

Addressing the shortfalls of Glucose Management Indicator (GMI) and Glycated Hemoglobin (HbA1c): Validation of updated GMI and personalized A1c

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Disclosures

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Glucose management indicator (GMI)

- GMI was developed as a CGM metric to reflect mean glucose in HbA1c unit
 - Established using linear regression between AG and HbA1c from clinical trial data
- GMI is a glycaemic quality metric in the Healthcare Effectiveness Data and Information Set (HEDIS), a quality performance tool in the United States
- However, GMI can show discordance with HbA1c, particularly at high and low glucose levels, potentially creating management difficulties.

Aims

Reduce HbA1c-GMI discordance by eliminating bias at low and high glucose levels while also tightening the relationship across all glucose levels

How?

A two-step approach:

Step 1: Use of updated GMI (uGMI), a theoretically-derived physiology model of GMI, to reduce discrepancy at low and high glucose levels.

$$\text{updated GMI} = (15.36 * AG^{-1} + 0.0425)^{-1}$$

Step 2: Use of personalised A1c, that accounts for differences in red blood cell (RBC) characteristics, and which can affect HbA1c.

The dedicated GDAC study validates uGMI and pA1c

GDAC Study¹

- A prospective 6-month US-UK study (18 centers): individuals with diabetes from different racial groups
- Exclusion criteria: conditions known to acutely alter red blood cell lifespan and HbA1c ≥ 15.5%
- Main characteristics
 - N=257 (Black 59, White 76, Asian 91, Other 31), T2D 73%, T1D 27%, female 45%
 - HbA1c 7.6 ± 1.2% (59 mmol/mol), diabetes duration 15 ± 11 years

$$PGR = (AG^{-1} + K_M^{-1}) * (100 * A1C^{-1} - 1)^{-1} * 10^5$$

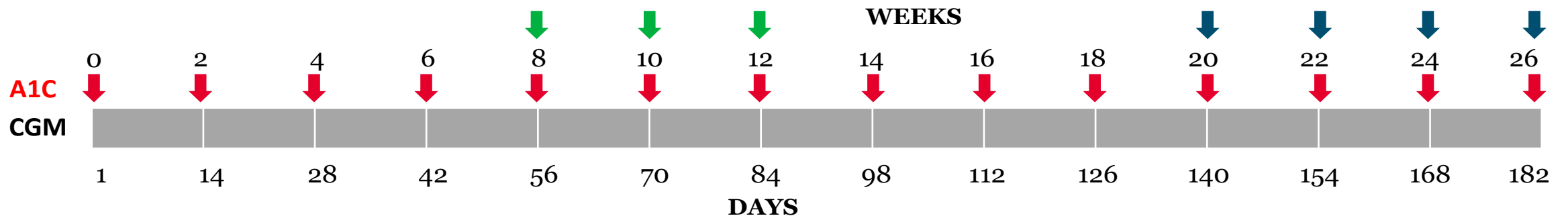
$$K_M = 473$$

$$pA1C = 100 * \left(1 + \frac{PGR}{PGR_{ref}} \left(\frac{100}{A1C} - 1 \right) \right)^{-1}$$

$$PGR_{ref} = 65.1$$

**Period to define
personal A1C factor**

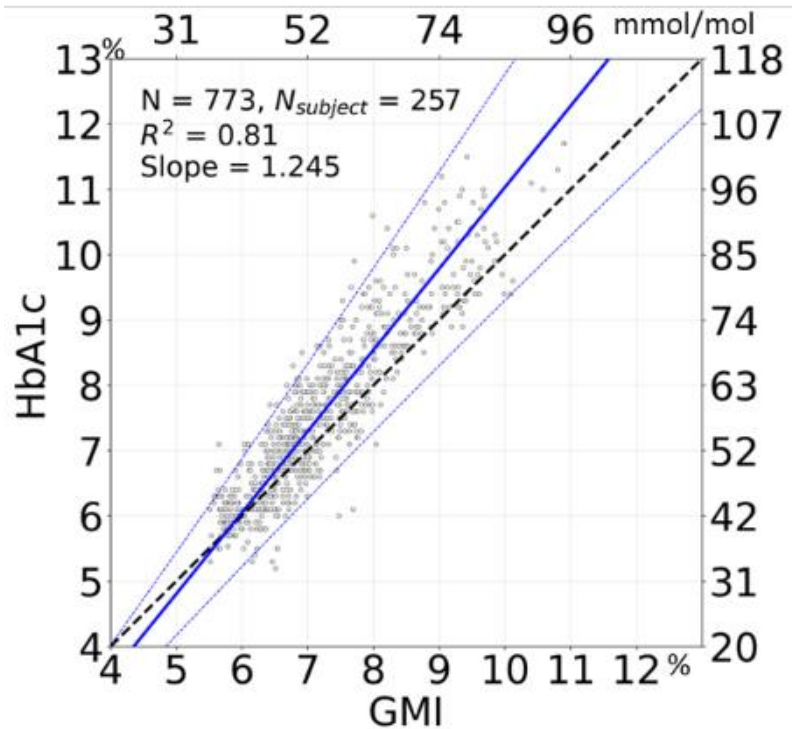
**Period to evaluate a new
glycemic marker “pA1C”**



GDAC: Correlation analyses in GDAC

GMI-HbA1c Discordance

- Proportional bias
- Spread of data

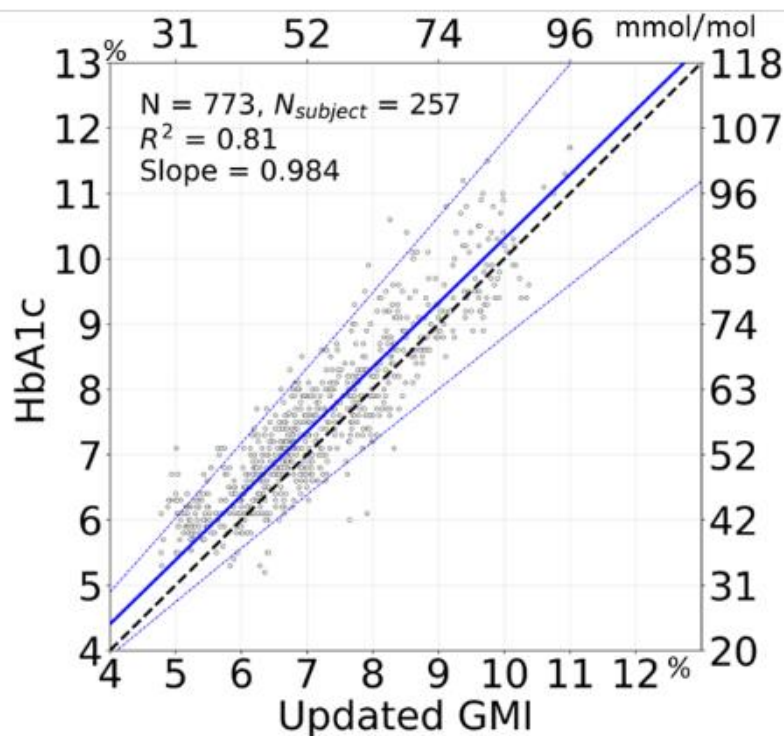
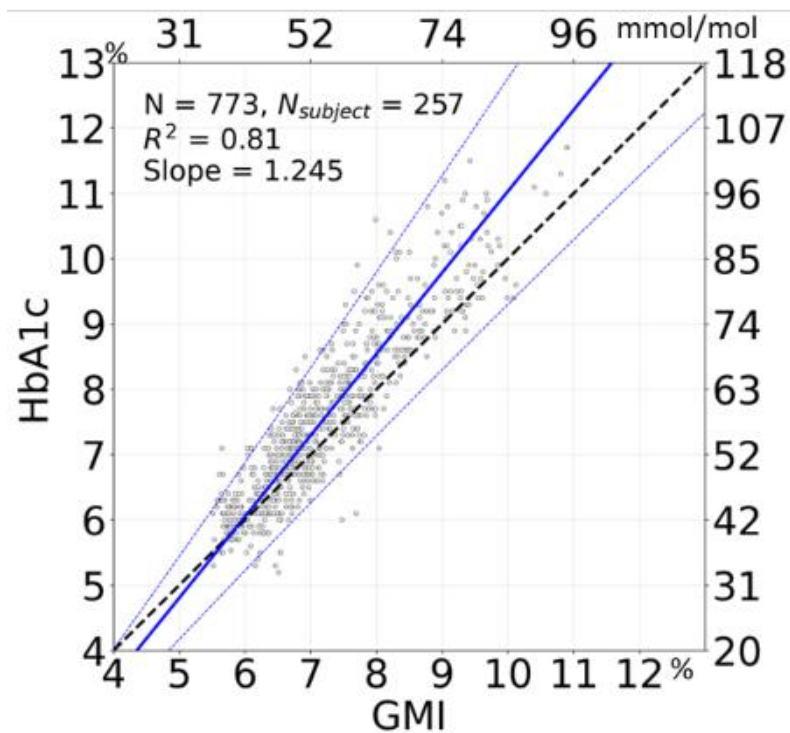


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Step 1 Reduction of proportional bias



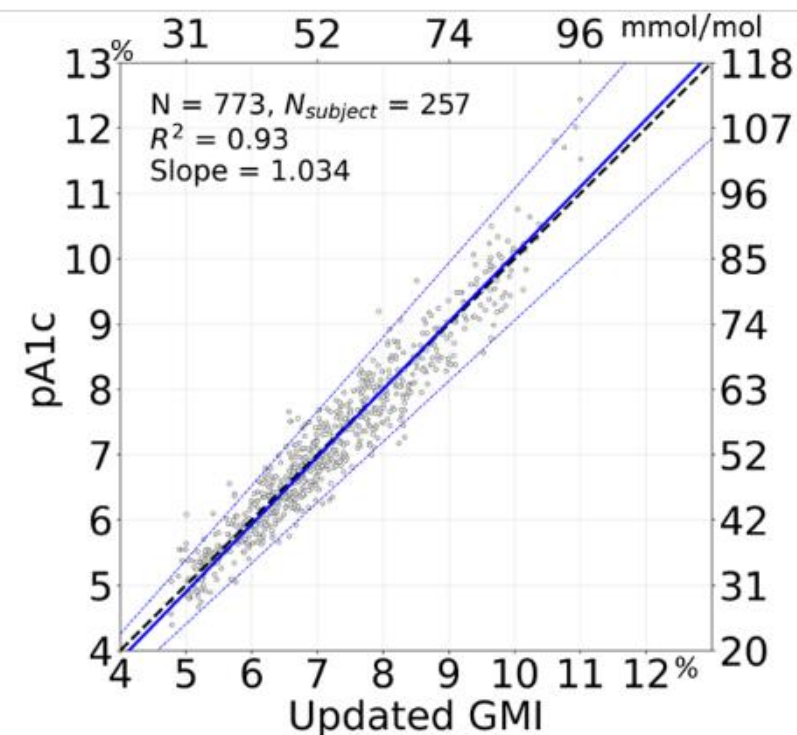
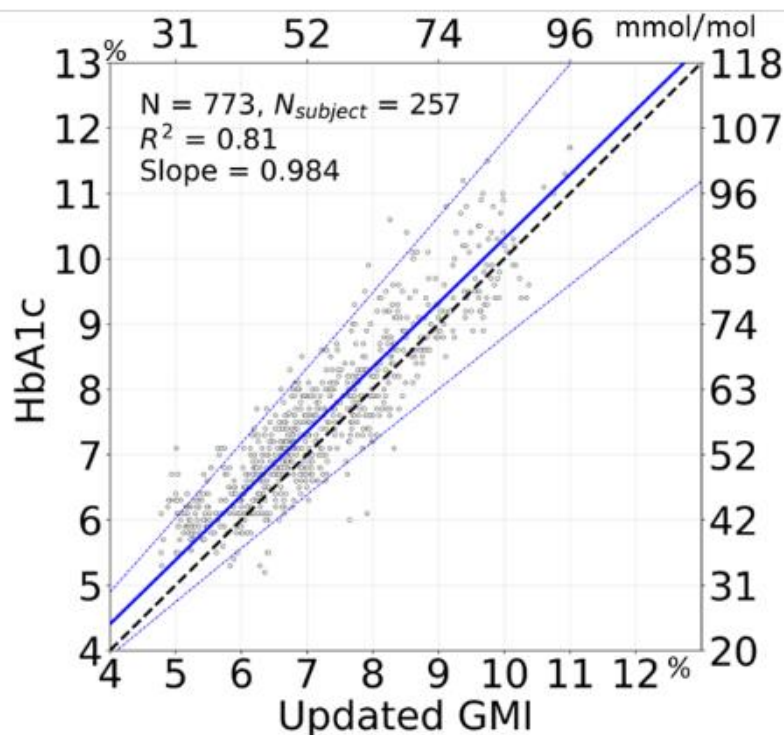
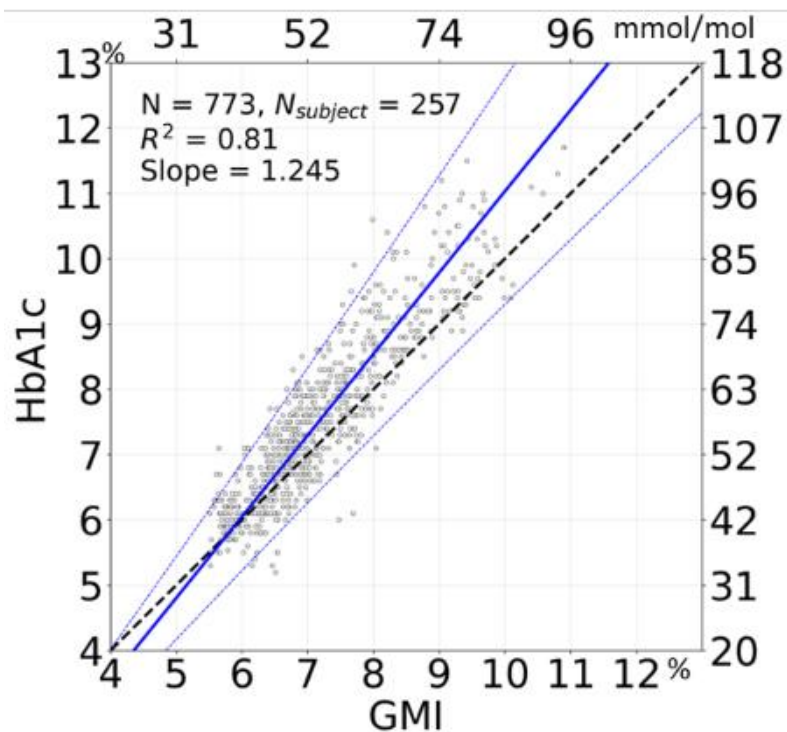
GDAC: Correlation analyses in GDAC

GMI-HbA1c Discordance

- Proportional bias
- Spread of data

Step 1 Reduction of proportional bias

Step 2 Reduction of data spread



Conclusions

- Current GMI shows inaccuracies at lower and higher glucose levels, as the regression between the two glycemic markers is not close to unity
- Updated GMI removes discordance with A1C at high and low glucose
- pA1C further tightens agreement across the full range of glucose by accounting for personal differences in RBC characteristics

Thank you for your attention

GDAC: Correlation analyses with T2D in GDAC

