

Real-world evidence of the effect of continuous subcutaneous insulin infusion vs multiple daily injections on HbA1c in 25,000 adults with type 1 diabetes: a quasi-experimental study

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BACKGROUND & OBJECTIVES

The use of continuous subcutaneous insulin infusion (CSII) via an insulin pump is a widely used therapeutic strategy for achieving near-normal blood glucose for people with type 1 diabetes (T1D). Clinical trials have shown that CSII can improve glycated hemoglobin (HbA1c) compared with the standard of care, multiple daily injections (MDI). Whether and to which extent this is the case in the real world remains, however, largely unresolved.

Thus, the objective of this study was to estimate the effect of CSII via an insulin pump on HbA1c compared with MDI, using real-world population data.

METHODS

DESIGN

A quasi-experimental, longitudinal cohort study from 2010-2020 was designed based on prospectively collected, register-based data. All adults with T1D in Denmark were identified using a validated algorithm and were available for inclusion in the final cohort. The cohort was open, i.e., new individuals entered the cohort upon diagnosis with T1D. Insulin pump users were distinguished from MDI users yearly based on insulin pump procedure codes and insulin pump-specific prescribed insulin.

ESTIMATION

The identification strategy to estimate the average treatment effect of the treated (ATT) of insulin pump therapy exploited the longitudinal and treatment-staggered data structure by using a doubly robust difference-in-differences estimator. Event study analyses were conducted, and heterogeneity effects were examined for sex, age, education, HbA1c at treatment initiation and continuous glucose monitor (CGM) use.

RESULTS

- The cohort consisted of 26,683 individuals with a total of 243,601 person-years
- An ATT of -3.6mmol/mol (95%CI: -4.2 – -2.9) was identified for HbA1c
- Event study analysis revealed the largest decrease within the first year of treatment, which then stabilized (Figure 1)
- Decreases were largest among women (Figure 2), the relatively older, those with relatively high HbA1c at treatment initiation, and CGM users.

CONCLUSIONS

On average, insulin pump therapy decreases HbA1c compared with MDI, particularly within the first year of therapy. Compared to clinical trials, the identified effect of insulin pump therapy is slightly smaller in magnitude. Importantly, not everyone benefits the same as evident in subgroup analyses. For instance, women switching to insulin pump therapy seem to benefit significantly more than men.

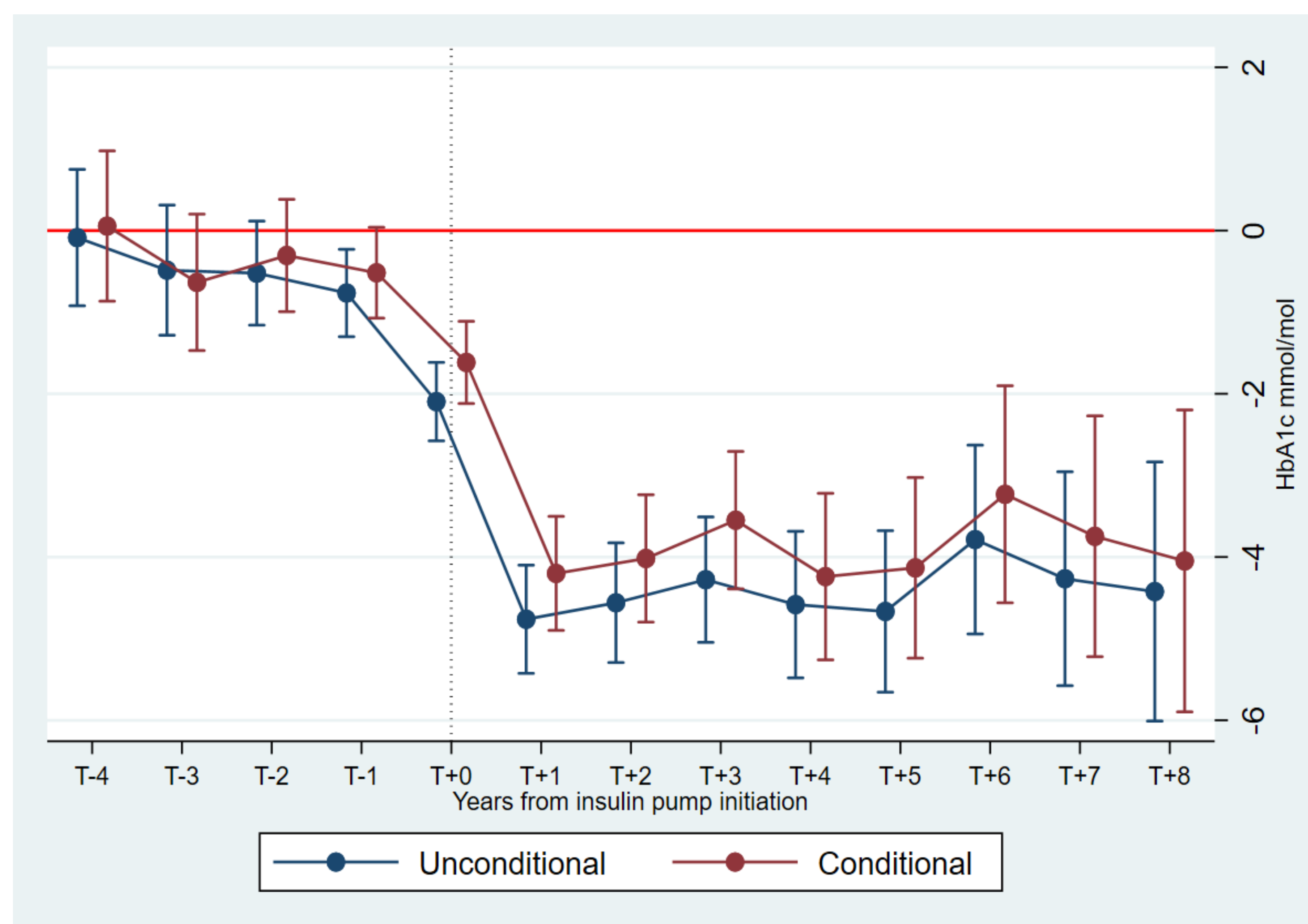


Figure 1: Dynamic event study analysis of average treatment effects of insulin pump therapy vs. multiple daily injections.

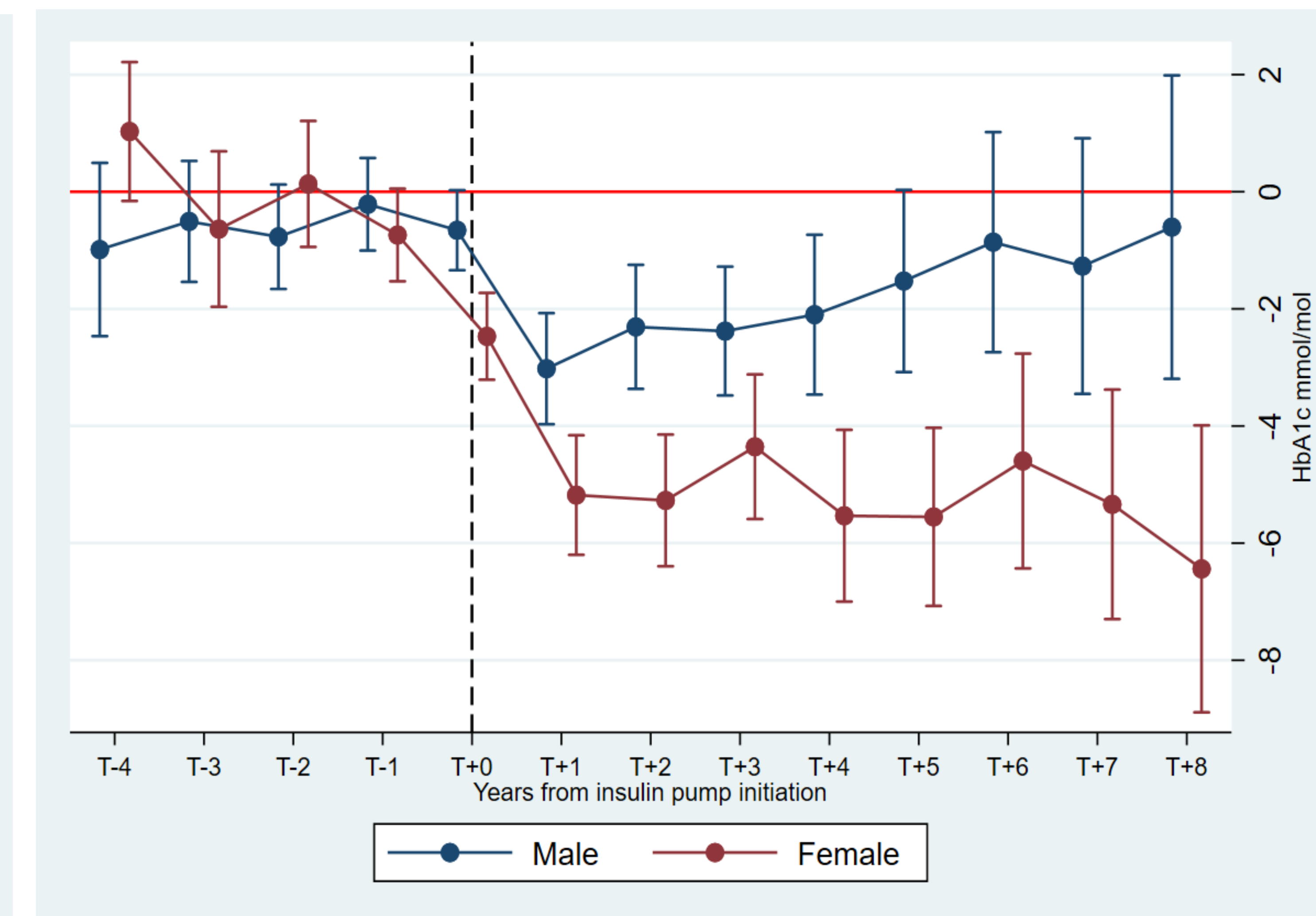


Figure 2: Dynamic event study analysis of average treatment effects of insulin pump therapy vs. multiple daily injections, stratified by sex.