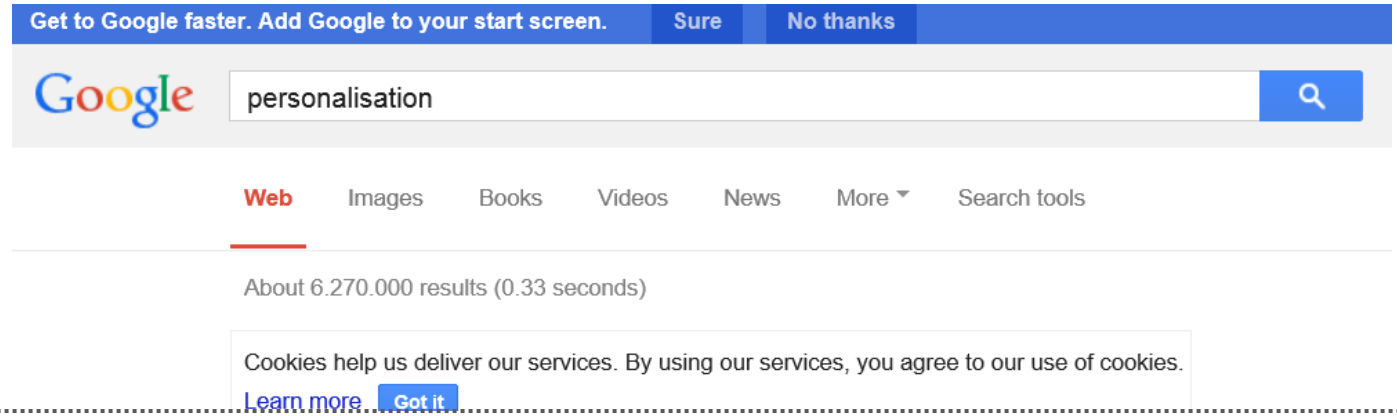
On the other end:

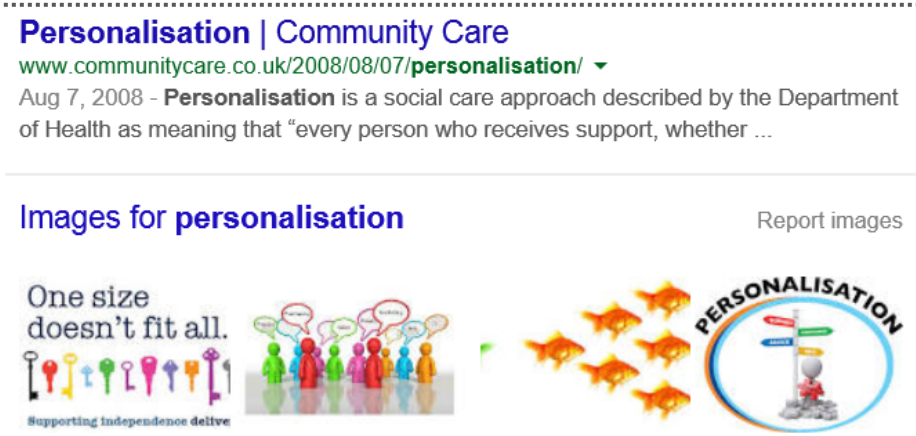
the strive for personalized nutrition

Venice 2014



Personalisation/individualisation will, definitely, be the mantra of the Millennium.

Business Today



The world is changing:

food systems between SCIENCE and ROMANCE

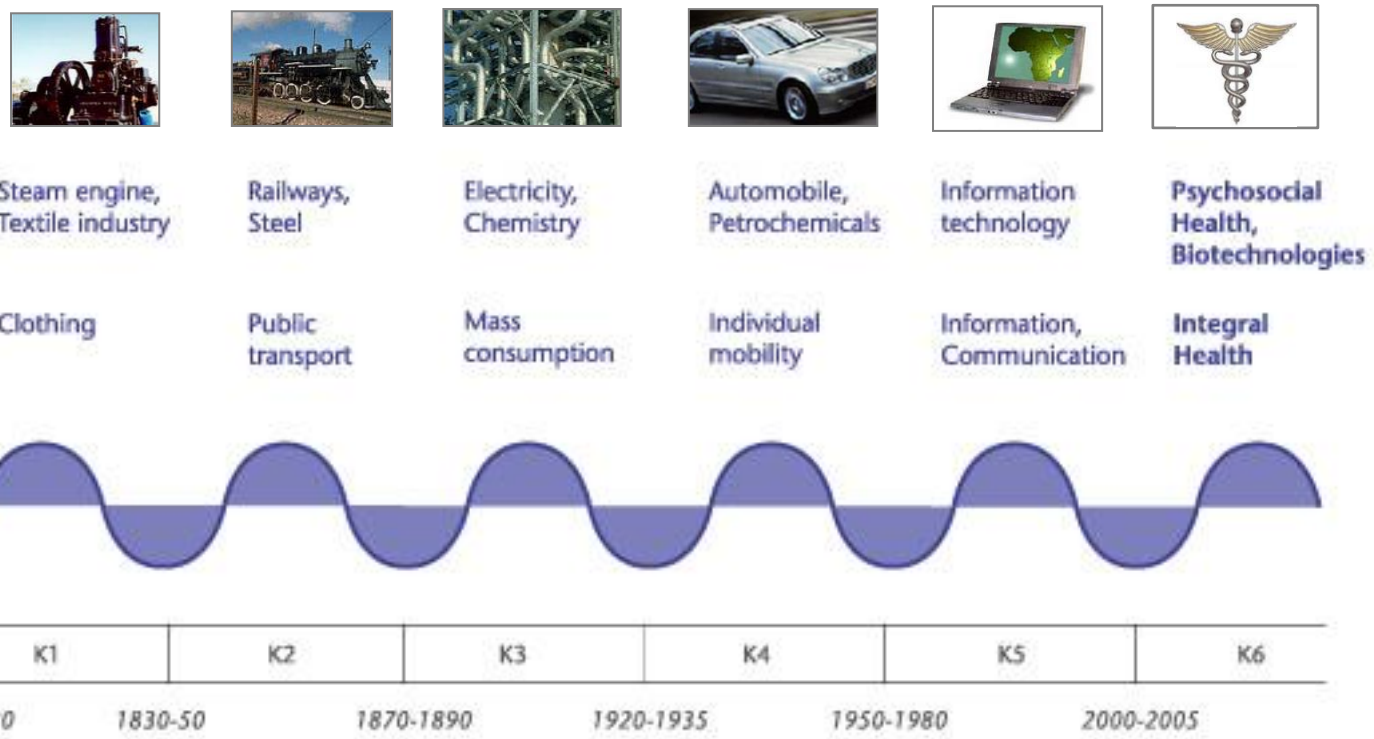
ROMANCE	SCIENCE

PRODUCER

CONSUMER

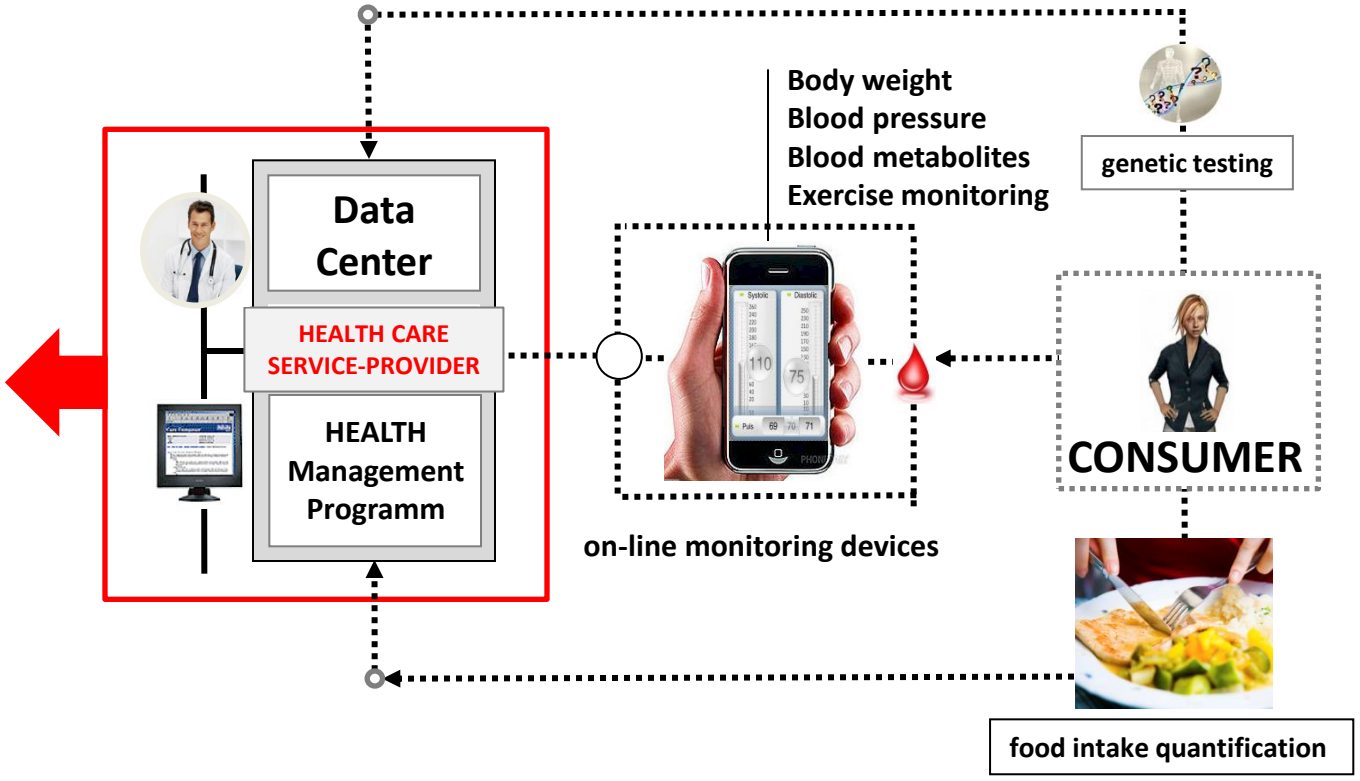
Personalized nutrition as part of integral health

Kondratieff-cycles – long waves of prosperity



The Sixth Kondratieff, *Leo and Nefiodow, Simone, 2014*

Personalised nutrition and health services: my view



Personalised nutrition and health services: my view

RESTAURANT

SUPERMARKET

Data Center

HEALTH CARE SERVICE-PROVIDER

HEALTH Management Programm

Body weight
Blood pressure
Blood metabolites
Exercise monitoring

on-line monitoring devices

genetic testing

CONSUMER

food intake quantification

Personalised nutrition and health services: my view

3D-printer

RESTAURANT

SUPERMARKET

Home delivery

Data Center

HEALTH CARE SERVICE-PROVIDER

HEALTH Management Programm

Body weight
Blood pressure
Blood metabolites
Exercise monitoring

on-line monitoring devices

genetic testing

CONSUMER

food intake quantification

Developments

Genotyping

Genetic tests and personalised nutritional advice

Jennie Ahlgren, Ethics, Lund University

70 % were willing to have a genetic test done in order to get personalised nutritional advice

67 % were willing to have a genetic test done for some other health purpose (e.g. to know how much they would be able to smoke without risking their health)

43 % said they would have a genetic test done even though they were likely to suffer psychologically from it

70 % believes that their quality of life would benefit from following a personalized diet

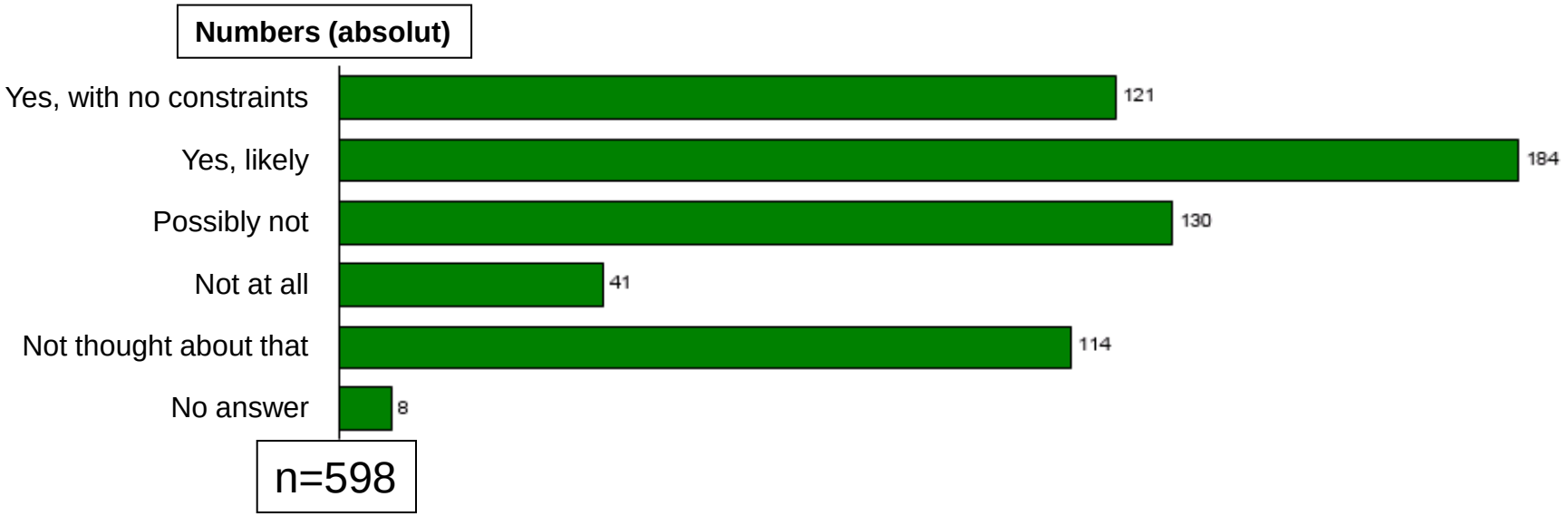
More than **70 %** would choose a longer life with poorer quality of life over a shorter life with maintained quality of life

Genetic tests and personalised nutritional advice

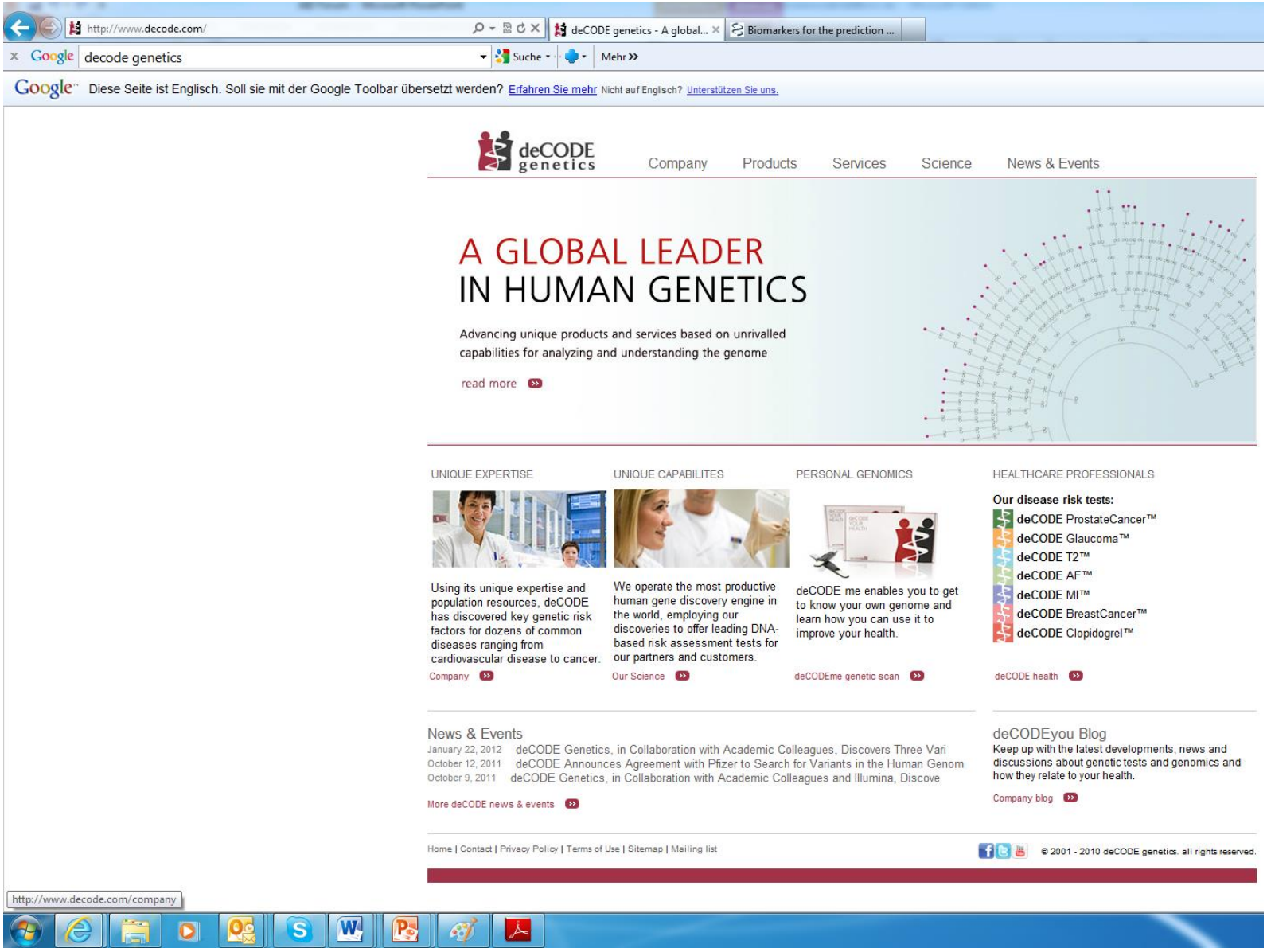
Public Understanding of Nutrigenomics – a Survey

Ilka Grötzinger*, Herbert Piechot, Judith Schaefer, Manuela Bergmann
German Institute of Human Nutrition (DIfE), * Technology Foundation Berlin (TSB)

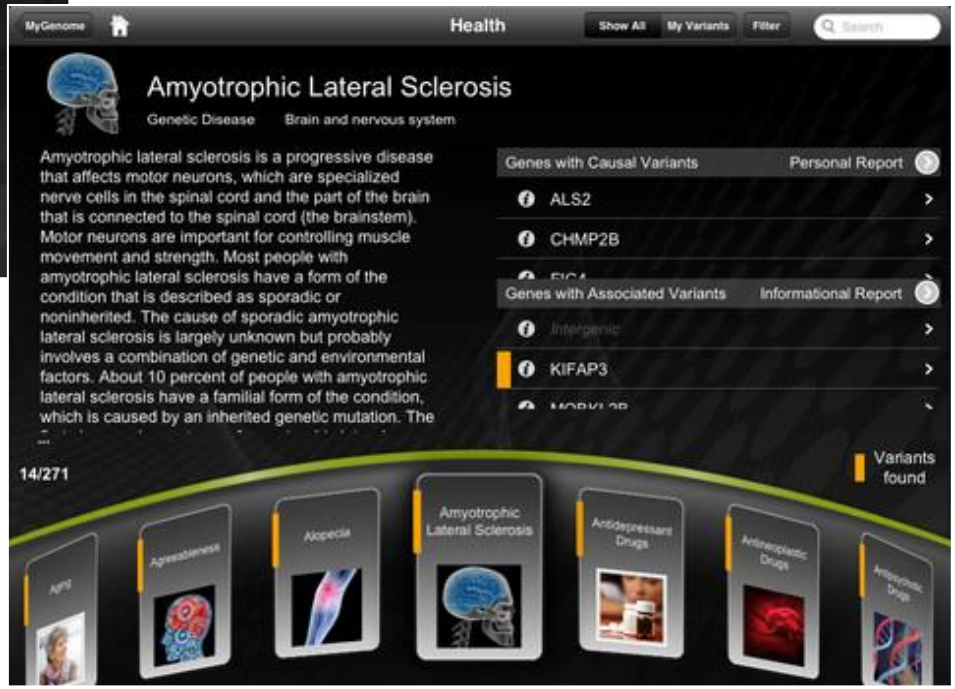
Would you get genetic testing done to adopt your diet based on that for improving health?



Genotyping in the commercial environment



My Genome App displaying my individual risk alleles



Genotyping in the commercial environment

Google 23andme Suche Mehr

Google™ Diese Seite ist Englisch. Soll sie mit der Google Toolbar übersetzt werden? Nicht auf Englisch? Unterstützen Sie uns.
Der Content dieser sicheren Seite wird über eine sichere Verbindung zur Übersetzung an Google gesendet. Erfahren Sie mehr

23andMe

sign in | register kit | 0

welcome | ancestry | health | how it works | store | search | help

JOURNEY THROUGH YOUR DNA

AS SEEN ON PBS

finding your roots with HENRY LOUIS GATES, JR.

FAMOUS ANCESTOR

learn more

finding your roots | neil schwartzman | renae bates | muhammad ali

For as little as $99 plus $9 per month, you can take a journey through your DNA with 23andMe's Personal Genome Service® (1-year subscription required)

Order Your Personal Genome Service

the spittoon

MAY 06

Quiz Answers: Traits Associated With BMI

Last week we quizzed our readers on traits associated with BMI among 23andMe's customers. Congratulations to Suellen, the winner of the quiz! So what were the correct answers? Read on...

discoveries

- Parkinson's, Cholesterol, Type 2 Diabetes and BMI
- Parkinson's Disease, Back Pain and Joint Replacement
- Parkinson's Disease and Personality

reports

video tutorials

explore our collection of education materials

"Just found a 3rd cousin in the UK...thanks @23andMe :)

Alisha Noelle

U.S. Department of Health & Human Services

a A A

U.S. Food and Drug Administration
Protecting and Promoting *Your* Health

A to Z Index | Follow FDA | FDA Voice Blog

SEARCH

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Inspections, Compliance, Enforcement, and Criminal Investigations

Compliance Actions and Activities
Warning Letters
2013

23andMe, Inc. 11/22/13

Department of Health and Human Services

Public Health Service
Food and Drug Administration
10903 New Hampshire Avenue
Silver Spring, MD 20993

Nov 22, 2013

Ann Wojcicki
CEO
23andMe, Inc.
1390 Shoreline Way
Mountain View, CA 94043

Document Number: GEN1300666
Re: Personal Genome Service (PGS)

WARNING LETTER

Dear Ms. Wojcicki,

The Food and Drug Administration (FDA) is sending you this letter because you are marketing the 23andMe Saliva Collection Kit and Personal Genome Service (PGS) without marketing clearance or approval in violation of the Federal Food, Drug and Cosmetic Act (the FD&C Act).

This product is a device within the meaning of section 201(h) of the FD&C Act, 21 U.S.C. 321(h), because it is intended for use in the diagnosis of disease or other conditions or in the cure, mitigation, treatment, or prevention of disease, or is intended to affect the structure or function of the body. For example, your company's website at www.23andme.com/health (most recently viewed on November 6, 2013) markets the PGS for providing "health reports on 254 diseases and conditions," including categories such as "carrier status," "health risks," and "drug response," and specifically as a "first step in prevention" that enables users to "take steps toward mitigating serious diseases" such as diabetes, coronary heart disease, and breast cancer. Most of the intended uses for PGS listed on your website, a list that has grown over time, are medical device uses under section 201(h) of the FD&C Act. Most of these uses have not been classified and thus require premarket approval or de novo classification, as FDA has explained to you on numerous occasions.

Some of the uses for which PGS is intended are particularly concerning, such as assessments for BRCA-related genetic risk and drug responses (e.g., warfarin sensitivity, clopidogrel response, and 5-fluorouracil toxicity) because of the potential health consequences that could result from false positive or false negative assessments for high-risk

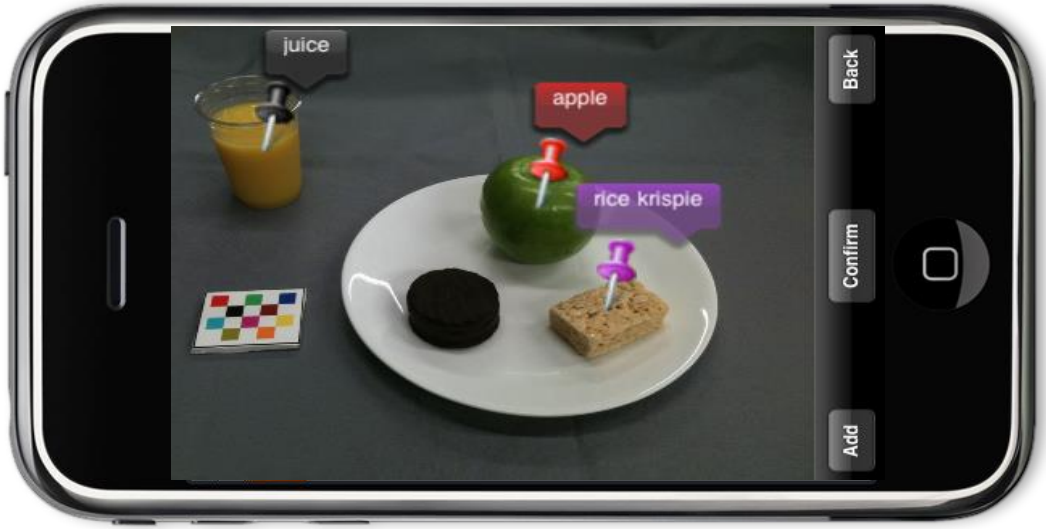
Developments

Food intake assessment devices

New devices for assessing food intake

Technology Based Dietary Assessment

(www.tadaproject.org)



Carol J. Boushey

Epidemiology Program, University of Hawaii Cancer Center, Honolulu,HI
Department of Nutrition Science, Purdue University, West Lafayette, IN

PURDUE UNIVERSITY

UNIVERSITY OF HAWAI'I CANCER CENTER

NATIONAL CANCER INSTITUTE

NIDDK NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES

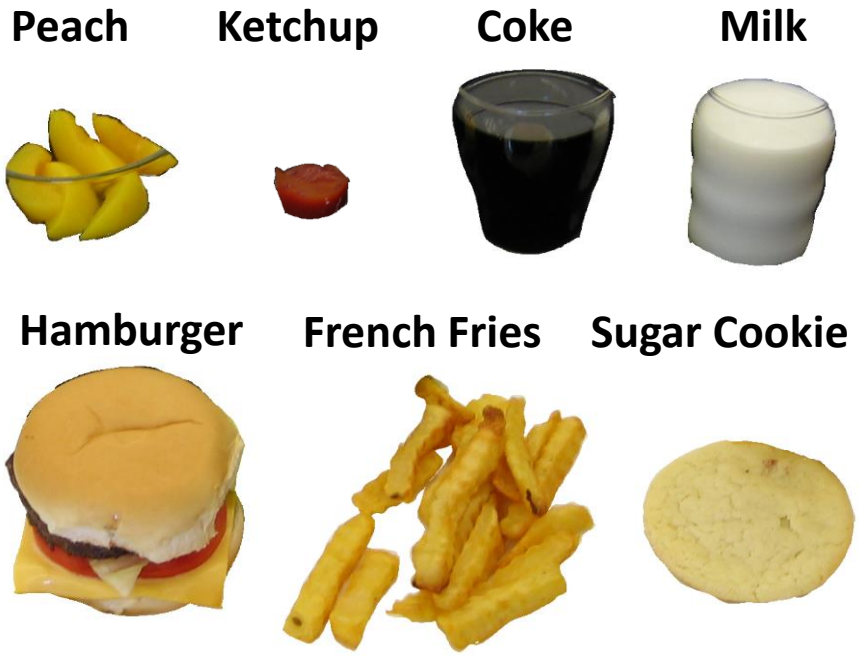
U.S. Department of Health and Human Services
National Institutes of Health
National Institute of Enviromental Health Sciences

New devices for assessing food intake

Ideal Image Analysis for Image-Based Dietary Assessment

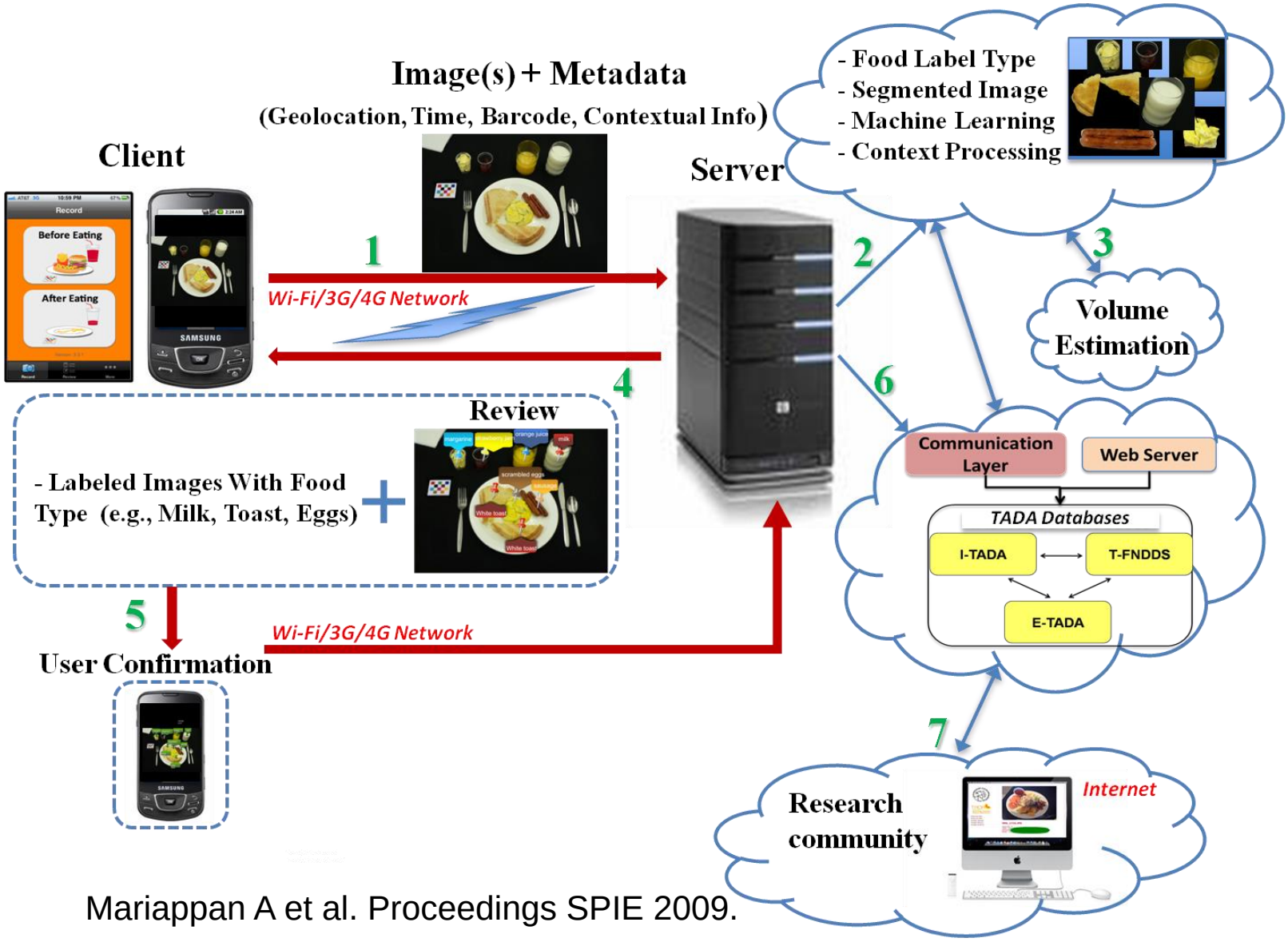
Meal Image

locate & identify →



Six BL *et al*. J Am Diet Assoc 2010; Zhu F *et al*. IEEE J Sel Top Signal Process 2010

Mobile Telephone Food Record (mpFR) System

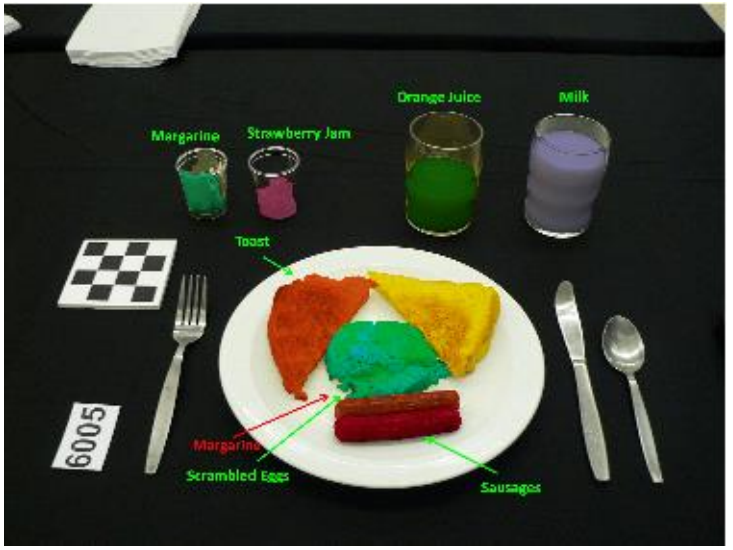


Mariappan A et al. Proceedings SPIE 2009.

New devices for assessing food intake

Classification Accuracy of Food Items

Percentage of Training Data	Correct Classification Percentage
10	88.1
25	94.4
50	97.2



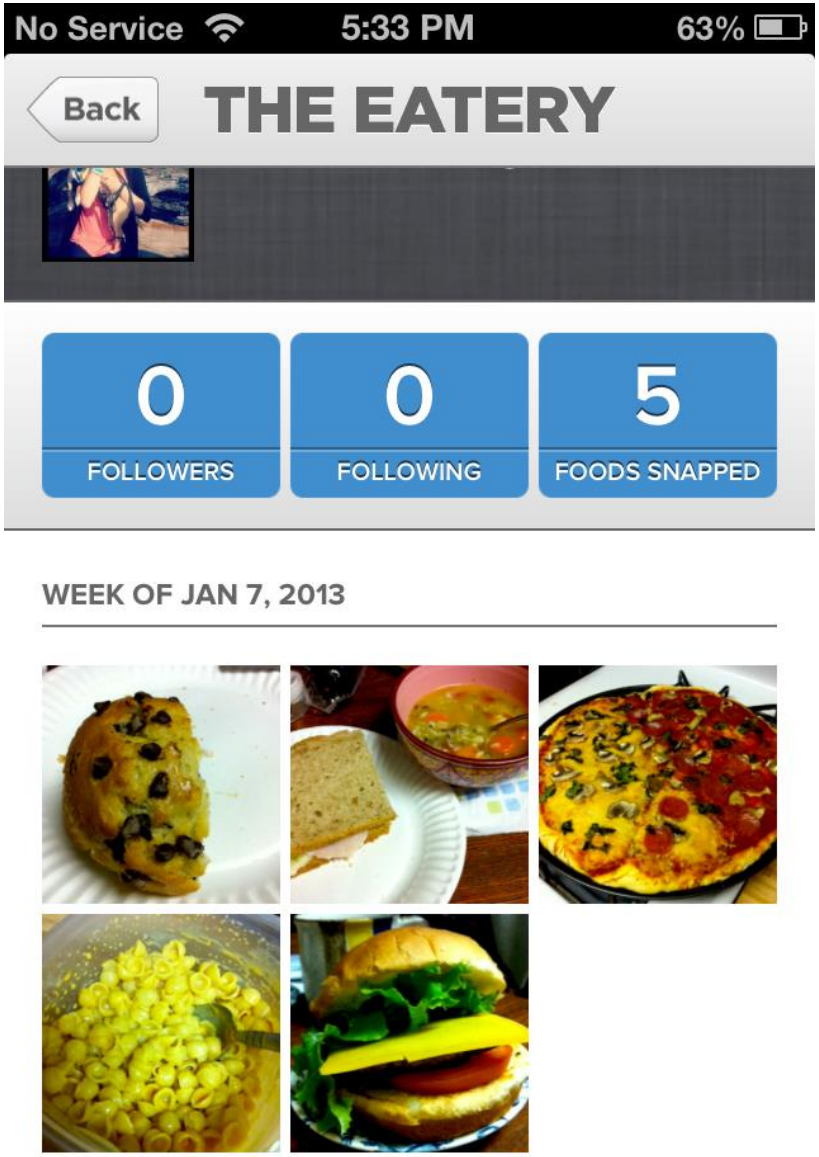
Scrambled eggs - 10% training	70%	30% (Margarine)
Scrambled eggs - 25% training	78%	22% (Margarine)
Scrambled eggs - 50% training	87%	13% (Margarine)

Zhu F *et al*. IEEE J Sel Top Signal Process 2010.

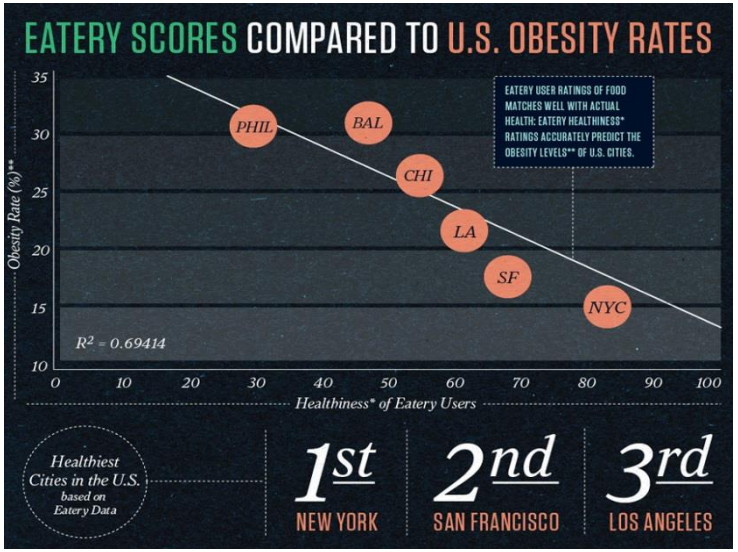
Developments

New communication tools

New communication tools to promote healthy eating



New communication tools to promote healthy eating



New communication tools to promote healthy eating

alpro
soya
organic
Achmea's
choice
7000
21
7
1000
HEALTH
BONUS
HEALTHY CHOICE POINTS
13400
Bora R.

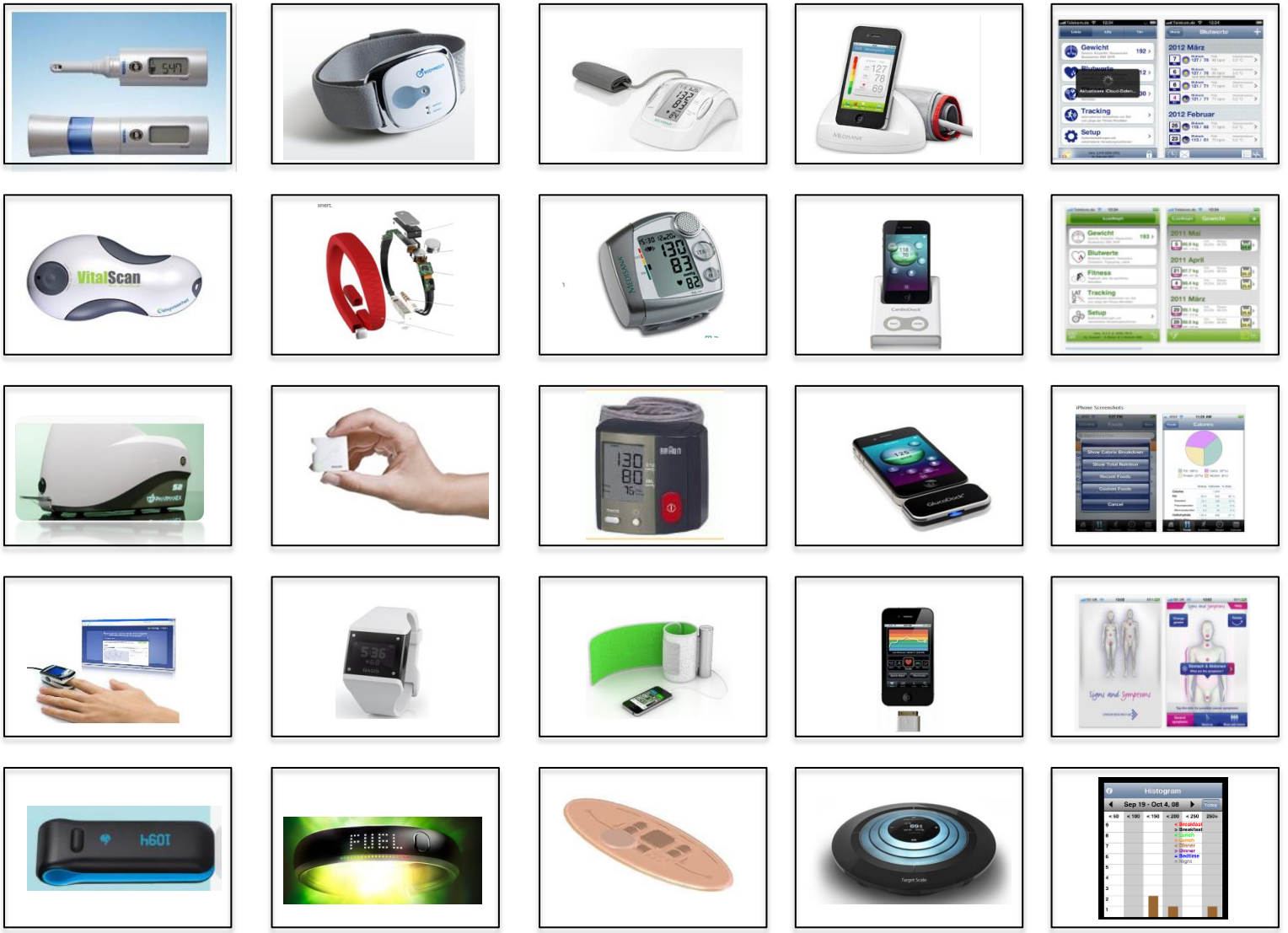
New communication tools to promote healthy eating

„the healtyh choice as the easy choice“

Developments

Health monitoring devices

New electronic devices for assessing body functions



New electronic devices for assessing body functions

Proteus Raisin System brings together networked pills, wearable physiologic monitoring, and mobile health for an integrated personalized medicine solution

Ingestible Technology

Proteus ingestible sensors

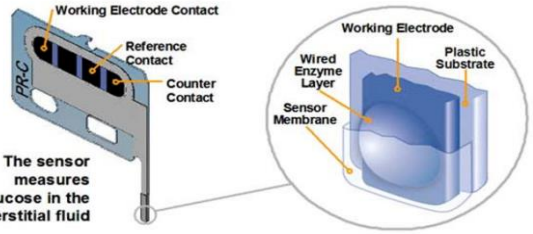
Proteus ingestible event markers (IEMs) are tiny, digestible sensors made from food ingredients, which are activated by stomach fluids after swallowing. Once activated, the IEM sends an ultra low-power, private, digital signal through the body to a microelectronic receiver that is either a small bandage style skin patch or a tiny device insert under the skin. The receiver date- and time-stamps, decodes, and records information such as the type of drug, the dose, and the place of manufacture, as well as measures and reports physiologic measures such as heart rate, activity, and respiratory rate.

The IEM is manufactured on silicon wafers, and is extremely economical to produce, costing a few cents per sensor in large quantities.

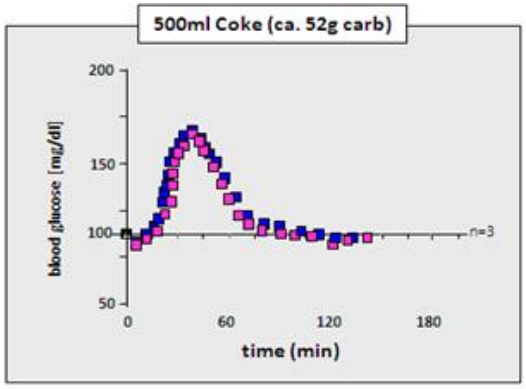
The IEM is the cornerstone of the company's Raisin™ System, which is currently in clinical development. The Raisin™ System measures the body's response to medications and is intended to improve the management of chronic diseases like heart failure, infectious disease and psychiatric disorders.

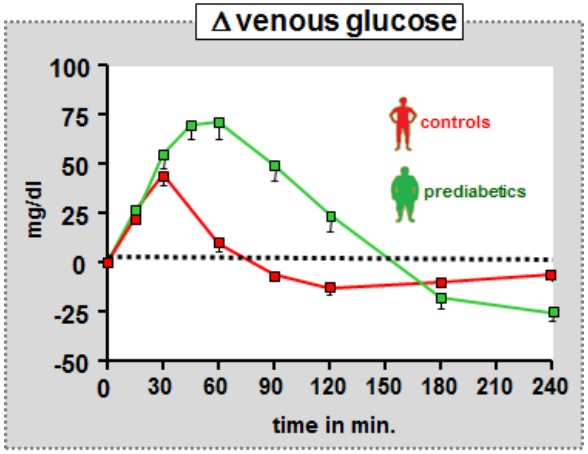
New electronic devices for assessing body functions

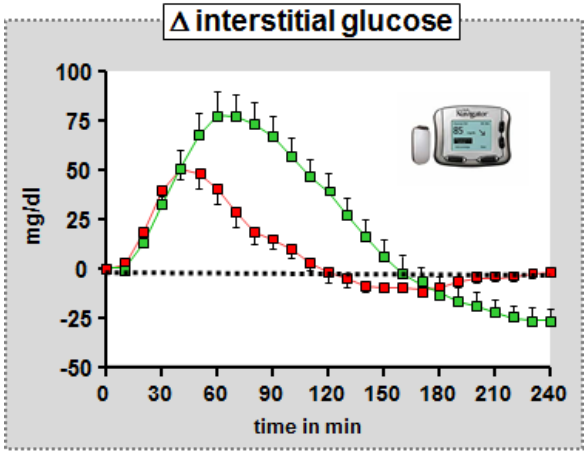
Oral glucose tolerance tests



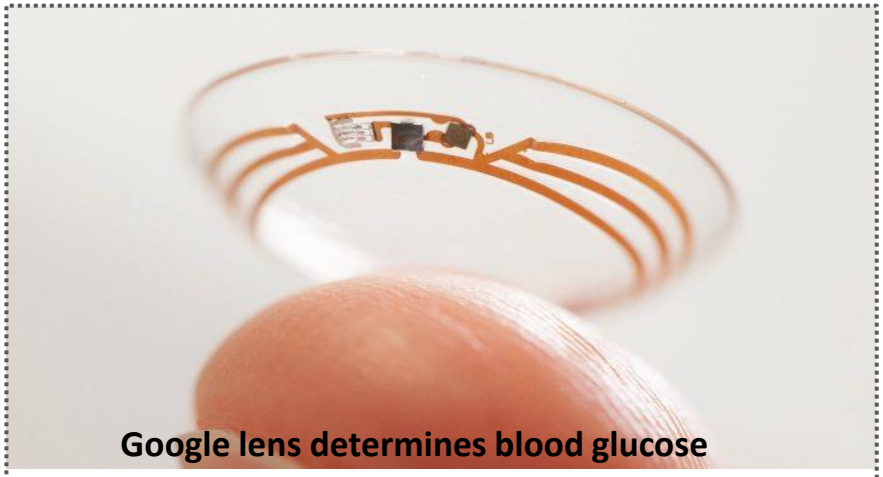
Using amperometry, the sensor utilizes a working electrode coated with a sensing element (Wired Enzyme) that converts glucose concentration to electrical current.



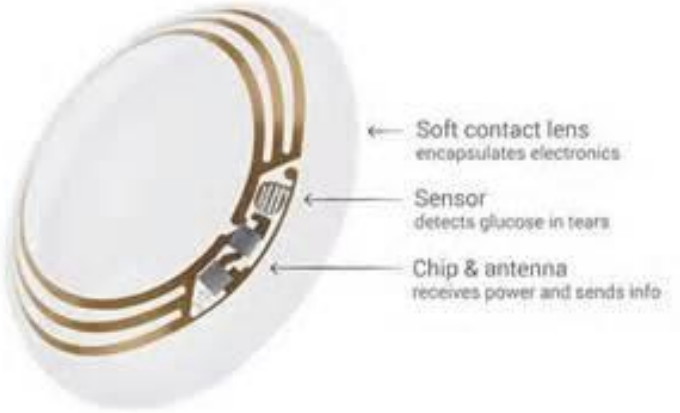




New electronic devices for assessing body functions



Google lens determines blood glucose



vitaMe

Nutriphone hopes to commercialize smartphone-enabled vitamin D deficiency testing

times during its announcement of Google Fit on Wednesday, that users would control what health and the platform access to. "That's the key," the company's representative said. "You're in control"

Google Unveils Its Hub For Health Tracking, Google Fit

Wearable Tech Is Plugging Into Health Insurance

PTC*Voice:* Becoming Cyborgs: Wearable Tech Disrupts Healthcare

DEVELOPER PREVIEW

The Google Fit SDK

New APIs to make building fitness apps and devices easier.

sor data
apps
nsors API.

Collect activity data

Connect your app and devices to Google Fit with the Recording API.

Help users keep track

Access and edit the user's fitness history with the History API.

Developments

New services

New food delivery services

Munchery

DAILY MENU | HOW IT WORKS | INVITE & EARN | GIFTS | Sign in

Eat Better with Munchery. SIGN UP TO EAT BETTER SIGN IN

Menus for September

TODAY | FRI 09/06 | MON 09/09 | TUE 09/10 | WED 09/11 →

ABOUT THE CHEF

PAST MEALS

★★★★½ (633)

Like 86

Chef Steven Levine

Alum of Cosmopolitan (Exec Chef), NY: Zoe Restaurant (Exec Chef), Aureole, The River Cafe, The Quilted Giraffe

Grilled Salmon, Basil Whipped Potatoes, Charred Tomatoes

WHEAT-FREE

$14.49

ADD ITEM

"The Reubenesque"

$11.99

ADD ITEM

Place an Order

Does Munchery Serve My Area?

Your ZIP LOOK UP ZIP

See our FAQs for more info.

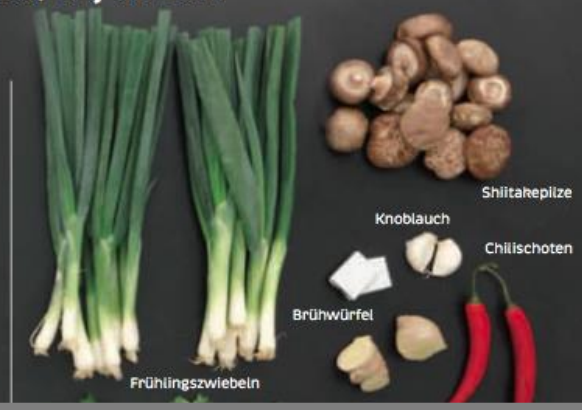
from Phone to Fork

Available on the iPhone App Store

New food delivery services

Asiatische Hühnersuppe mit Shiitakepilzen und Pak Choi

Eine heiße Angelegenheit: Die chilischarfe Asia-Hühnersuppe ist sehr schnell gemacht. Sie wärmt auch an kalten Tagen mit würziger Sojasoße, frischem Ingwer, edlen Shiitakepilzen und feinem Pak Choi-Gemüse.



60 ml Olivenöl
(für 4 Personen)

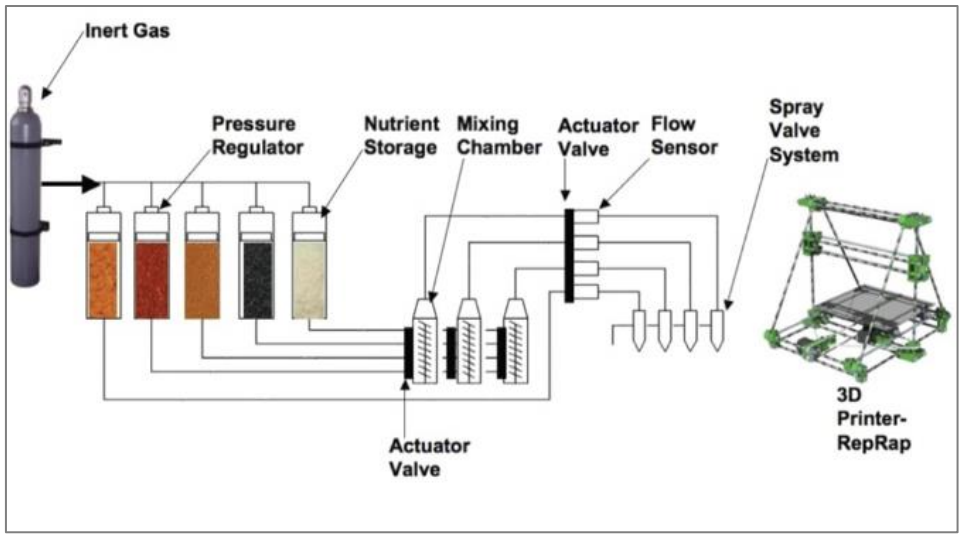
Salz

edarf im Wandregal

Developments

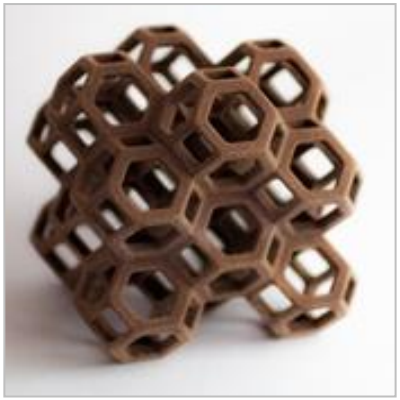
New food production technologies

New food production technologies

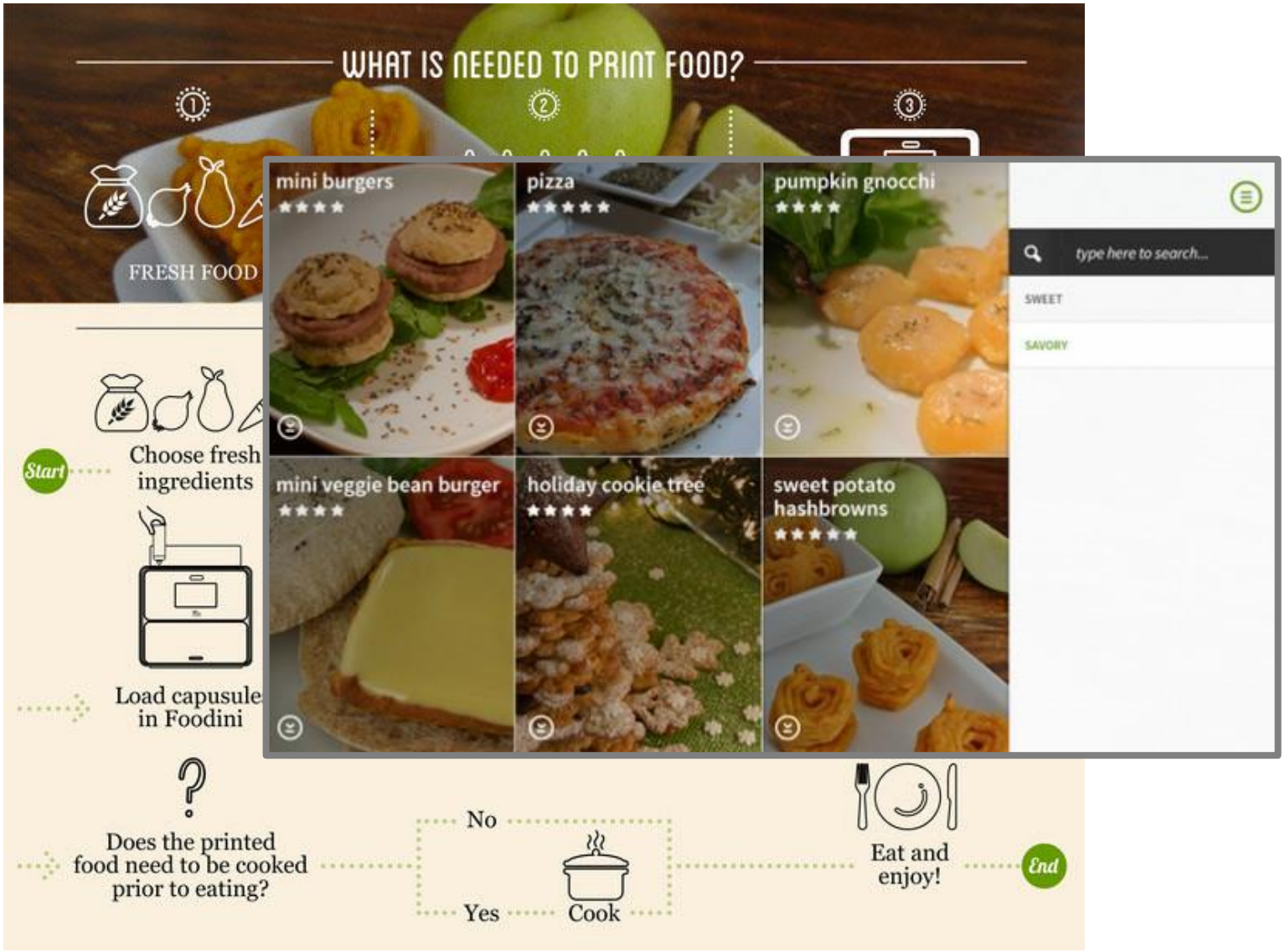


New food production technologies

New food production technologies

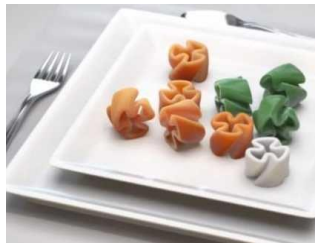


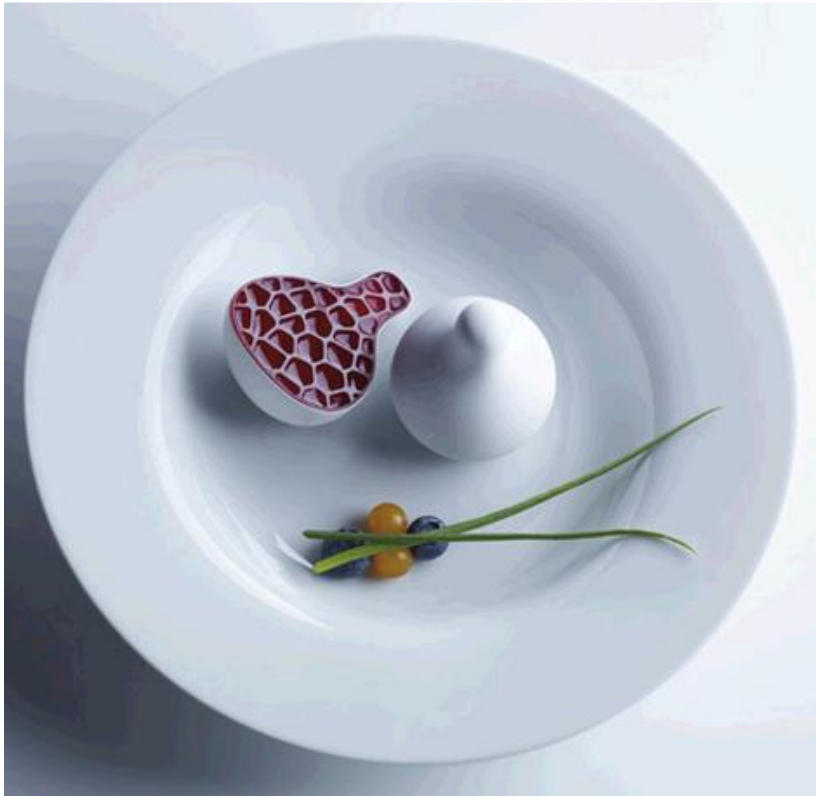
New food production technologies



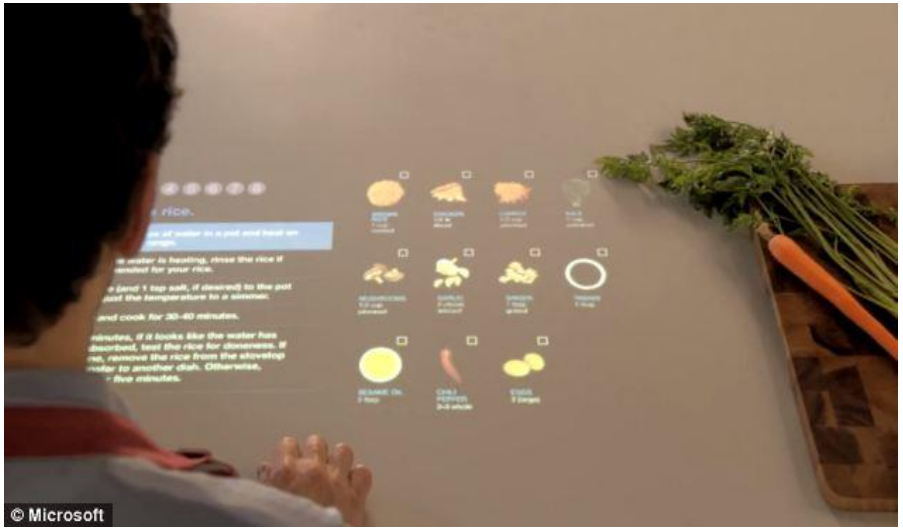
https://www.youtube.com/watch?v=rPngd9NkX3A#t=125

New food production technologies





New food production technologies



New food production technologies

The ROSIE humanoid robot designed by TUM

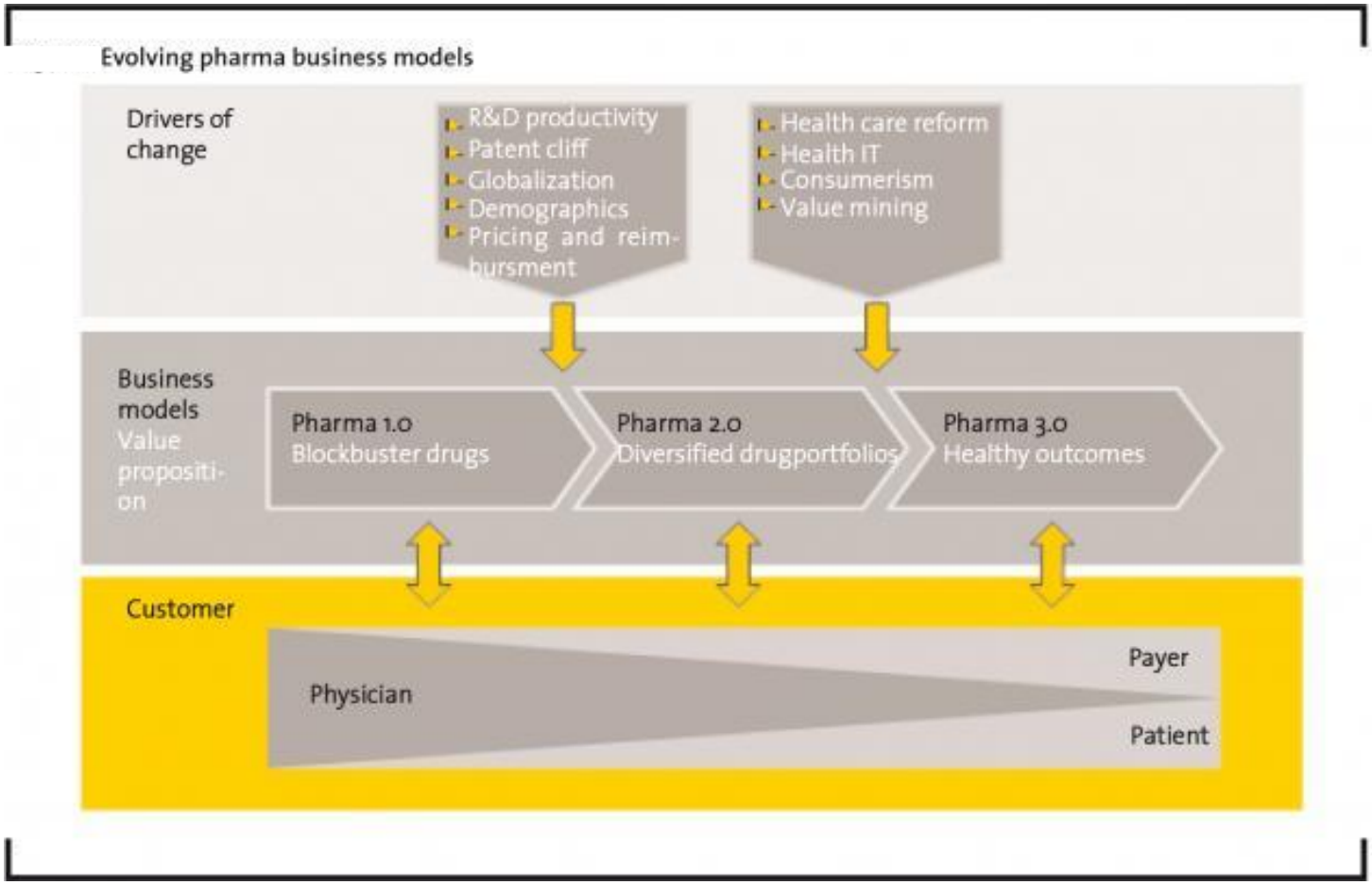
The ARMAR humanoid robot designed by KIT

http://www.youtube.com/watch?v=gbIDPqb_2iM&feature=player_embedded#t=11

Developments

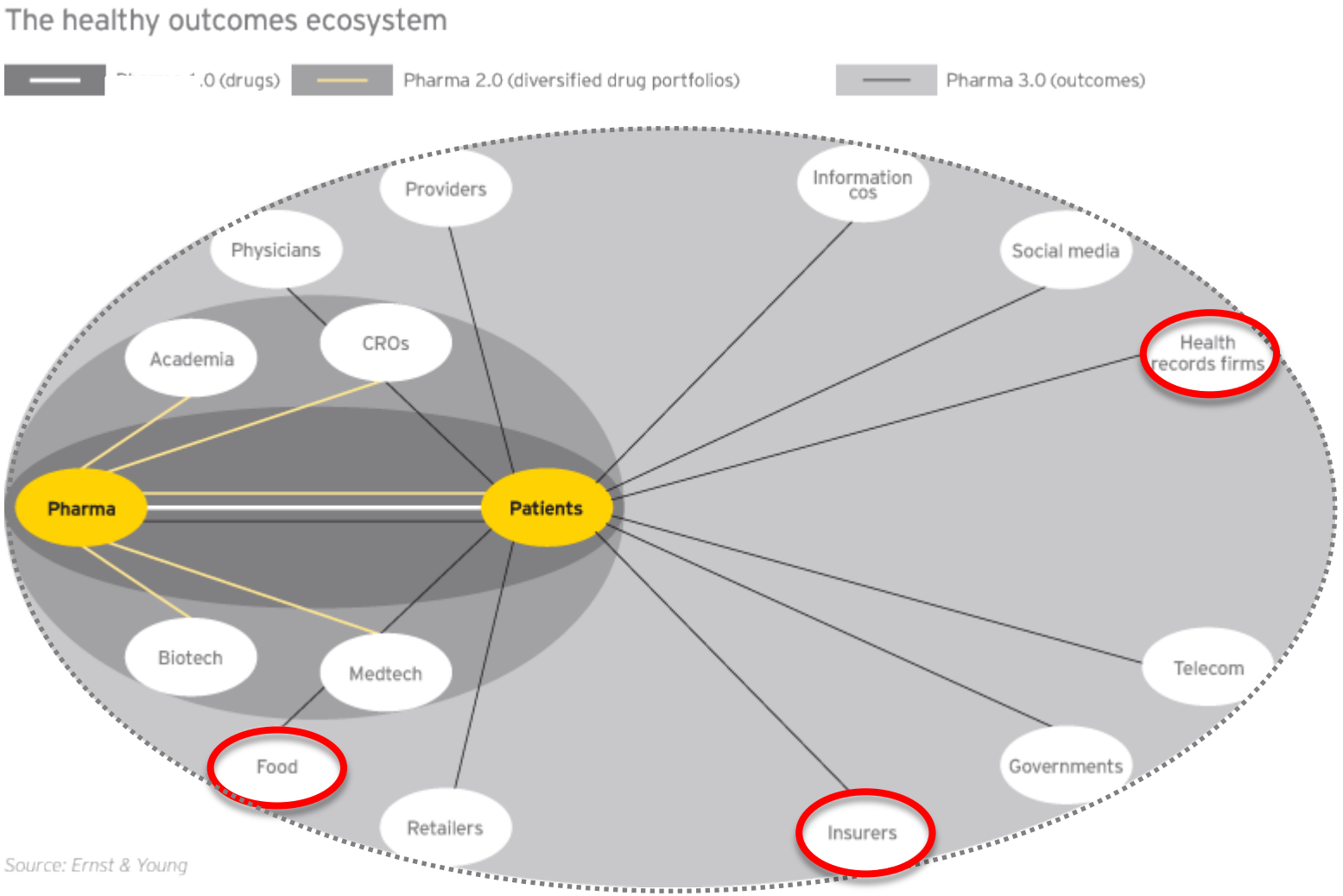
New alliances

Pharma 3.0: pharma on the move



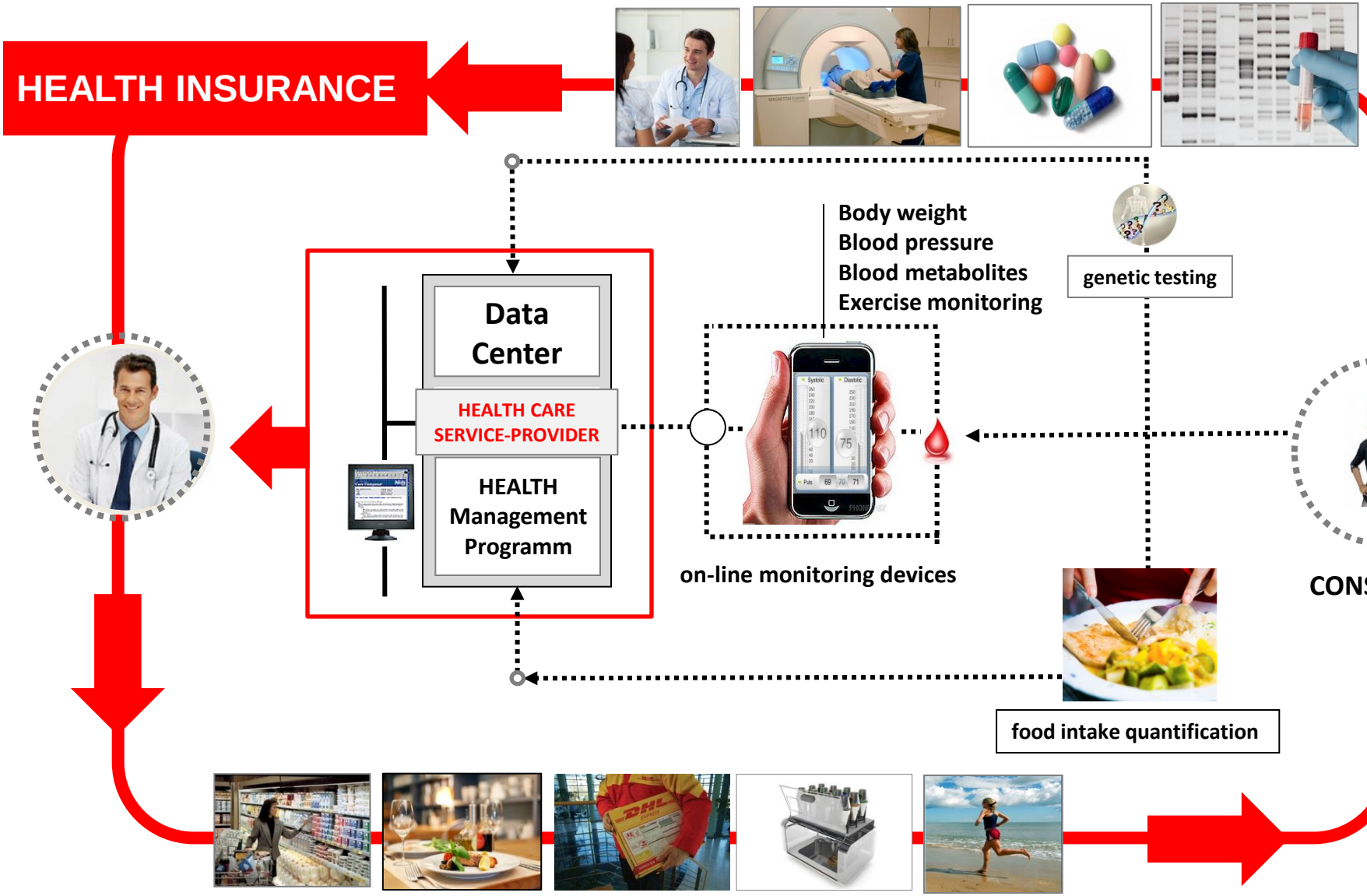
Ernst and Young, Global Pharmaceutical Reports

Food and Pharma: new alliances?



Ernst and Young, Global Pharmaceutical Reports

Personalised nutrition and health services



food4me.org

food4me.org

Search... OK

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latest news

Personalised Nutrition

Studies have shown that individuals respond differently to various nutrients. For example, omega-3 polyunsaturated fatty acids, the 'healthy fats' found in oily fish that are believed to protect against cardiovascular disease, have been found to be more beneficial in individuals with a particular genetic make-up (Ferguson et al., 2010). The point is, we are all different, and so the way we respond to our diet is also different. Such research suggests that blanket public dietary advice is not the most effective technique for improving public health.

Read more

An integrated analysis of opportunities and challenges for personalised nutrition.

Food4Me will consider all aspects of personalised nutrition; from investigating consumer understanding to producing technologies for implementation and investigating gene expression in response to diet.

Read more about the food4me project

Home
About
Expected outcomes
Research
News
Partners
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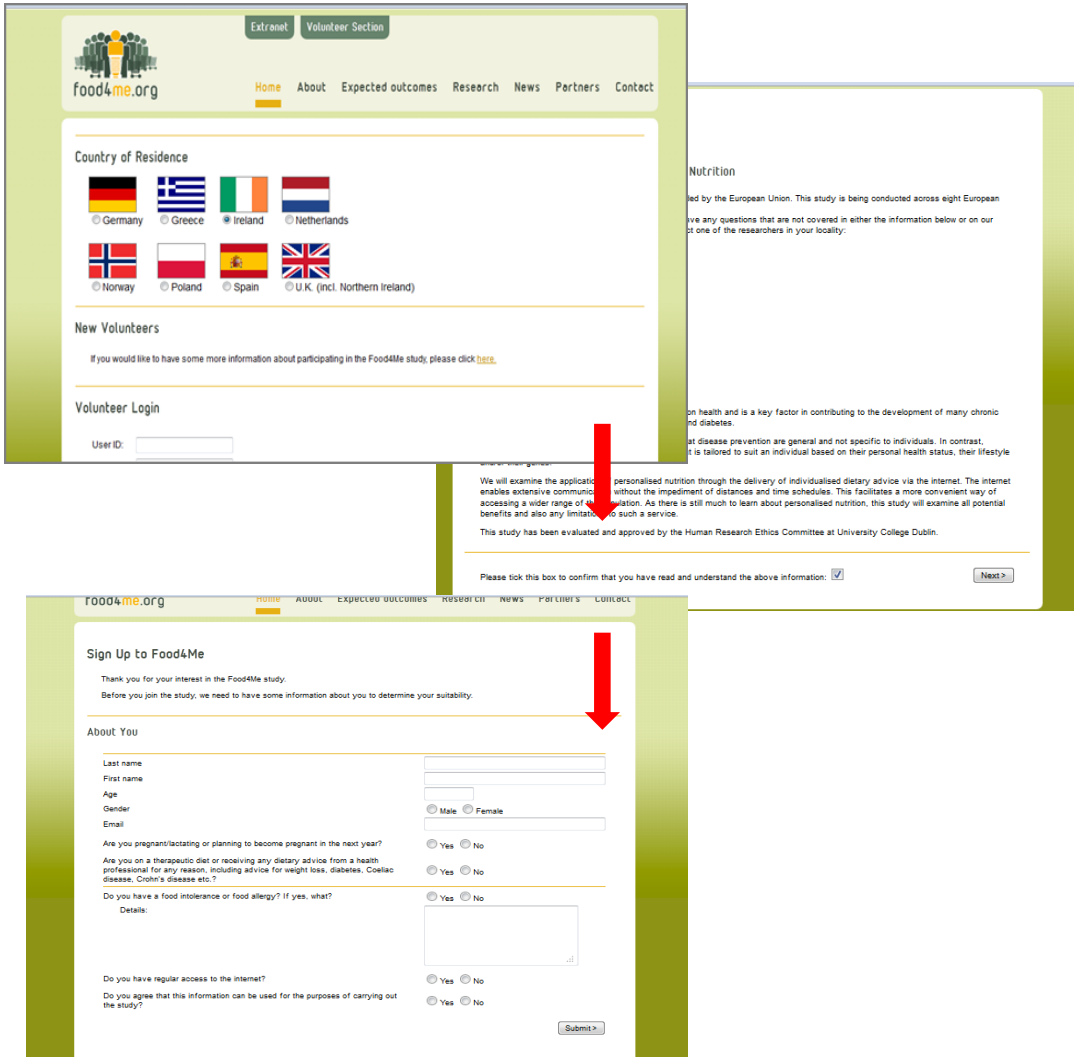
This project is supported by the European Commission under the Food, agriculture and fisheries, and biotechnology Theme of the 7th Framework Programme for Research and Technological Development.

food4me: an integrated analysis of opportunities and challenges for personlized nutrition

1. Smart Sister
2. My Health My Home
3. Me Inc
4. Nudging Society

food4me is a decentralized – solely web-based program

Sign up (info)
Screening and consent 1
Screening and consent 2

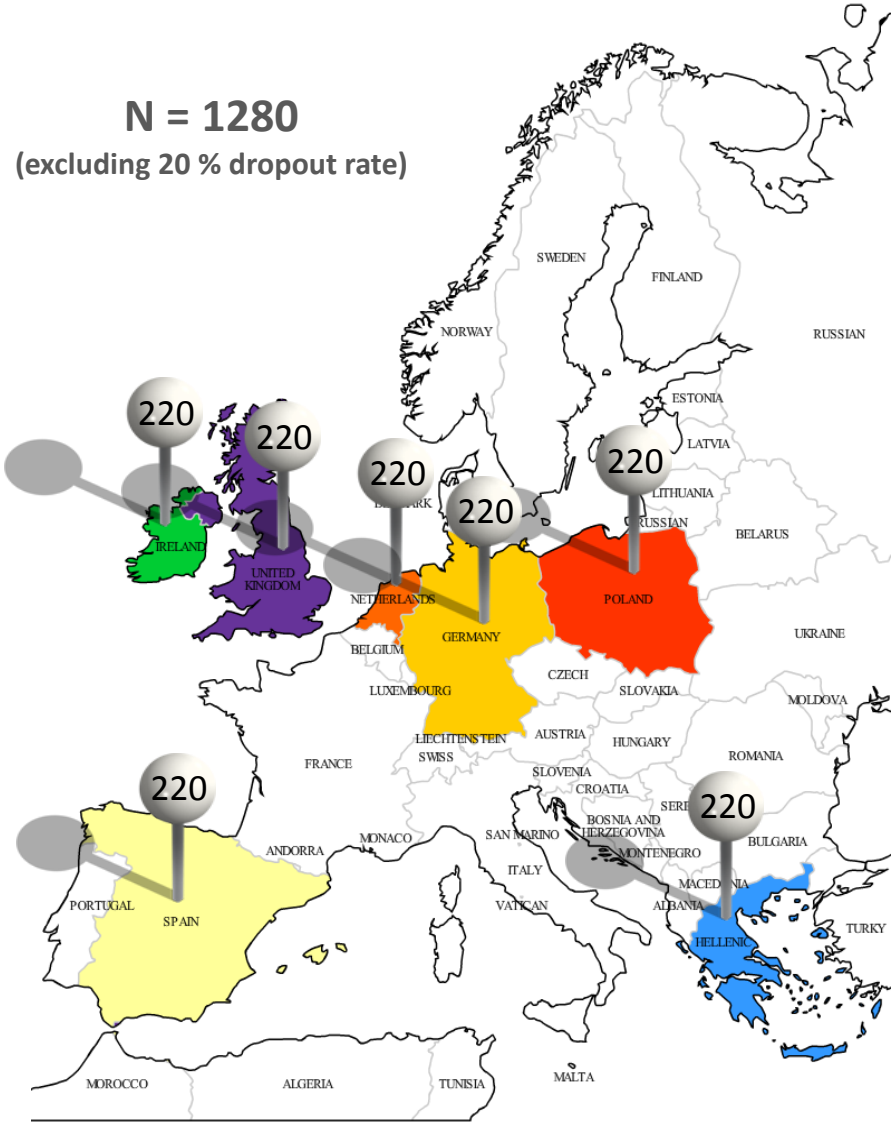


food4me has 7 study centres

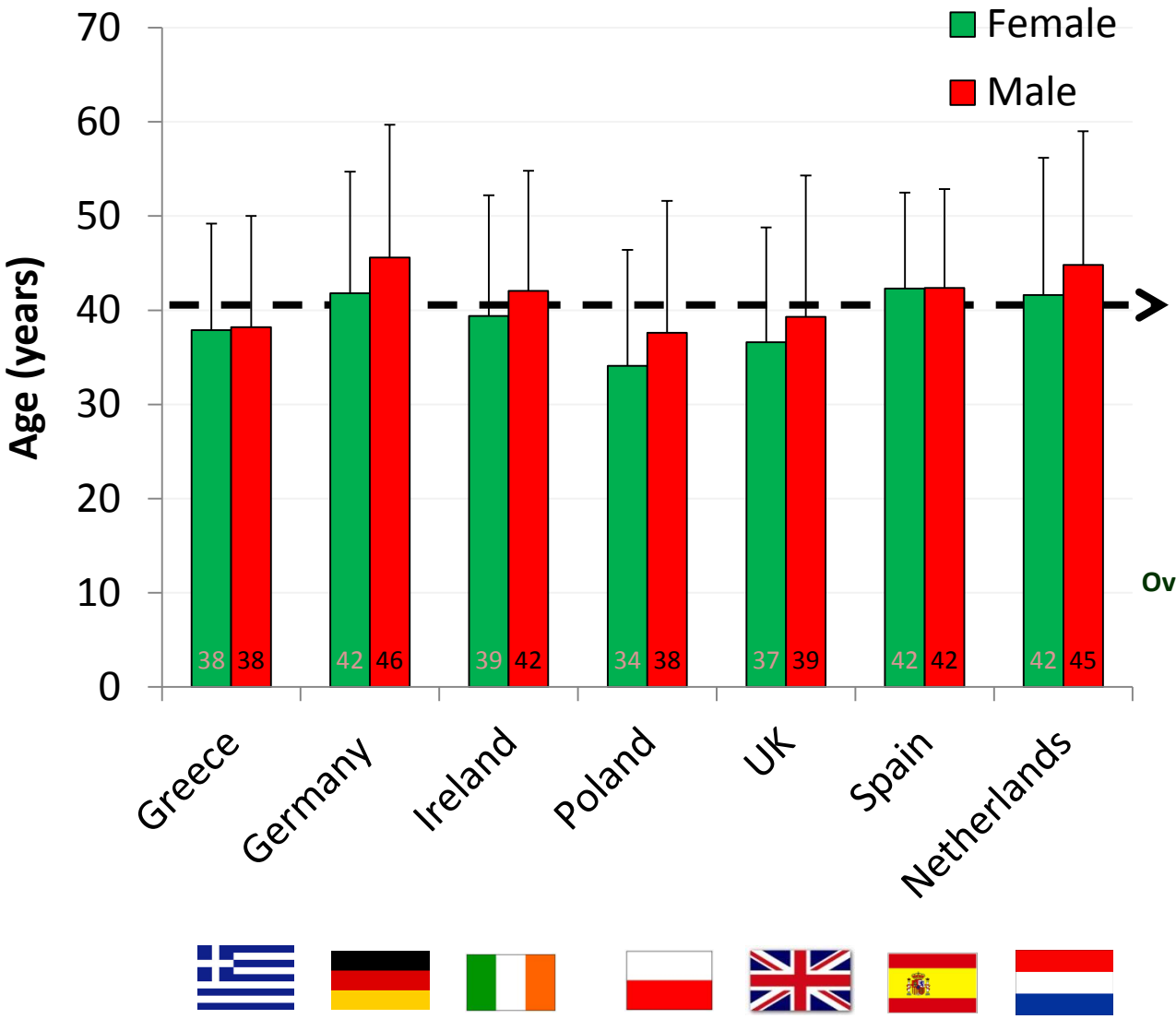
- University College Dublin (Ireland)
- Maastricht University (The Netherlands)
- University of Navarra (Spain)
- University of Reading (UK)
- National Food & Nutrition Institute Warsaw (Poland)
- Harokopio University Athens (Athens)
- Technische Universität München (Germany)

Coordinated by Newcastle University

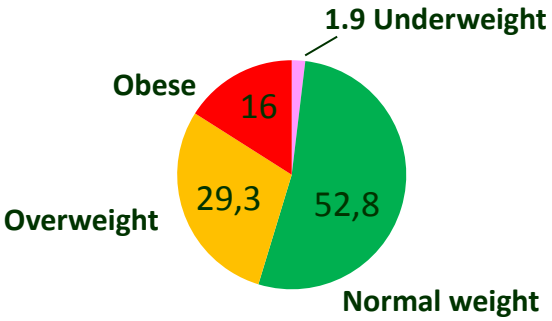
N = 1280
(excluding 20 % dropout rate)



food4me has 7 study centres



Mean age: 40 years
(39y Females; 41y males)



food4me has 4 levels of personalized advice

Creme

Potatoes, Rice and Pasta

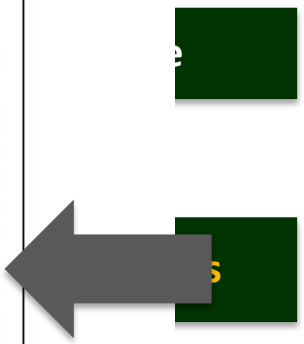
How often would you have consumed each of the following in the past month?

	Portion size	Never (<1 per month)	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day
Potatoes - mashed, instant, roast	Small	○	●	○	○	○	○	○	○	○
Potatoes - boiled, jacket	Medium	○	○	●	○	○	○	○	○	○
Potato dishes e.g. salads, dauphinoise		●	○	○	○	○	○	○	○	○
Chips		●	○	○	○	○	○	○	○	○
White rice	Medium	○	●	○	○	○	○	○	○	○
Brown rice, buckwheat and barley groats	Medium	○	○	●	○	○	○	○	○	○
White pasta, noodles and other grains e.g. cous cous, polenta		●	○	○	○	○	○	○	○	○
Wholemeal pasta		○	○	●	○	○	○	○	○	○
Lasagne, moussaka, ravioli and tortelini, filled dumplings		○	○	○	○	○	○	○	○	○
Pizza, calzone		○	○	○	○	○	○	○	○	○
Springrolls		○	○	○	○	○	○	○	○	○
Potato or Plain Dumplings		○	○	○	○	○	○	○	○	○
	Portion size	Never (<1 per month)	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day

Wholemeal Pasta

Choose your usual portion size for this food group

○ Very Small	○ Small	○ Small / Medium	○ Medium	○ Medium / Large	○ Large	○ Very Large



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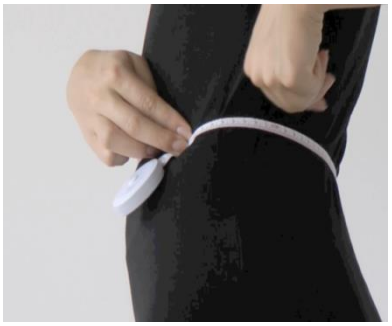
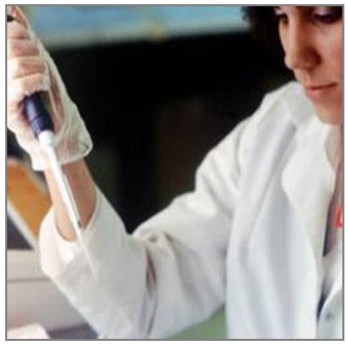
food4me has 4 levels of personalized advice





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onth 3 Month 6

Defined SNP shortlist

(Top 10 most relevant SNPs in nutrition, based on current research)

	Gene	SNP	Nutritional link
1	**ApoE**	rs429358 & rs7412	Saturated fat intake and cholesterol level
2	**FADS1**	rs174546	Intake of omega-3 fat
3	**FTO**	rs9939609	Body weight and exercise
4	**ADRB2**	rs1042713	lower salt intake
5	**BCMO1**	rs	Vitamin A status
6	**MTHFR**	rs1801133	Folate intake and cardiovascular health
7	**TCF7L2**	rs7903146	Weight loss at a low fat diet compared to other weight loss diets.
8	**SOD2**	Ala16Val	Antioxidant intake
9	**ApoA2**	265T>C	Cholesterol level
10	**ApoA5**	rs662799	Cholesterol level

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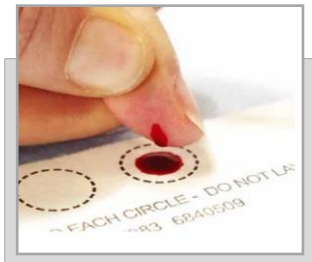
Month 6

Compliance of volunteers to data and sample collection



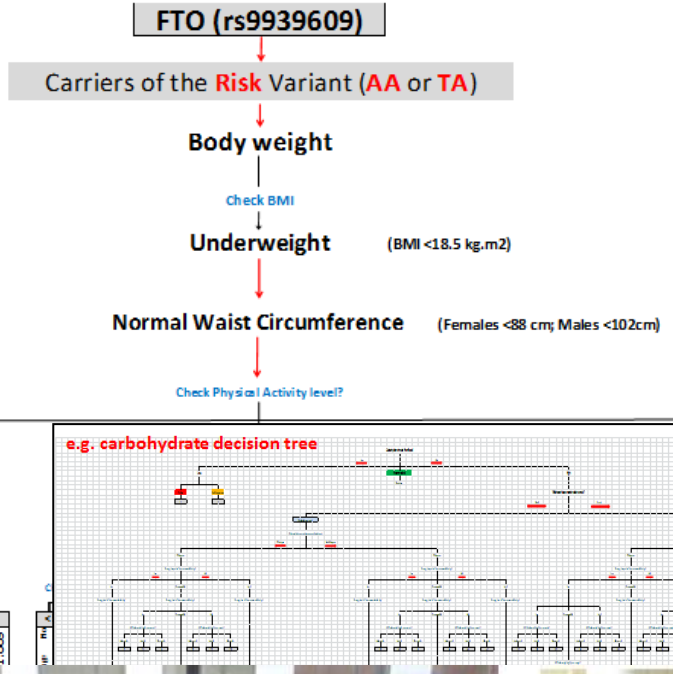
Blood collection compliance: 95%
67 out of 1294 did not complete the blood spot collection

Physical Activity compliance: 85%
195 out of 1294 have not provided full PA data

Buccal swabs compliance: 98%
28 out of 1294 have not provided usable samples

WP2 questionnaire compliance: 38%
495 out of 1294 have completed the WP2 questionnaire

Decision trees for advice provided to the participants



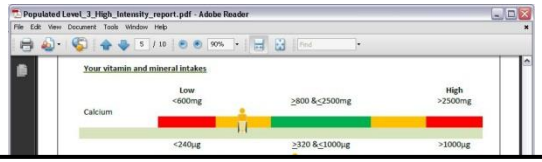
Gene (SNP) (2)
Body weight (3)
Waist (2)
Physical activity (3)
Glucose level (3)
Cholesterol levels (3)

324 possible

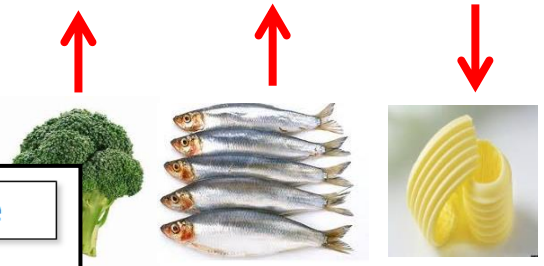
From food intake assessment to menus

Food intake

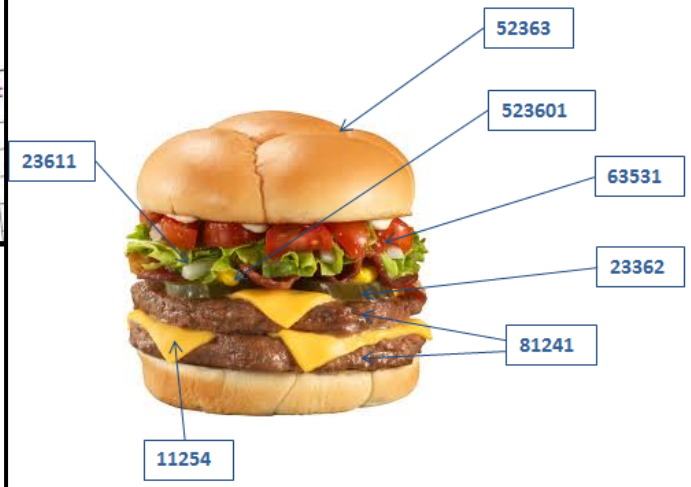
Nutrient intake data



Food based advice



Individual food codes



A **single** meal code

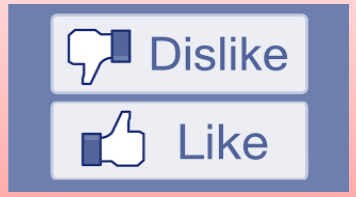
23611, 11254, 81241, 23362, 63531, 52360, 52363.

Meal pattern data

From food intake assessment to menus

Participant data

TOTAL FAT	%	36.60	HI
SAT FAT	%	17.38	HI
TRANS	%	0.56	OK
MONO FAT	%	12.98	LO
POLY FAT	%	4.29	LO
OMEGA-3	%	0.52	LO



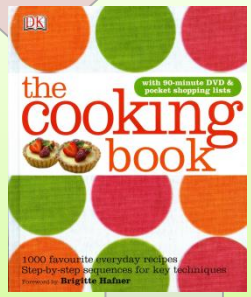
Recommendations & Recipes

Saturated Fat (% of total energy)		<10%	≥10 &≤15%	>15
Salt (g)	18-50yrs	≤3.75	>3.75 & ≤5.75	>5.75
	51-70yrs	≤3.25	>3.25 & ≤5.75	>5.75
	>70yrs	<3	≥3 & <5.75	>5.75

Target nutrients of participant **GREEN**

RED nutrients least **AMBER**

No nutrient worse than FFQ



Personalised menus

Breakfast

Lunch

Dinner

Snacks

Summary

- *Personalized nutrition is/becomes reality.*
- *It is in the mainstream - in THE STRIVE FOR HEALTH.*
- *Moreover, it is the EASY CHOICE when out-sourced.*
- *It will come in numerous SHADES with more or less science, more or less services and/or products.*
- *It can be envisiged that serveillance of healthy lifestyles could in the future define the basis of health insurance costs*