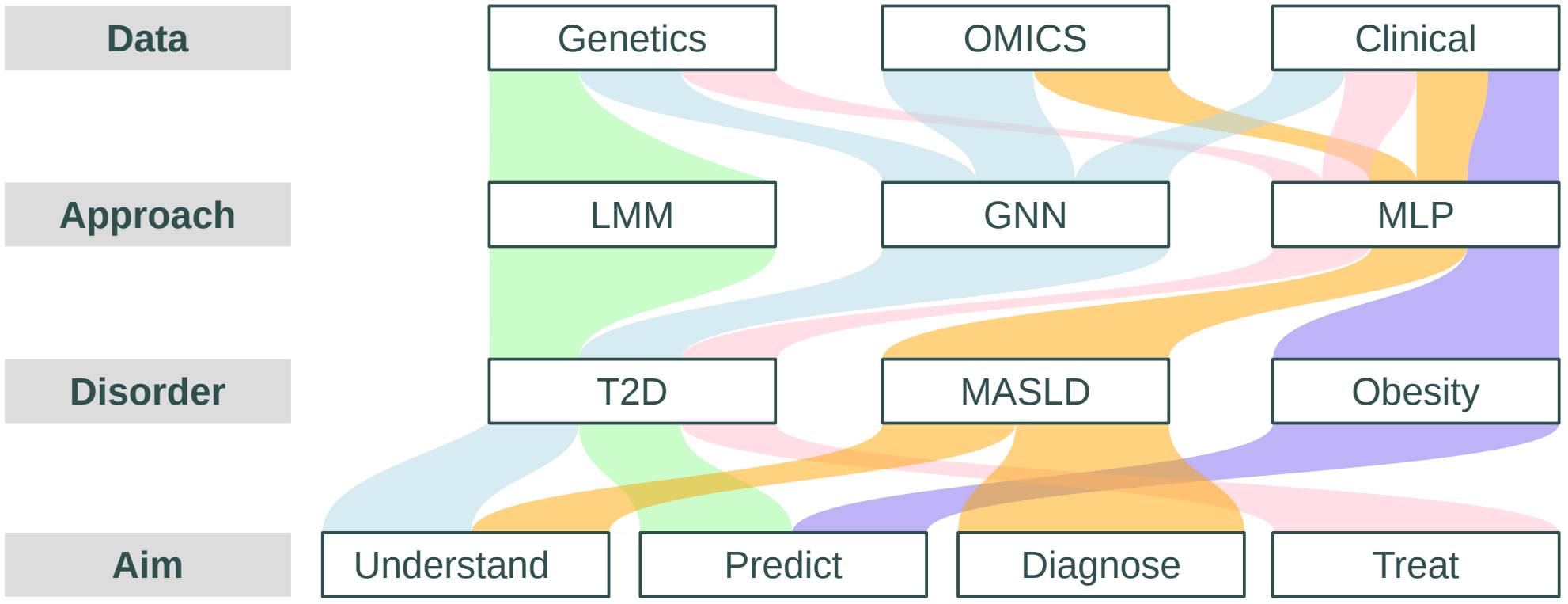
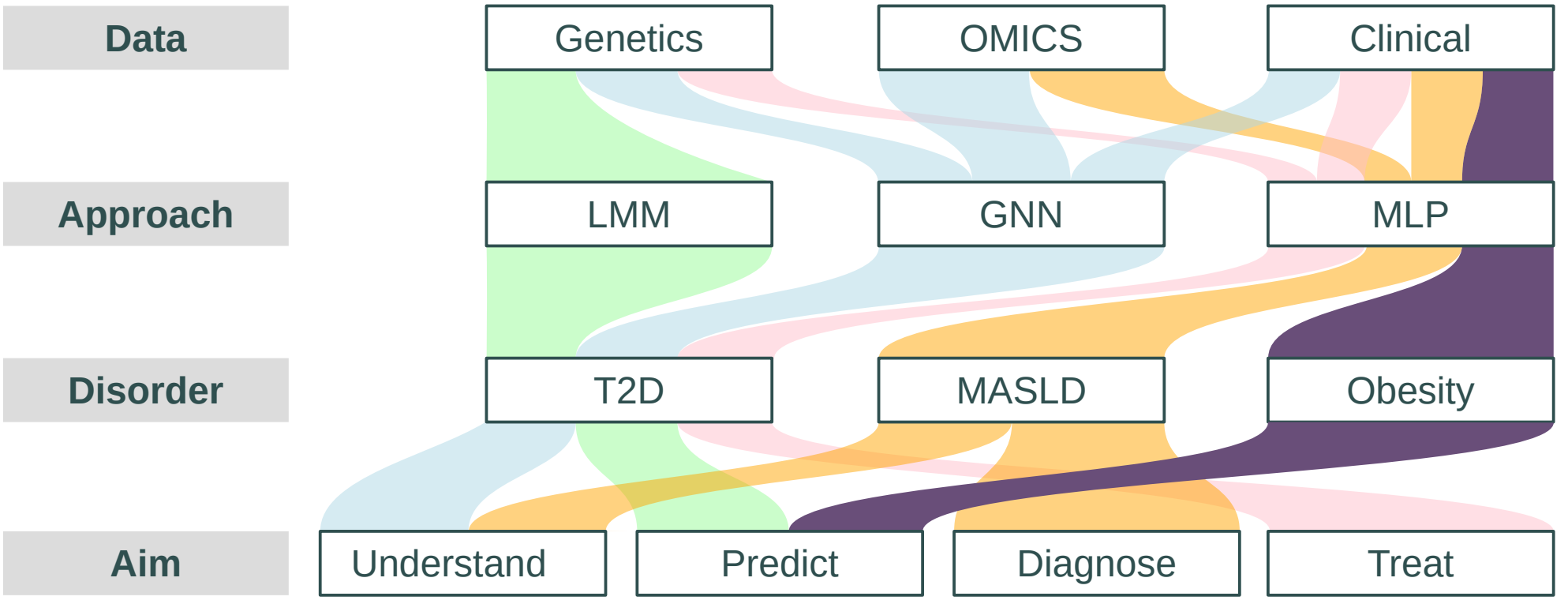
IA @ Egenodia


Steatosis
Diabetes
Artificialintelligence
Obesity
Deeplearning
Neuralnetwork
Encoderdecoder
Inflammation
Attention
Mash
Gru
Tensor
Gemini
Neuralnetwork
Lstm
Chatgpt
Cnn
Dnn
Artificialintelligence
Transformer
Predict
Fullyconnected
Treatment
Largelanguagemodel
Rnn
Encoderdecoder
Vae
Diagnosis
Prognosis
Deeplearning
Ssm
Llama
Autoencoder
Convolutional
Dense
Claude
Masld
Cluster
Tensor
Lmm
Transformer
Ssm
Claude
Steatosis
Dnn
Treatment
Rnn
Inflammation

Artificial Intelligence for the precision medicine of cardiometabolic disorders




Sami Le Guilcher



horizon europe

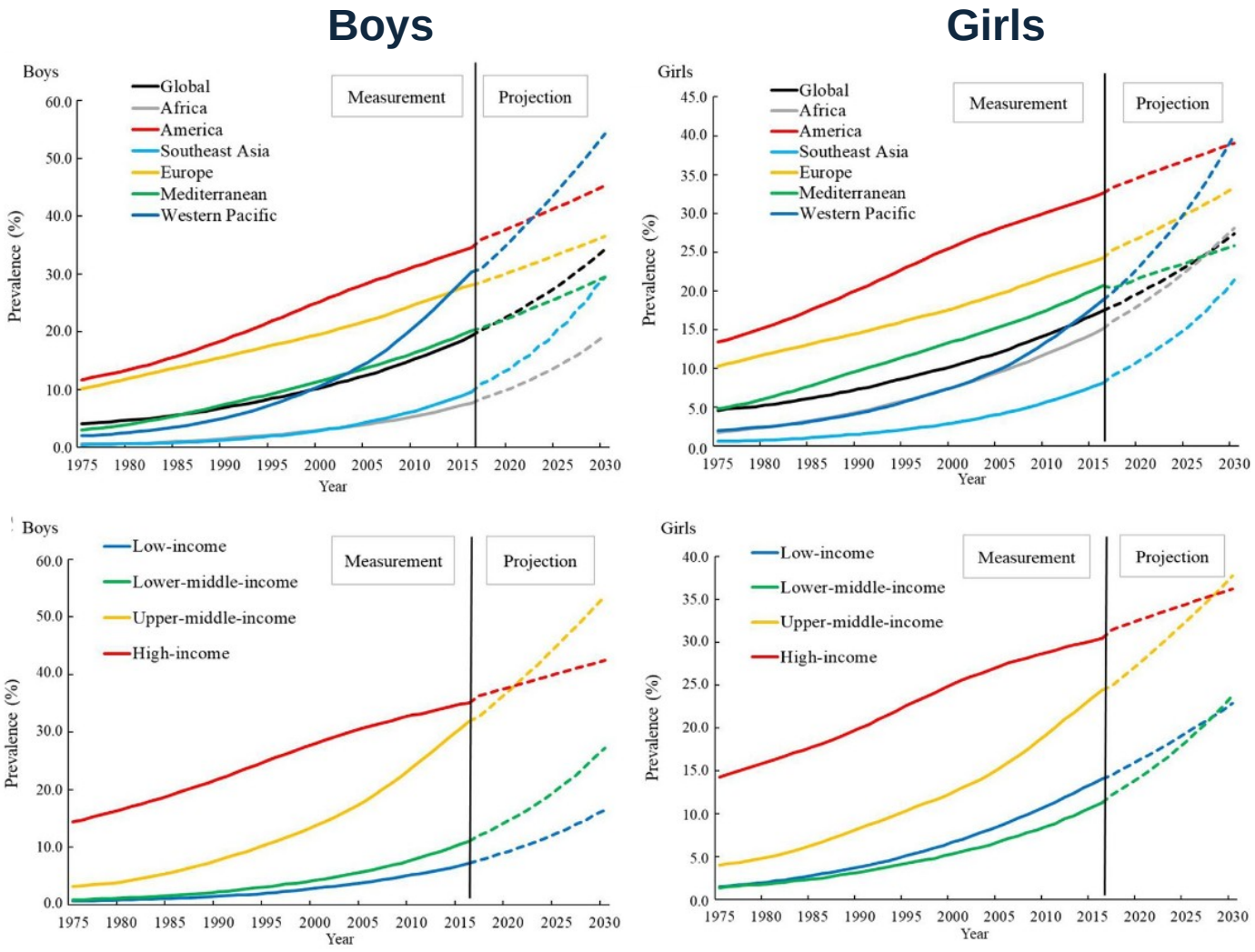
Obelisk

Childhood obesity, a fast growing epidemics, World

Geography

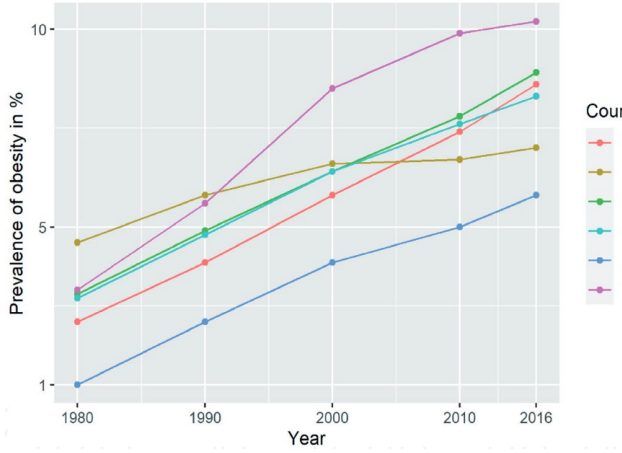
~1/3 of children are now overweight

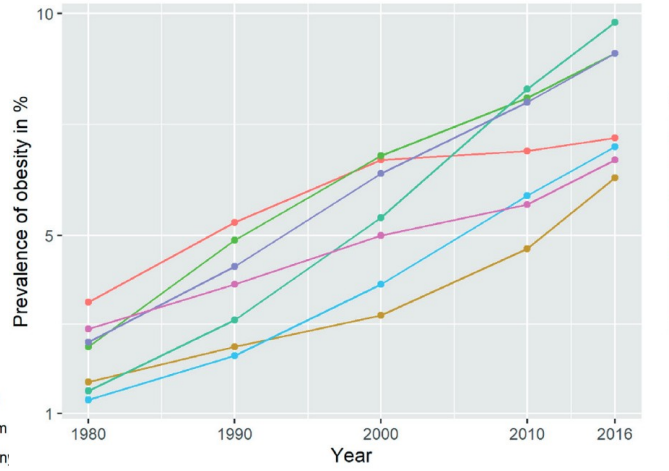
Income

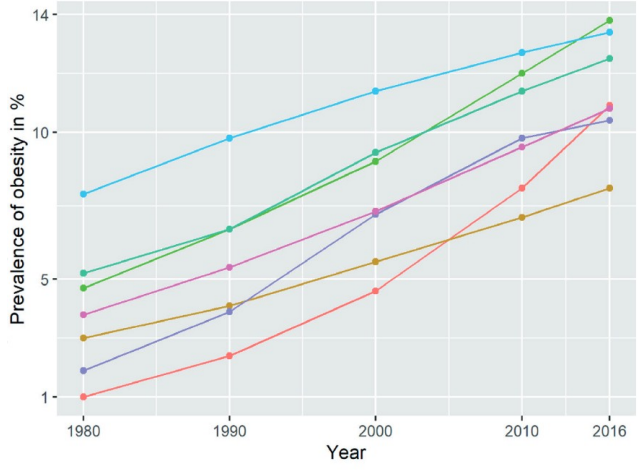


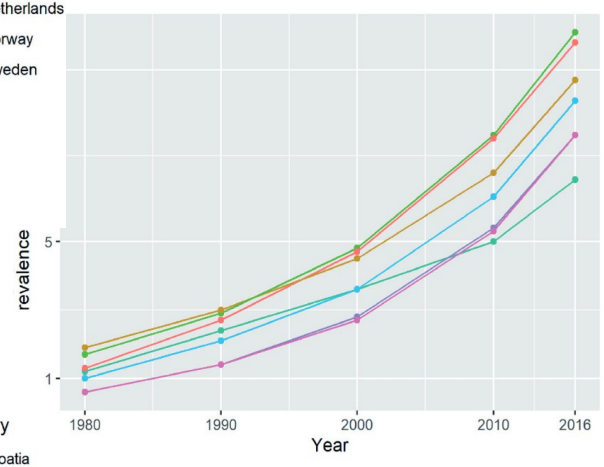
Gao *et al* (2023)
Spatial–temporal trends in global childhood overweight and obesity from 1975 to 2030: a weight mean center and projection analysis of 191 countries. *Globalization and Health*, 19
https://doi.org/10.1186/s12992-023-00954-5

Childhood obesity, a fast growing epidemics, Europe





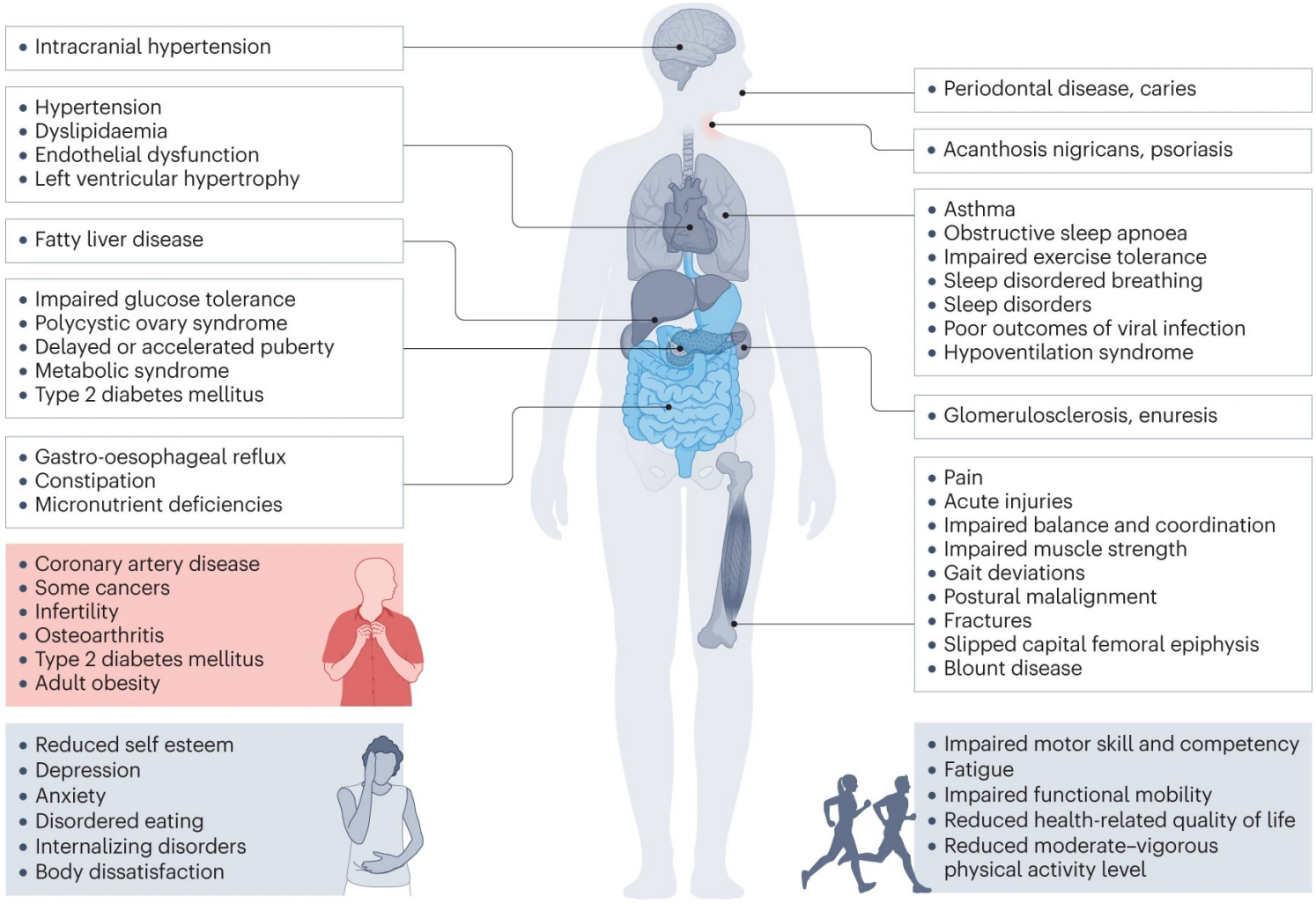




7-10% of European children are obese

Nitari *et al* (2020)
Epidemiology of Obesity in Children and Adolescents
Teamwork in Healthcare, IntechOpen
https://doi.org/10.5772/intechopen.93604

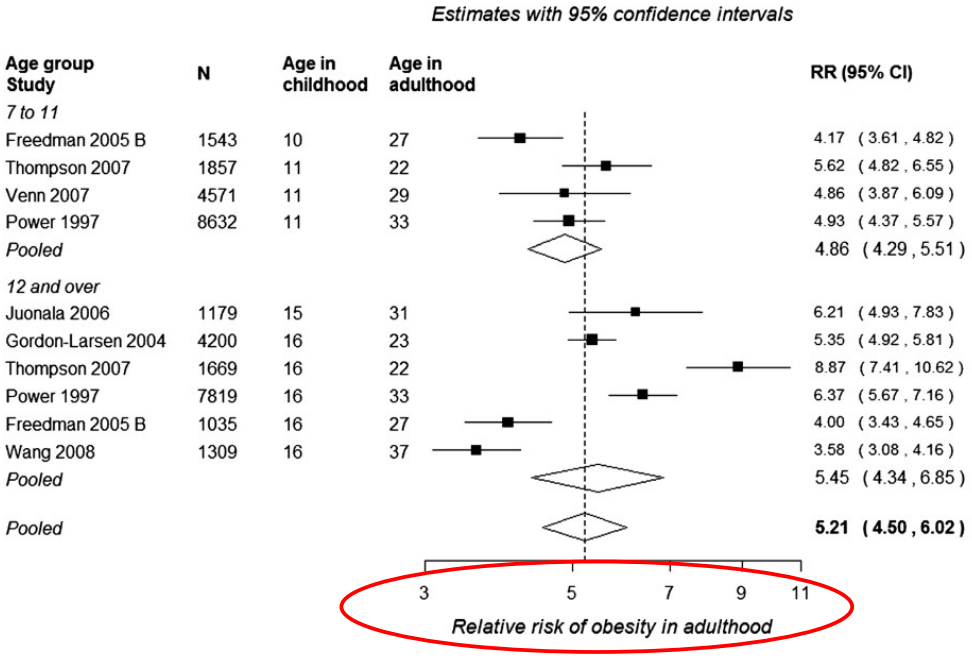
Childhood obesity triggers health problem throughout life

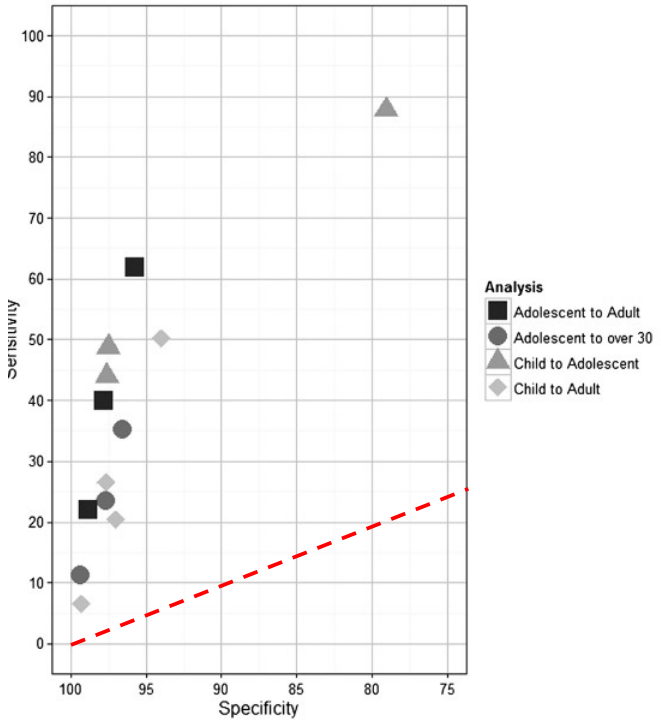


In adults

Lister *et al* (2023)
Child and adolescent obesity.
Nat Rev Disease Primer, 9: 24.
https://doi.org/10.1038/s41572-023-00435-4

Childhood obesity as a predictor of adult obesity





Simmonds *et al* (2016) Predicting adult obesity from childhood obesity: a systematic review and meta-analysis. *Obesity Reviews*, 17: 95-107. https://doi.org/10.1111/obr.1233

Obelisk

Preventing Childhood Obesity

FIGHTING CHILDHOOD OBESITY TO STAY HEALTHY ALL OVER THE LIFE (OBELISK)

Obelisk has received funding from the European Union's Horizon Europe Research and Innovation Programme under grant agreement 101080465. UK participant in Horizon Europe Project Obelisk is supported by UKRI grant number 10077650 (Beta Technology). This work is further supported by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 23.00160.

Obelisk Project Impacts

Increase the implementation of successful preventive and treatment programs in clinics and communities.

Decrease the rates of childhood obesity across the EU.

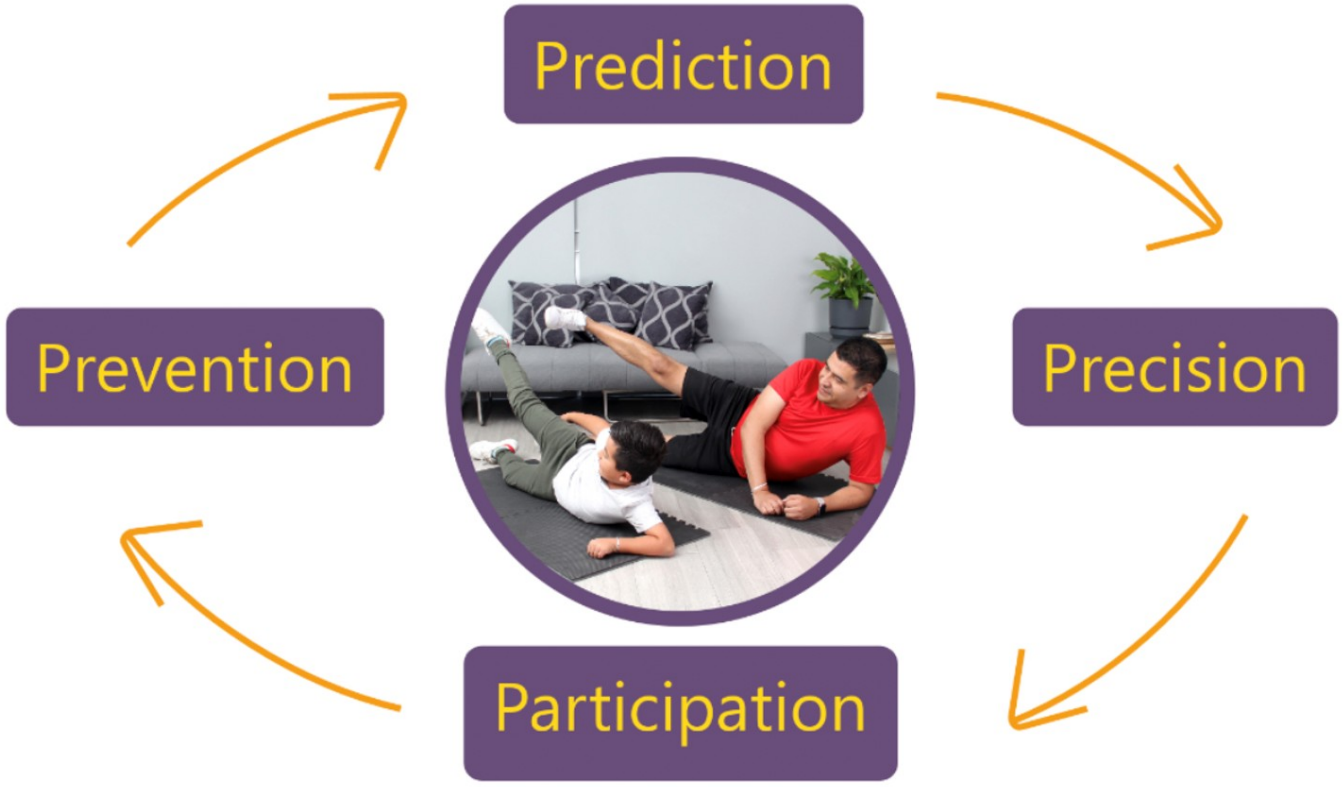
Increase the percentage of children and adolescents with obesity who successfully receive treatment and recover from obesity before adulthood.

Throughout their lives, children and adolescents with obesity experience improved health and a higher quality of life.

Families of children at risk for obesity or already have obesity can benefit from reduced economic burden through preventative measures and treatment options.

The evaluation of semaglutide in real-life scenarios may lead to the development of promising new medications, including dual GIP/GLP1 receptor agonists, for common types of early-onset obesity accompanied by appetite dysregulation.

WP5 4P strategies for children with obesity



Obelisk
Preventing Childhood Obesity

WP1 Cohorts & Trajectories

- To enrich an ongoing catalogue of FAIR data on children and their parents

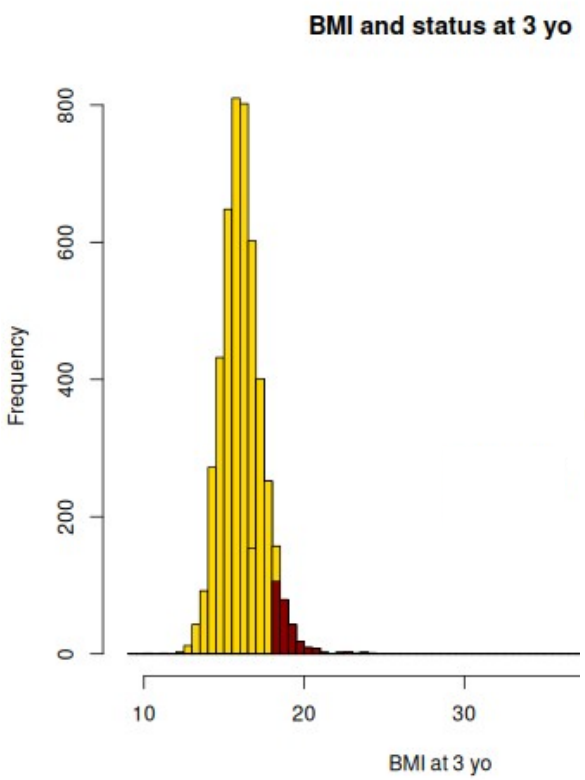
- To define and explore the trajectories of childhood obesity

- To model and evaluate the burden of childhood obesity trajectories

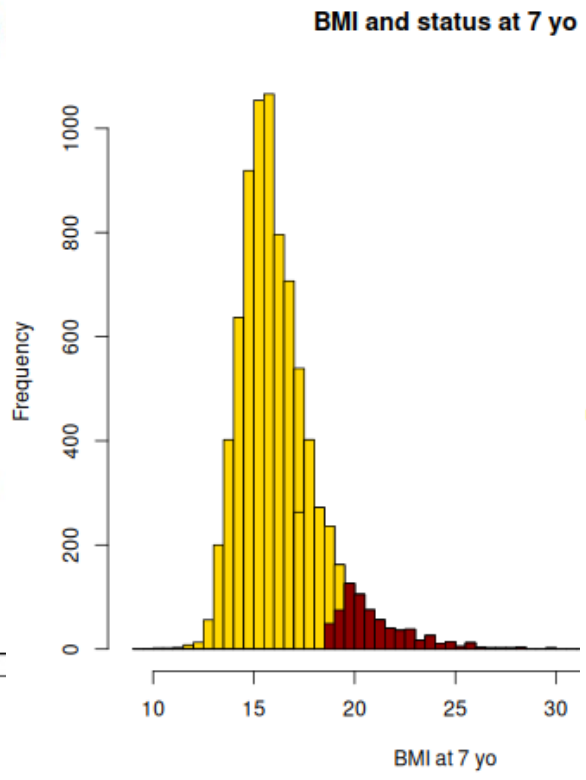
Country	Cohort
Denmark	TOPS
Denmark	Offspring of Mother With GDM
EU	EU Child Cohort Network ((ALSPAC, Generation R, EDEN, Picolipiù)
Finland	Northern Finland Birth Cohort 1966
Finland	Northern Finland Birth Cohort 1986
Finland	Finnish Gestational Diabetes study
France	French cohort on rare obesity
France	GOOD
France	ELIPSE
Italy	PRECI.MED-VR (Obesity)
Italy	Childhood obesity group- Messina

Obelisk
Preventing Childhood Obesity

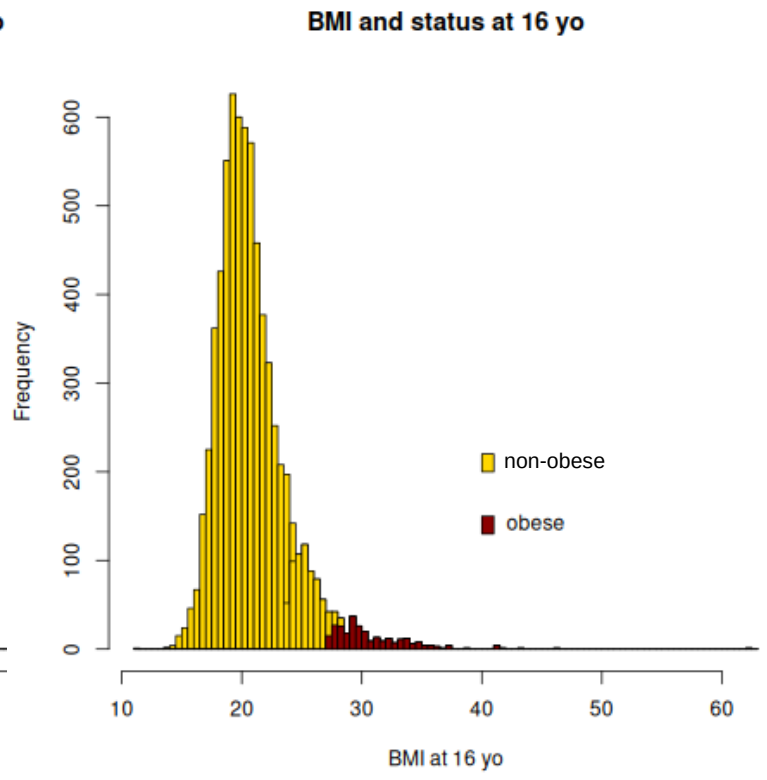
The Finn youth population was reasonably fit



5.85%

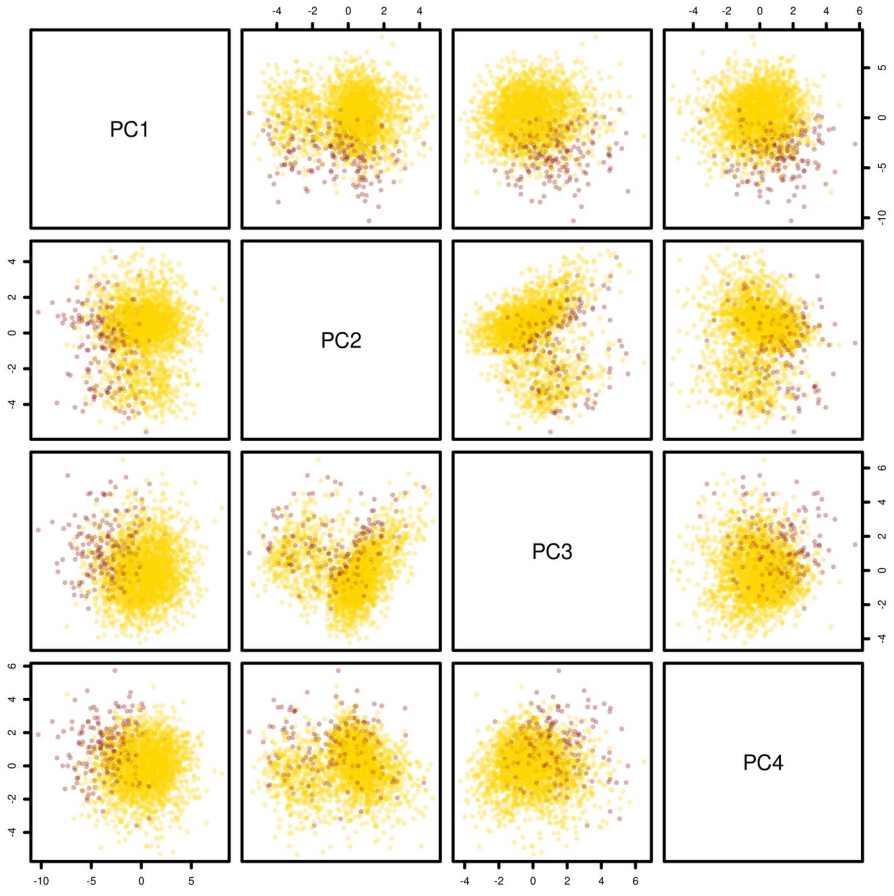


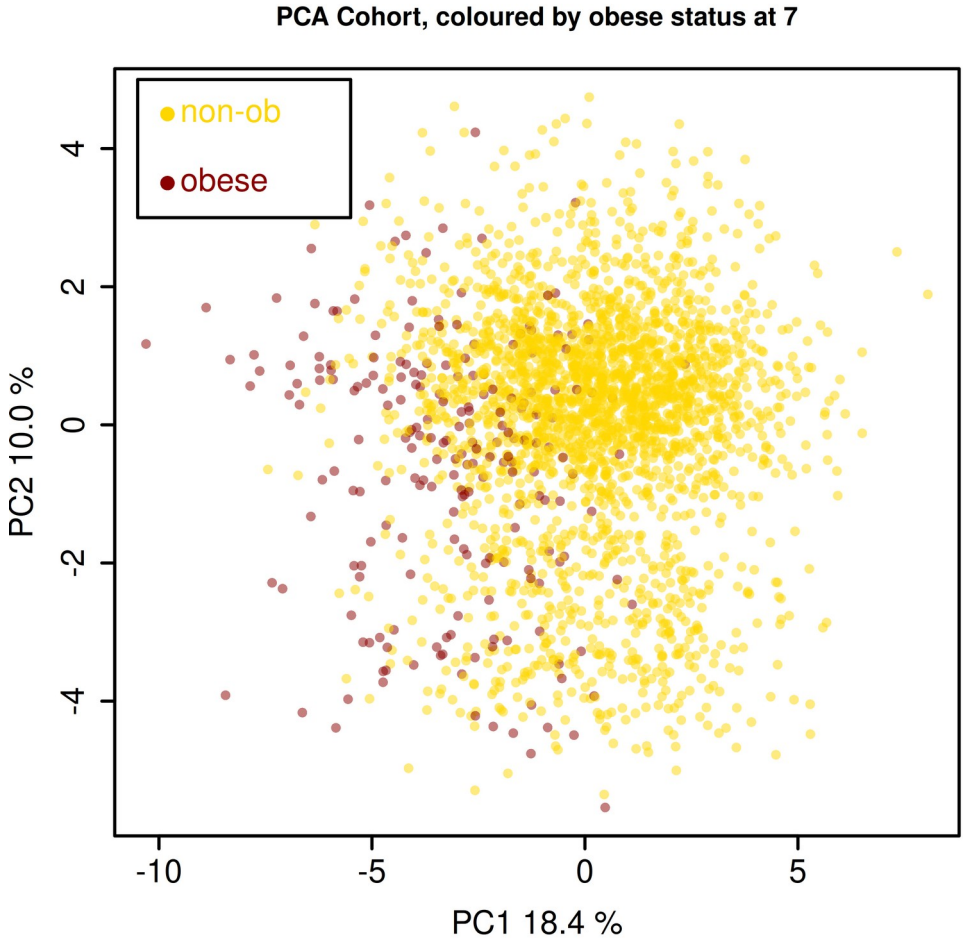
8.69%



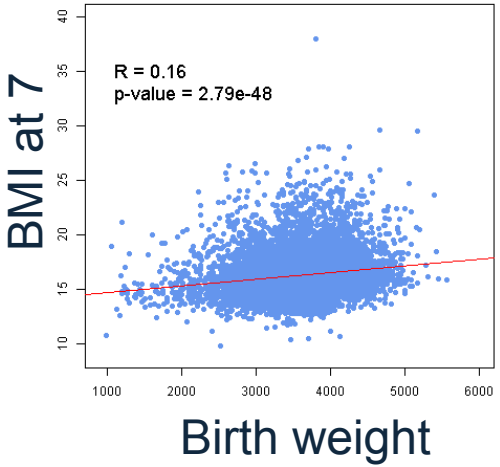
4.02%

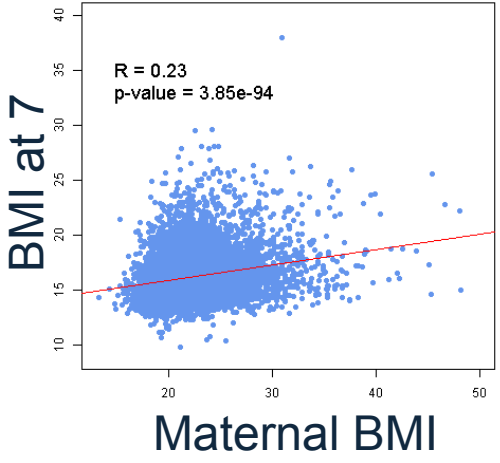
Obese *vs* non-obese differ but clusters are not well defined

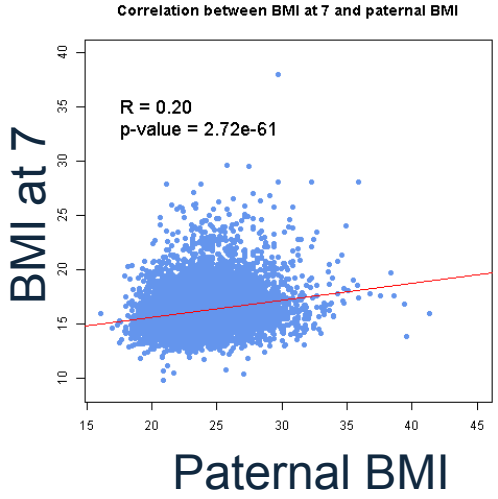




Few quantitative variables clearly correlate with obesity



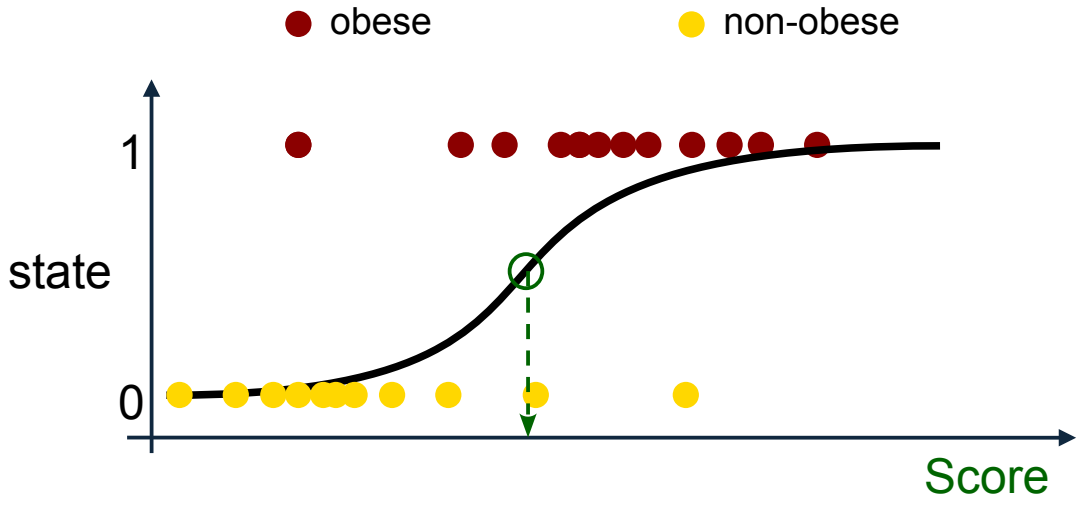




SOA: Morandi *et al* 2012, biological and socioeconomic variables

$$p(X) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 V_1 + \beta_2 V_2 + \ldots)}}$$

linear regression

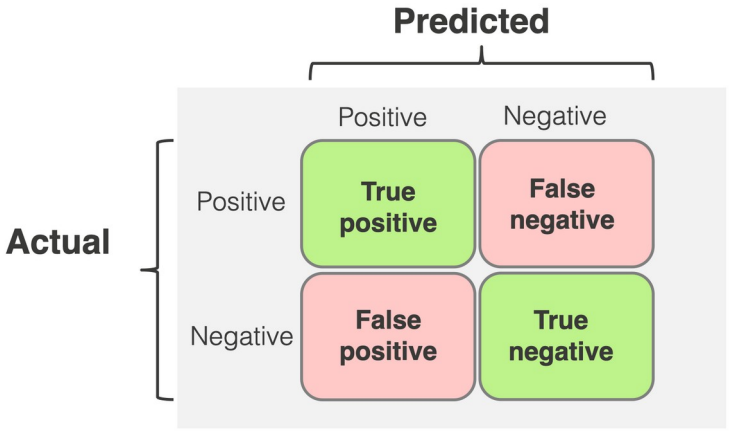


NFBC·1986:¶

Risk·for·childhood·obesity = e^(-10.61+0.12·x·maternal·BMI·+·0.18·x·paternal·BMI·-0.31·x·number·of·household·members·-·0.69·x·maternal··occupation·+·0.61·x·gestational·smoking*·+·0.75·x·birth·weight)·/·(1·+·e^(-10.61+0.12·x·maternal·BMI·+·0.18·x·paternal·BMI·-0.31·x·number·of·household·members·-·0.69·x·maternal··occupation·+·0.61·x·gestational·smoking*·+·0.75·x·birth·weight))¶

Morandi A, Meyre D, Lobbens S, Kleinman K, Kaakinen M, Rifas-Shiman SL, Vatin V, Gaget S, Pouta A, Hartikainen AL, Laitinen J, Ruokonen A, Das S, Khan AA, Elliott P, Maffeis C, Gillman MW, Järvelin MR, Froguel P (2012) Estimation of Newborn Risk for Child or Adolescent Obesity: Lessons from Longitudinal Birth Cohorts. *PLoS ONE* **7**(11): e49919. https://doi.org/10.1371/journal.pone.0049919

Evaluating a model's performance

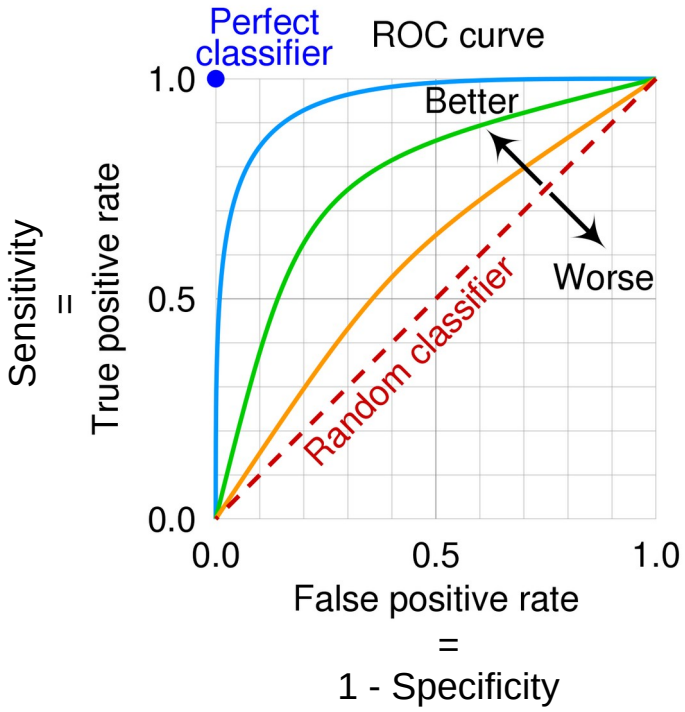


Accuracy = (TP+TN)/(TP+FN+TN+FP)

Sensitivity (true positive rate) = TP/(TP+FN)
"Can we predict all obese kids?"

Specificity (true negative rate) = TN/(TN+FP)
"Can we avoid wrongly predictiing obesity?"

Receiver operating characteristic (ROC) curve: performance ~ Area Under the Curve (AUC)



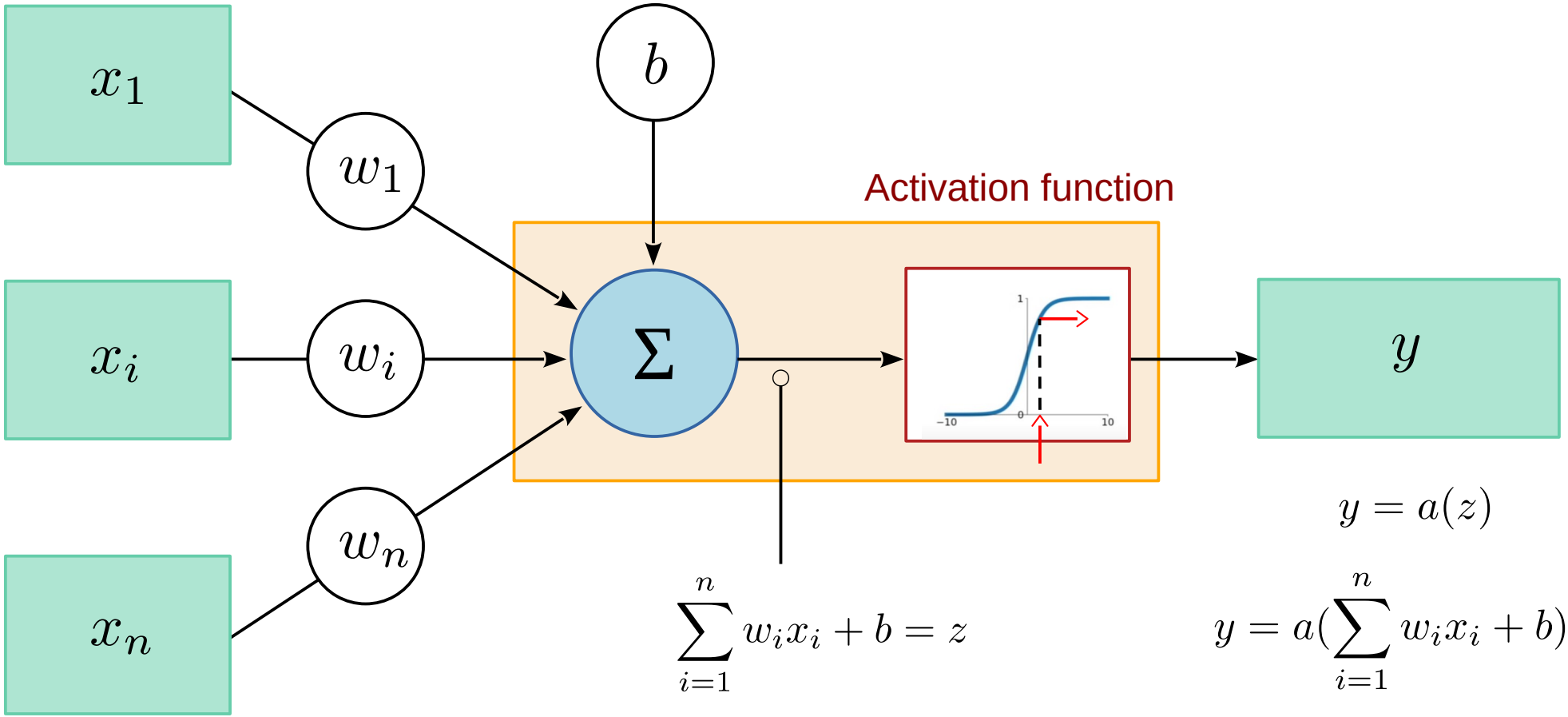
SOA: Morandi *et al* 2012, biological and socioeconomic variables

	AUROC when term is added
Childhood Overweight-Obesity	
Maternal BMI	*0.63 (0.60–0.65)*
Paternal BMI	*0.65 (0.62–0.67)*
N of household members	*0.66 (0.64–0.68)*
Gestational weight gain	*0.66 (0.64–0.69)*
Birth weight	*0.67 (0.65–0.69)*
Maternal smoking	**0.67 (0.65–0.69)**

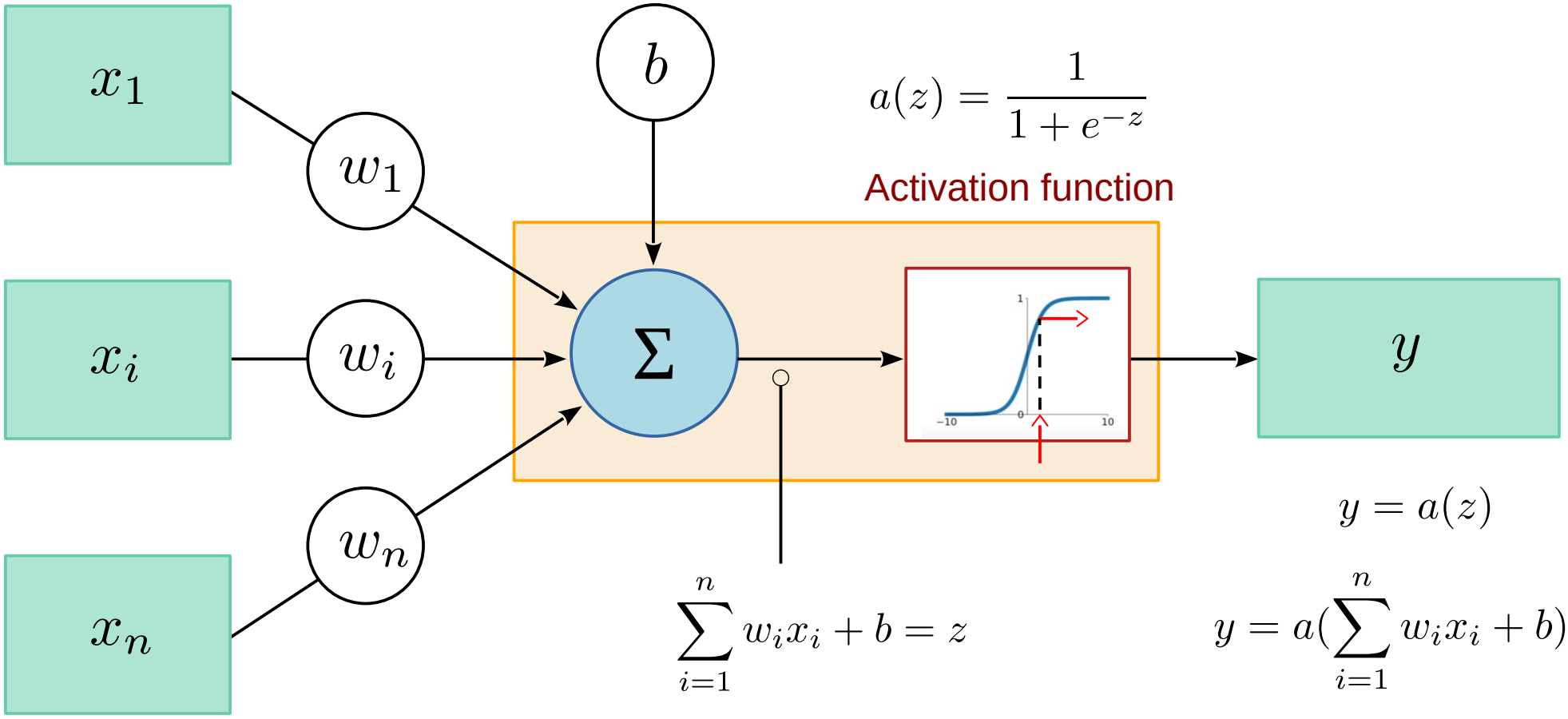
	AUROC when term is added
Childhood Obesity	
Paternal BMI	*0.68 (0.64–0.73)*
Maternal BMI	*0.74 (0.70–0.78)*
N of household members	*0.77 (0.73–0.80)*
Birth weight (kg)	*0.77 (0.73–0.80)*
Maternal occupation	*0.77 (0.73–0.81)*
Gestational smoking	**0.78 (0.74–0.82)**

Morandi A, Meyre D, Lobbens S, Kleinman K, Kaakinen M, Rifas-Shiman SL, Vatin V, Gaget S, Pouta A, Hartikainen AL, Laitinen J, Ruokonen A, Das S, Khan AA, Elliott P, Maffeis C, Gillman MW, Järvelin MR, Froguel P (2012) Estimation of Newborn Risk for Child or Adolescent Obesity: Lessons from Longitudinal Birth Cohorts. *PLoS ONE* **7**(11): e49919. https://doi.org/10.1371/journal.pone.0049919

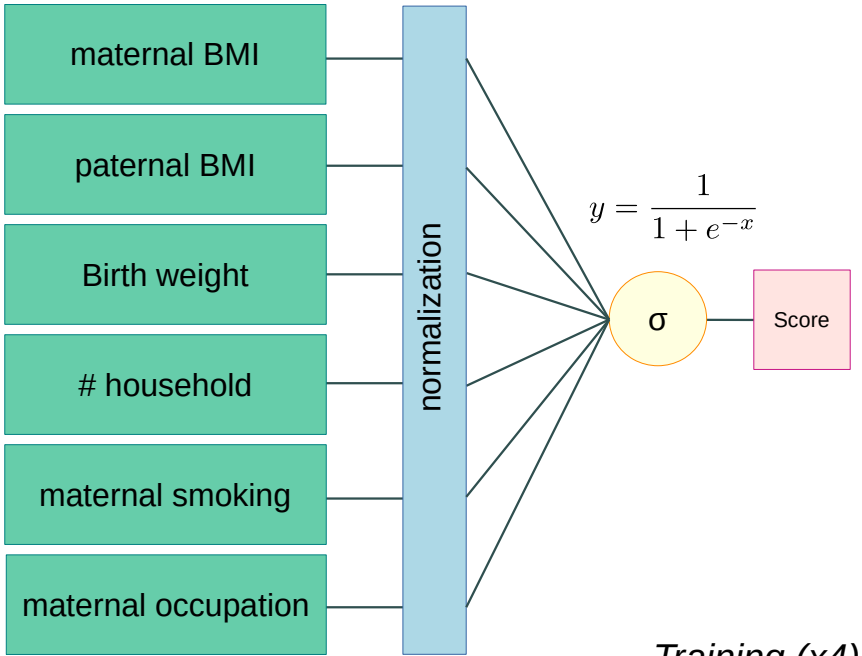
The artificial neuron



logistic regression ≈ 1 artificial neuron



Let’s retrain Morandi

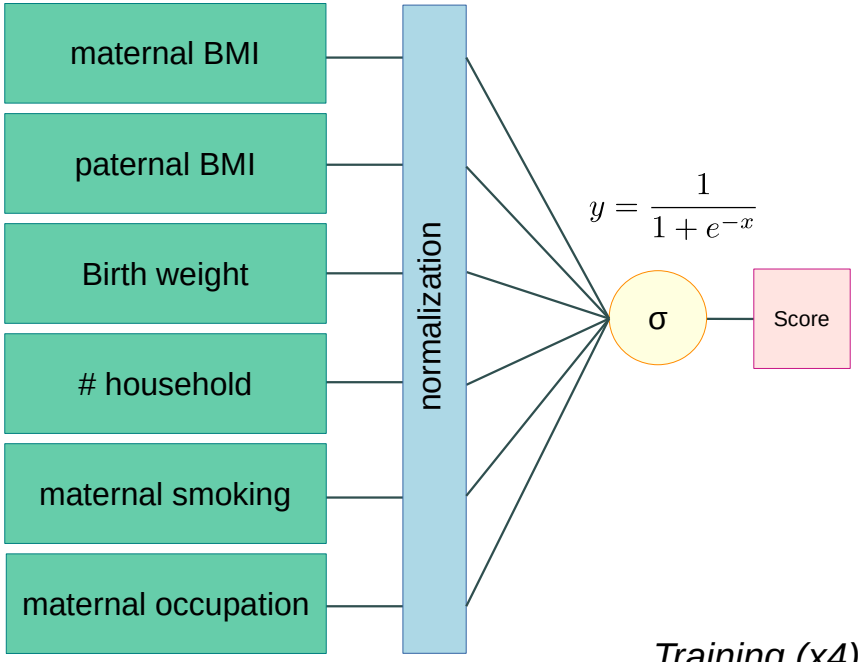


NB:
Maternal occupation
1 = unskilled/apprentice/unemployed
2 = skilled manual
3 = skilled non manual
4 = entrepreneur/professional

Training (x4)
290 obese
580 non-obese

Test and Validation
96 obese
192 non-obese

Let's retrain Morandi



NB:
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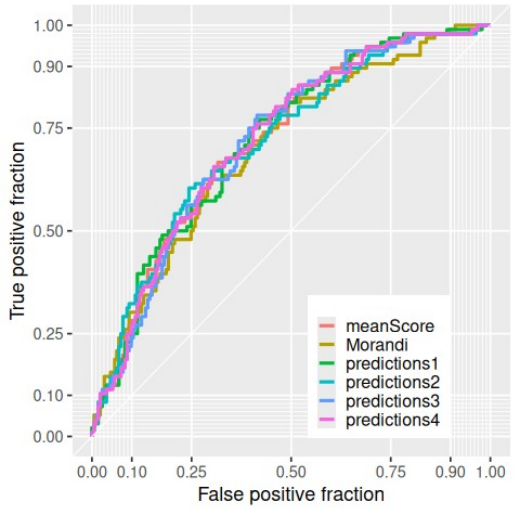
3 = skilled non manual
4 = entrepreneur/professional

Training (x4)
290 obese
580 non-obese

Test and Validation
96 obese
192 non-obese

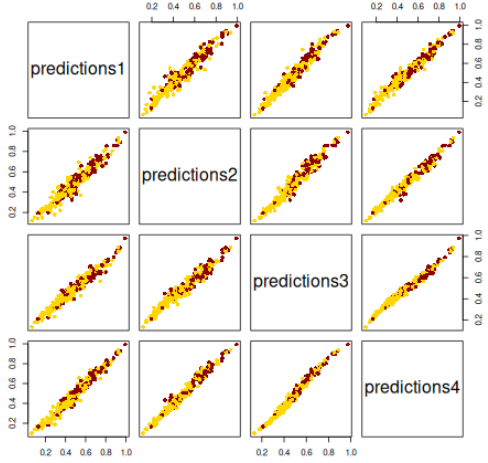
Validation set

AUC
Morandi = 0.701
Now = 0.72
Sensitivity = 64.6

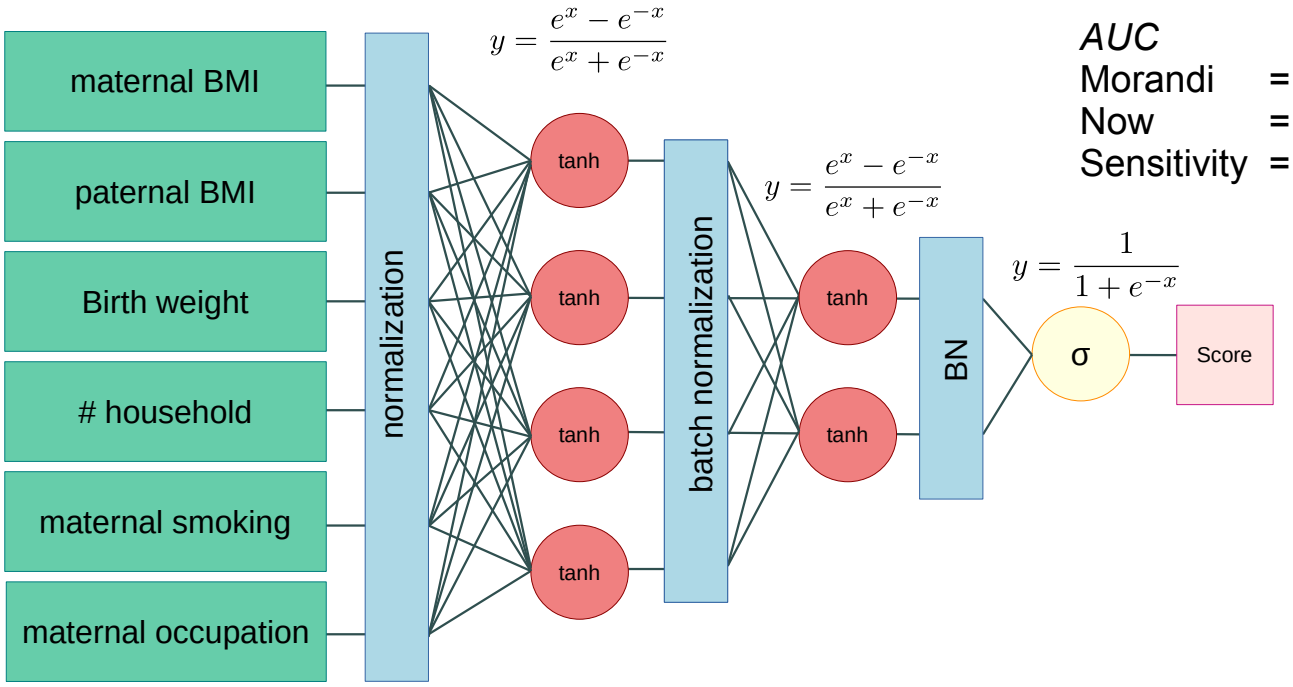


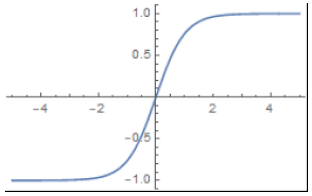
- actually obese
- actually non-obese

Comparison models' scores



Can we improve on that?





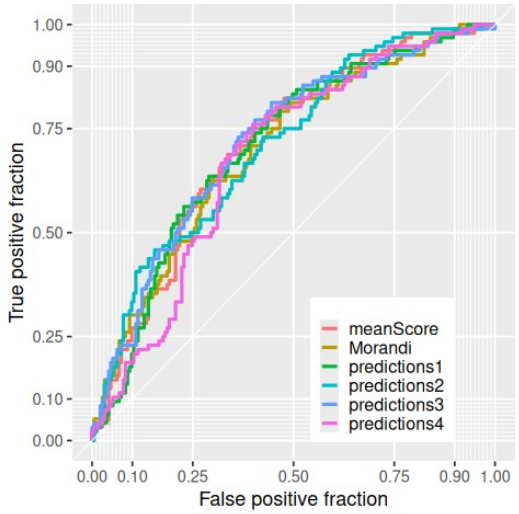
AUC

Morandi = 0.701

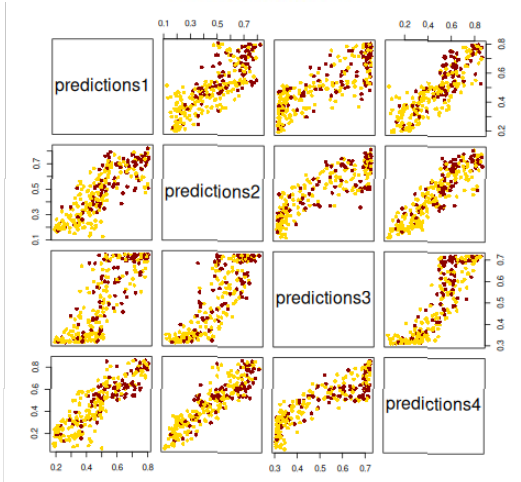
Now = 0.726

Sensitivity = 67.7

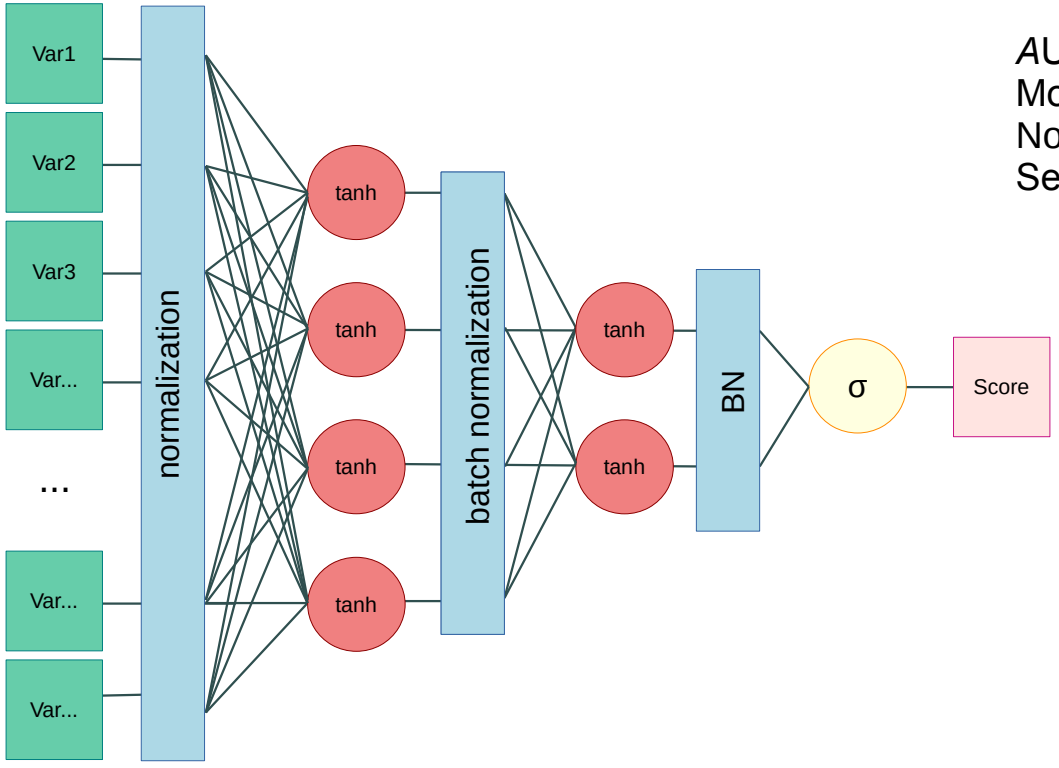
Validation set



Comparison models' scores

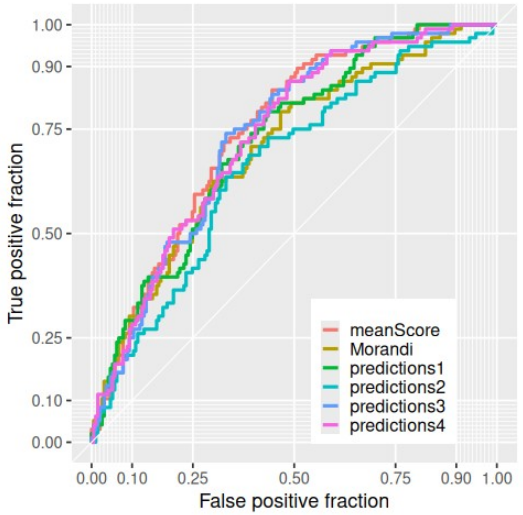


Increasing the number of variables

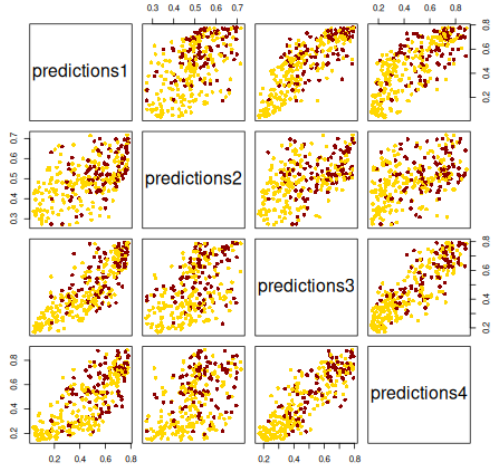


AUC
Morandi = 0.701
Now = 0.745
Sensitivity = 69.8

Validation set



Comparison models' scores

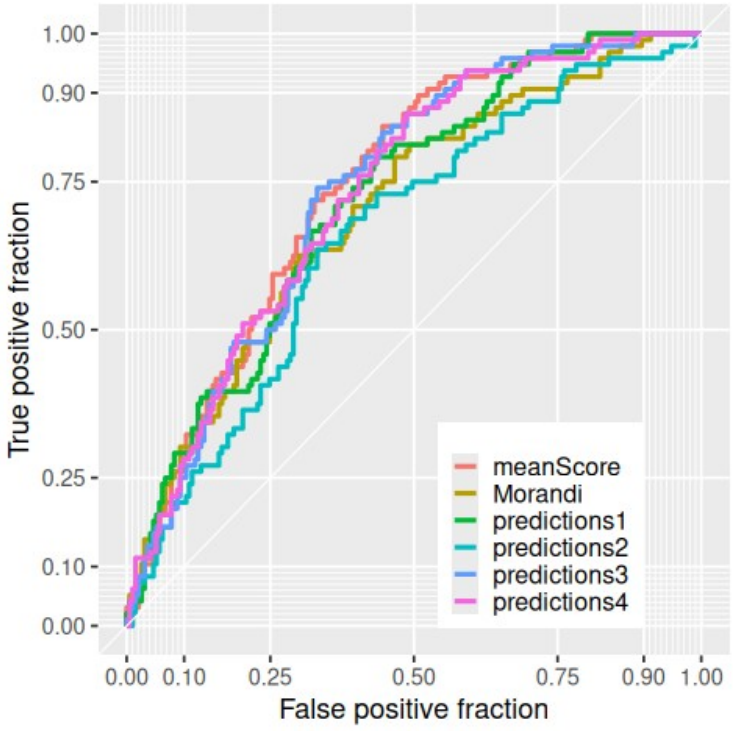


Variables =
gender, birth weight, BMI mat, BMI pat, gestational weight gain, # household, maternal smoking (2nd month), maternal and paternal alcohol, maternal and paternal education, maternal and paternal occupation

4 levels based on ISCED

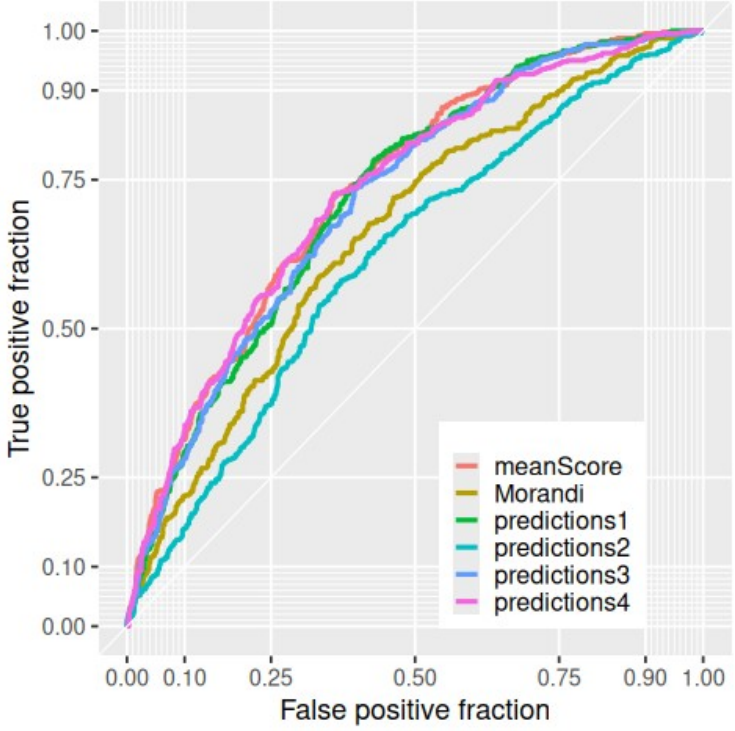
Increasing the number of variables

Validation set



AUC
Morandi = 0.701
Now = 0.745
Sensitivity = 69.8

Entire set



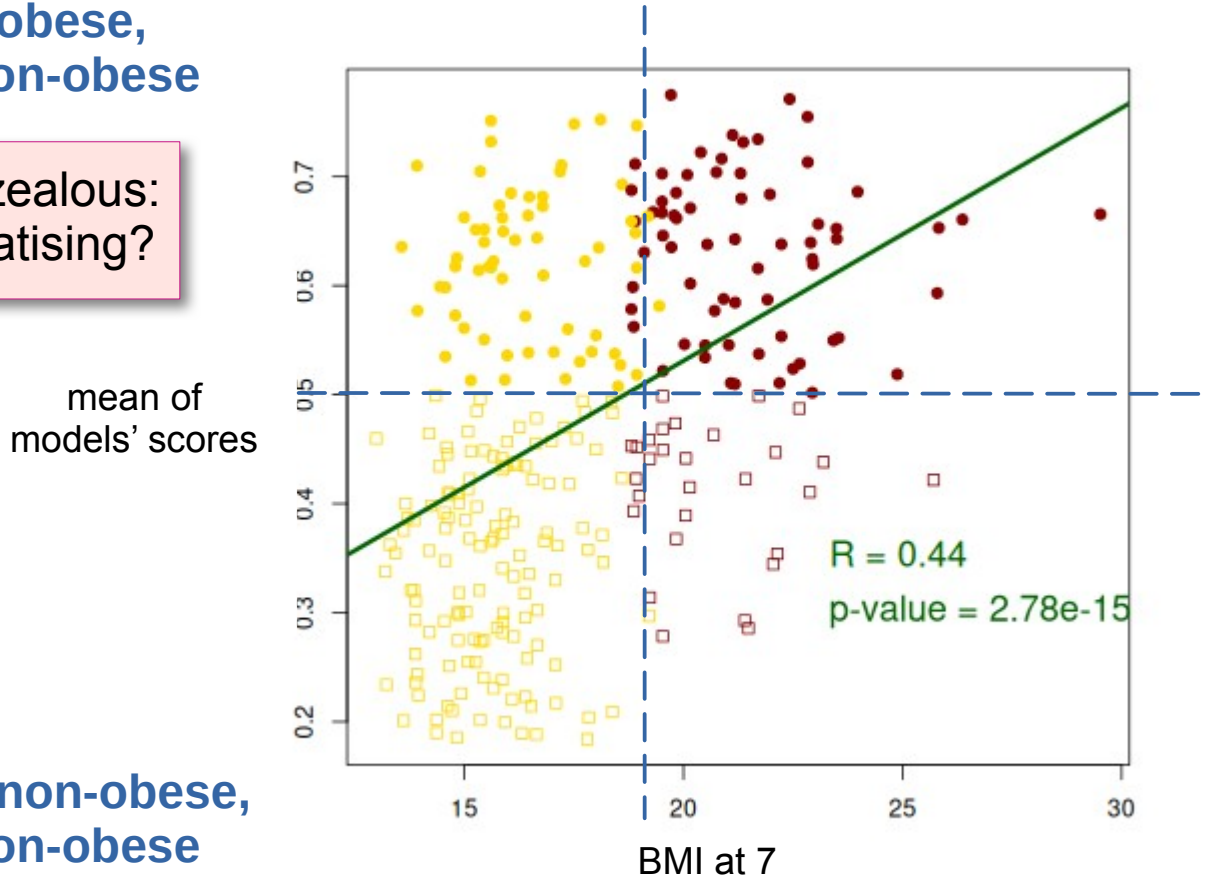
AUC
Morandi = 0.661
Now = 0.73
Sensitivity = 71.4

How good is the prediction?

FP =
predicted obese,
actually non-obese

Over-zealous:
Stigmatising?

TP =
predicted obese,
actually obese



Missed:
Failure to duty?

TN =
predicted non-obese,
actually non-obese

FN =
predicted non-obese,
actually obese

mean of models' scores correlates with BMI

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Université de Lille

UMR 1283 8199
Functional (Epi)genomics and Mechanisms of Type 2 Diabetes and Related Diseases

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Région Hauts-de-France