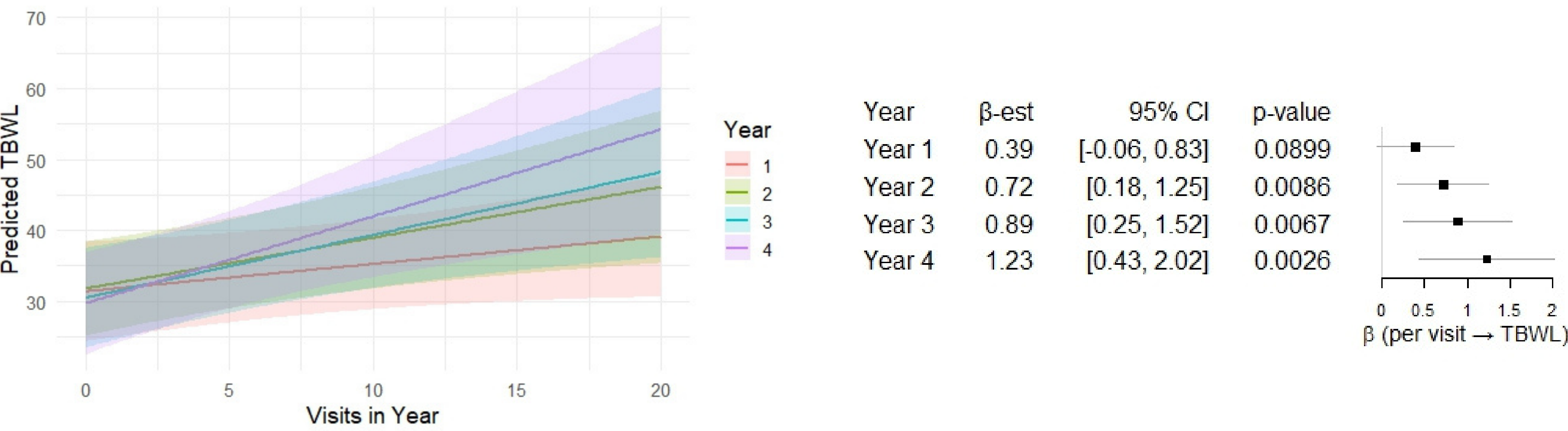


Fig 6. Adjusted Response Curves and Forest Plot for **Annual Visits** within each follow up year and TBWL%

Cumulative visit counts mask temporal effects. When visits are analyzed within each year, the impact of follow-up becomes progressively stronger in later postoperative years.

RESULTS

Among 138 patients (95.7% female; 34.8% residing in distressed communities), RYGB was a significant independent predictor of both TBWL and BMI reduction (e.g., TBWL β range: 6.2-7.8%, $p < 0.001$). Of the total patients, 123 had 1-year, 90 had 2-year, 53 had 3-year, and 33 had 4-year follow-up data available. Cumulative visits were significantly associated with TBWL in Years 1–3 (Year 1: $\beta = 0.72$, $p = 0.0039$; Year 2: $\beta = 0.66$, $p = 0.0001$; Year 3: $\beta = 0.53$, $p = 0.0002$), with a smaller effect in Year 4 ($\beta = 0.29$, $p = 0.0307$). Annual visits, in contrast, demonstrated increasing strength over time (Year 2: $\beta = 0.72$, $p = 0.0086$; Year 3: $\beta = 0.89$, $p = 0.0067$; Year 4: $\beta = 1.23$, $p = 0.0026$), highlighting the growing importance of active engagement in later postoperative years. For BMI reduction, the strongest associations for both cumulative and annual visits were observed in Year 2 (Cumulative: $\beta = 0.71$, $p = 0.0130$; Annual: $\beta = 1.24$, $p = 0.0169$), identifying a critical window for intensified intervention.

CONCLUSIONS

These findings demonstrate that cumulative visit frequency is most impactful in the early postoperative period, supporting the role of structured engagement from the outset. However, the increasing effect size of annual visits over time underscores the distinct and growing importance of continued year-specific follow-up in long-term outcome maintenance.

CONTACT

Presenting Author:
Asra tus Saleha Siddiqui

Contact:
(682) 377-9453

Email:
asrasiddiqui1995@gmail.com