

# ZOOM forward

▶▶ **22** ECO  
IFSO-EC

**Congress on Obesity**  
Maastricht, 4-7 May 2022

Easy to use and interpretable model  
based on artificial intelligence  
for predicting 5-year weight trajectories  
after bariatric surgery

**Patrick Saux**, Pierre Bauvin, Julien Teigny, Violeta Raverdy, Helene Verkindt, Guelareh Dezfoulan, Mihaela Moldovanu, Severine Andrieux, Julien Couster, Marie Lepage, Anne Jacobs, Daan Jacobs, Valerie Montpellier, Florence Galtier, David Nocca, Robert Caiazzo, Philippe Preux, Francois Pattou.

# Conflict of Interest

Patrick Saux

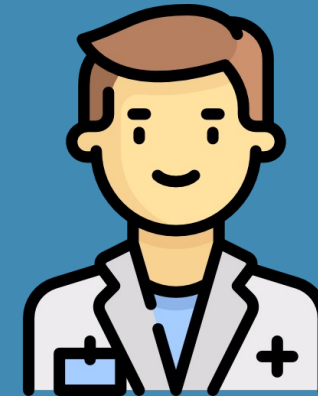
I have nothing to disclose...

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... except I am not from medical sciences.



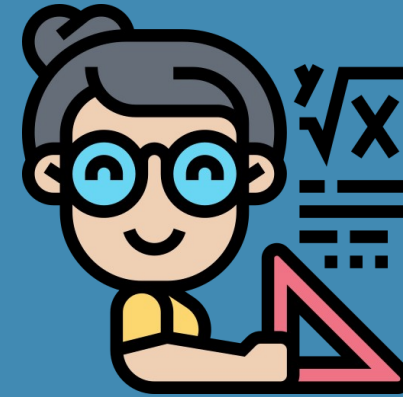


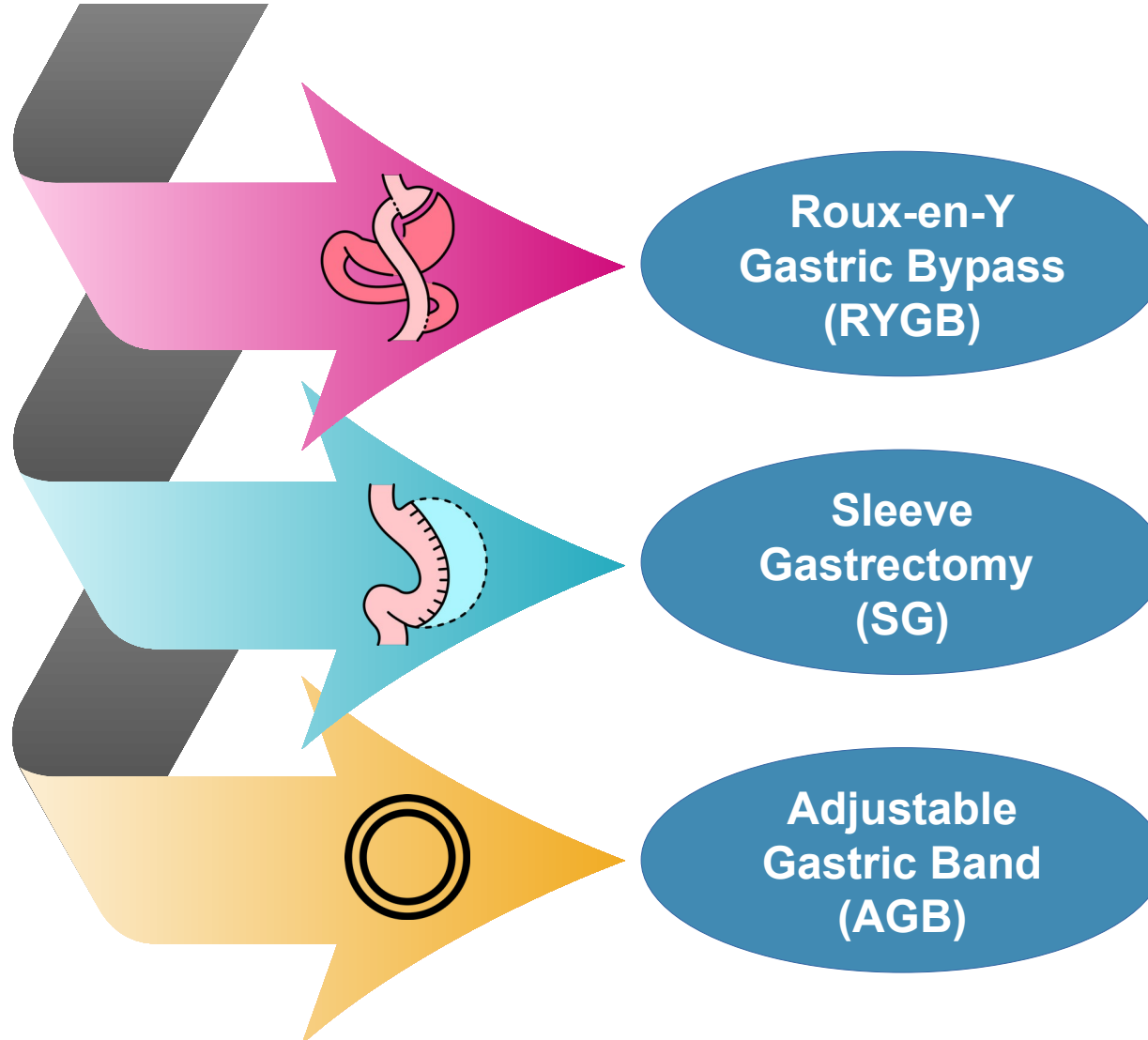
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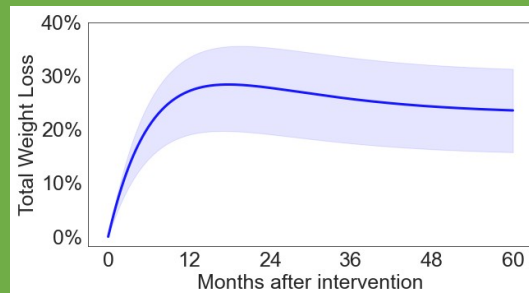
## Outcome

### Total Weight Loss (%TWL)

- between preop and follow-up visits (12, 24, 60 months post-op)
- continuous outcome in %



## ABOS

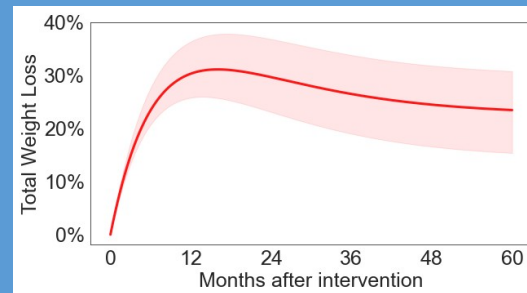


**Prospective cohort**

N=1,147  
RYGB, SG, AGB  
1370 attributes at baseline



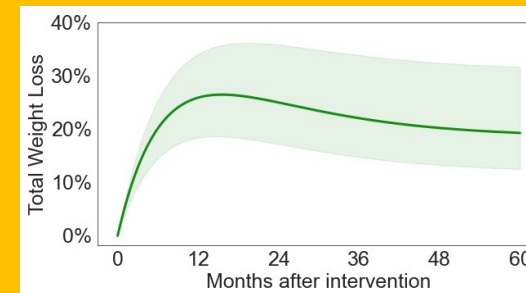
## Montpellier



N=348  
SG



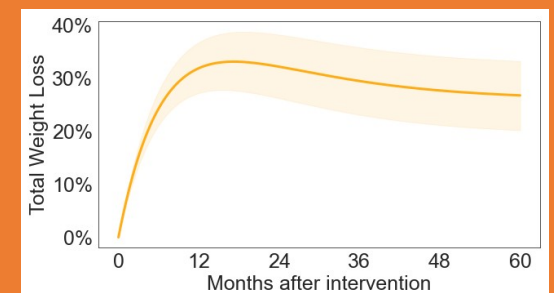
## PRECOS



N=237  
RYGB, SG, AGB

## NEDERLANDSE OBESITAS KLINIEK

## NOK



N=5,697  
RYGB, SG, AGB



**ABOS**



**Montpellier**



**PRECOS**

NEDERLANDSE  
**OBSITAS**  
KLINIEK

**NOK**

**Derivation cohorts**

**Validation cohorts**



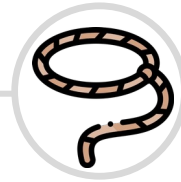
# Weight Loss Predictive Model



## Preprocess

- Cleaning, imputation
- Visit date adjustment

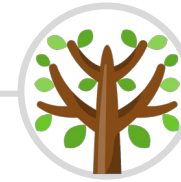
**Preprocessing**



## LASSO

- Extract most predictive features
- Validated by clinicians

**Feature  
extraction**



## Regression Tree

- Stratification of patients
- Interpretable

**Calibration**



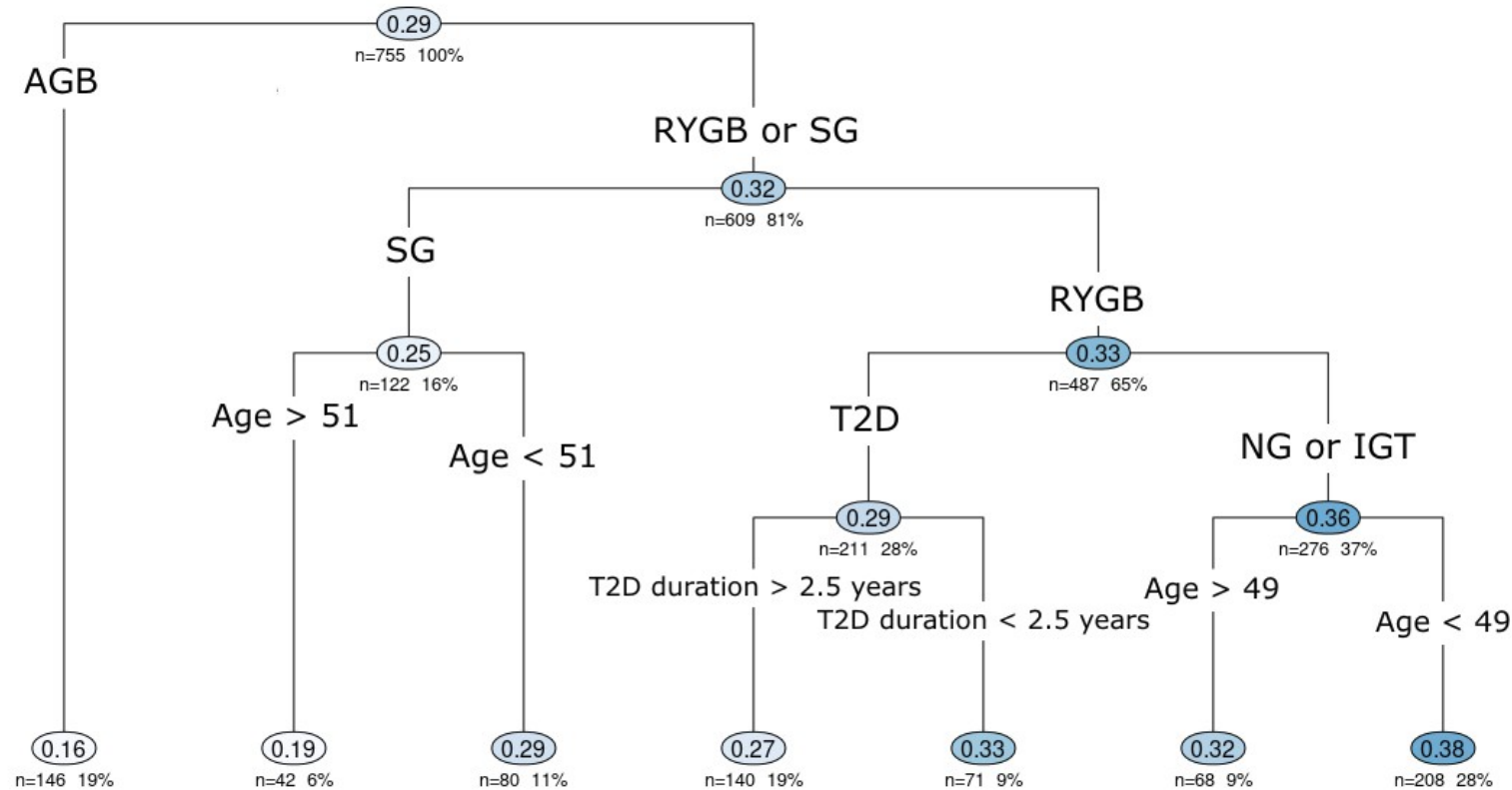
## Testing

- Root Mean Squared Error (RMSE)
- Inter-Quartile Range (IQR) prediction interval

**Validation**



# TWL Prediction at M24



Colour intensity = %TWL value  
low %TWL :   
high %TWL :

Results as of December 2021.

T2D: type II diabetes.  
IGT: impaired glucose tolerance.  
NG: normoglycemic.

# Validation Results

## Testing literature model in ABOS cohort

Model	Month Operation		n	RMSE
<b>Cottam2</b>	12	SG	232	4.8
<b>Velazquez1</b>	12	RYGB	741	4.0
<b>Wise</b>	12	RYGB	686	4.7
<b>Goulard</b>	12	SG	232	5.9
<b>Seyssel1</b>	12	RYGB	744	4.0
<b>Janik</b>	12	SG	232	5.1
<b>Baltasar2</b>	24	RYGB + SG + GB	1098	7.0
<b>Baltasar3</b>	24	RYGB	684	5.3
<b>Baltasar4</b>	24	SG	191	7.5
<b>Velazquez2</b>	24	RYGB	684	5.0
<b>Seyssel2</b>	24	RYGB	684	5.1
<b>Seyssel3</b>	60	RYGB	398	5.9

## Regression Tree Model

	At 12 months	At 24 months	At 60 months
Internal test data (n=230)	3.9	4.7	4.8
External validation data (n=5,934)	3.3	4.1	4.8
Literature models	4.0 - 5.9	5.0 - 7.5	5.9

## Weight Trajectory Prediction

Informations

Unique patient

By CSV

Weight (Kg)

140

Height (cm)

170

Age

58

Predict!

Weight trajectory ?

Type of intervention

Bypass

Smoker?

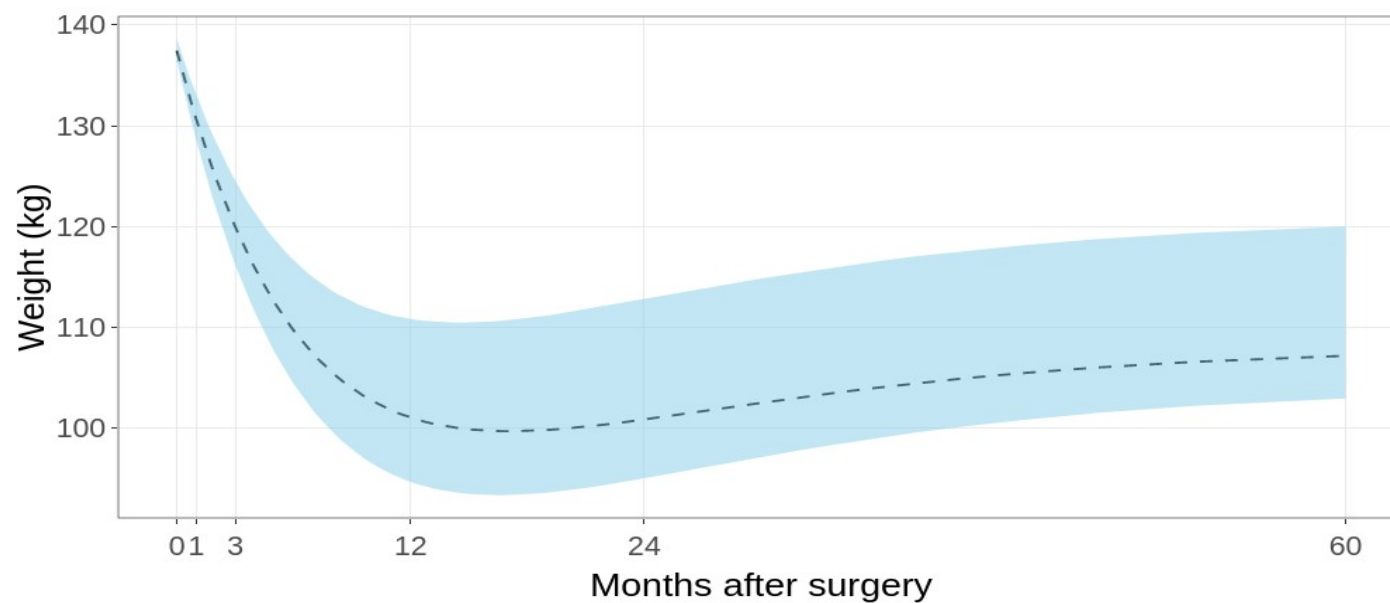
No

Type 2 diabetes?

Diabetes

Number of years with Type 2 diabetes ?

7



Columns definition ?

	%TWL	BMI	%EWL
Month 01 predictions	9	44.1	18
Month 03 predictions	14	41.7	28
Month 12 predictions	28	34.9	57
Month 24 predictions	27	35.4	55
Month 60 predictions	24	36.8	49



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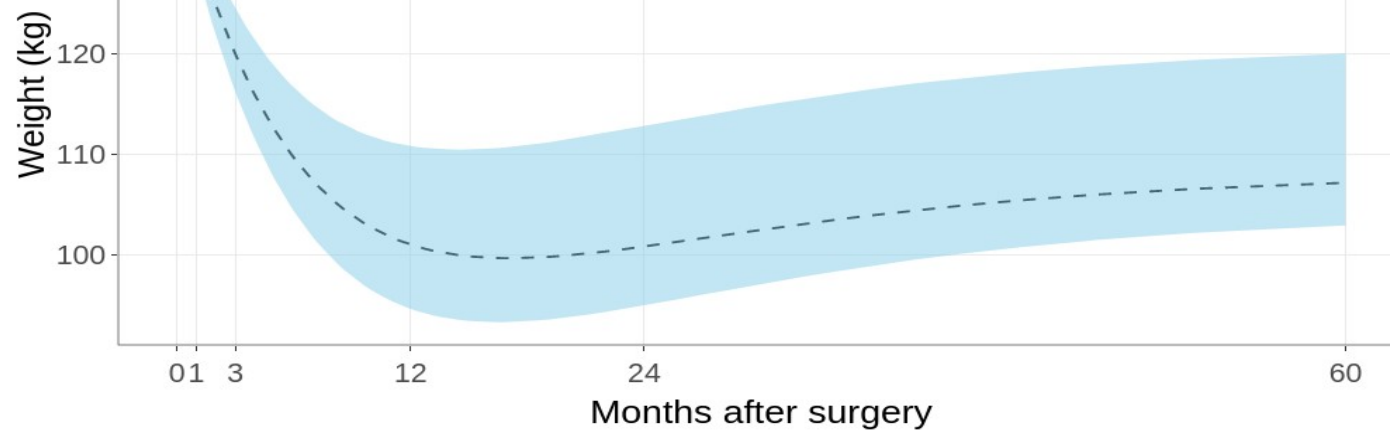
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- Patient attributes
- Can be used at home/during visit



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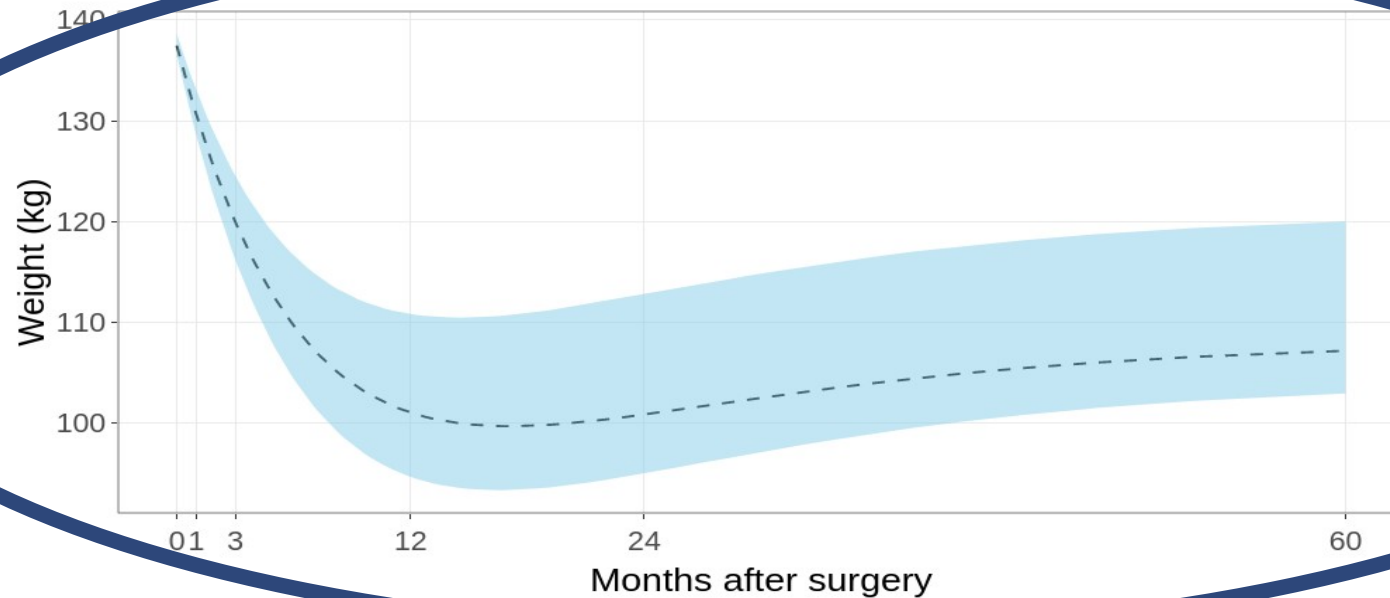
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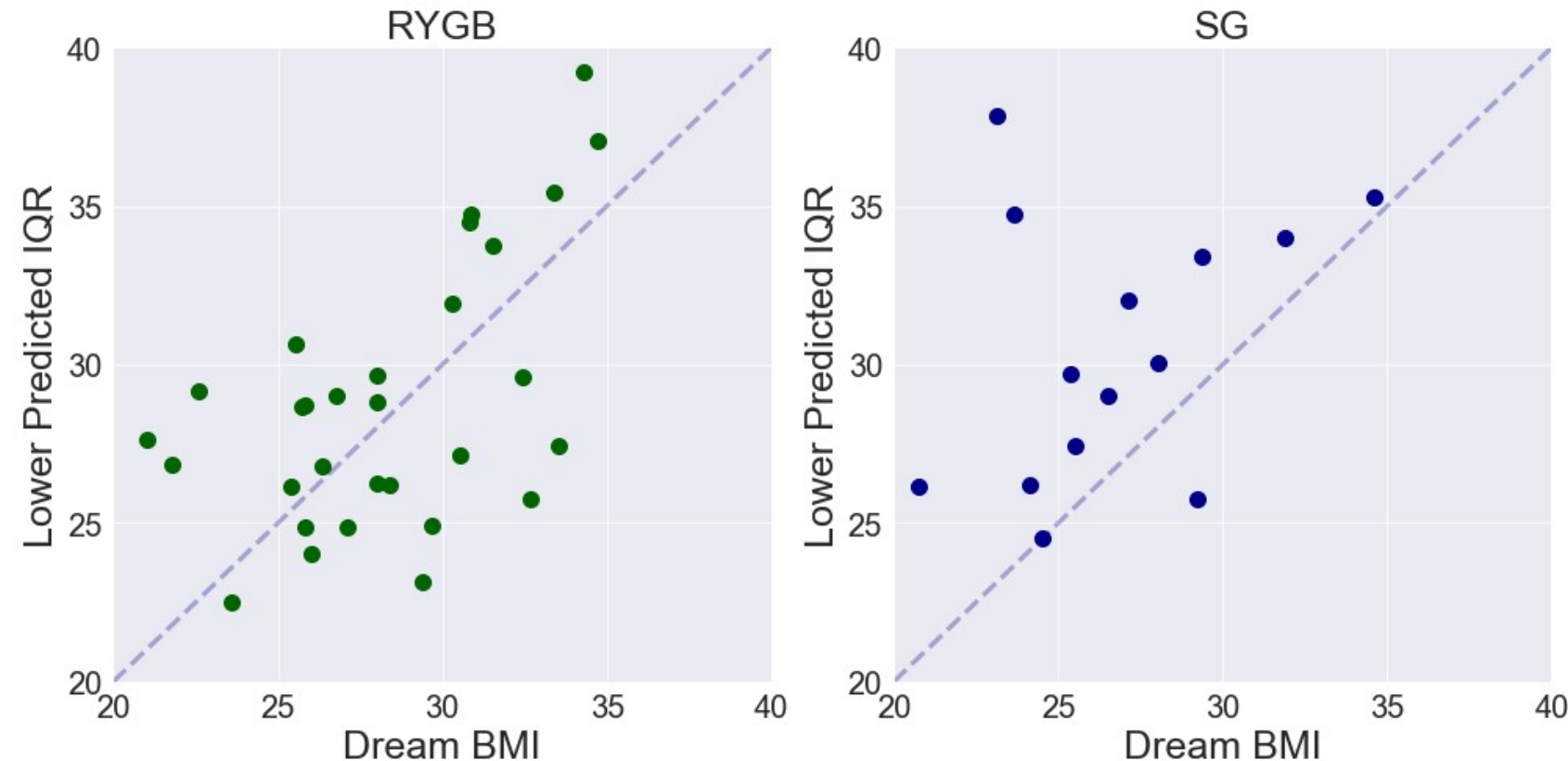
Diabetes



- Dashed line: expected trajectory for a “standard” patient
- Shaded area: “reasonable” deviation from expected (IQR)

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# Application: managing expectations



- 81 patients at CHU Lille
- Subjective “**dream weight**” provided during pre-op visit.

→ **Dream weights** are often outside of IQR.



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# Online Weight Trajectory Prediction Tool



<https://weight-trajectory-prediction-test.univ-lille.fr/>