

Overdiagnosis of prediabetes by GMI: Use of updated GMI improves alignment with HbA1c and Time Above Range

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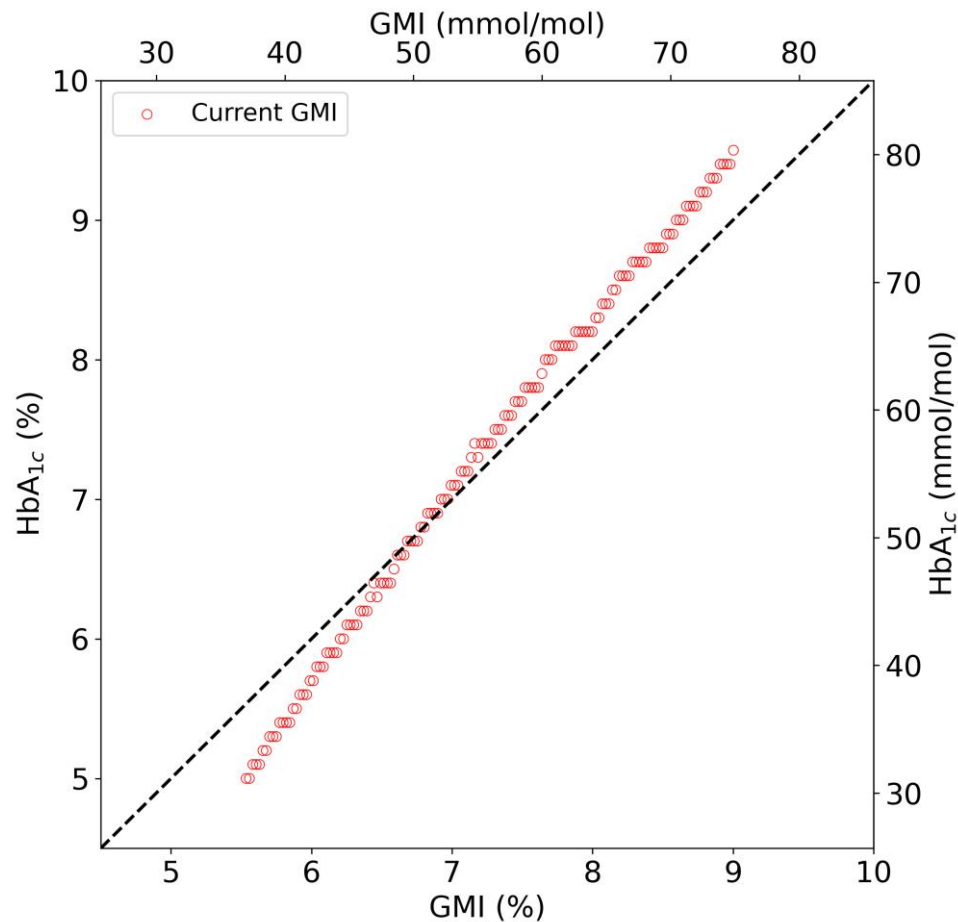
Disclosures

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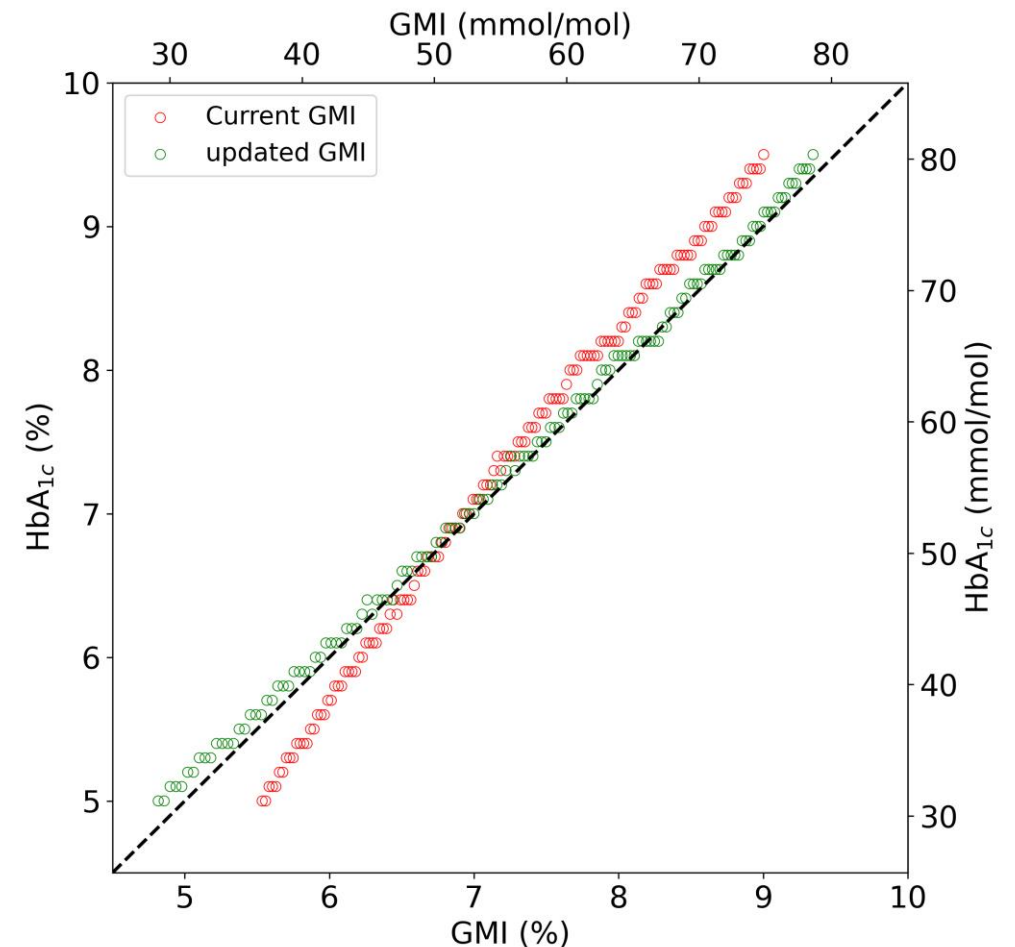
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Updated GMI (1)

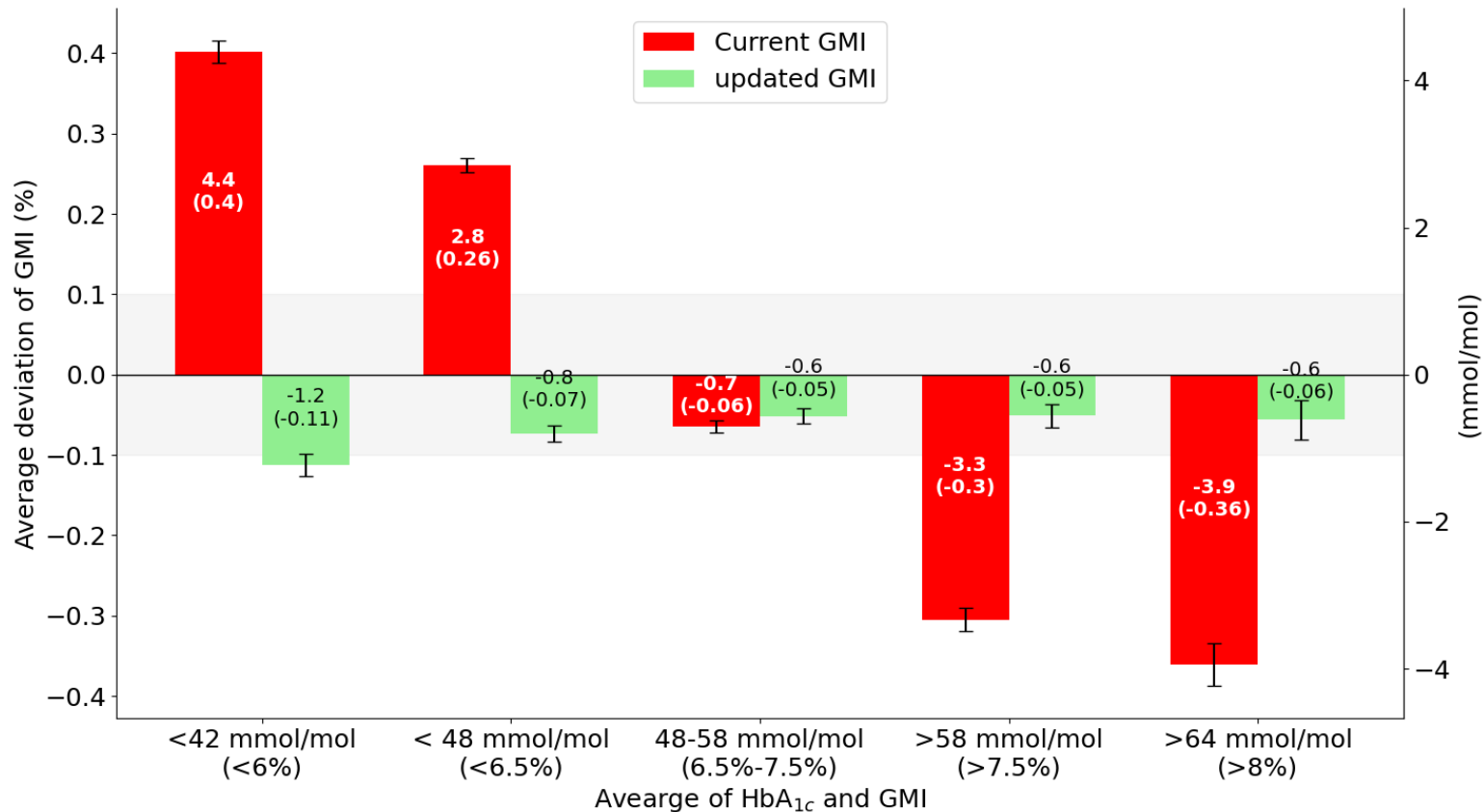
CGM-derived GMI does not align with HbA_{1c} at high and low glucose levels, thus creating management difficulties



To reduce GMI-HbA_{1c} bias, a physiology-based model of GMI was evaluated using RCTs and real-world data



Updated GMI (2)



AG (mg/dL)	A1c (%)	GMI (%)	Updated GMI (%)
90		5.5	4.7
95	5.1	5.6	4.9
100	5.2	5.7	5.1
120	5.9	6.2	5.9
140	6.6	6.7	6.6
150	6.9	6.9	6.9
160	7.3	7.1	7.2
180	7.8	7.6	7.8
200	8.4	8.1	8.4
240		9.1	9.4
250		9.3	9.6

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

Aims

Current GMI can overdiagnose prediabetes and therefore our aims were:

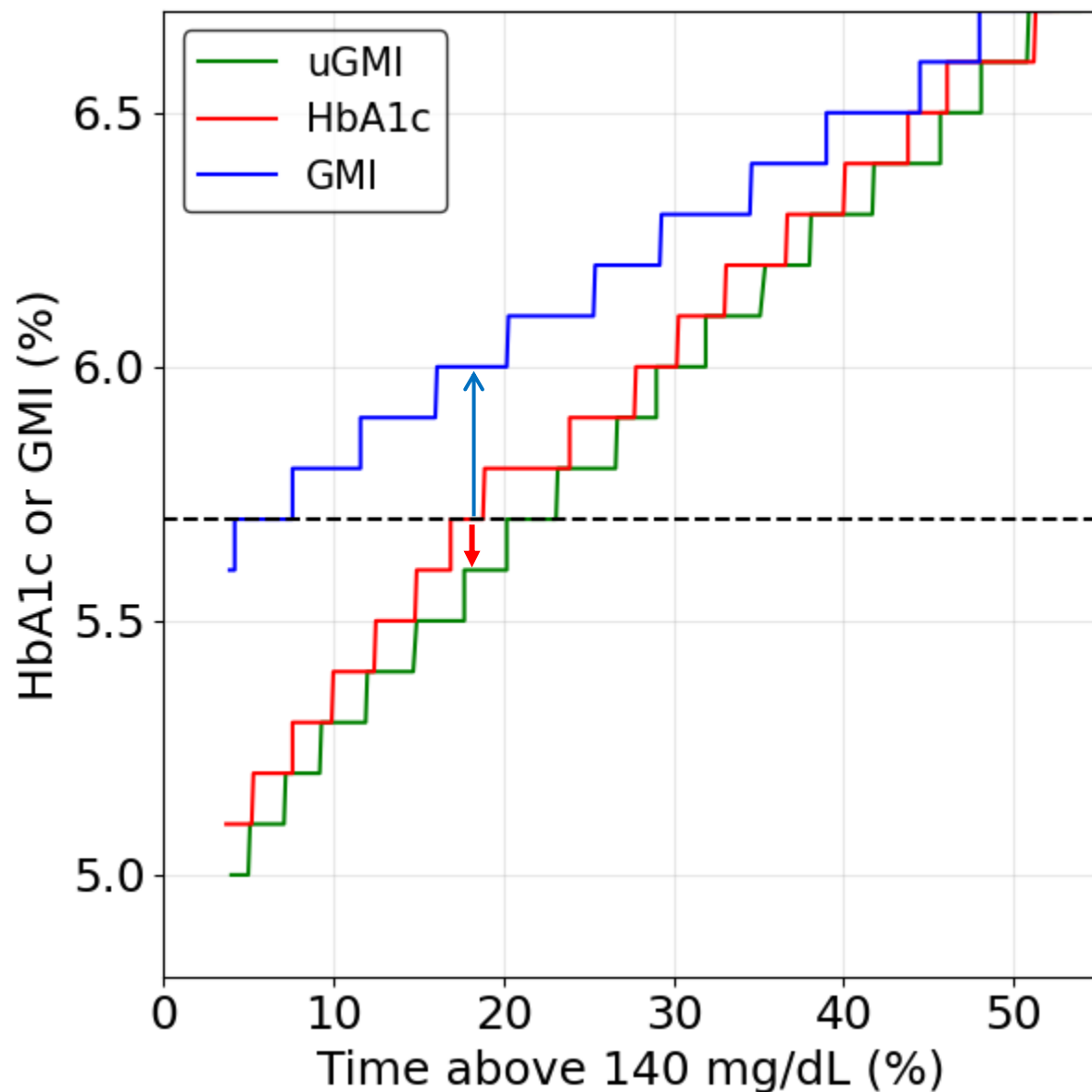
1. Fully assess HbA1c-GMI discordance in the prediabetes range.
2. Evaluate alignment of updated GMI (uGMI) with HbA1c.
3. Understand alignment of time above 140mg/dL (TIR140) with HbA1c, GMI and uGMI.

Materials and Methods

$$uGMI = (15.36/AG + 0.0425)^{-1}$$
$$GMI = 0.02392 * AG + 3.31$$

- **Real-world data from linked LibreView CGM and laboratory HbA1c**
 - 14,993 individuals in US with HbA1c and preceding 56-day CGM
- **The following pairs were evaluated**
 - HbA1c-TA140
 - GMI-TA140
 - uGMI-TA140
- **Mean-value line calculated per pair**
 - Rank order pairs analysed
 - Running averages of two values were calculated in a moving window of 100 pairs over the composite ranking
- **Averages of these metrics were subsequently compared in the prediabetes range**

Prediabetes is over-diagnosed with GMI

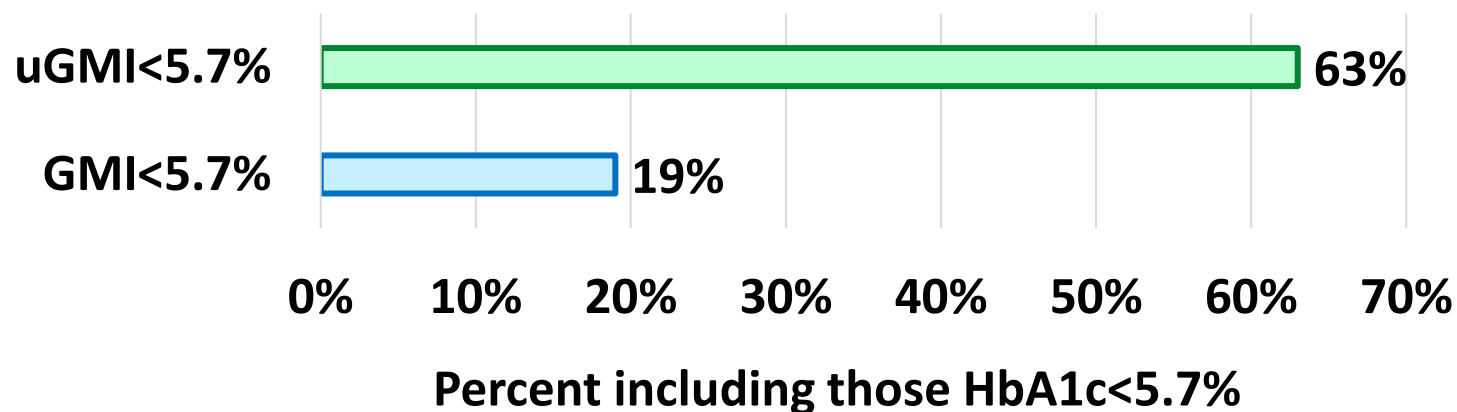


HbA1c of **5.7%** aligned with uGMI of **5.6%**

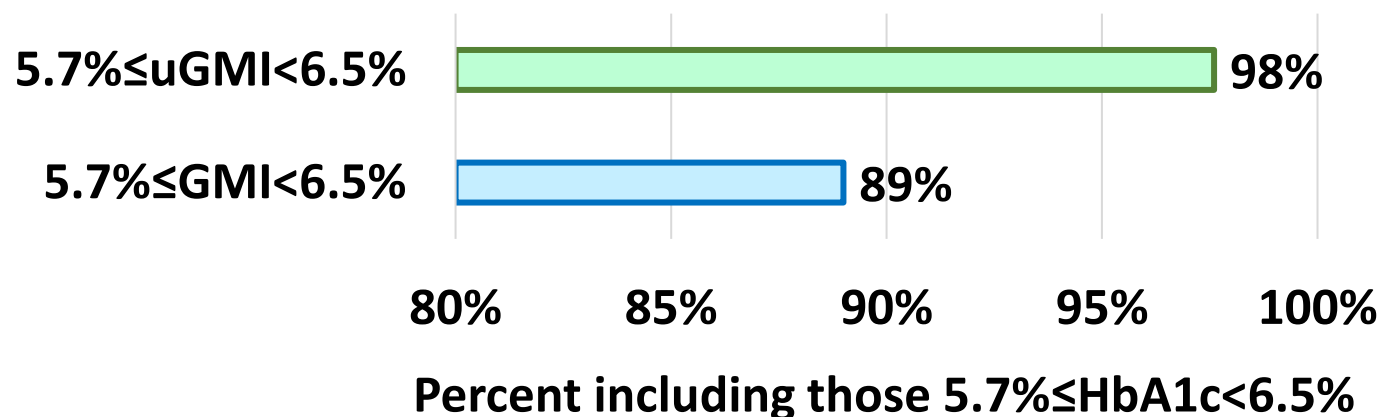
HbA1c of **5.7%** aligned with GMI of **6.0%**

HbA1c = 5.7%
TA140 = 17%

Evaluation in prediabetes range

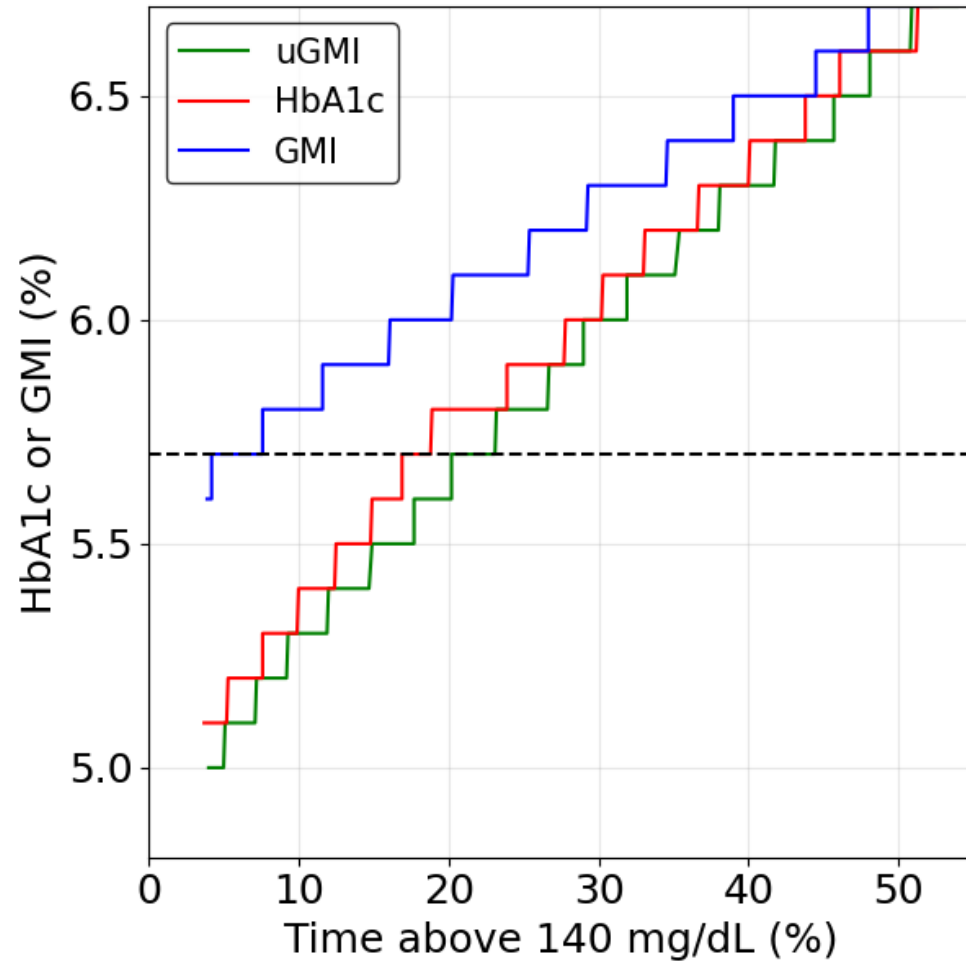


Of those with HbA1c < 5.7%, only 19% had GMI in the normoglycemic range, increasing to 63% with uGMI



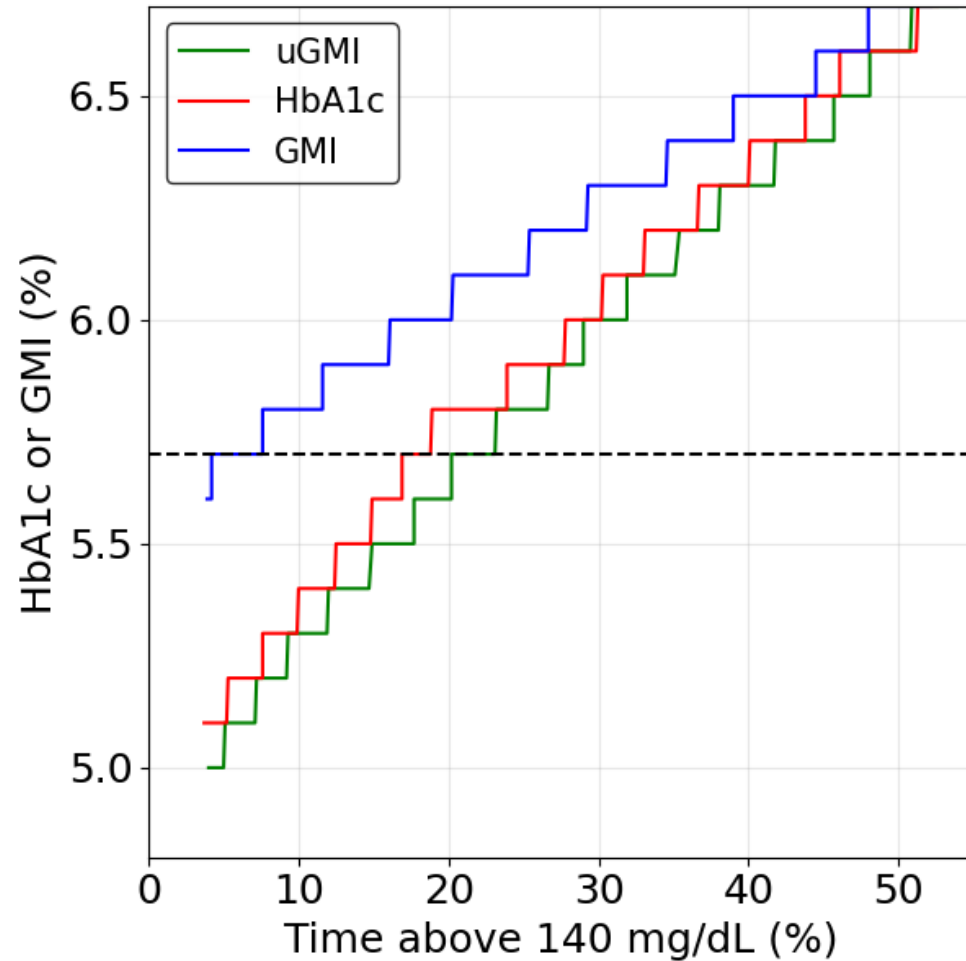
Of those with 5.7% ≤ HbA1c < 6.5%, uGMI accurately reflected this range, in contrast to GMI

What about Time>140 mg/dL



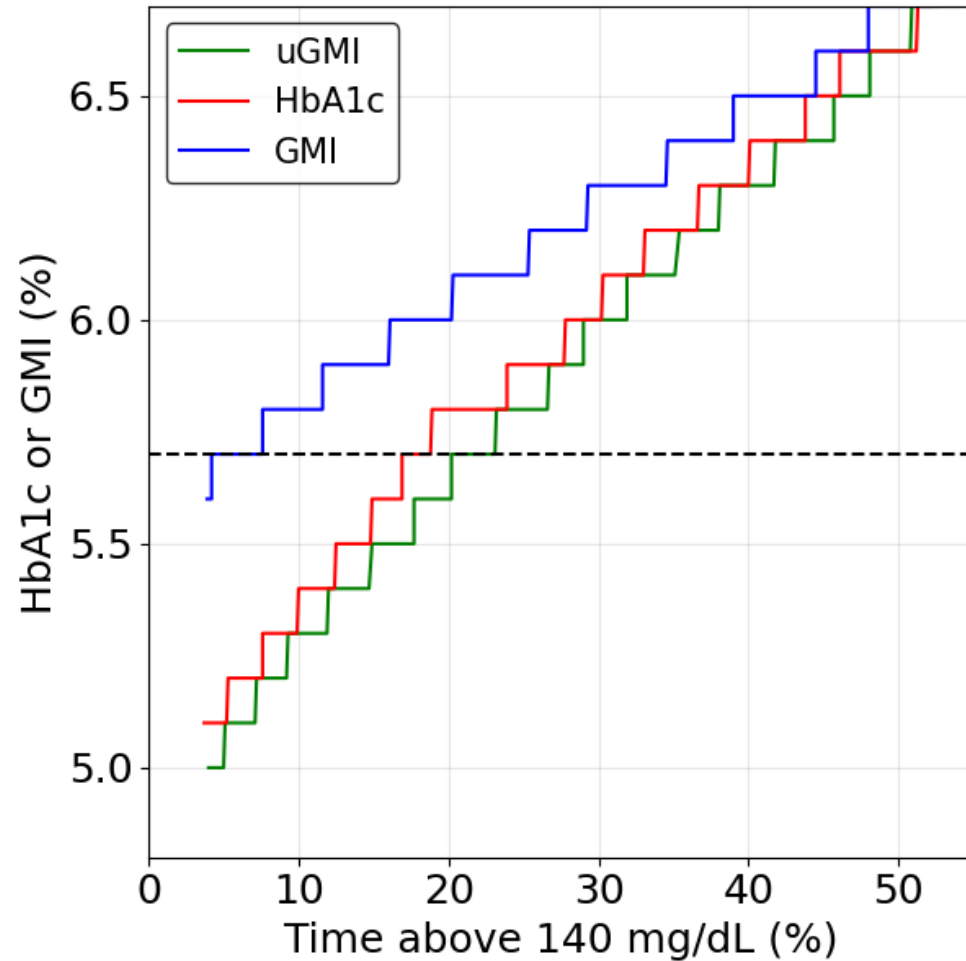
HbA1c, GMI, uGMI (%)	TA140 for HbA1c (%)
5.1	3.7 - 4.7
5.2	4.8 - 7.0
5.3	7.1 - 9.3
5.4	9.4 - 11.9
5.5	11.9 - 14.3
5.6	14.3 - 16.4
5.7	16.5 - 18.5
5.8	18.6 - 21.9
5.9	21.9 - 29.6
6.0	27.1 - 29.6
6.1	29.6 - 32.0
6.2	32.0 - 36.3
6.3	36.3 - 38.9
6.4	38.9 - 43.9
6.5	43.9 - 45.3

What about Time>140 mg/dL



HbA1c, GMI, uGMI (%)	TA140 for HbA1c (%)	TA140 for uGMI (%)
5.1	3.7 - 4.7	4.6 - 6.6
5.2	4.8 - 7.0	6.6 - 8.7
5.3	7.1 - 9.3	8.7 - 11.2
5.4	9.4 - 11.9	11.3 - 14.1
5.5	11.9 - 14.3	14.2 - 16.8
5.6	14.3 - 16.4	16.9 - 19.6
5.7	16.5 - 18.5	19.6 - 22.2
5.8	18.6 - 21.9	22.2 - 25.9
5.9	21.9 - 29.6	26.0 - 28.5
6.0	27.1 - 29.6	28.5 - 30.9
6.1	29.6 - 32.0	30.9 - 34.8
6.2	32.0 - 36.3	34.8 - 36.8
6.3	36.3 - 38.9	36.8 - 40.9
6.4	38.9 - 43.9	41.1 - 45.1
6.5	43.9 - 45.3	45.1 - 47.0

What about Time>140 mg/dL



HbA1c, GMI, uGMI (%)	TA140 for HbA1c (%)	TA140 for uGMI (%)	TA140 for GMI (%)
5.1	3.7 - 4.7	4.6 - 6.6	-
5.2	4.8 - 7.0	6.6 - 8.7	-
5.3	7.1 - 9.3	8.7 - 11.2	-
5.4	9.4 - 11.9	11.3 - 14.1	-
5.5	11.9 - 14.3	14.2 - 16.8	-
5.6	14.3 - 16.4	16.9 - 19.6	-
5.7	16.5 - 18.5	19.6 - 22.2	3.9 - 6.7
5.8	18.6 - 21.9	22.2 - 25.9	6.8 - 10.5
5.9	21.9 - 29.6	26.0 - 28.5	10.5 - 15.0
6.0	27.1 - 29.6	28.5 - 30.9	15.1 - 19.4
6.1	29.6 - 32.0	30.9 - 34.8	19.4 - 24.0
6.2	32.0 - 36.3	34.8 - 36.8	24.0 - 28.5
6.3	36.3 - 38.9	36.8 - 40.9	28.5 - 33.0
6.4	38.9 - 43.9	41.1 - 45.1	33.1 - 36.8
6.5	43.9 - 45.3	45.1 - 47.0	36.8 - 42.2

Conclusions

- GMI readings can be misleading at lower glucose levels, resulting in the overdiagnosis of prediabetes
- In contrast, uGMI better aligns with HbA1c minimizing the misdiagnosis of prediabetes
- In addition, uGMI and HbA1c show good alignment in relation to TA140, in contrast to GMI
- Taken together, uGMI should replace GMI as a CGM metric due to better alignment with HbA1c

Thank you for your attention