Diabetes Management and Monitoring by HIV Status in South Africa: A Regression Discontinuity Analysis Using National Health Laboratory Service Data

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BACKGROUND

- **Global Impact of Diabetes**: Diabetes is a major global health concern. In South Africa, type 2 diabetes is the second leading cause of adult mortality, while type 1 carries a higher mortality rate among children and adolescents.
- **HIV and Diabetes:** People living with HIV (PLWH) face distinctive challenges in diabetes management. Chronic inflammation and insulin resistance, common among PLWH, can influence glucose regulation and increase the risk of diabetes-associated complications.
- **Diabetes Management**: Guidelines recommend that upon receiving a diabetes diagnosis, patients receive laboratory glucose monitoring every 3-6 months. When left inadequately managed, diabetes can result in serious and potentially fatal complications, as such, compliance to diabetes management guidelines is critical.

OBJECTIVE

To evaluate compliance to diabetes management guidelines in South Africa's public sector health facilities using a regression discontinuity approach.
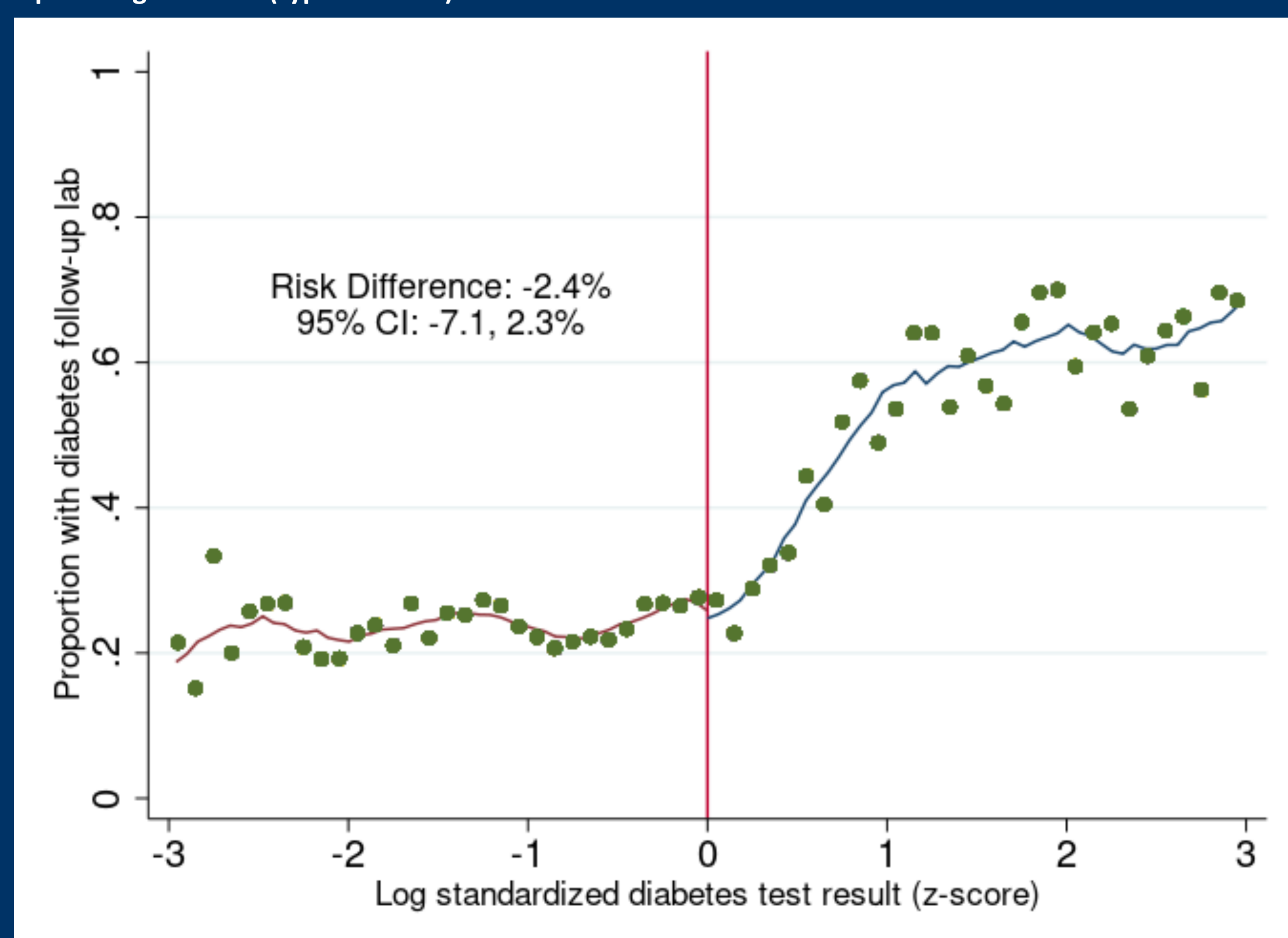
METHODS

- **Database**: South Africa's National Health Laboratory Services (NHLS) cohort was used. NHLS is the sole provider of laboratory services for the public health system.
- **Study Population:** Individuals aged 0-80 years who had their first diabetes laboratory test between Jan 1, 2012 – Jan 1, 2016.
- **HIV Status**: Individuals were identified as living with HIV (PLWH) if they had undergone any HIV-associated test (e.g., CD4 count, viral load, ELISA) any time before their first diabetes test or up to 24-months after.
- **Diabetes Diagnosis Criteria**: Individuals were classified as having lab-diagnosed diabetes if their laboratory-determined fasting blood glucose was ≥ 7.0mmol/L, random blood glucose ≥ 11.1mmol/L, or hemoglobin A1c (HbA1c) $\geq 6.5\%$.
- **Diabetes cohorts:** individuals aged 0 to <30 years were classified as type 1 diabetes, individuals aged 30 to 80 years were classified as type 2 diabetes.
- **Statistical Analysis:** We applied a regression discontinuity approach to estimate the causal intention-to-treat (ITT) effect of having a laboratory value indicative of diabetes on the likelihood of receiving a follow-up test within 24-months.

RESULTS

a) People living with HIV (type 2 cohort)

Risk Difference: -1.7%
95% CI: -4.1, 0.7%
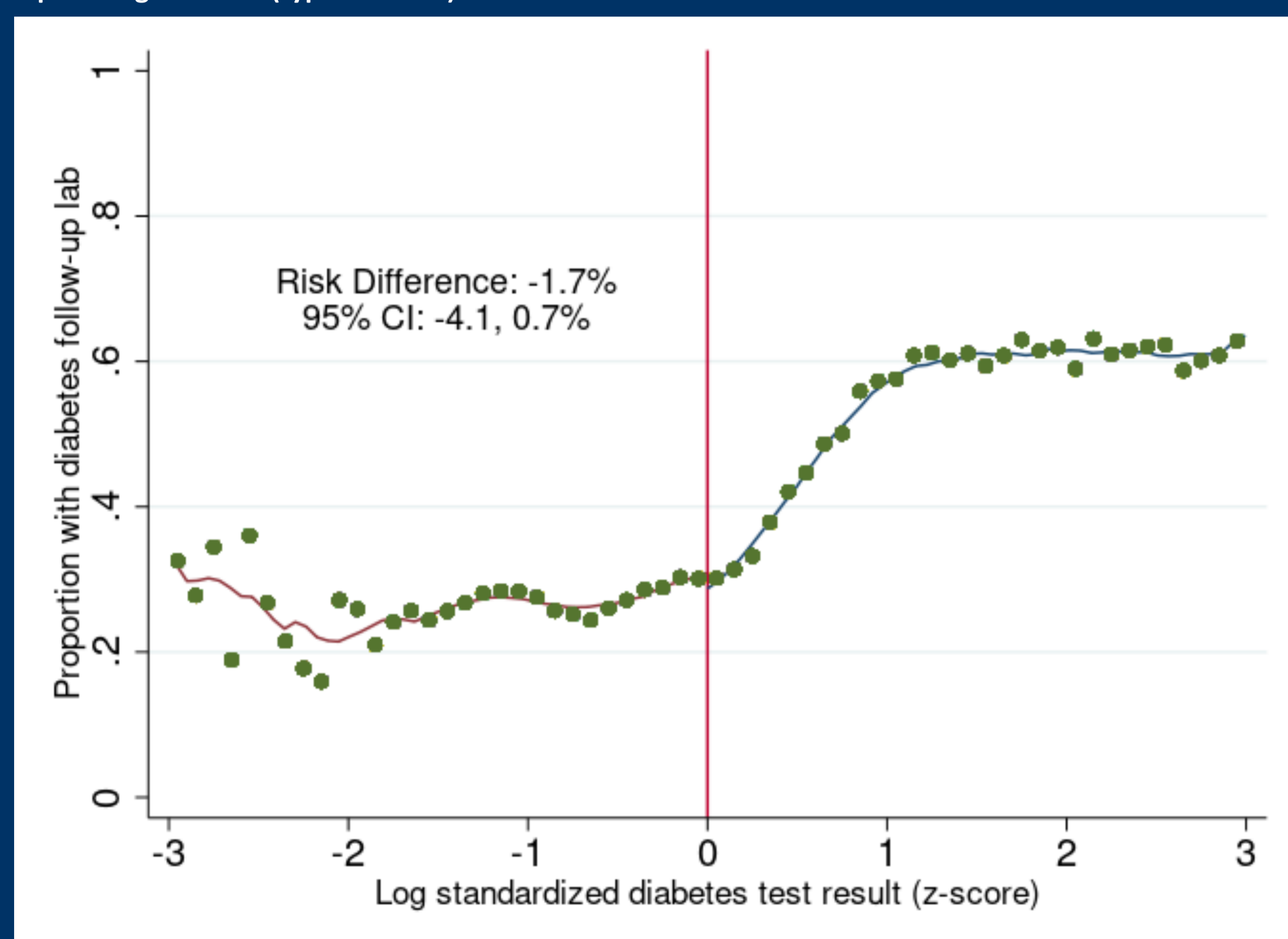
b) People living without HIV (type 2 cohort)

Risk Difference: -2.4%
95% CI: -3.5, -1.3%
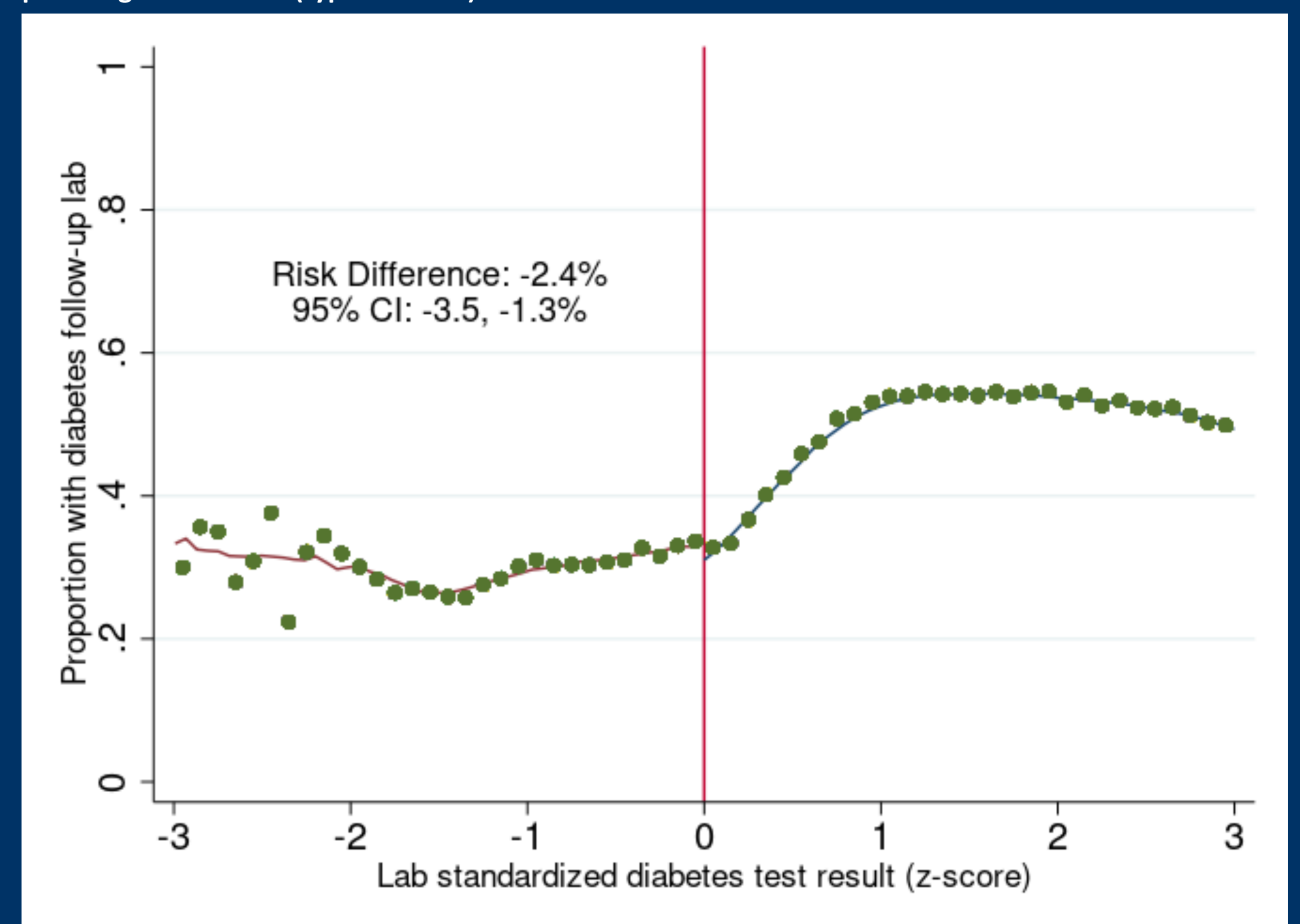
c) People living with HIV (type 1 cohort)

Risk Difference: -2.4%
95% CI: -7.1, 2.3%

d) People living without HIV (type 1 cohort)

Risk Difference: -1.8%
95% CI: -4.1, 0.6%
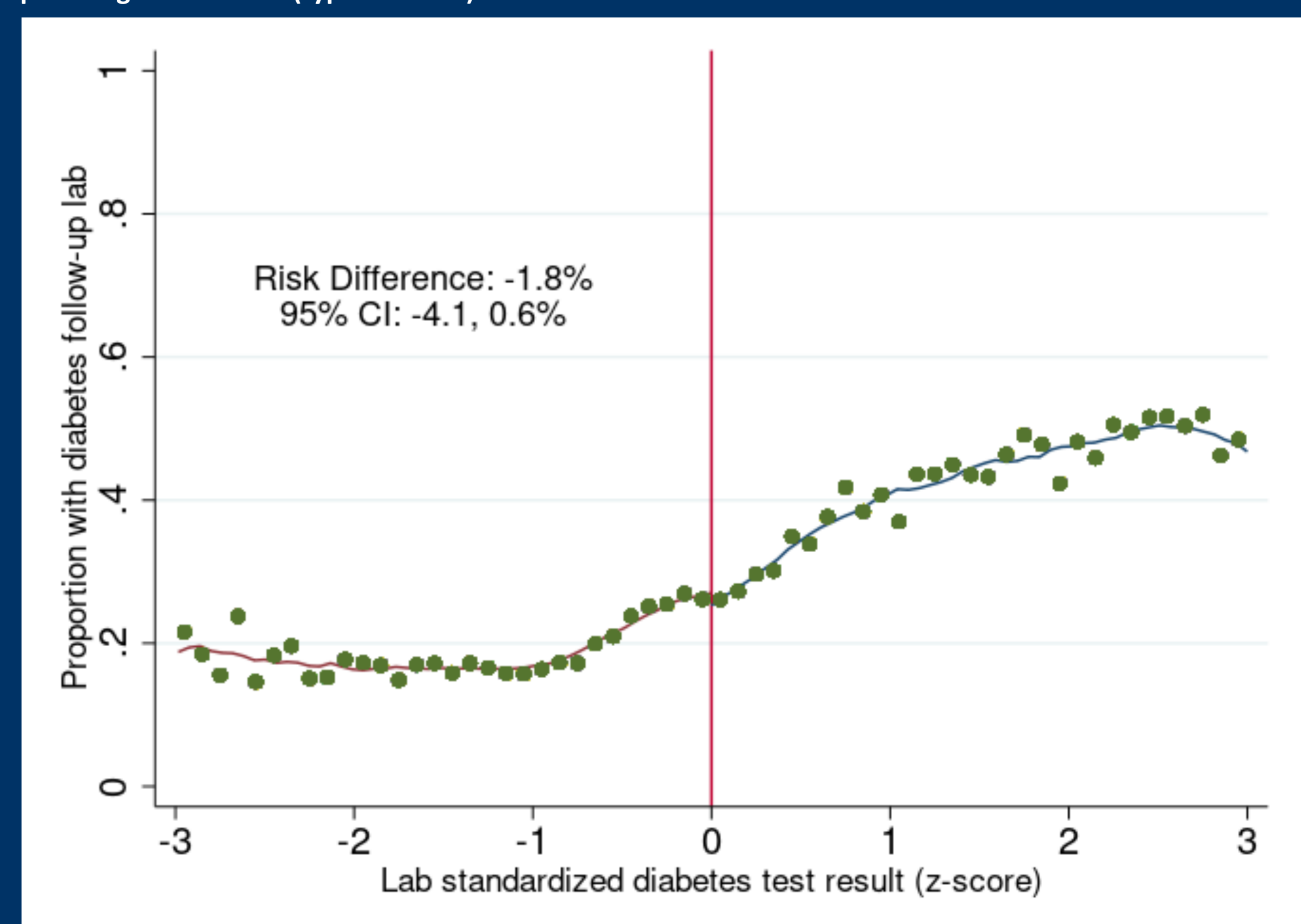
RESULTS

- Among 695,719 individuals aged 30-80 years (type 2 cohort) with a diabetes test during follow-up, 50.6% had lab-diagnosed diabetes. Among 144,269 patients age <30 years (type 1 cohort), 15.1% had lab-diagnosed diabetes.
- There was no clinically meaningful difference in the likelihood of having a follow-up lab within 24-months at the diagnostic threshold in either cohort (see Figures).
- Trends to the right of the diagnostic threshold indicate that as diabetes test values increased, the probability of having a follow-up lab also increased. This trend was particularly pronounced among PLWH.

CONCLUSIONS

- In a national cohort study, there was no apparent increase in diabetes monitoring upon diagnosis.
- Only as diabetes test values increased did we see an increase in the likelihood of undergoing the recommended follow-up laboratory assessments.
- PLWH (vs PLWOH) showed slightly increased likelihoods of receiving follow-up lab tests, potentially due to increased contact with the healthcare system.
- Strategies to improve patient education and healthcare system support are crucial to improve guideline compliance and overall diabetes management.