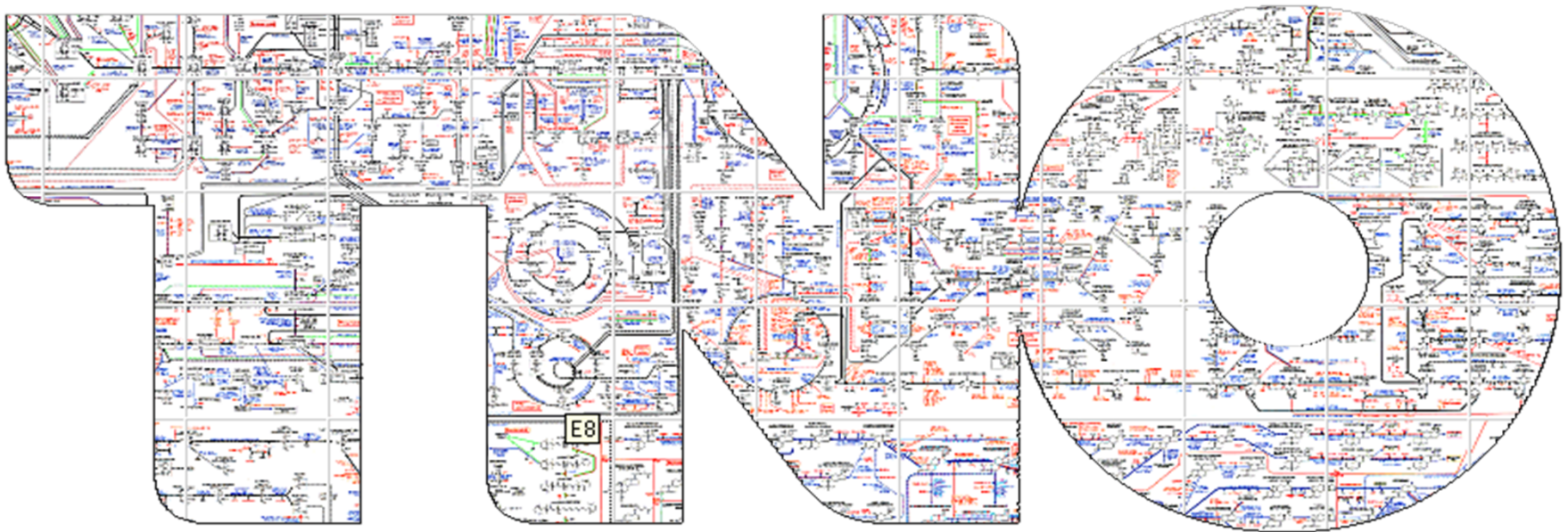


Children are not little adults (yet)

The next frontier of biomarkers for assessing
childhood health

Ben van Ommen



Health as a system

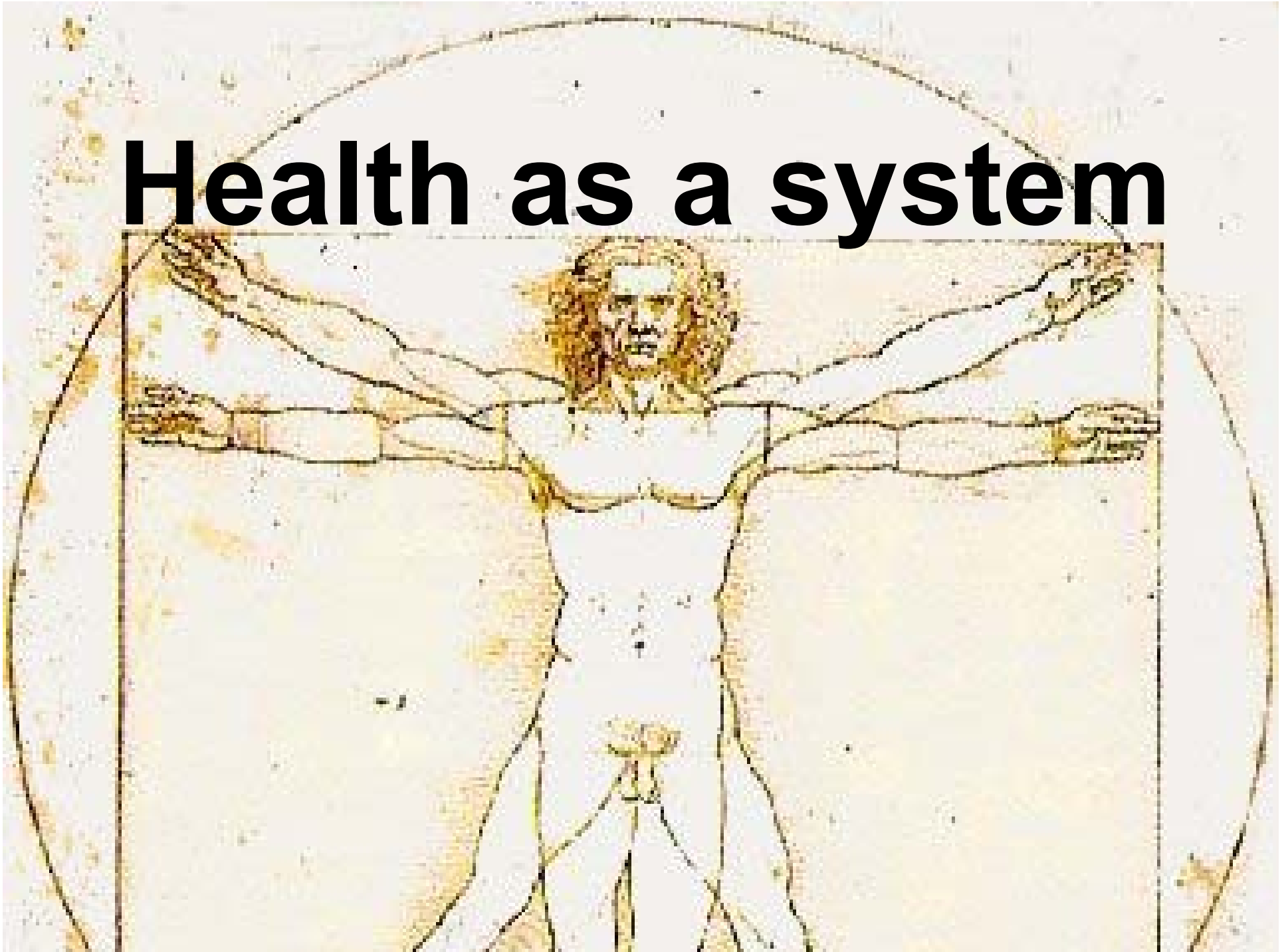
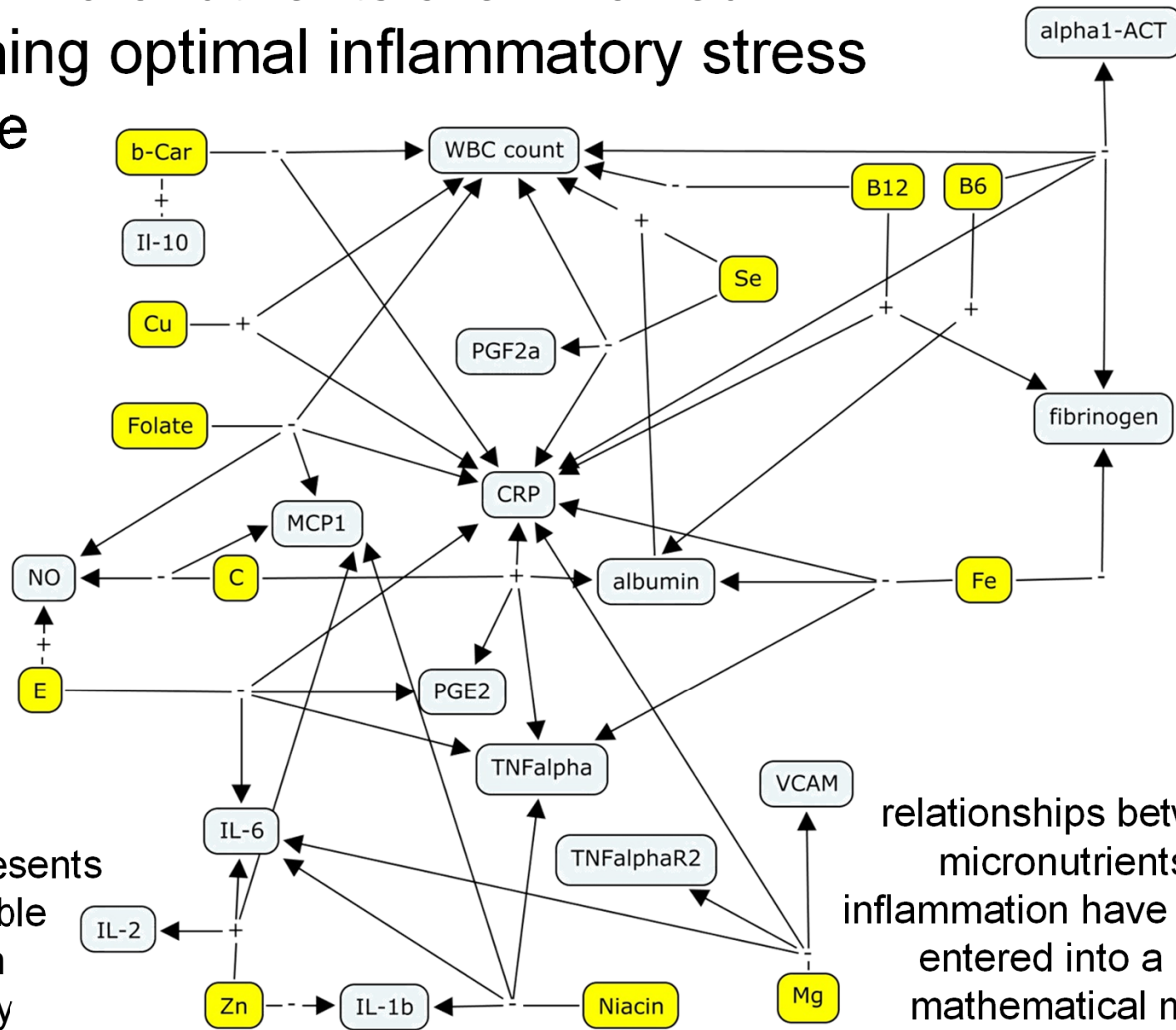


TABLE 12 Summary of key nutrient biomarkers¹

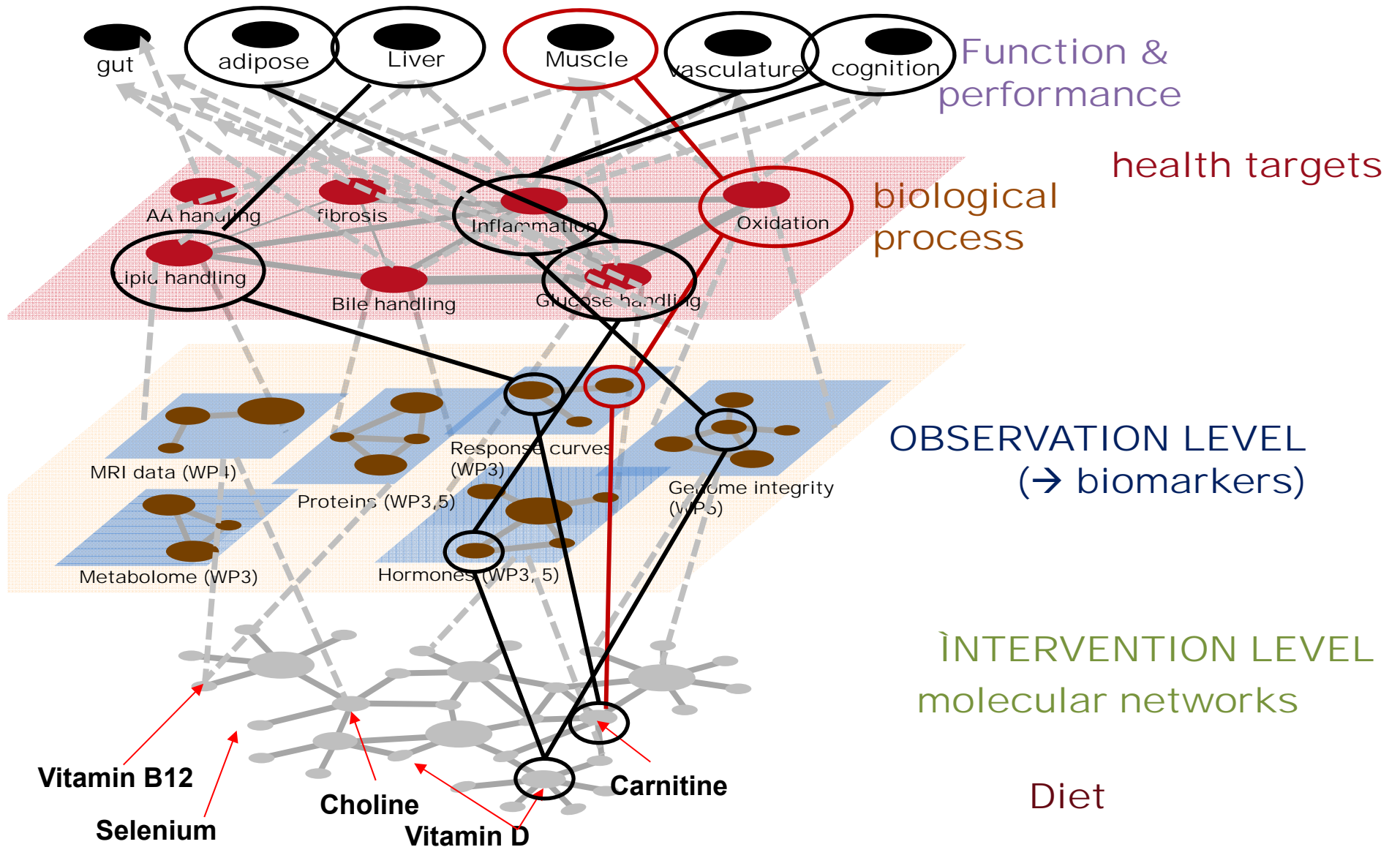
| Nutrient | Commonly used biomarker/indicators | Magnitude and direction of inflammation effect | Settings where used |
|--------------|------------------------------------|--|--------------------------------|
| Iron | Ferritin | +++ | Clinical, research, population |
| | sTfR | + | Research, population |
| | Hemoglobin | | Clinical |
| | Body iron | + | Research, population |
| | Ratio of TfR:ferritin | + | Research |
| | TfR index | + | Research, clinical |
| | ZPP | + | Clinical, population |
| | Hepcidin | 0 | Research |
| Vitamin A | Retinol | — | Clinical, research, population |
| | RBP | — | Research, population |
| | Breast-milk retinol | | Research |
| | Retinol dose response test | | Research |
| Zinc | Serum/plasma zinc | — | Clinical, population |
| Folate | Erythrocyte folate | + | Clinical, population |
| | Plasma or serum folate | — | Clinical, population |
| Vitamin B-12 | Serum/plasma total cobalamin | 0 | Clinical, population |
| | Serum holotranscobalamin | | Research |
| | Plasma/urine MMA | 0 | Clinical, population |
| | Plasma total homocysteine | + | Clinical |
| Iodine | Urinary iodine | 0 | Population |
| Vitamin D | 25(OH)D | — | Clinical, population |
| Vitamin B-6 | Plasma pyridoxal 5-phosphate | — | Research, population |
| Vitamin C | Serum ascorbic acid | — | Research, population |

Multiple micronutrients are involved in maintaining optimal inflammatory stress response



Each arrow represents at least one reliable published human intervention study

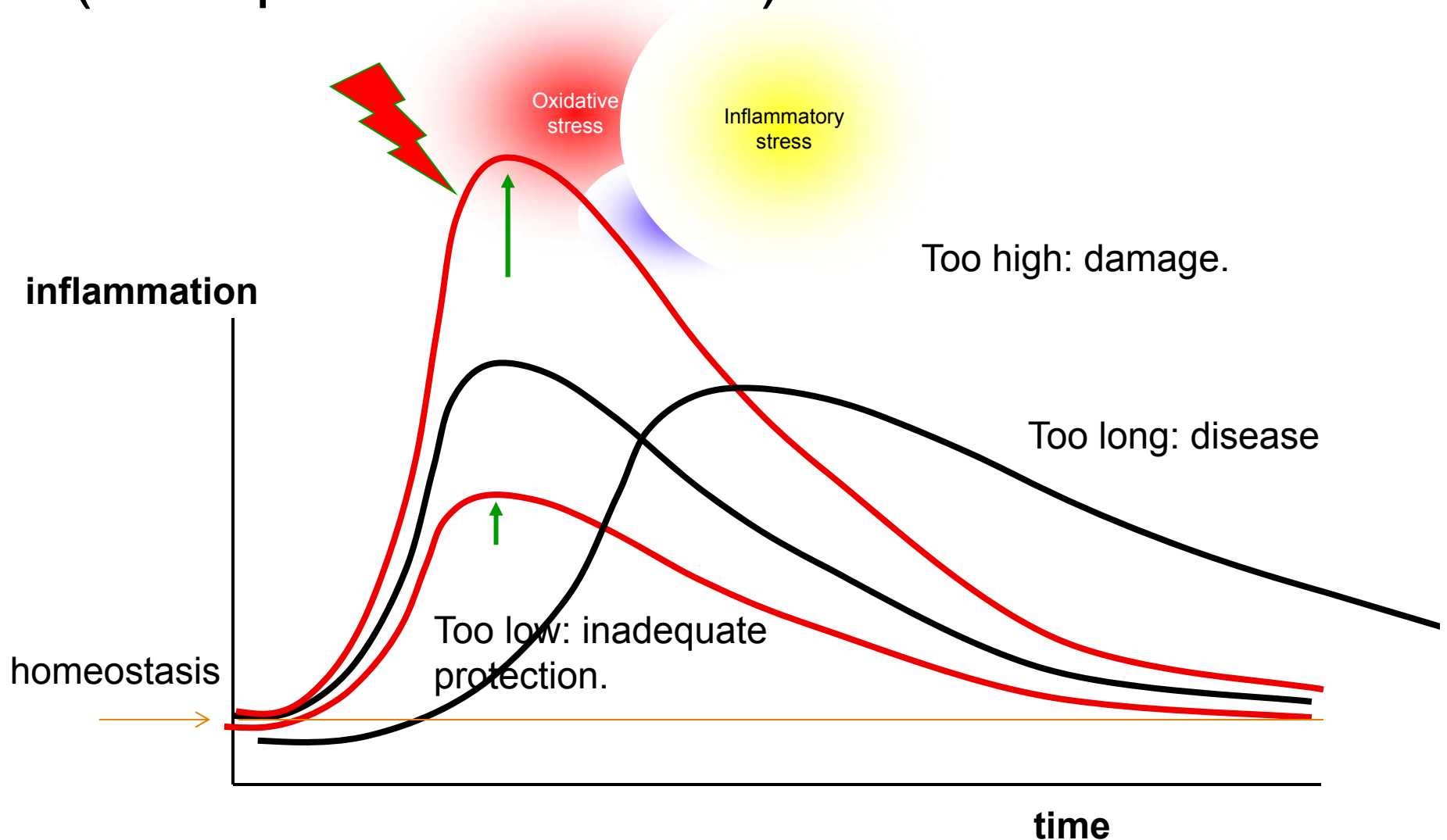
relationships between micronutrients and inflammation have been entered into a basic mathematical model



The concept of flexibility



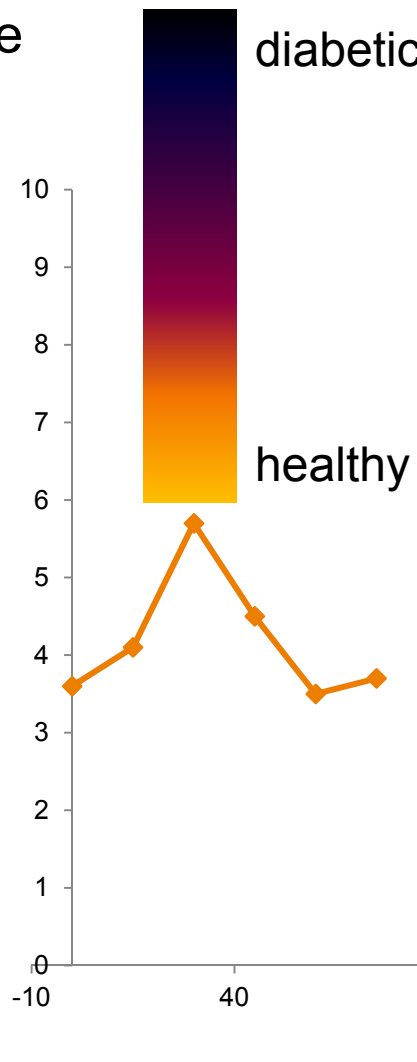
Health is not static but “the ability to adapt” (example: inflammation)





My reaction

Glucose
(mM)



My breakfast





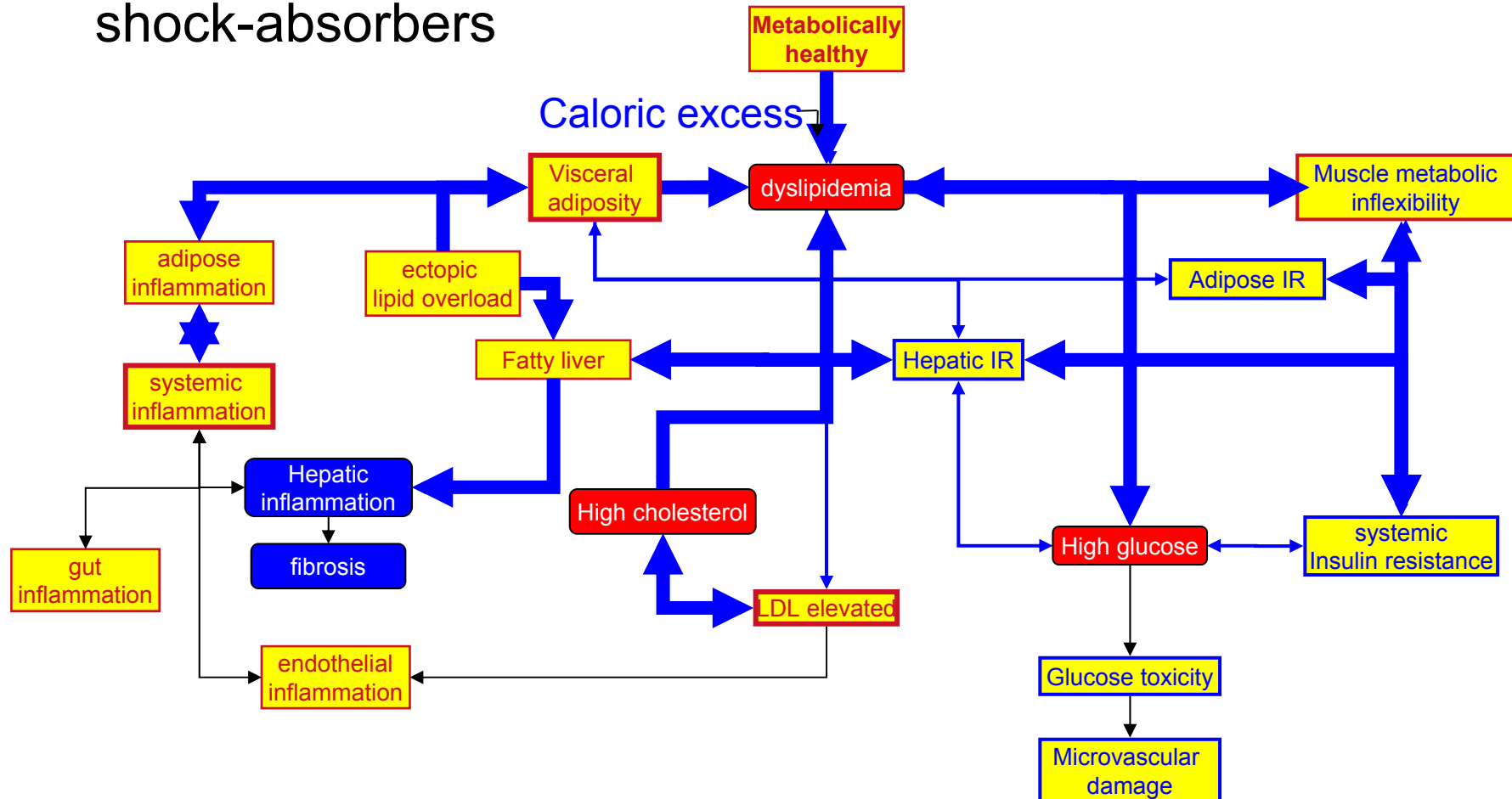
Do we
understand the
challenge?



Do we
understand the
response?



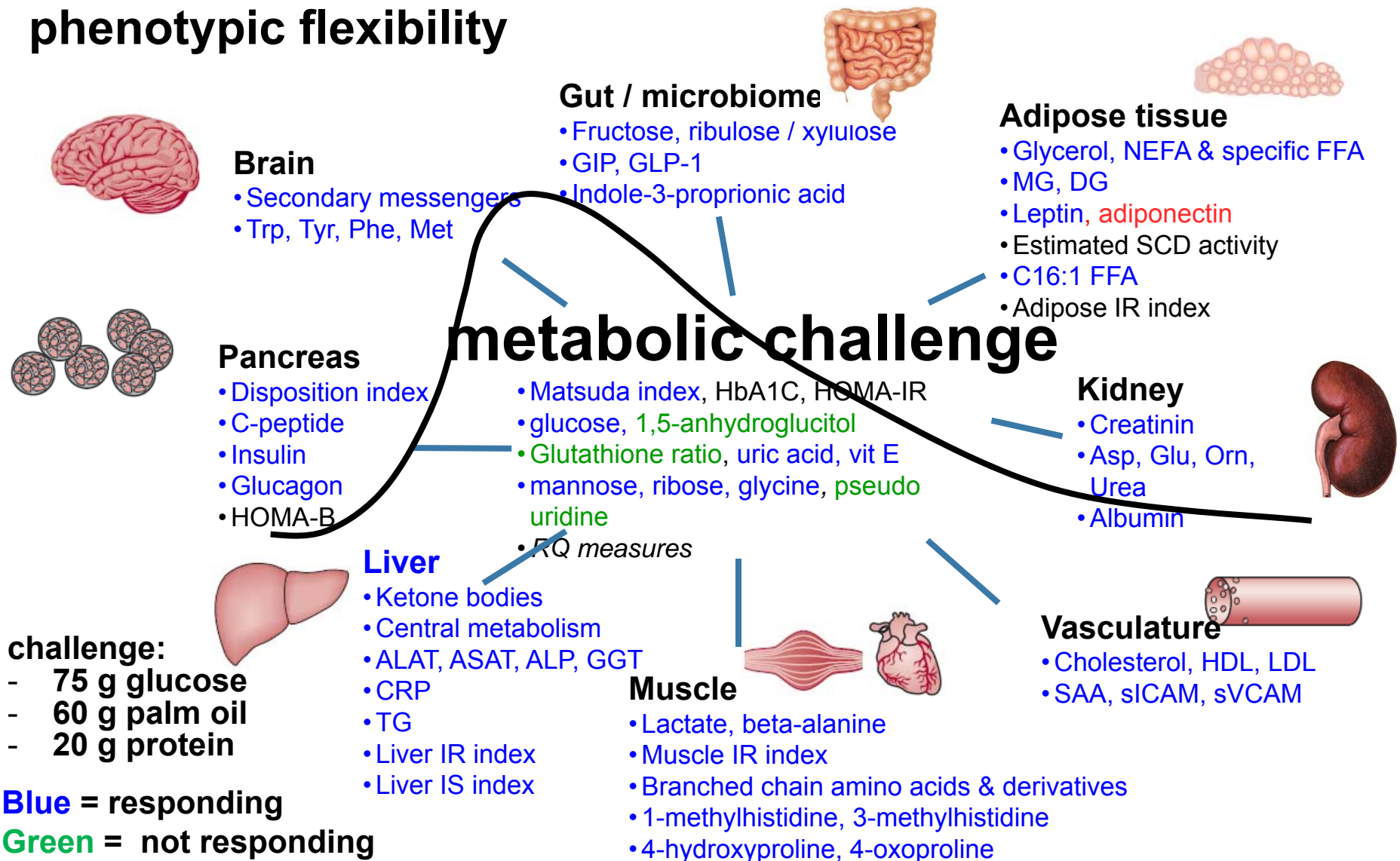
But health is not static! Systems flexibility is the key
All components of metabolic-inflammatory physiology are shock-absorbers





How to quantify health

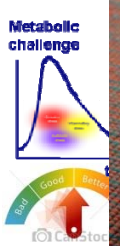
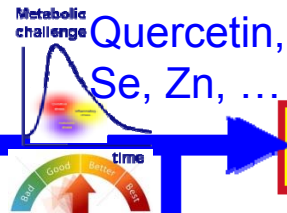
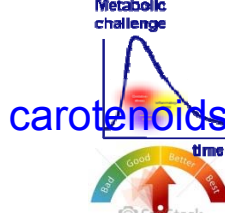
a biomarker panel that reports on multiple aspects of phenotypic flexibility



Using Food to
Optimize Your Child's
Focus & Improve
Overall Health

TELE CLASS &
TWITTER CHAT
**How to
optimize
health?**





Visceral adiposity

Metabolic health

dyslipidaemia

Sta

Adipose IR

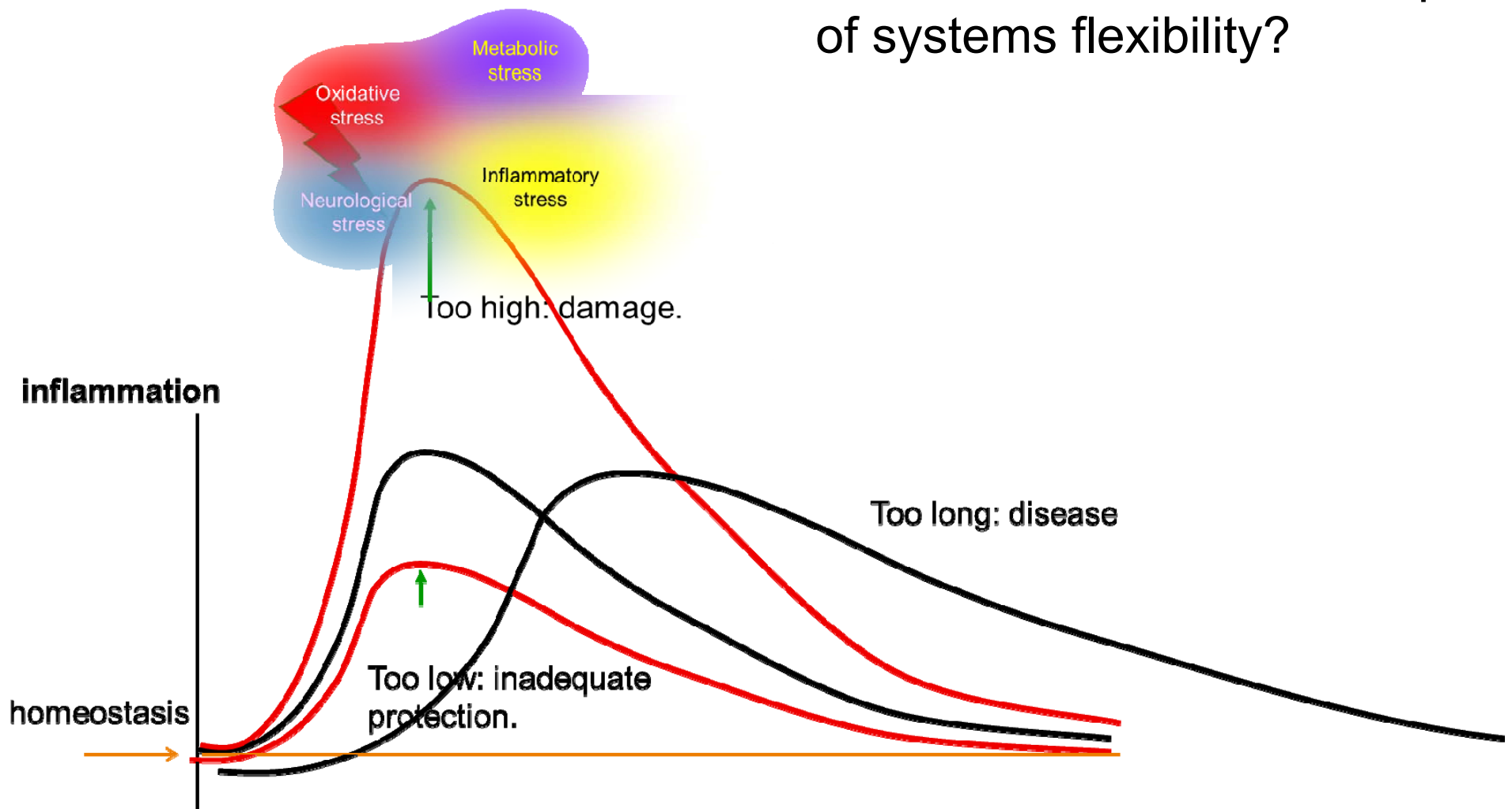
low glycemic index

интервью

LDL elevated

procyanidins

How universal is the concept
of systems flexibility?



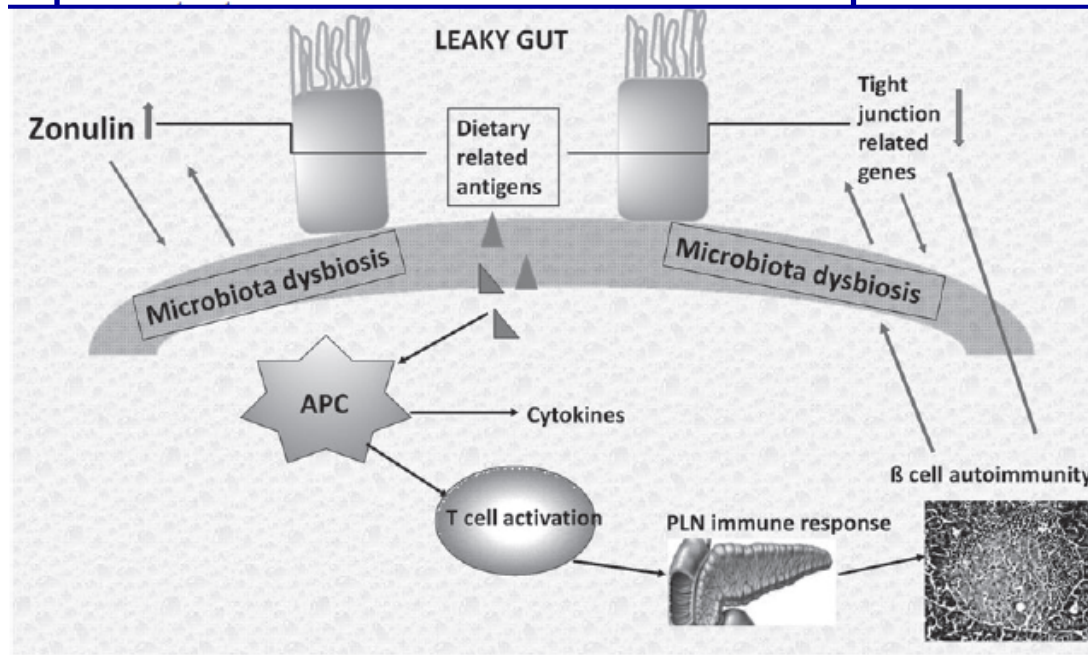
Serious (Early) Life Events and Type 1 Diabetes

Serious Life Events

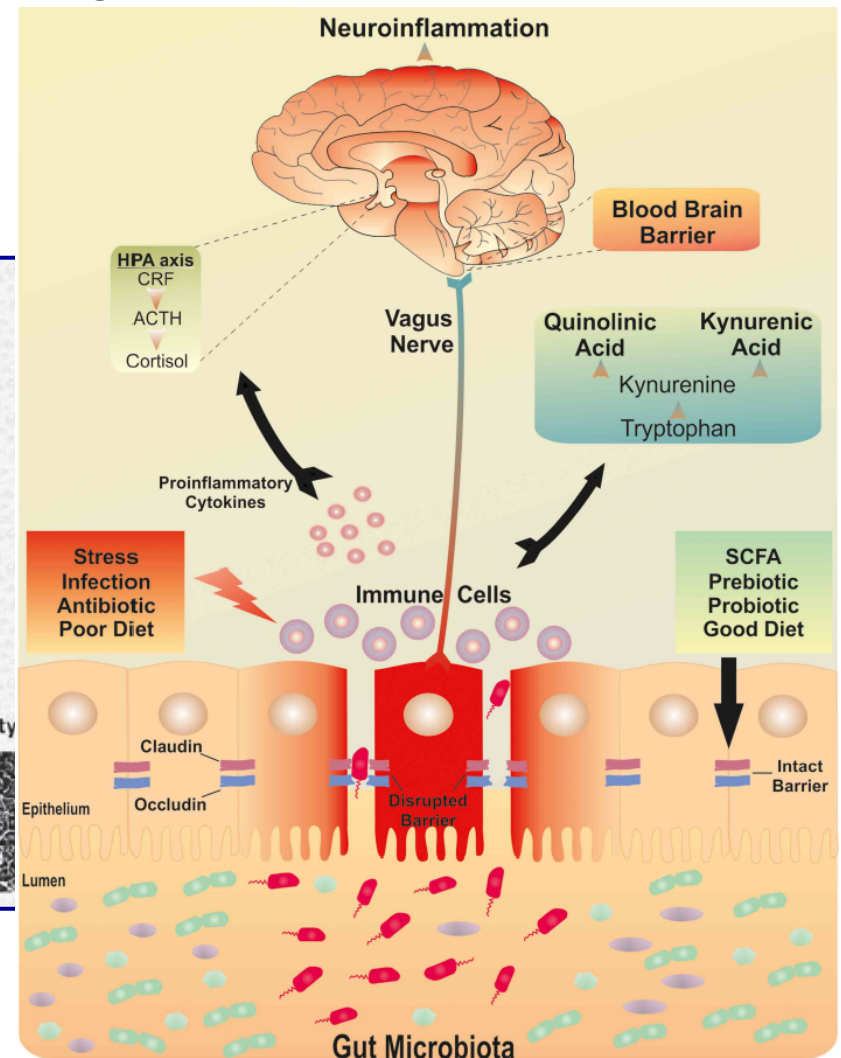
Child

Death and illness 1. Death of relative

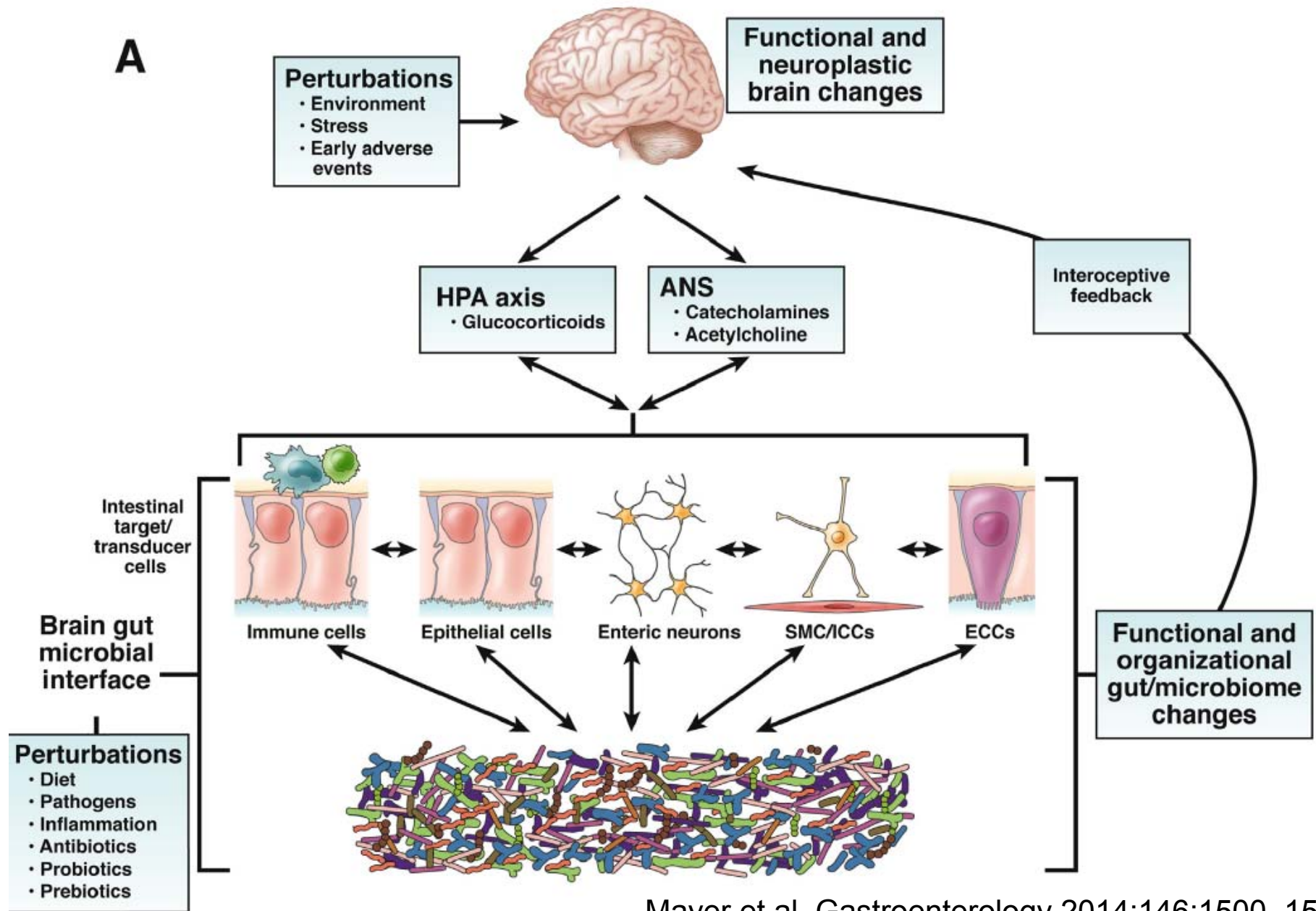
New family 2. Parents divorced/separated



... we found that a Serious Life Event experienced by the child at any time during the first 14 years of life increased the risk of diagnosis of type 1 diabetes ...



Nygren, Diabetologia 2015
Li, Pediatric Diabetes 2015
Kelly, Frontiers Cellular Neuroscience 2015





P. CURELLI / PHOTO LUCALAMY

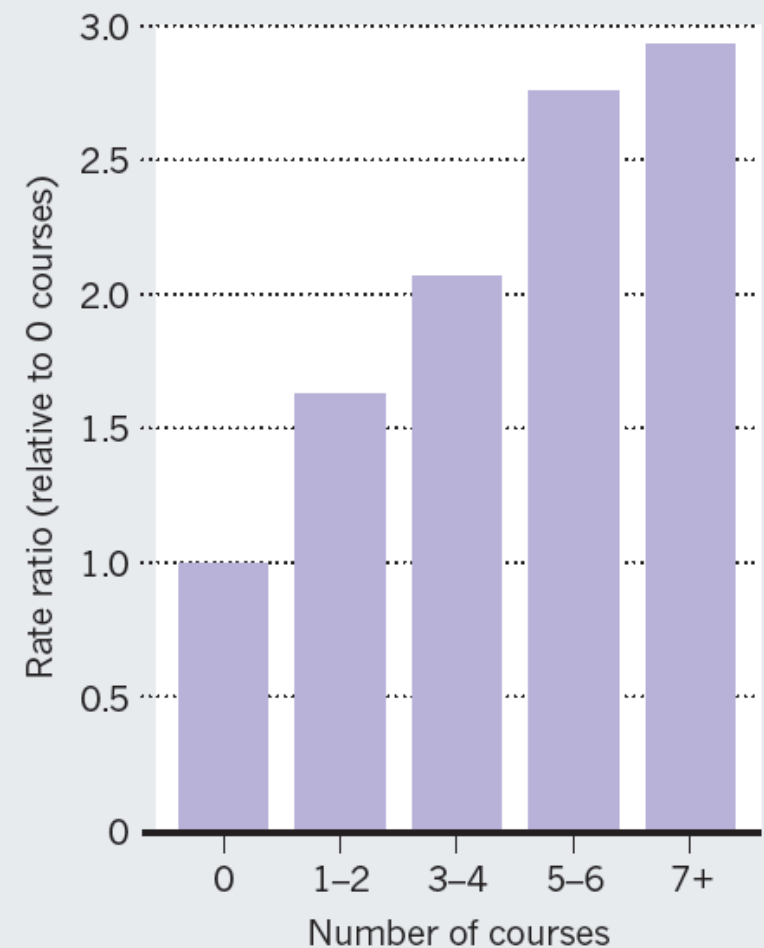
Dosed up: could excessive prescription of antibiotics be hampering children's ability to fight disease?

Stop the killing of beneficial bacteria

Concerns about antibiotics focus on bacterial resistance — but permanent changes to our protective flora could have more serious consequences, says **Martin Blaser**.

TROUBLING CORRELATION

The risk of inflammatory bowel diseases in children rises with the number of courses of antibiotics taken.



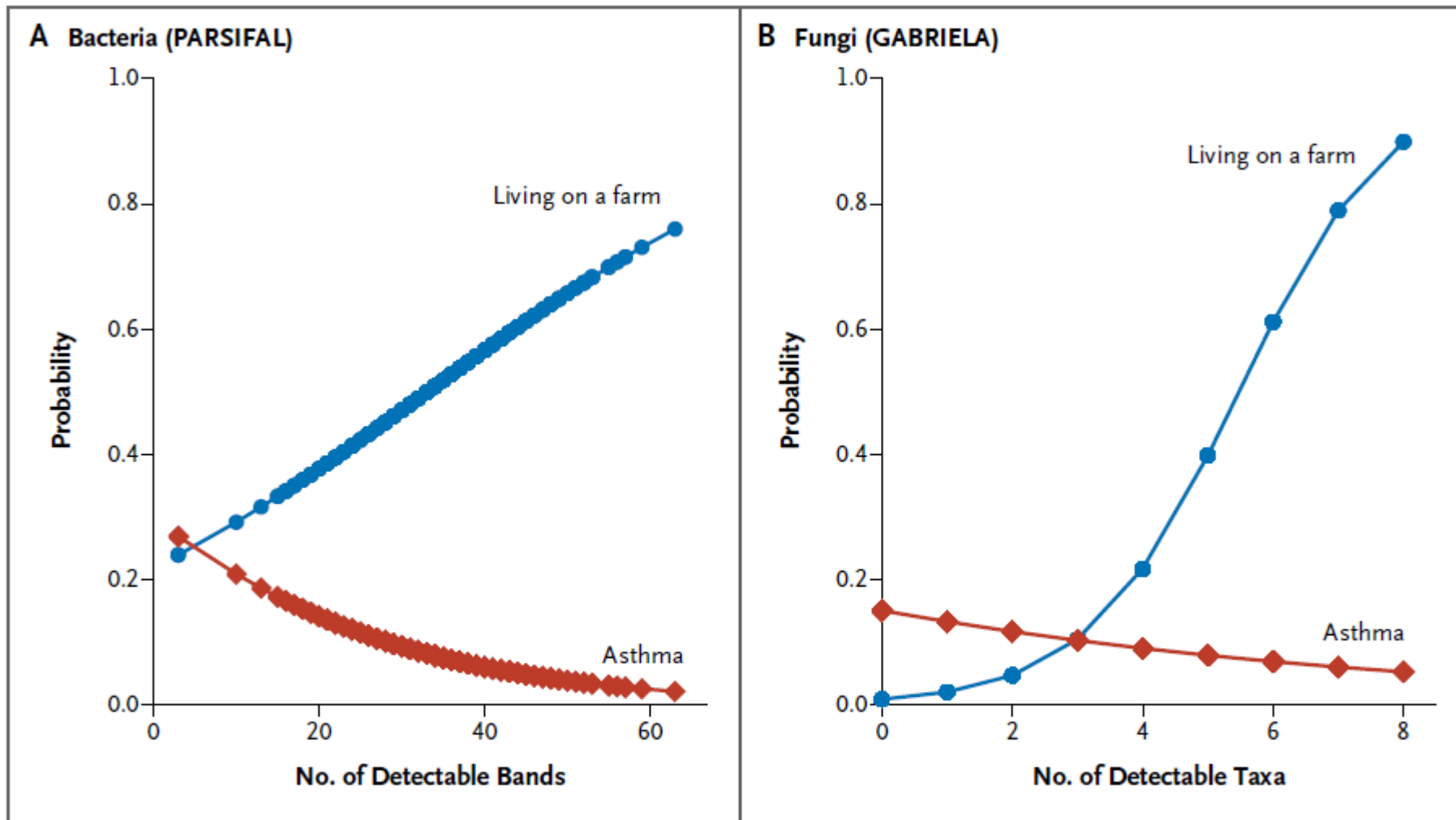
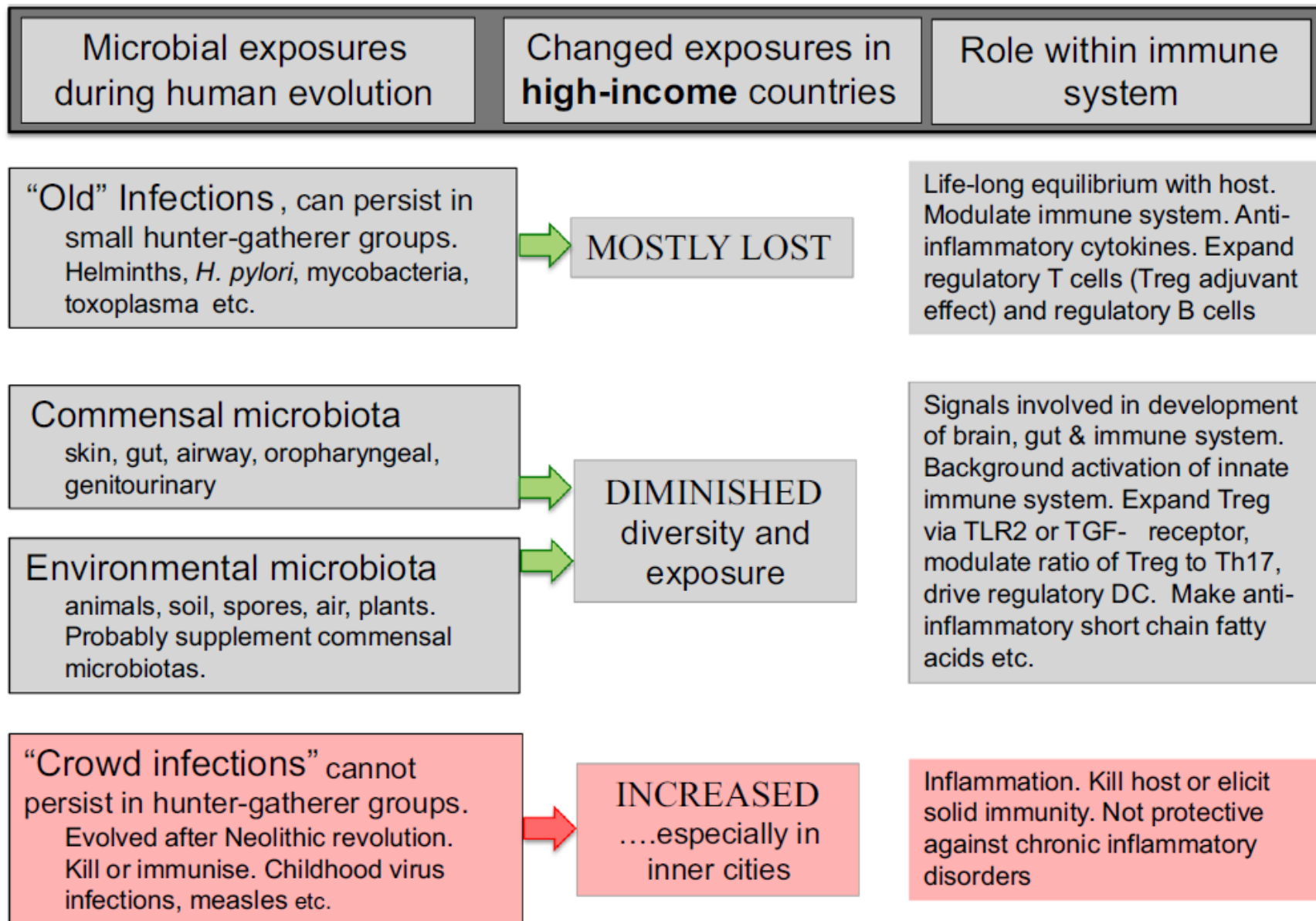
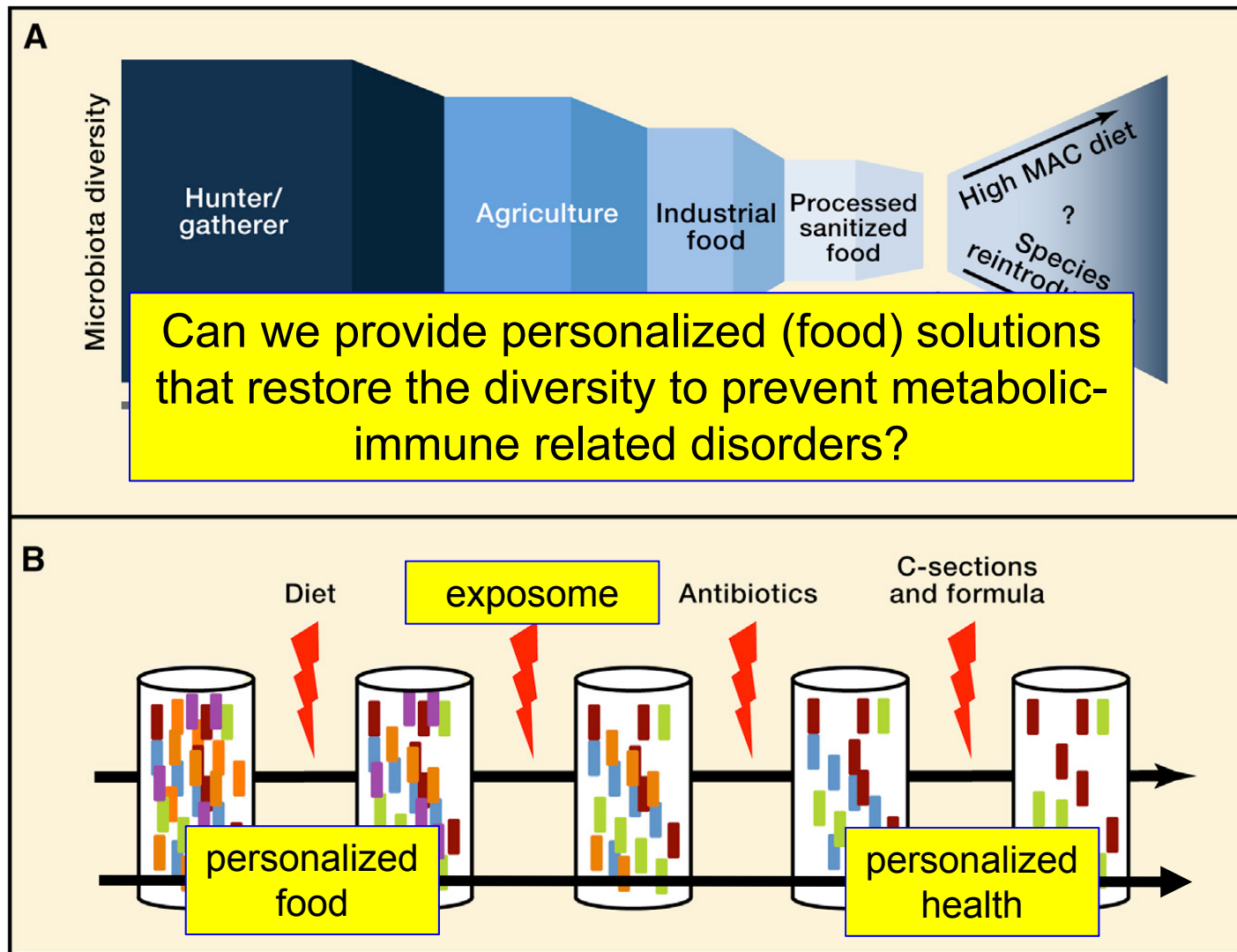


Figure 3. Relationship between Microbial Exposure and the Probability of Asthma.

In both the PARSIFAL study and GABRIELA, the range of microbial exposure was inversely associated with the probability of asthma.



The Multiple-Hit Hypothesis for how the Microbiota of Industrialized Societies Has Lost Diversity over Time



Are flexibility, resilience and optimal immune system related?



Nature's Best Antibiotics ...

and how
to use
them!



Specific

Measurable

What does this mean in practice?

Goal

Achievable

How to shape a health system and economy?

Realistic

iOS 8

All-New
Features

Photos



Messages

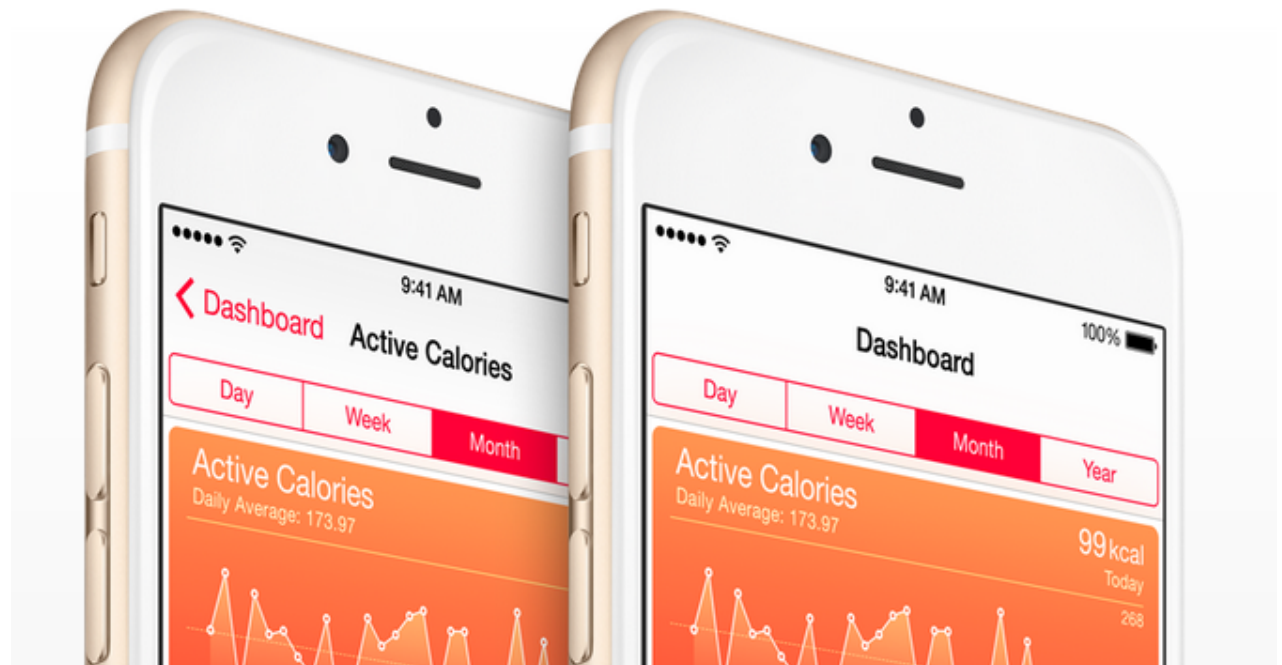


Design

Health.

An entirely new way to use your health and fitness information.

The new Health app gives you an easy-to-read dashboard of your health and fitness data. And we've created a new tool for developers called HealthKit, which allows all the incredible health and fitness apps to work together, and work harder, for you. It just might be the beginning of a health revolution.





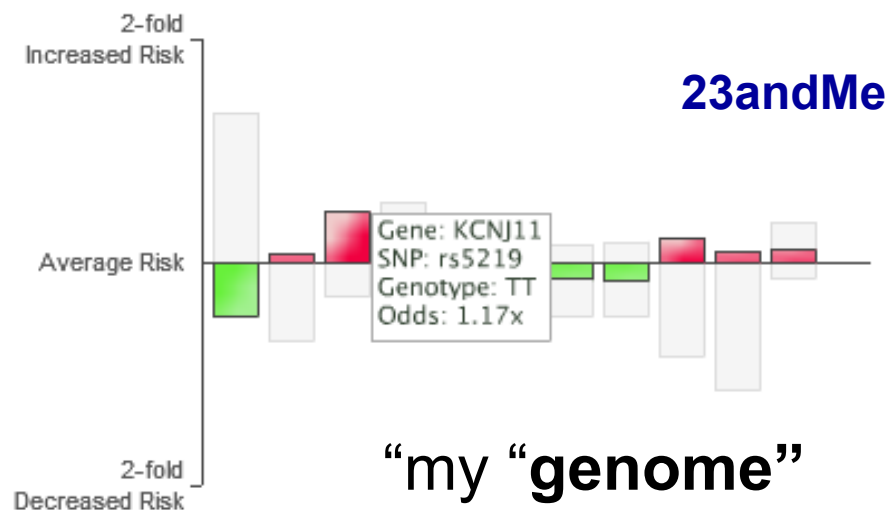
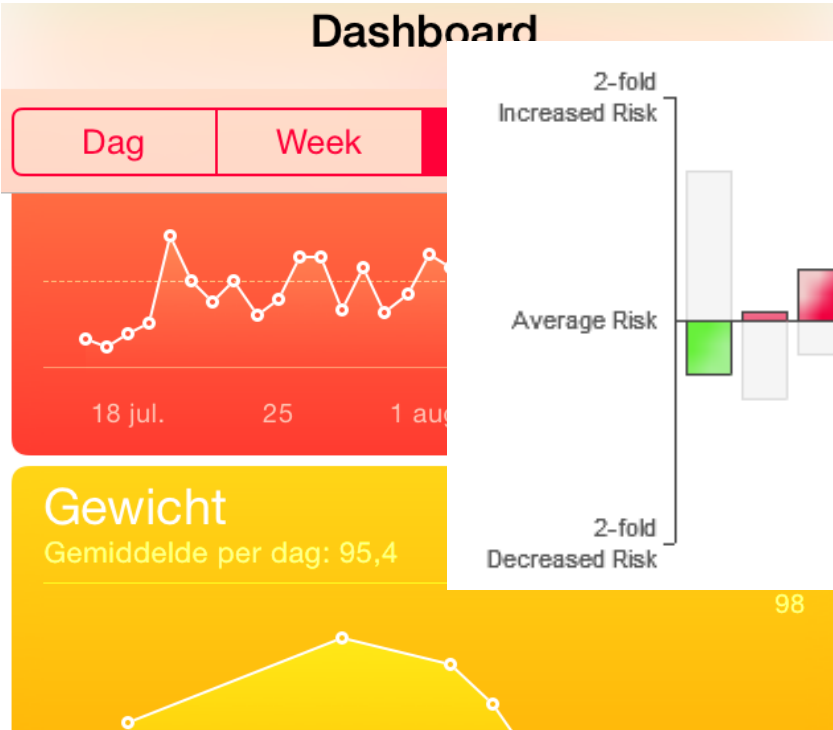
“my food intake” Voedingcentrum, VitalinQ

TNO innovation
for life

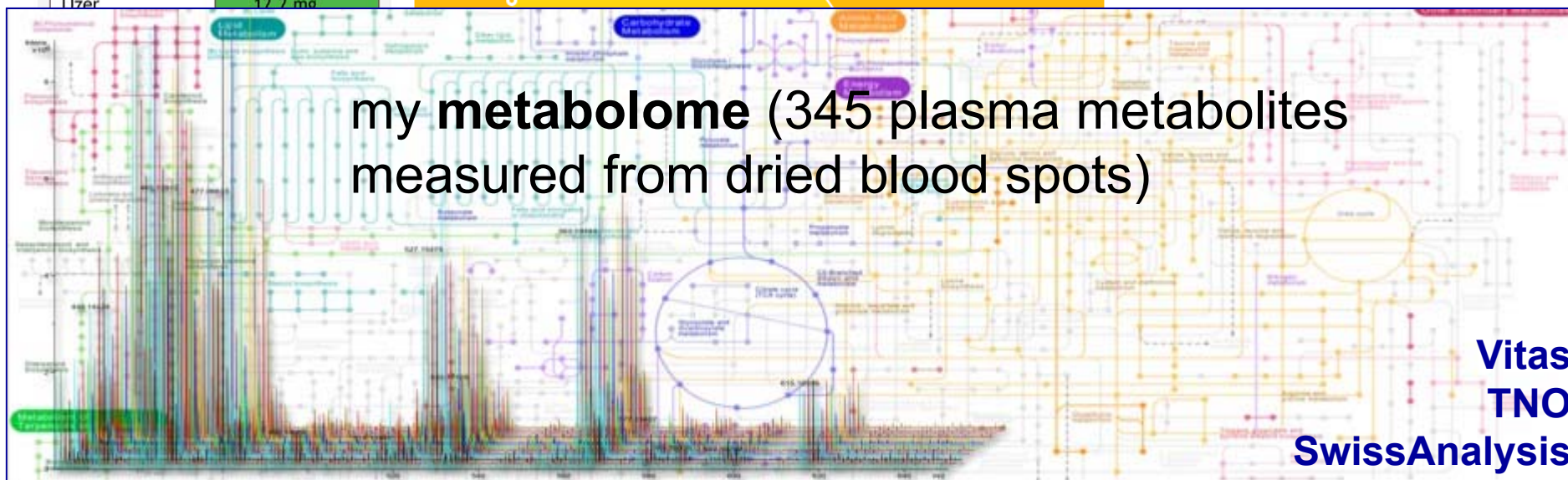
Mijn Eetmeter

Dit is wat je gemiddeld over de afgelopen 30 dagen hebt

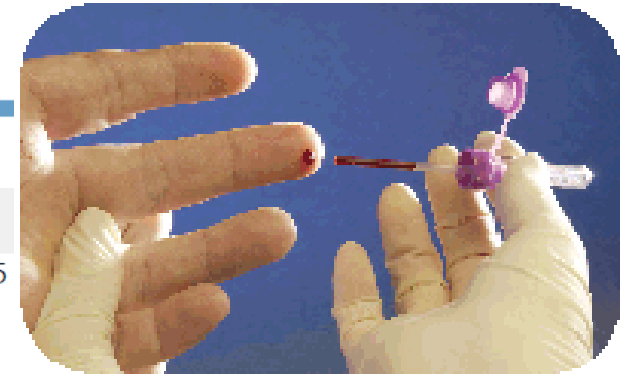
| | |
|---------------|-----------|
| Energie | 2270 kcal |
| Vet | 112,7 g |
| Verzadigd vet | 44 g |
| Eiwit | 101,2 g |
| Koolhydraten | 189,6 g |
| Vezels | 22,5 g |
| Zout | 8,54 g |
| Alcohol | 6 g |
| Water | 2078 g |
| Natrium | 3415 mg |
| Kalium | 3432 mg |
| Calcium | 1274 mg |
| Magnesium | 369 mg |
| Lijzer | 12,2 mg |



my **metabolome** (345 plasma metabolites measured from dried blood spots)



Vitas
TNO
SwissAnalysis



Chemie

| | | | | |
|-------------------|--------|--|-------------|--------|
| Bilirubin gesamt | 22.0 + | | 3.4 - 20.5 | |
| HbA1C in % | 5.0 | | 0 - 6.5 | |
| Ferritin | 222 | | 40 - 400 | |
| Maagnesium | 0.80 | | 0.66 - 1.07 | mmol/L |
| CRP ultrasensitiv | 0.5 | | 0 - 5.0 | mg/L |

Hormone

| | | | | |
|-----------|------|--|------------|------|
| TSH Basal | 0.78 | | 0.35 - 3.0 | mU/L |
|-----------|------|--|------------|------|

Vitamine

| | | | | |
|------------|------|--|----------|--------|
| Folsaeure | 9.2 | | 6 - 38 | nmol/L |
| Vitamin B6 | 49 | | 28 - 120 | nmol/L |
| Vitamin B1 | 55 - | | 67 - 333 | nmol/L |

Mikronährstoffhaushalt

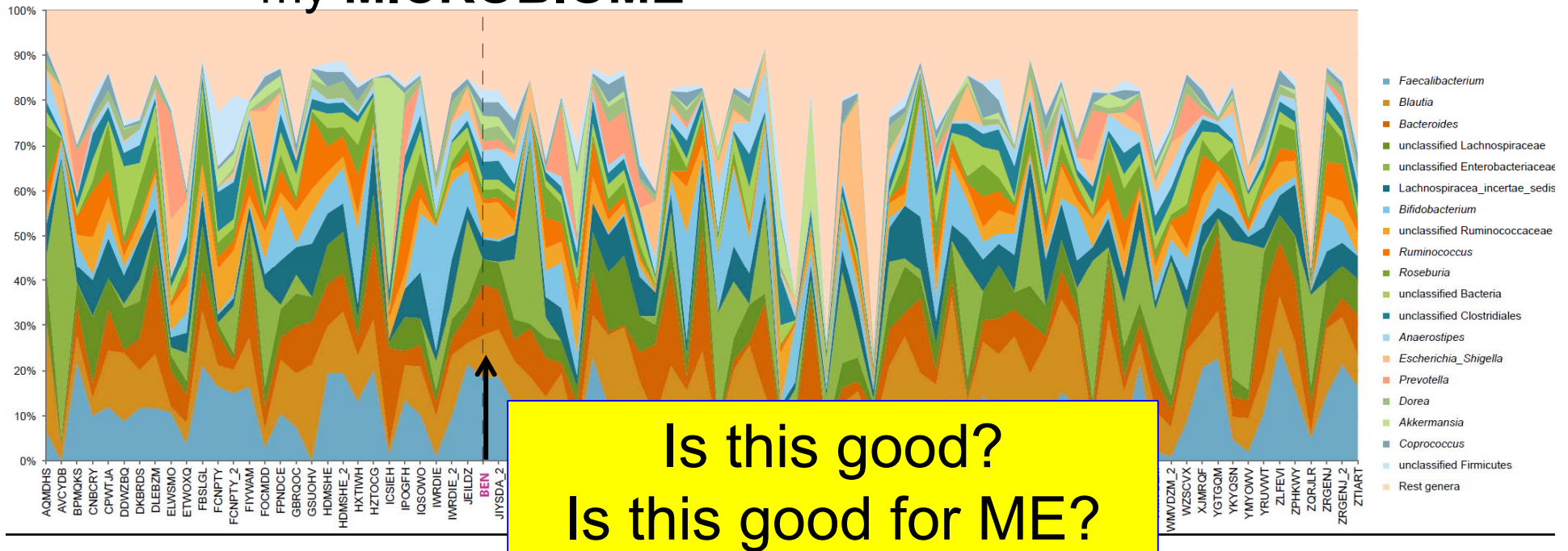
my specialized clinical chemistry

| | | | | |
|--------------------|--------|--|-------------|--------|
| Vitamin D3 (25-OH) | 96 | | 75 - 175 | nmol/L |
| Zeaxanthin/ Lutein | 1.29 + | | 0.35 - 0.95 | μmol/L |
| Lycopin | 2.42 + | | 0.4 - 1.2 | μmol/L |
| beta-Crpytoxanthin | 0.47 | | 0.15 - 0.65 | μmol/L |
| Alpha-Carotin | 0.58 | | 0.1 - 0.8 | μmol/L |
| Beta-Carotin | 2.02 | | 0.4 - 2.7 | μmol/L |
| Retinol (VitA) | 3.73 | | 0.86 - 3.8 | μmol/L |
| Alpha Tocopherol | 47.5 | | 28.0 - 48.0 | μmol/L |
| Gamma Tocopherol | 1.44 | | 1.3 - 4.8 | μmol/L |

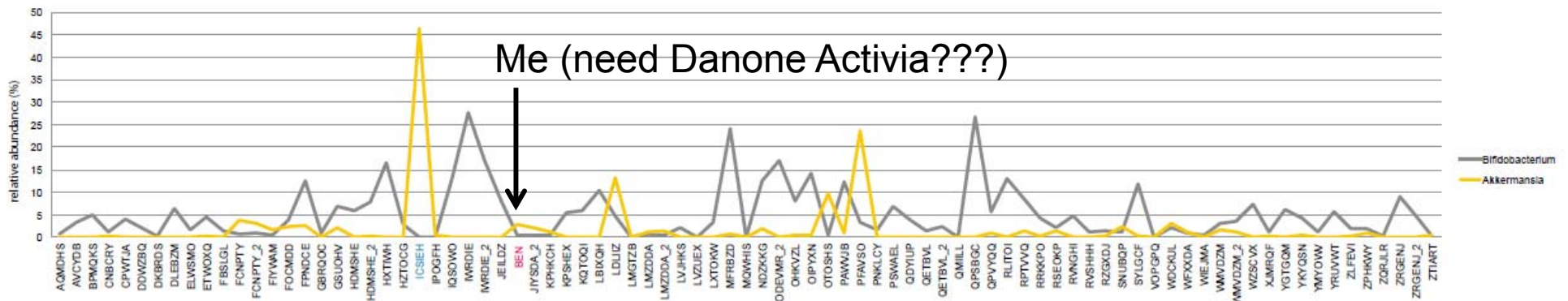
Stresshormone und Neurotransmitter

| | | | | |
|----------|-----|--|----------|--------|
| Cortisol | 192 | | 79 - 536 | nmol/L |
|----------|-----|--|----------|--------|

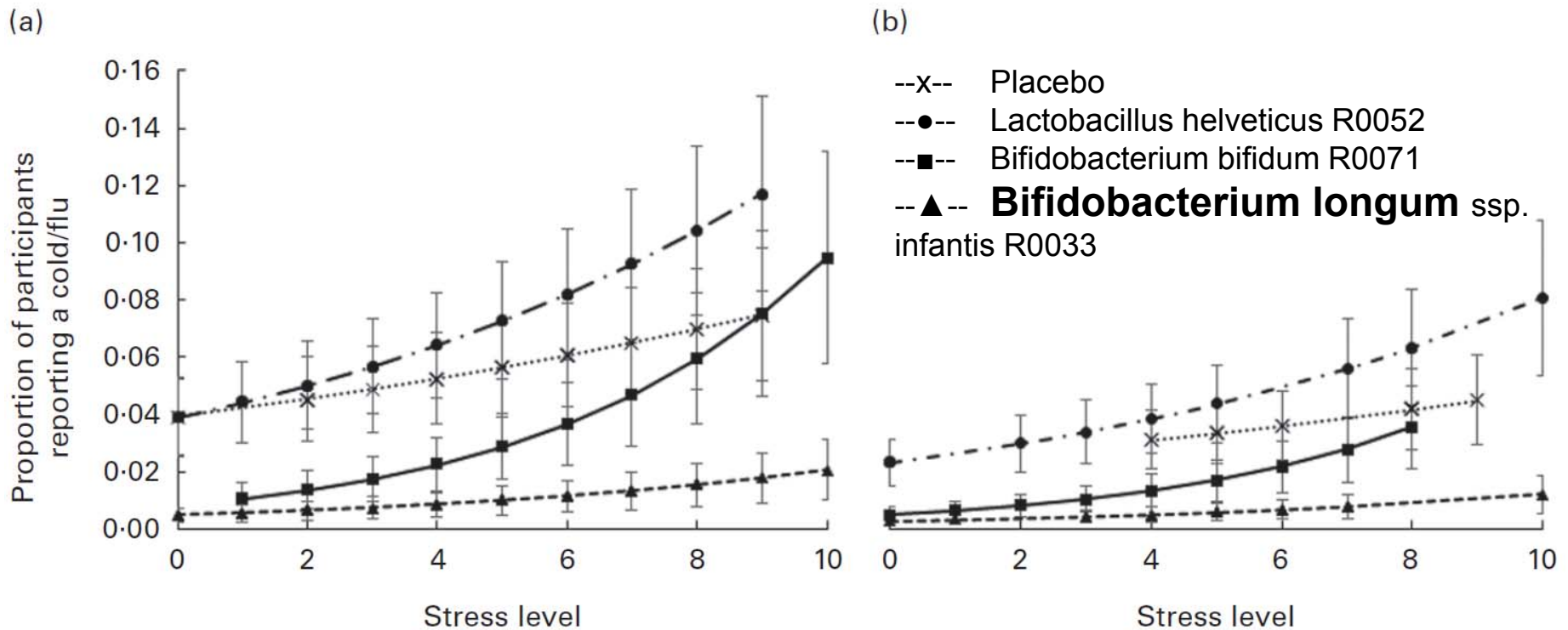
my MICROBIOME



Akkermansia and Bifidobacterium



Stress, cold/flu, probiotics



Where is our health data and
how is it really useful to us?

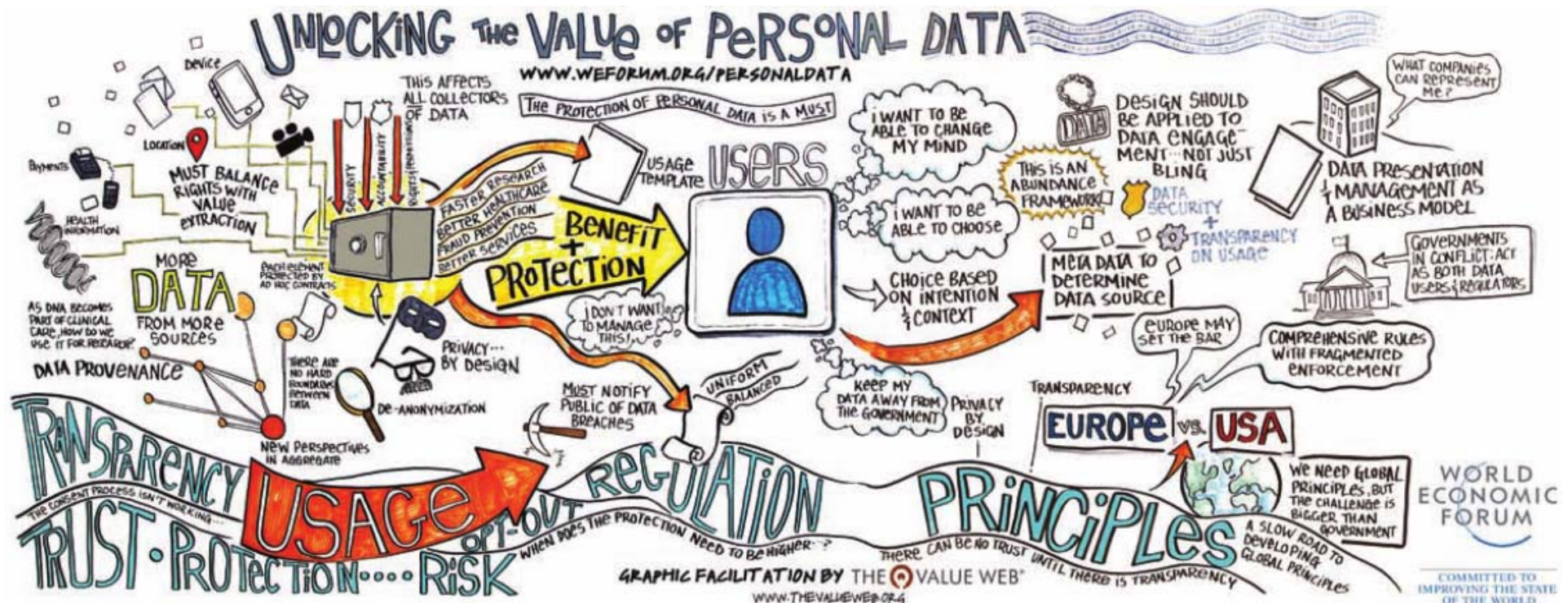
Medical Records



Unlocking the Value of Personal Data: From Collection to Usage

WORLD
ECONOMIC
FORUM

COMMITTED TO
IMPROVING THE STATE
OF THE WORLD





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VIDEOS

Forbes / Business

JAN 6, 2015 @ 3:58 PM 83,608 VIEWS

Despite regulatory troubles
testing firm 23andMe raise
money JULY 2, 2015

Surprise! With \$60 Million Genentech Deal, 23andMe Has A Business Plan

Despite corporate drama, i

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PatientsLikeMe Sheds New Light On Genetech Deal

By Lt. Dan

May 8th 2014

News

0 comments

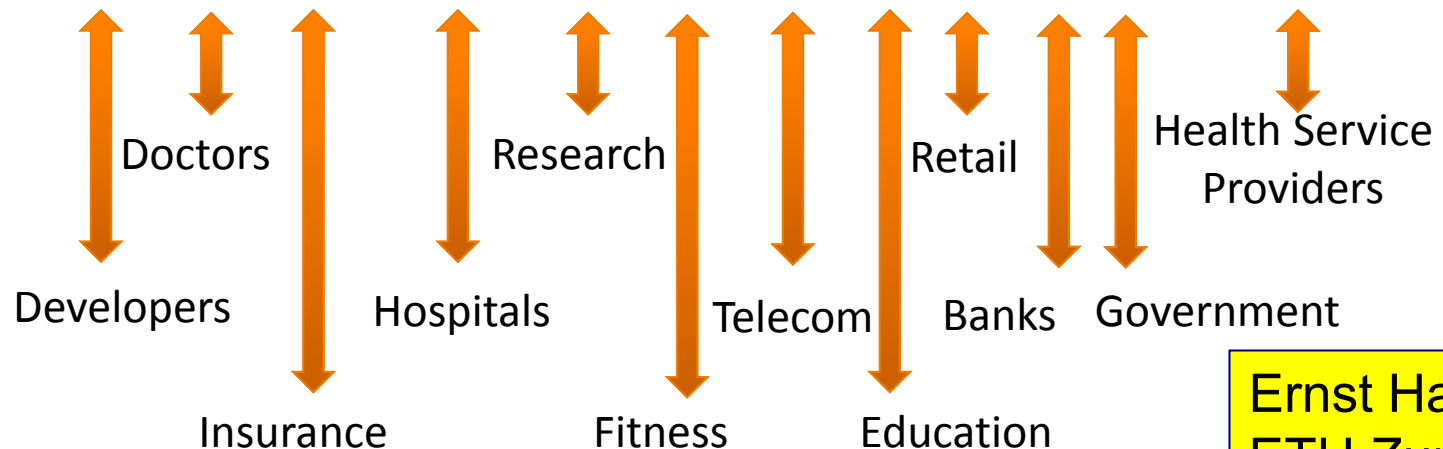
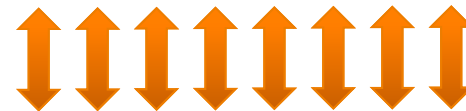
patientslikeme®

Tweet 2

PatientsLikeMe, a patient social media site that builds disease-specific digital communities, made news last month when it announced a new data sharing deal with drug manufacturer Genetech. The deal provides Genetech with unrestricted access to all of the de-identified data PatientsLikeMe is collecting from its users for a five-year period.

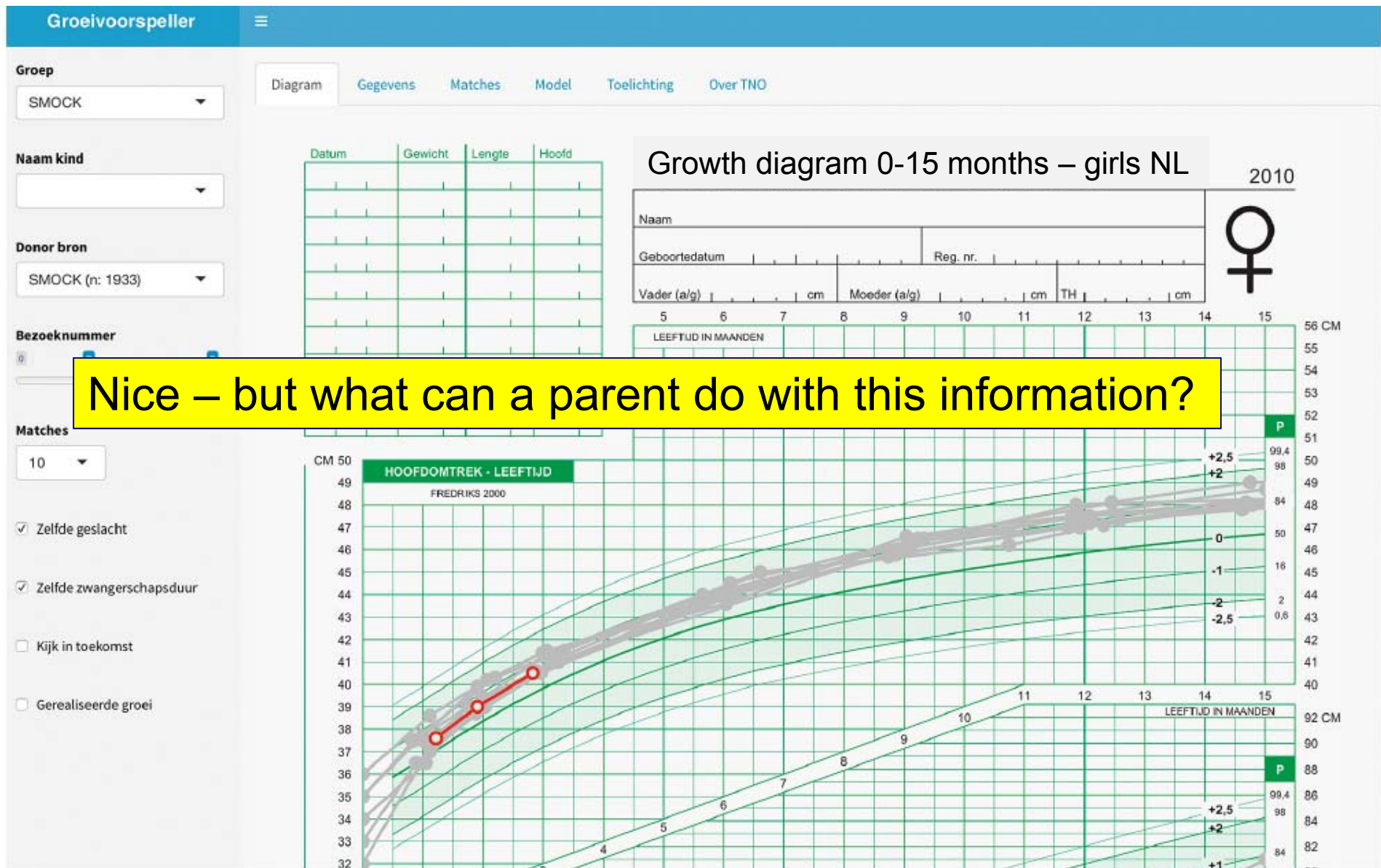
The deal represents a new monetization strategy for PatientsLikeMe, a company that has done work with pharmaceutical companies in the past, but in a different capacity. Prior to the announcement, PatientsLikeMe monetized through three business channels, all marketed to pharmaceutical companies. The first service included building disease-specific communities at the request of a drug manufacturer, so that they could study the long-term effects of the disease, and understand what aspects of the disease, and the medications used to treat it, patients were struggling with most. The second offered survey and polling services that would allow drug manufacturers to study individual patient populations within the PatientsLikeMe network. The third monetization strategy involved building predictive tools that used aggregated data from its communities to calculate individual patient outcome probabilities based on a variety of secondary risk factors.

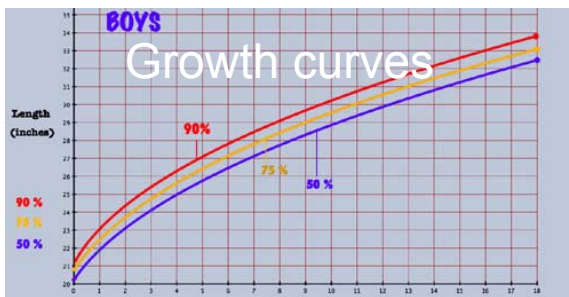
The “Health Data Cooperative” as legal entity that valorizes my health data.



Ernst Hafen
ETH Zurich

Predictor of head circumference





**What data do we
really have / need
and what should we
do with it?**



**Personal
ownership of all
health data**

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Press Releases](#)[Newsletter &
Progress Reports](#)[Bulletin Board](#)[Many Faces of
Diabetes](#)

Groundbreaking Information Theory Method Seeks Answers in Global Childhood Development Data

GRANT FROM BILL & MELINDA GATES FOUNDATION WILL FUND ANALYSIS

April 14, 2015

Seattle— Researchers at Pacific Northwest Diabetes Research Institute (PNDRI) in Seattle have received a grant from the Bill & Melinda Gates Foundation to apply their groundbreaking Information Theory method to childhood development data gathered by the foundation over several years. The goal of the collaboration is to reveal potential causes of inhibited cognitive and intellectual development in children around the world.

Dr. David Galas, Senior Investigator at PNDRI, and his colleague, Dr. Nikita Sakhanenko, initially developed the new approach to data analysis as a way to better understand biological complexity. “We can work with tens of thousands of variables simultaneously,” said Dr. Galas. “It is different from anything else currently being done.” Highly complex biological datasets often include vast numbers of variables. Some of the variables are irrelevant to phenomena being studied, essentially acting as noise that can mask dependencies. To compensate for this, typical approaches to this problem use simplified



HBGDki collaboration -OPP1126975 - Quantifying Healthy birth, growth and development knowledge integration

Project Member(s):

Ryan, L.

Funding or Partner Organisation:

Bill and Melinda Gates Foundation (Bill & Melinda Gates Foundation - Grand Challenges in Global Health)

Start year:

2015

Summary:

Grant application to the Bill and Melinda Gates Foundation for funding 40% of Prof Ryan's FTE, a post doc and travel on the HBGDki project to provide data analytics and modeling support to identify what intervention packages are the most effective for improving healthy growth.

Keywords:

biostatistics, big data

FOR Codes:

Biostatistics, Child Health

Ministry News



Minister of Health Launches Mother and Child Health Passport Project

14 March 2011

HE Minister of Health, Dr. Abdullah Bin Abdul Aziz Al Rabeeah, announced today that after studying available medical records relating to pregnancy and newborns dating back many years, the Ministry has set the issue of safeguarding maternal and child health as one of its highest priorities. HE also added that the Ministry's dedication towards its new Mother and Child Health



Passport Project is in alignment with the World Health Organization's concern with this vital issue worldwide.

During today's launch of the Mother and Child Health Passport Project at the Ministry's Divan, Dr. Al Rabeeah said that this nationwide initiative will achieve the Ministry's goals of providing necessary follow-up care for both mother and child by monitoring the mother's health condition during pregnancy and the child's subsequent health progress until the age of six. The program will also reduce both maternal and infant mortality rates. The first phase of this project will be implemented on Monday 14-3-2011 in all of the Ministry's primary healthcare centers throughout Kingdom. The second phase will cover the rest of the Kingdom's healthcare sectors through the Health Services Council.

Media Center Summary

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- ▶ [Events and Activities](#)
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- ▶ [Health Conferences and Seminars](#)
- ▶ [Interviews](#)
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Can we provide optimal nutrition for our kids based on their individual health status?

- What data?
- Who provides the interpretation and the advice?
- Who provides the food products?
- Who pays?
- How can we start?