The Other Pandemic
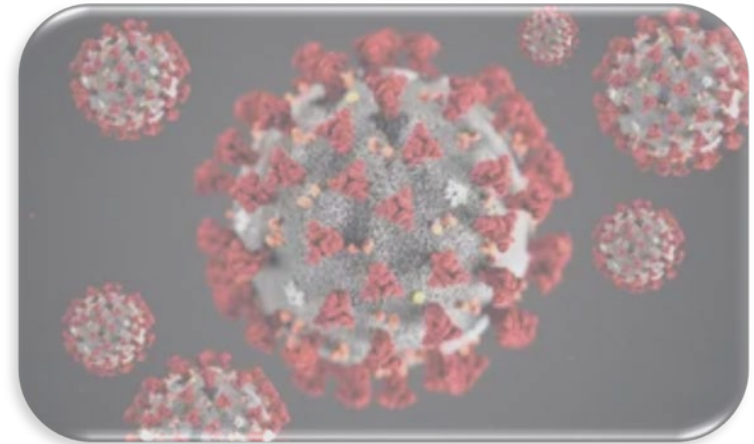

Dr Gareth Kantor
June, 2021

Poor metabolic health
~~is~~ was the world's single biggest
public health problem

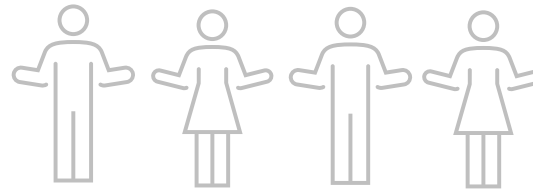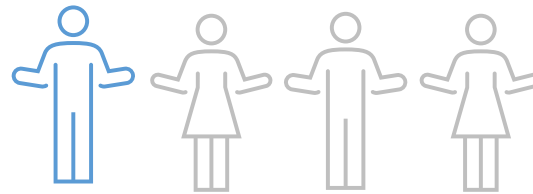driven largely by diet but
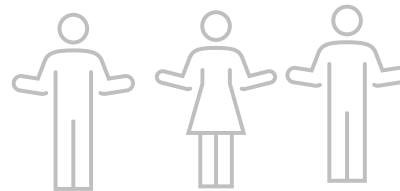
current approaches
aren't working

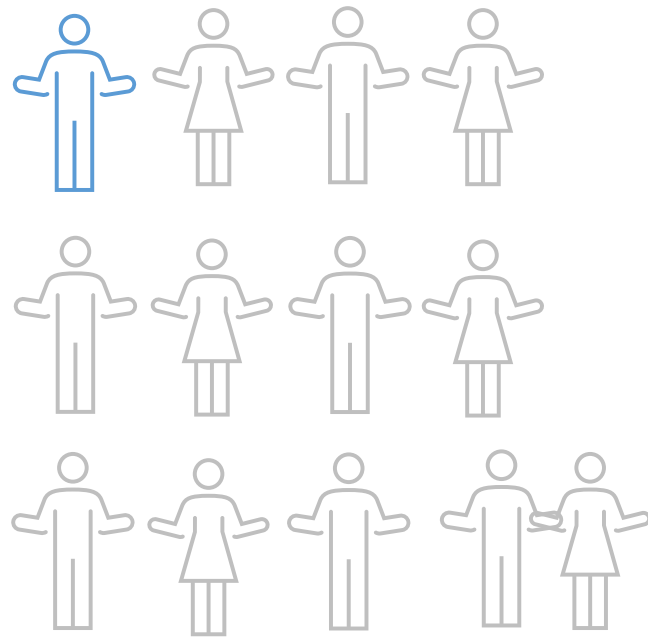**1 in 11**
diabetes

1 in 2
undiagnosed

463 million
adults

Metabolic Syndrome & Related Disorders, 2018

1 in 13
impaired glucose tolerance

Prediabetes

374 million
adults

> 70% of prediabetes progresses to diabetes

PLoS Biology 2018

International Diabetes Federation

Metabolic Syndrome & Related Disorders, 2018
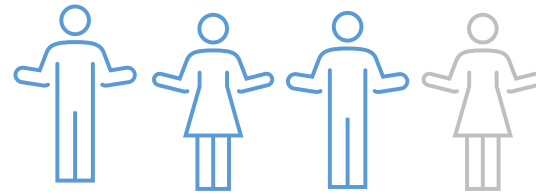
88%

metabolically unhealthy

Defined by
- blood sugar and HbA1c
- blood pressure > 140/90mmHg
- waist circumference
- triglycerides and HDL cholesterol

JAMA, 2015

National Health and Nutrition Examination Survey (USA)

3 in 4
people with diabetes
live in LMICs

	2010	2019
Diabetes	1.3m 4.5%	4.6m **12.7%**
Undiagnosed diabetes		2.4m
Impaired Glucose Tolerance (prediabetes)		3.4m **9%**
Attributable deaths	89,800	

Type 2 Diabetes

60

50   **54.9**

Per 1 000 beneficiaries

40

32.3

↑7% per year

20

10

0

2011 2012 2013 2014 2015 2016 2017 2018 2019
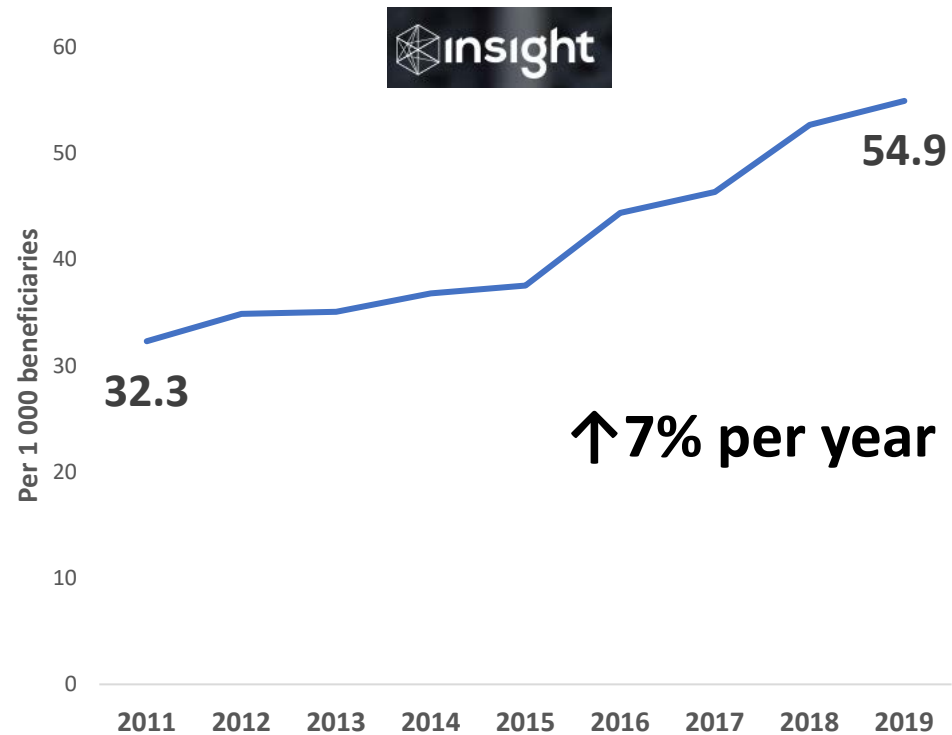
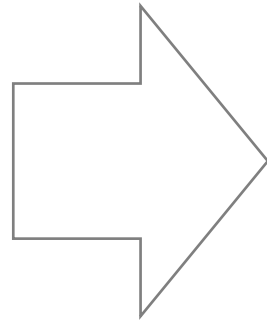**48.2%**   **Overweight & obesity**

Adults

10%
of global health expenditure
USD760 billion

Metabolic syndrome (MS)

**diabetes
high blood pressure
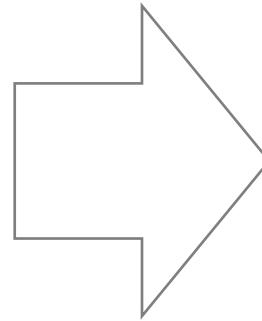obesity**

heart attack
stroke

dementia
cancer

+
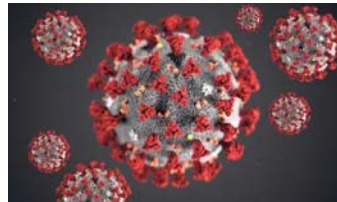
Covid-19

RR
(Relative Risk)

	RR
Mortality	**2.1**
Disease severity	2.5
Disease progression	3.3
Severe pneumonia	4.6

Huang I et al. Diabetes Metab Syndr 2020;1494):395-403

Cell Metabolism 31, 1068–1077, June 2, 2020

Roden M, Shulman GI. The integrative biology of type 2 diabetes. Nature 2019;576(7785):51-60.

fatty liver disease

insulin
resistance

↑ insulin
↓ β-cell function

dysfunction
lipolysis (breakdown)

↓ glycogen storage of
ingested carbohydrate
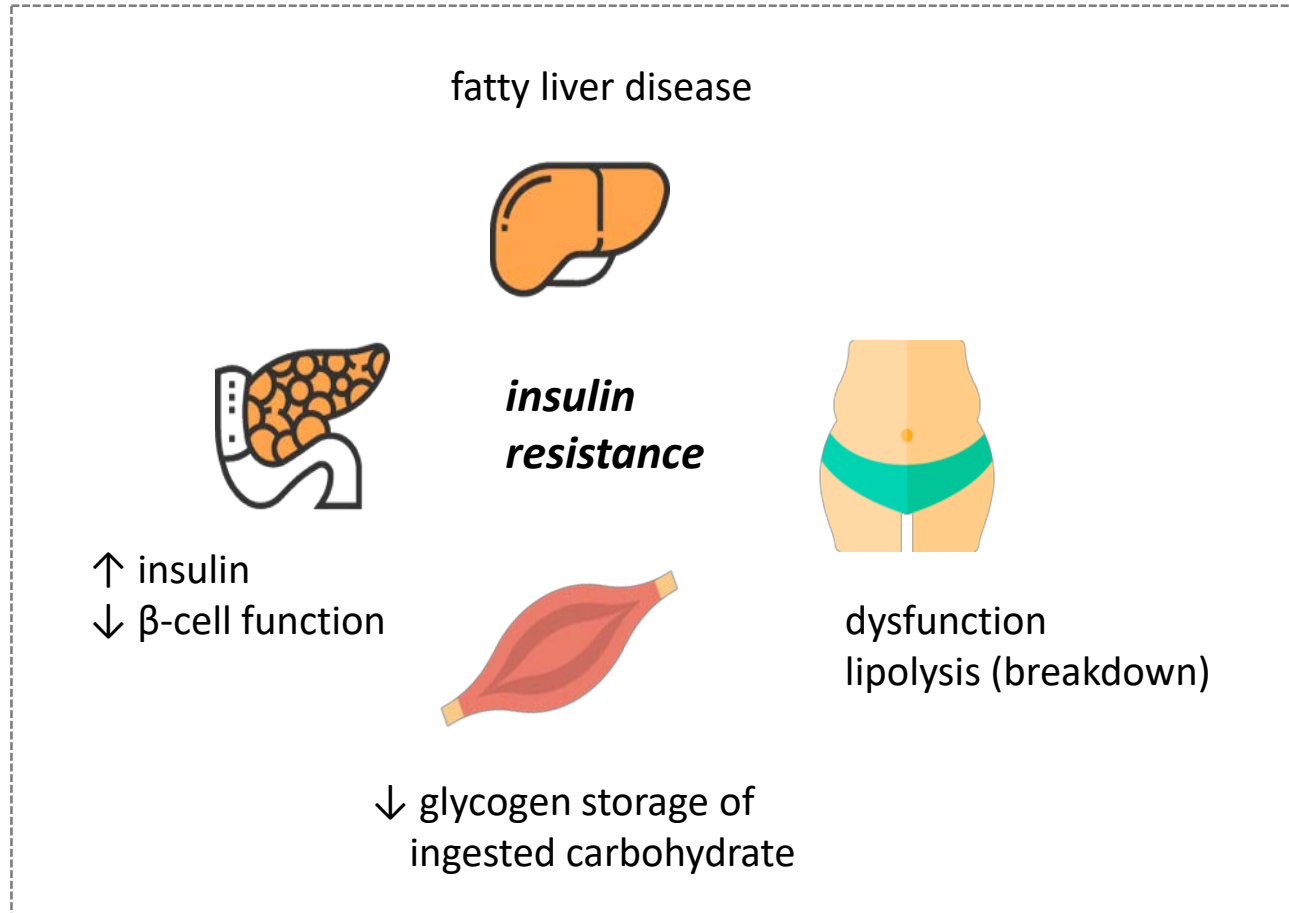
"insulin resistance and pancreatic dysfunction occur simultaneously and continuously, increasing the risk of disease even before diabetes is diagnosed"

Roden M, Shulman GI. The integrative biology of type 2 diabetes.
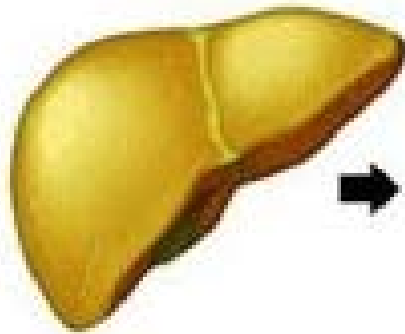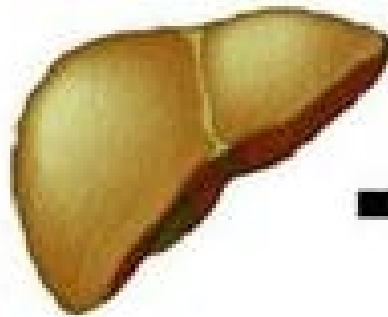Nature 2019;576(7785):51-60

images: flaticon.com

31% adults

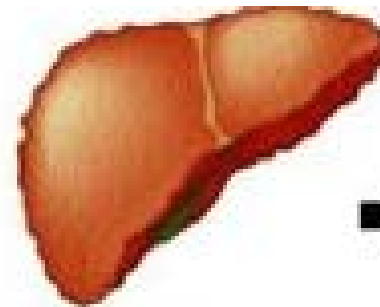**13%** children

6 million

600,000

Cancer
Liver transplant
Death

Non-alcoholic fatty
liver disease (NAFLD)

Steatohepatitis

Cirrhosis

https://sugarscience.ucsf.edu
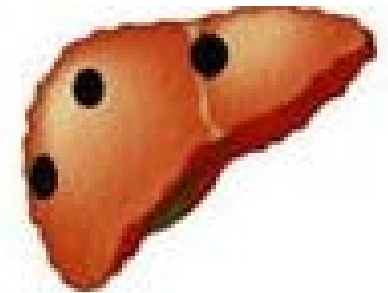
Biology and psychobiology

- Comfort
- Stress
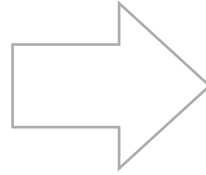- Sadness
- Boredom
- Socialisation

image: flaticon.com

"Overnutrition"
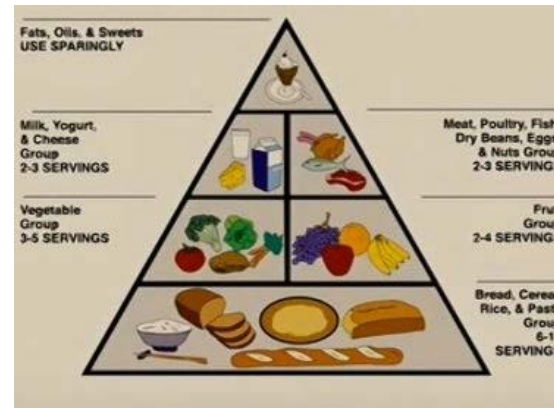i.e. excess calories
and/or carbohydrate excess

+

- Individual factors
- Environment factors

⟹

↑insulin
insulin resistance
↑blood sugar (hyperglycemia)

Nutritional guidelines

Climate change

Food supply - "food deserts"

image: NY Times

Social / cultural factors

↑ ↓ Carbs

↑ ↓ Fat

↑ ↓ Protein

Eat less

Vegan

Carnivore

Paleo

Banting

?

"Rich"

Poor

Nutritional epidemiology

- poor trial design
- inaccurate self-reporting
- health outcomes
  unknown

- every nutrient any outcome
- fanatical opinions
- implausible results

> ≥ 30g of nuts 3x/wk
> *39% reduction in total mortality*

Antioxidants (Basel). 2019 Aug; 8(8): 302.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6719153/

"no significant evidence for effects of **saturated fat consumption** on cardiovascular or total mortality."

Eur J Epidemiol. 2017; 32(4): 269–287

dark chocolate

unprocessed meat

whole-fat dairy

image: greenfield.eu.com

Higher-**fibre** diets improve

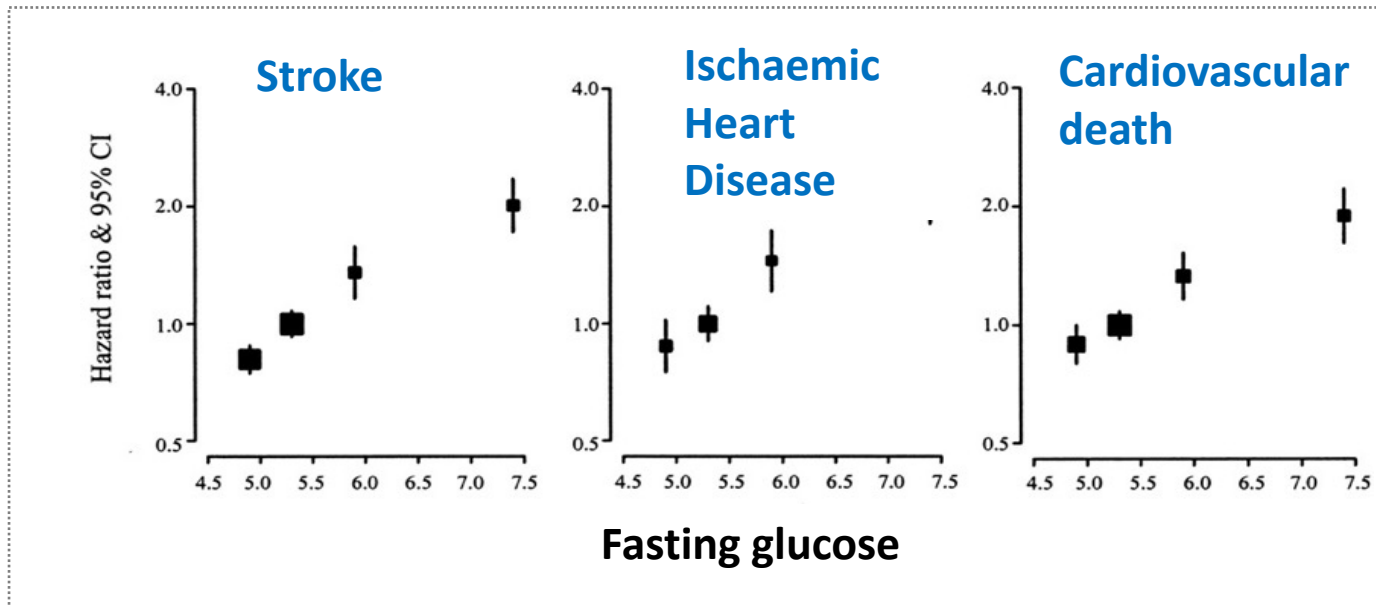- glucose control
- lipids
- body weight
- inflammation

↓ premature mortality

PLoS Med 17(3), e1003053 2020 Mar 6

Factors other than macronutrient content:

- meal composition
- food processing

	"Normal"	"Prediabetes"
Fasting	4.0 - 5.4 mmol/L	5.5 - 6.9 mmol/L
A1C	below 5.7%	5.7 - 6.4%

Stroke   **Ischaemic Heart Disease**   **Cardiovascular death**

Hazard ratio & 95% CI

Fasting glucose

Diabetes Care 2004;27:2836-2842

Diabetes Metab J 2015;39:273-282

Continuous Glucose Monitors

insert

Nutritional diary

Activity

Fitbit
Apple
Garmin

Continuous glucose monitoring is more sensitive than HbA1c and fasting glucose in detecting dysglycaemia in a Spanish population without diabetes

Santiago Rodriguez-Segade [a, b] ✉, Javier Rodriguez [a, b], Félix Camiña [a], Manuel Fernández-Arean [c], Vanessa García-Ciudad [c], Marcos Pazos-Couselo [d], Jose M. García-López [d], Manuela Alonso-Sampedro [e, f], Arturo González-Quintela [f], Francisco Gude [e]

n=322

% of participants with

episodes of blood sugar in **prediabetic** range (>7.8-11.0 mmol/L) — **73%**

32 - 53 mins/day

episodes of blood sugar in **diabetic** range (>11.0 mmol/L) — **5%**

some **hypoglycemia** (<3.9 mmol/L) — **44%**
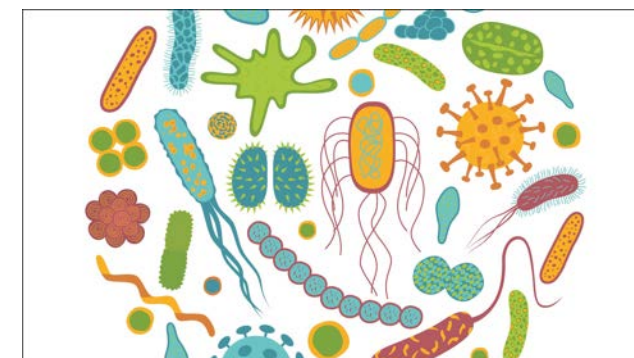
n=800
47,000 meals
dietary challenges
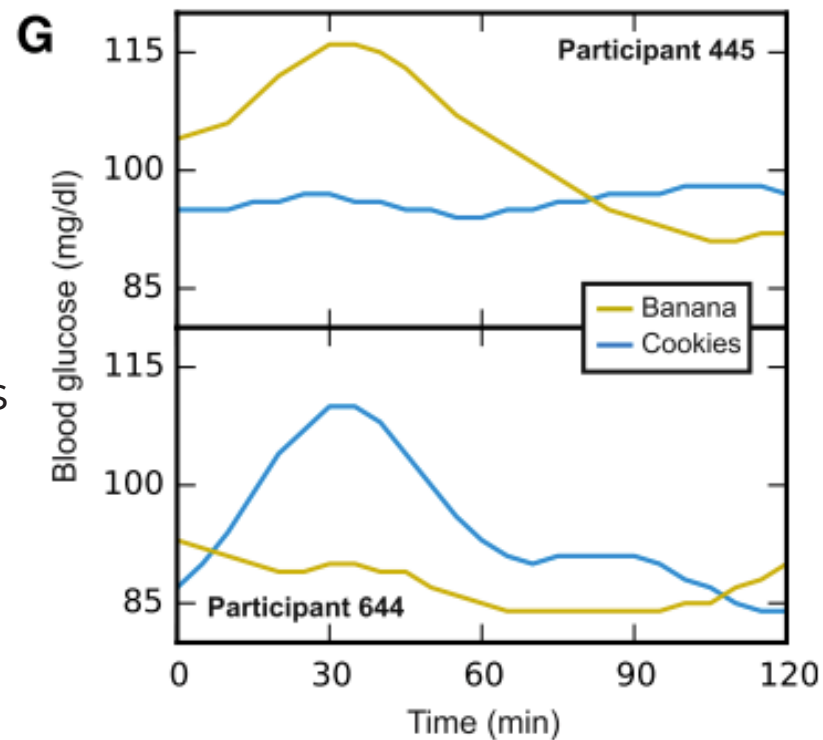
Zeevi et al, 2015, Cell 163, 1079–1094
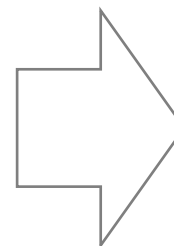
Variation driven by:

Gut microbiome

Your DNA

image: stockio.com

n= 57
CGM for 2-4 weeks
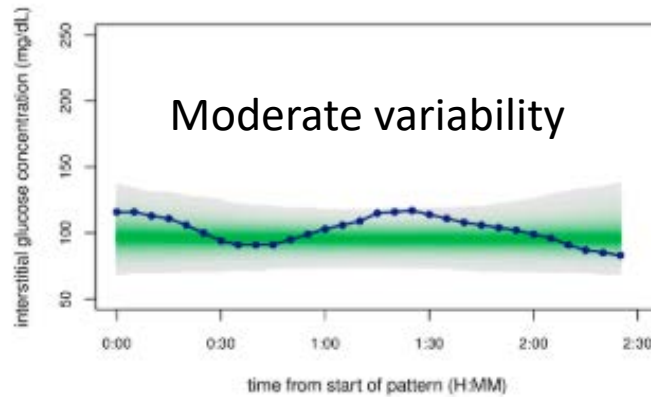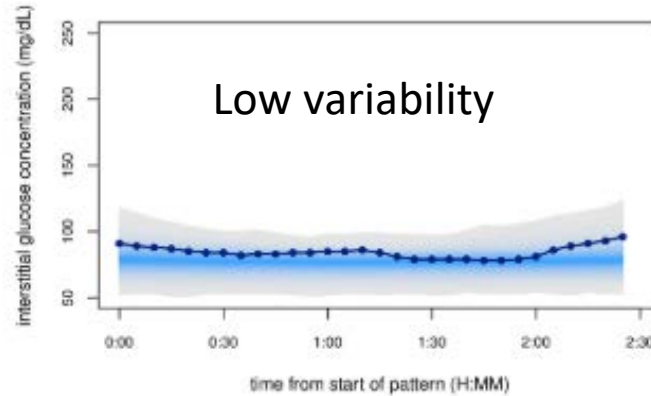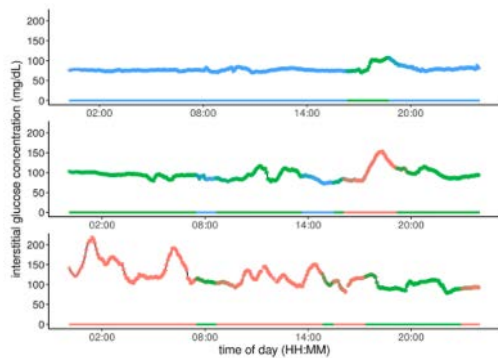
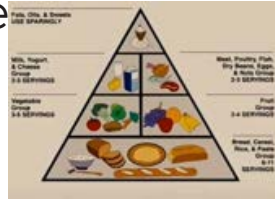"Glucotype"

Even individuals with normal blood sugar by standard measures may show high glucose variability

Low variability

Moderate variability

Severe variability
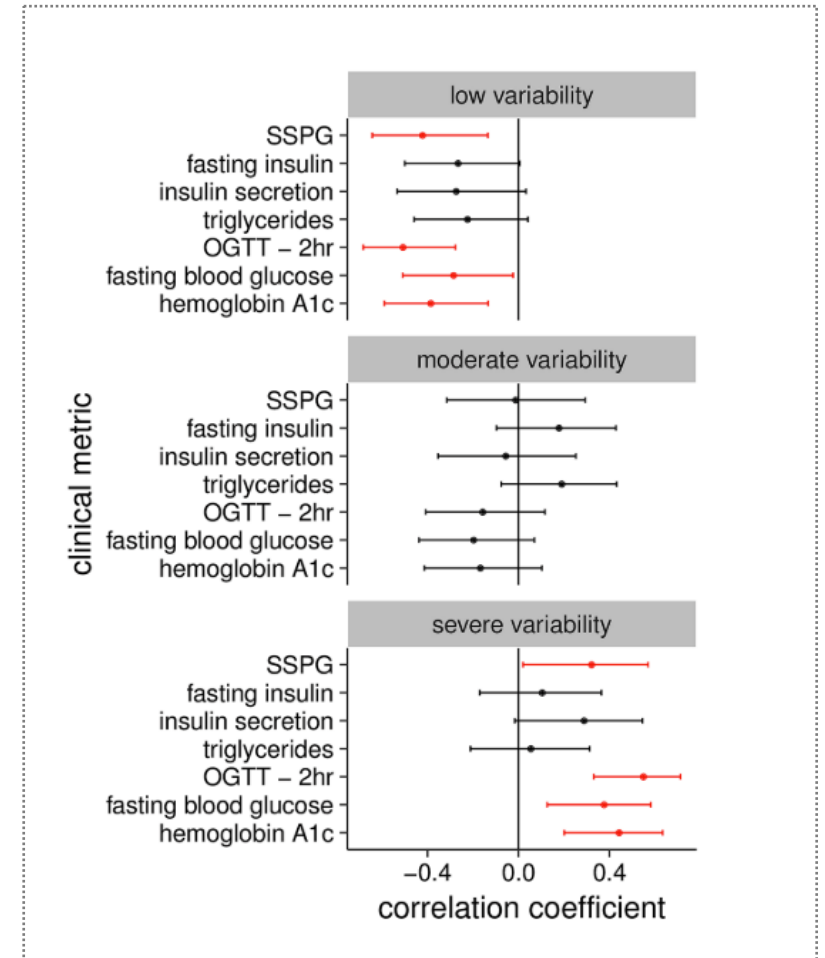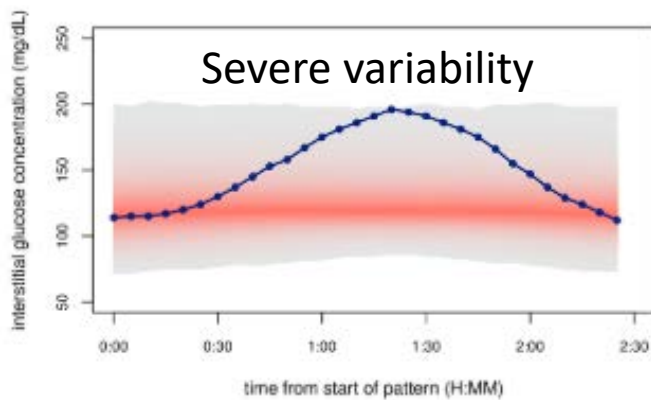
Healthiest subjects lowest variability

Dietary guideline
45-65%
carbohydrates

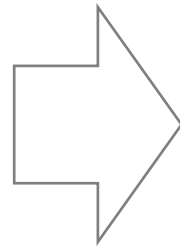Obesity Reviews, 2018

Hunter-gatherers
16-22%
c   s

cornflakes + milk
people without diabetes

prediabetic levels (> 7.8 mmol/L)   80%
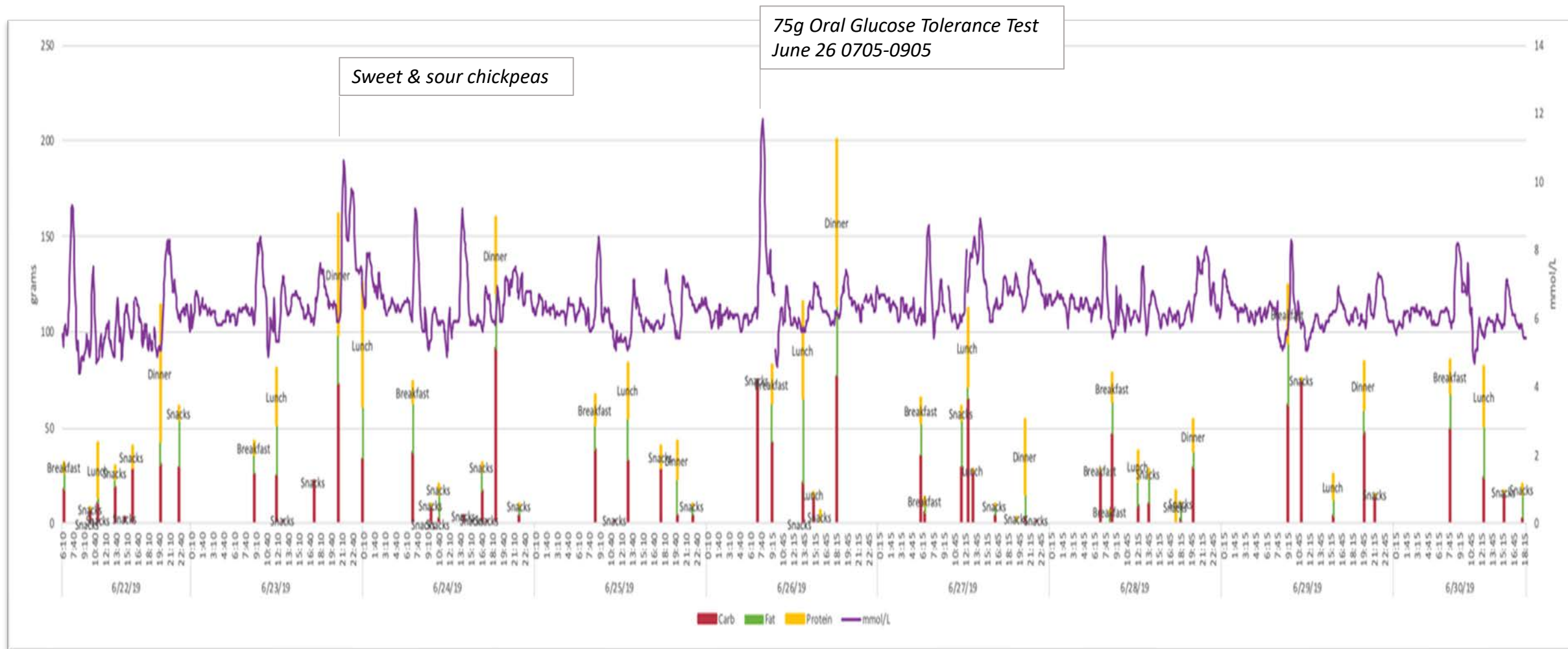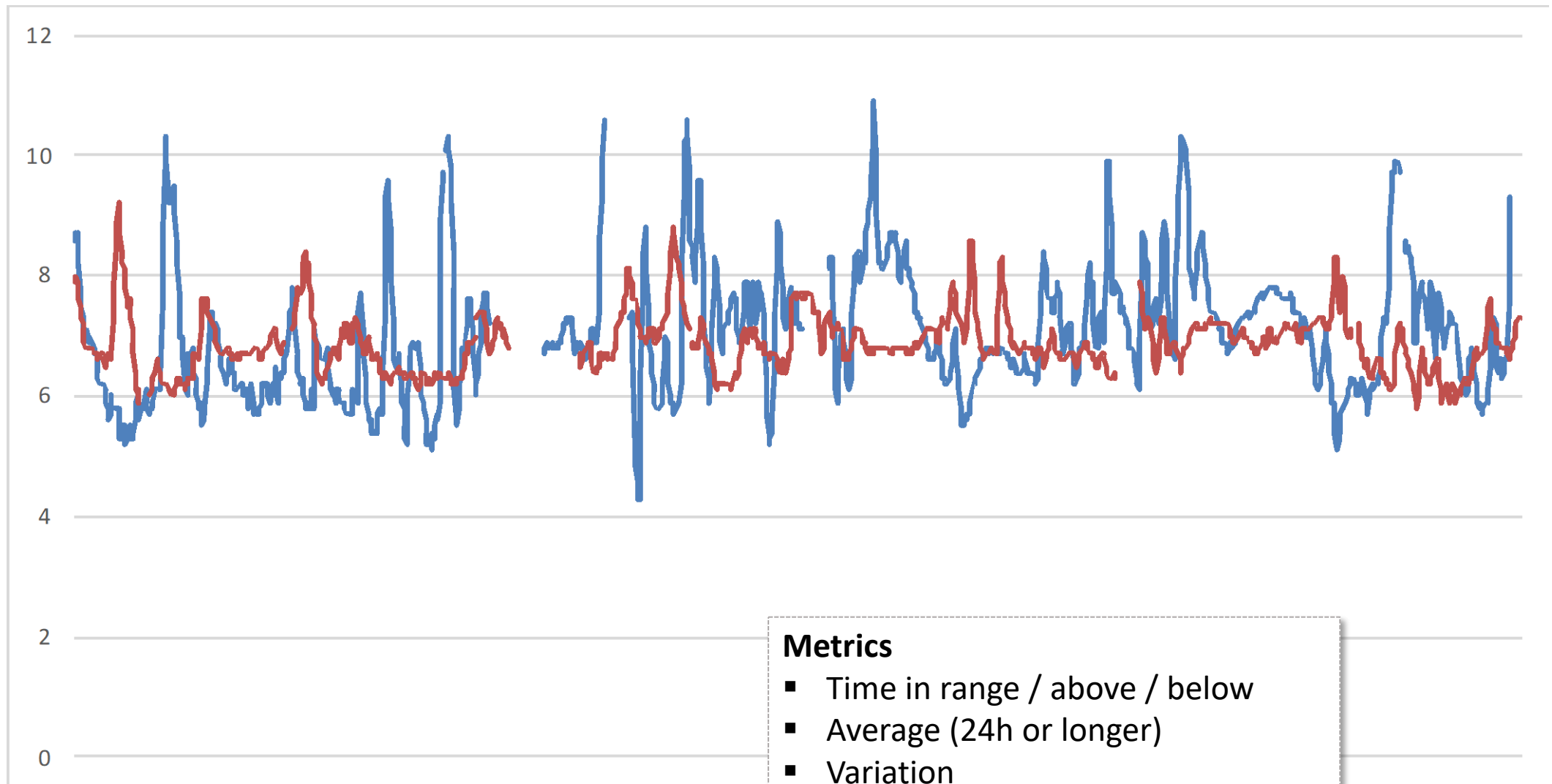diabetic levels (> 11.1 mmol/L)   23%

PLoS Biol 16(7): e2005143

Optimal…..

Time in range
Average
Variability

?

Nine days of CGM monitoring (Dexcom G6) - plasma glucose (mmol/l) - with meal macronutrients (grams)

Metrics
- Time in range / above / below
- Average (24h or longer)
- Variation

Week 1 – Liberal diet

Week 2 – Modified diet

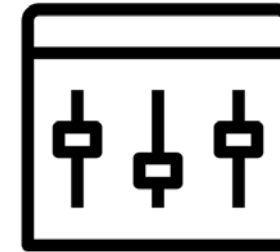**WHAT**

Your food
Food challenges

HOW

Mindful eating
Meals vs snacks

WHEN

Intermittent fasting
Meal timing

ADJUST

these factors to keep blood sugar in a healthy range

OBSERVE

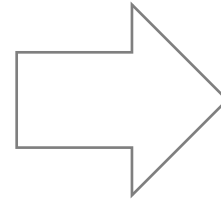in relation to CGM (blood sugar)

Cravings
Hunger/fullness
Sleep pattern
Exercise
Stress

Energy
Wellbeing
Mental clarity
Light exposure
Menstrual cycles

Risk assessment
Diagnosis
Motivation

Happy, healthy eating

NDD - No Dogma Diet

Guided by biology, personal preferences and data

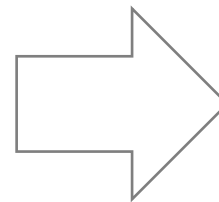Ketogenic diet

Low-calorie diet

REMISSION – OFF DIABETES DRUGS

Food as medicine…

5-7% weight loss ➡ **metabolic health**

HEALTHSPAN

- Happy eating
- Comfortable weight
- Enjoyable activity
- Sufficient sleep
- Social activity

Metabolic health

Healthy:

- Glucosome™
- Liver
- Lipids
- Blood vessels

Glucosome™
= A1C, range, variability, insulin
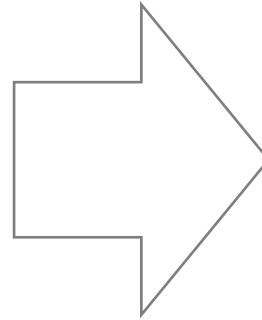
Basic Panel

Advanced testing

Genetic risk

Tracking

- ViDE™ (CGM)
- Activity
- Diet

ViDE=Visualisation of Dietary Effect

Poor metabolic health is a huge public health challenge, now exacerbated by Covid-19

Driven largely by diet but defying simple approaches

Solution

==risk-adjusted==

==preference-driven==

direct ==feedback== for behaviour change

==health care system== integration

==environmental== modification

==incentives==