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Accademie svizzere delle scienze
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Swiss Academies of Arts and Sciences

SAMW  Schweizerische
Akademie der Medizinischen
Wissenschaften

Challenges of Personalized Health for Clinical Medicine

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Personalisierte Medizin – Personalisierte Gesundheit





Personalised Medicine



Medicine Today

Reactive, population-based, one-size-fits-all model of care



Personalized Medicine

Predictive, preventive, patient-centric model of care



„Personalized medicine is a strategy to prevent, diagnose, and treat disease so as to achieve an optimal result for the individual.“

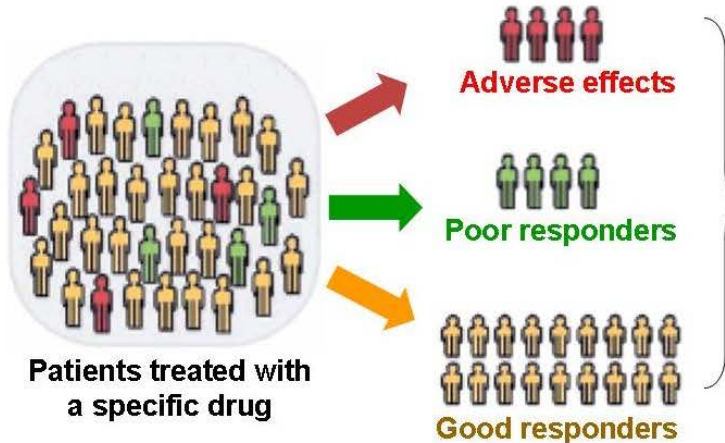
Meyer UA, Clin Pharmacol Ther 91, 373, 2012



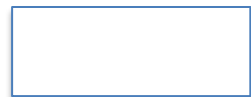
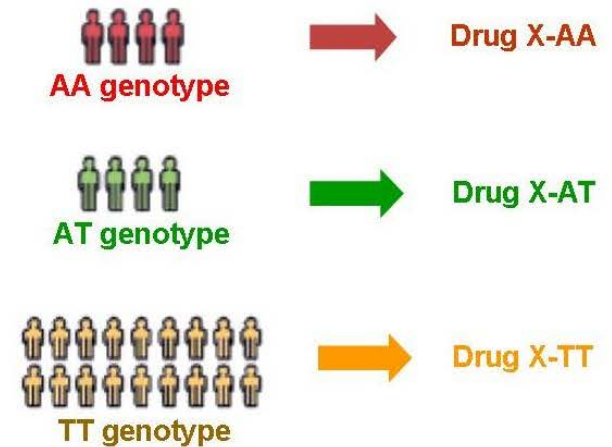
Individualized Drug Therapy

Genetic Factors

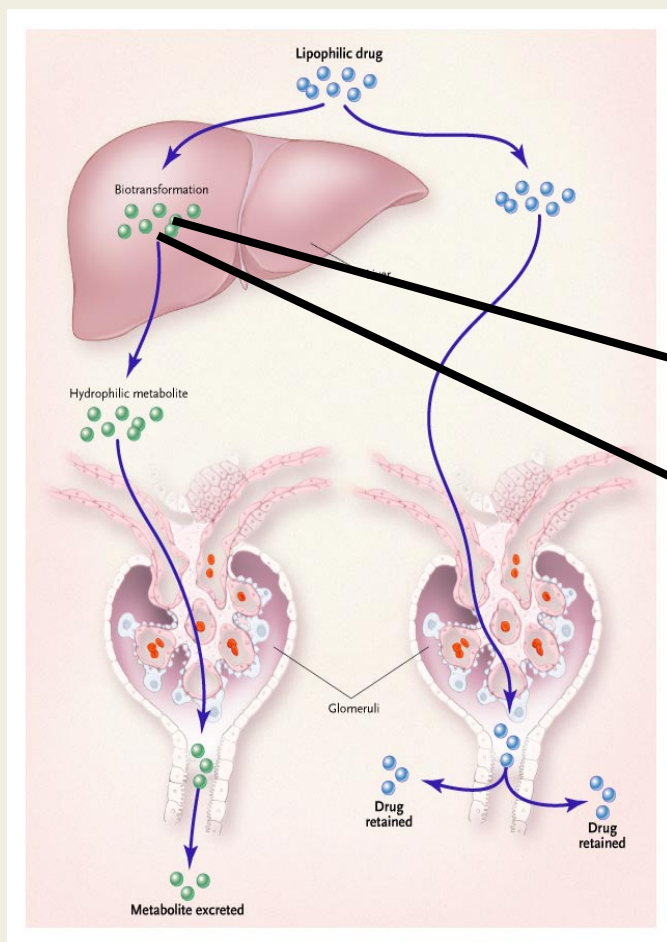
Personalized Medicine



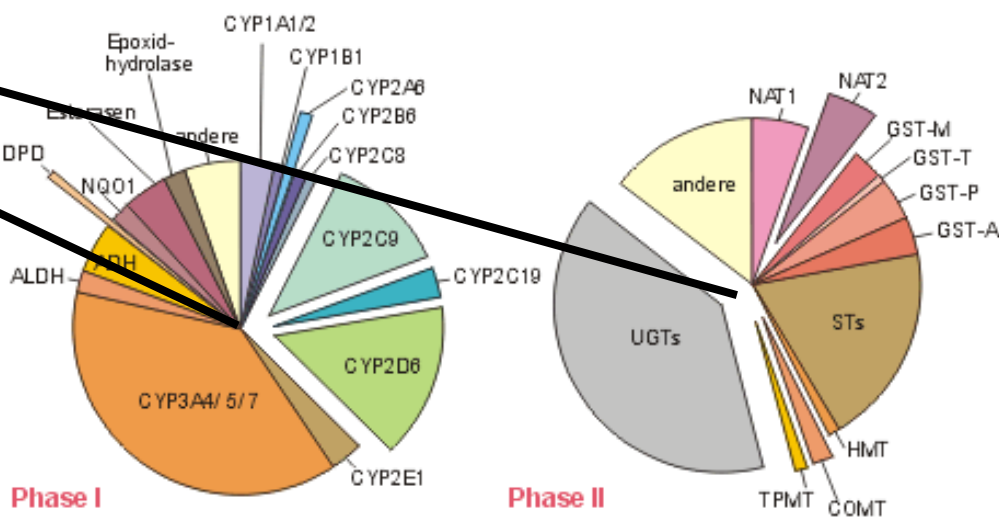
Genomic Medicine



Drug Elimination by Liver and Kidneys

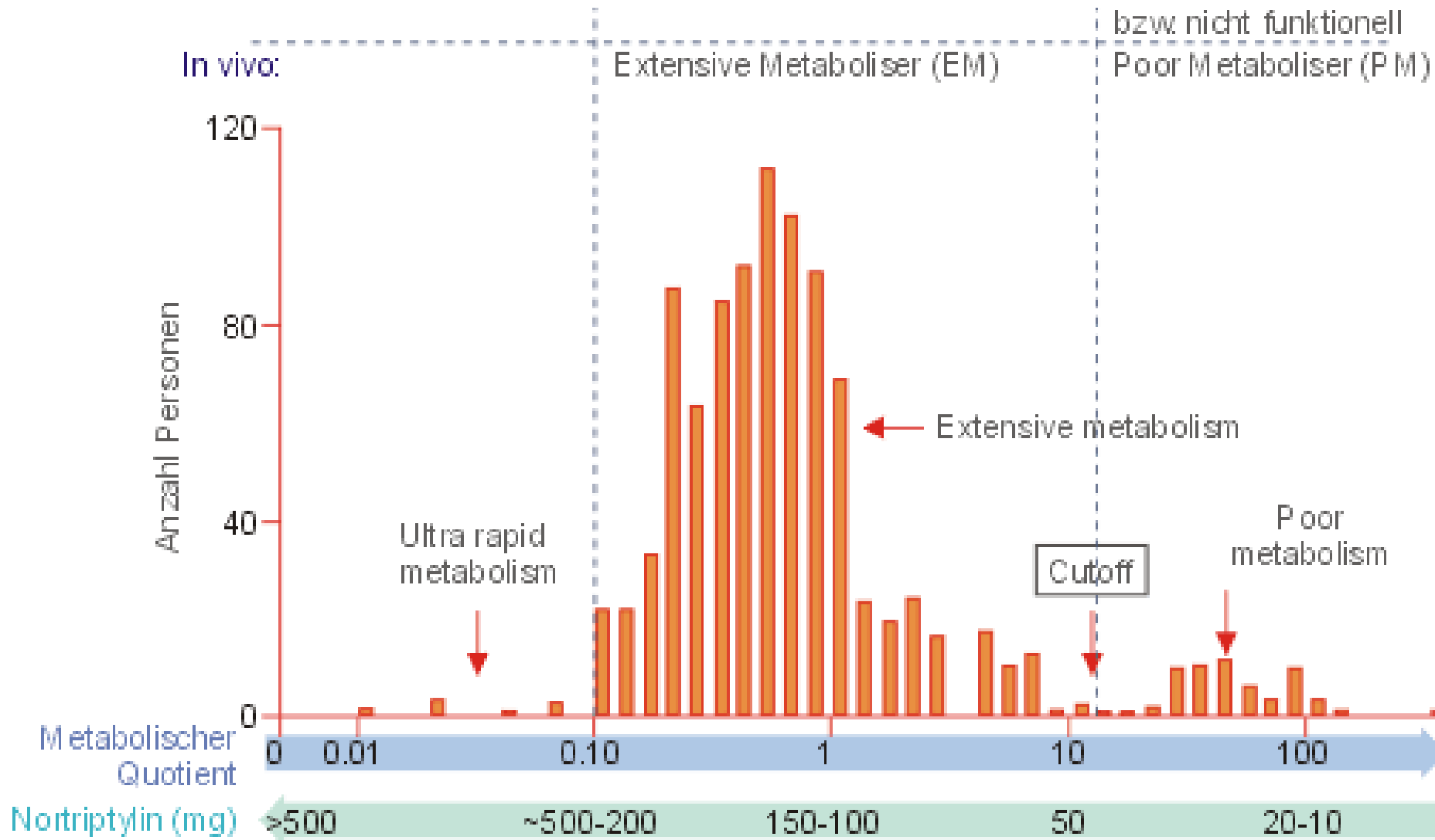


Phase I- und Phase II Enzyme



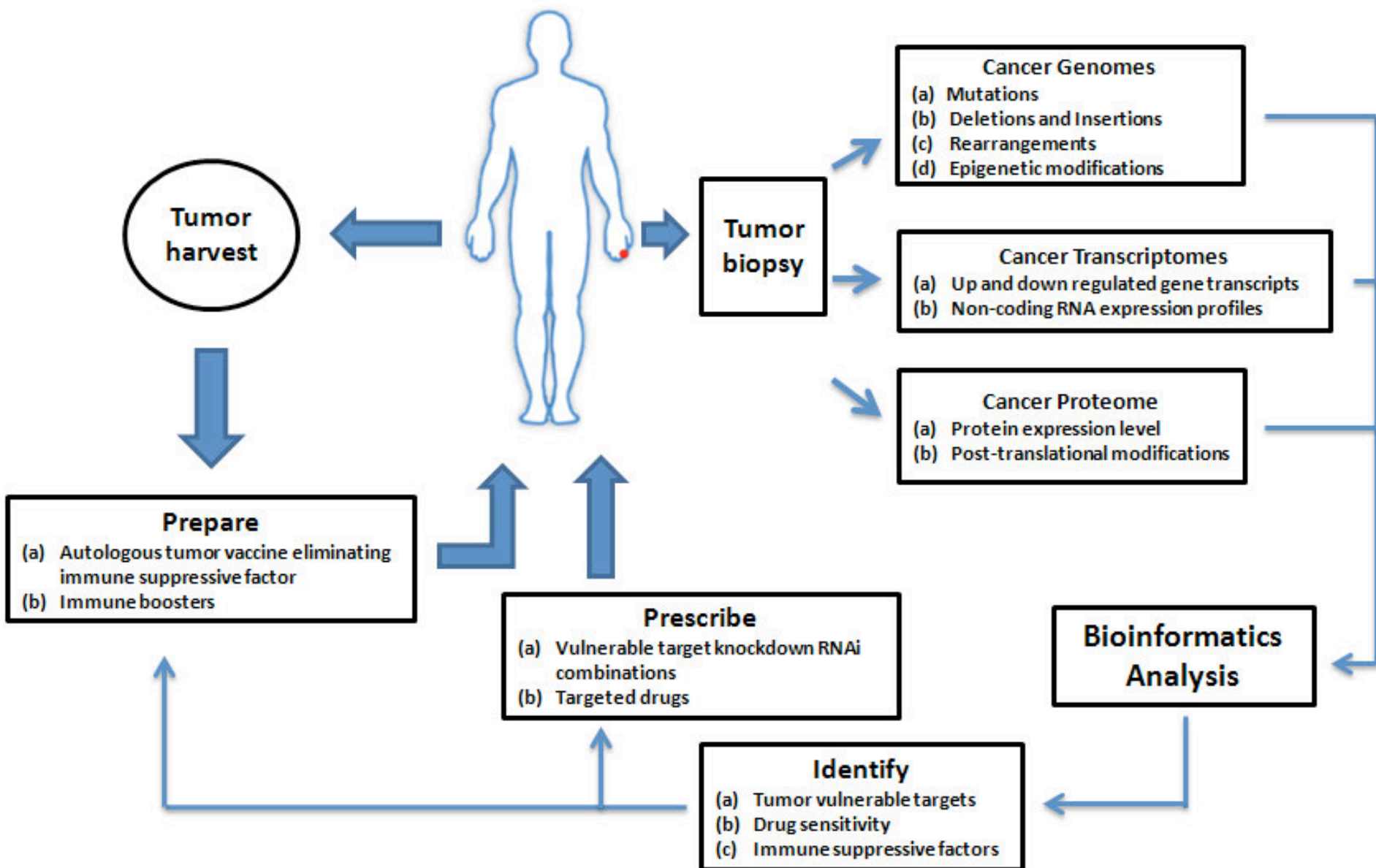
Drug-metabolizing Enzymes

Pharmakogenetics of CYP2D6

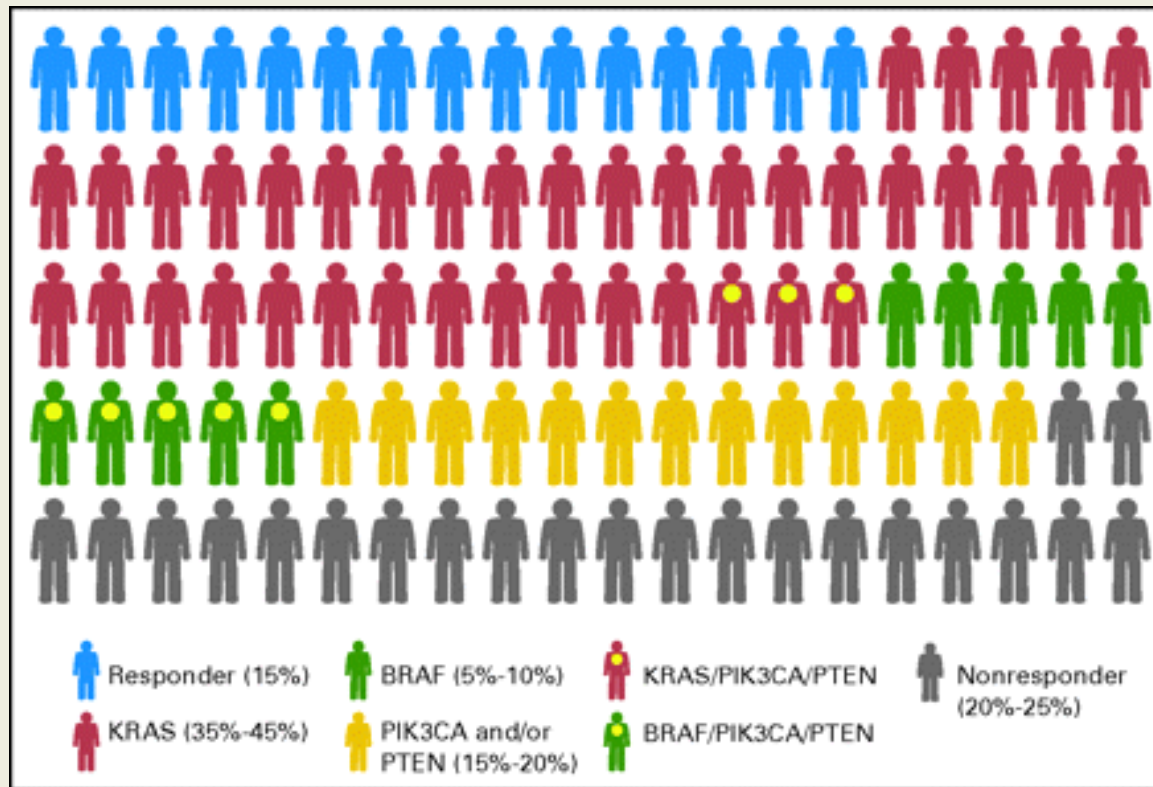


Genome Based Personalized Cancer Therapeutics

A Two Pronged Approach - The One Two Punch



Moleculargenetic Variants of Colon Carcinomas



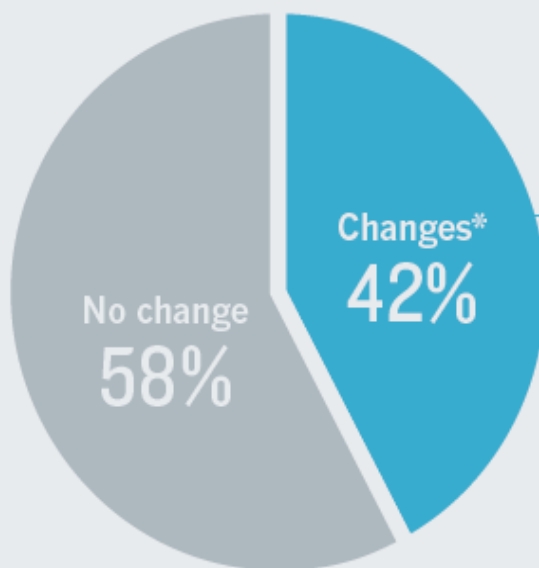
A: Bardelli A and S Siena: J Clin Oncol 28:1254-61, 2010

Changes of personal habits after receiving genomics results

SOURCE: PRELIMINARY DATA FROM PGEN STUDY, 2012-13

TAKING ACTION

After receiving genomics results, 42% of 1,051 surveyed people reported positive changes in their health behaviour. Only 1% of all respondents altered a prescription treatment without consulting a doctor.



Dietary patterns

72%

Exercise habits

61%

Supplements

17% with medical consultation 21% without medical consultation

Non-prescription drugs

10% with medical consultation 7% without medical consultation

Prescription drugs

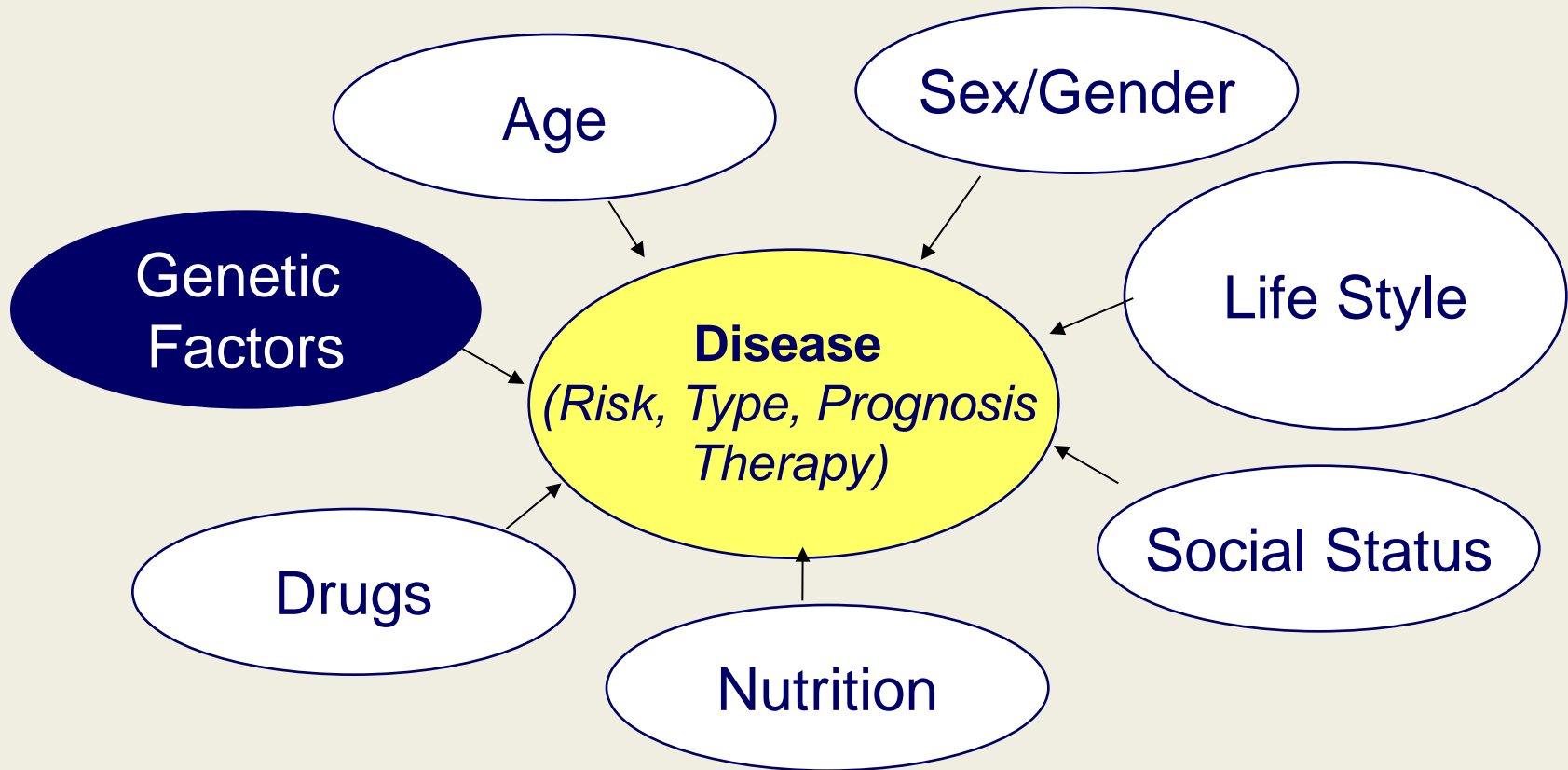
11% with medical consultation 2% without medical consultation

*Many respondents reported more than one change, so percentages total more than 100%.

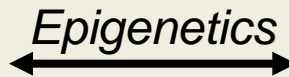
Nature **505**, 286–287, 2014 doi:10.1038/505286a



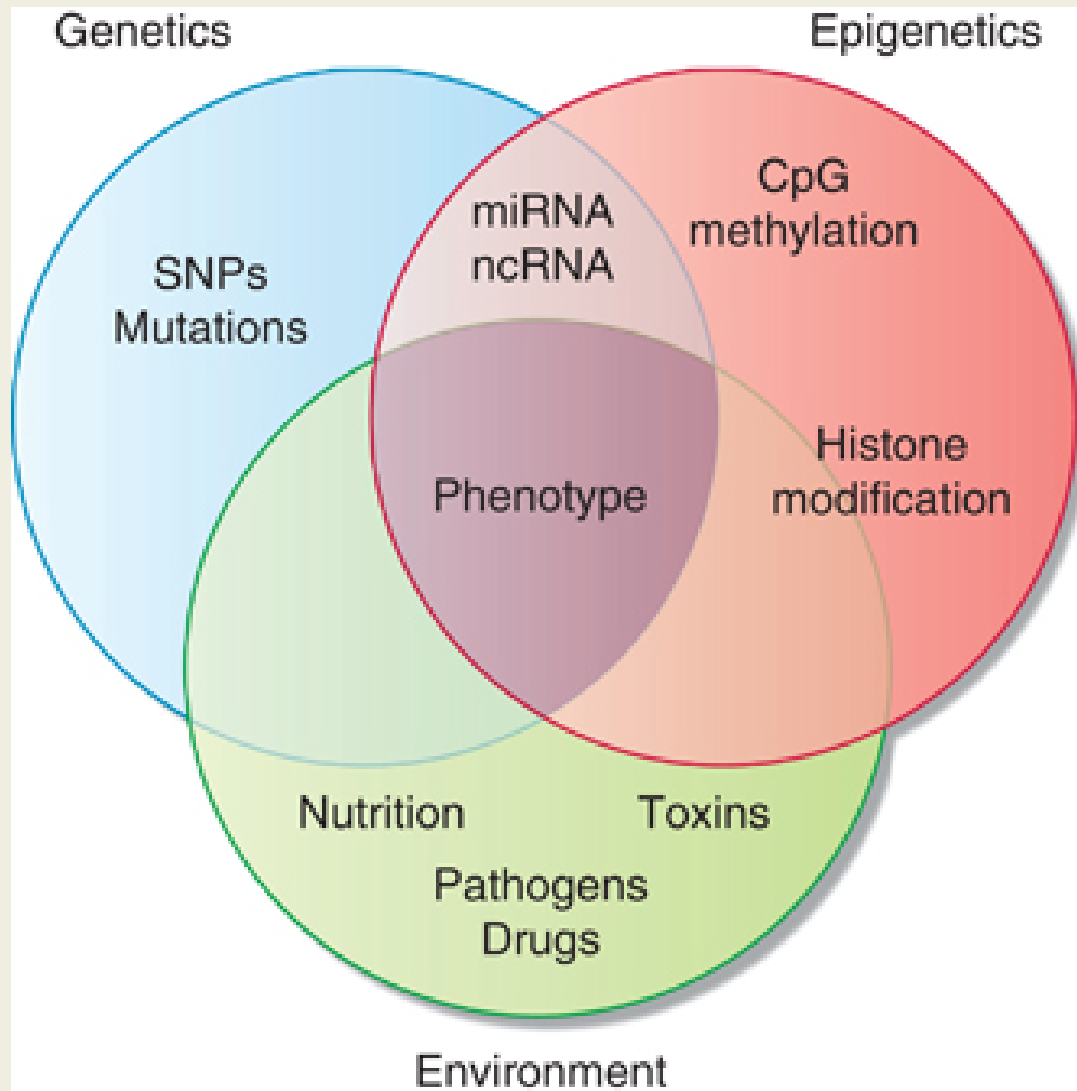
Genetic and Acquired Causes of Diseases



„inherited factors“



„acquired factors“



Epigenetics

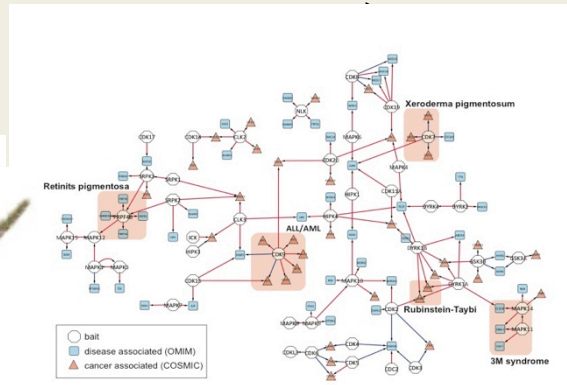
„Heritable changes in gene expression that are not due to changes in DNA sequence“
(transcriptional and post-transcriptional gene silencing)

A common theme to disease epigenetics is the disruption of phenotypic plasticity – the ability of cells to change their behaviour in response to internal or external environmental cues.

Vision "Personalized Health"

The scientific roots: Genotype- Networks- Phenotype

Environment
Epigenome



Genotype

**Molecular
networks**

Phenotype



The Measured Life

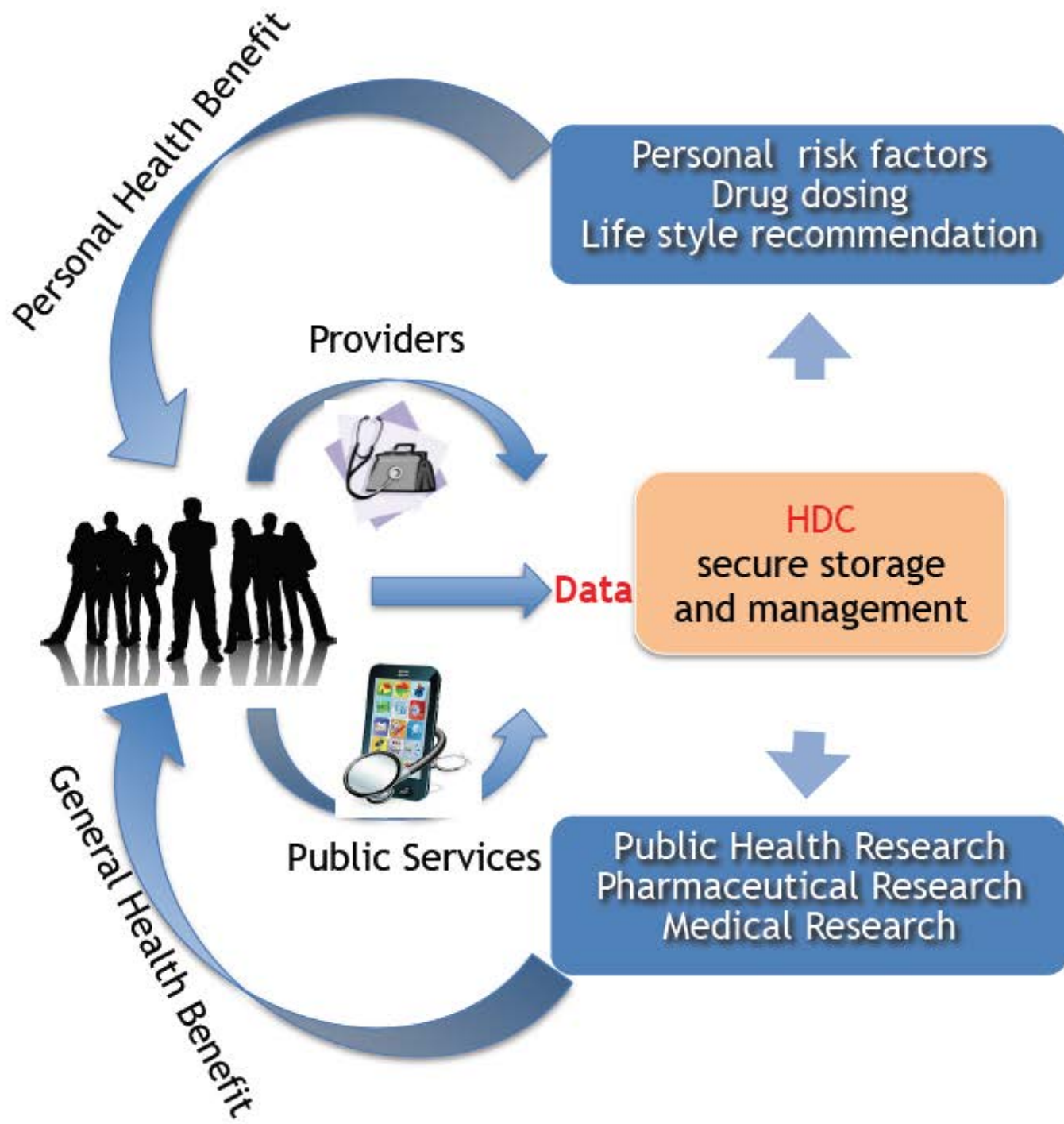
Die Vermessung des Ichs:

Prozentsatz der Deutschen, Franzosen und Briten, die Apps nutzen, um Daten aus ihrem Alltagsleben zu erfassen und auszuwerten.



Who has Access to the Personal Data ??

Daten und Gesundheit
Données et Santé
Dati e Salute
Data and Health



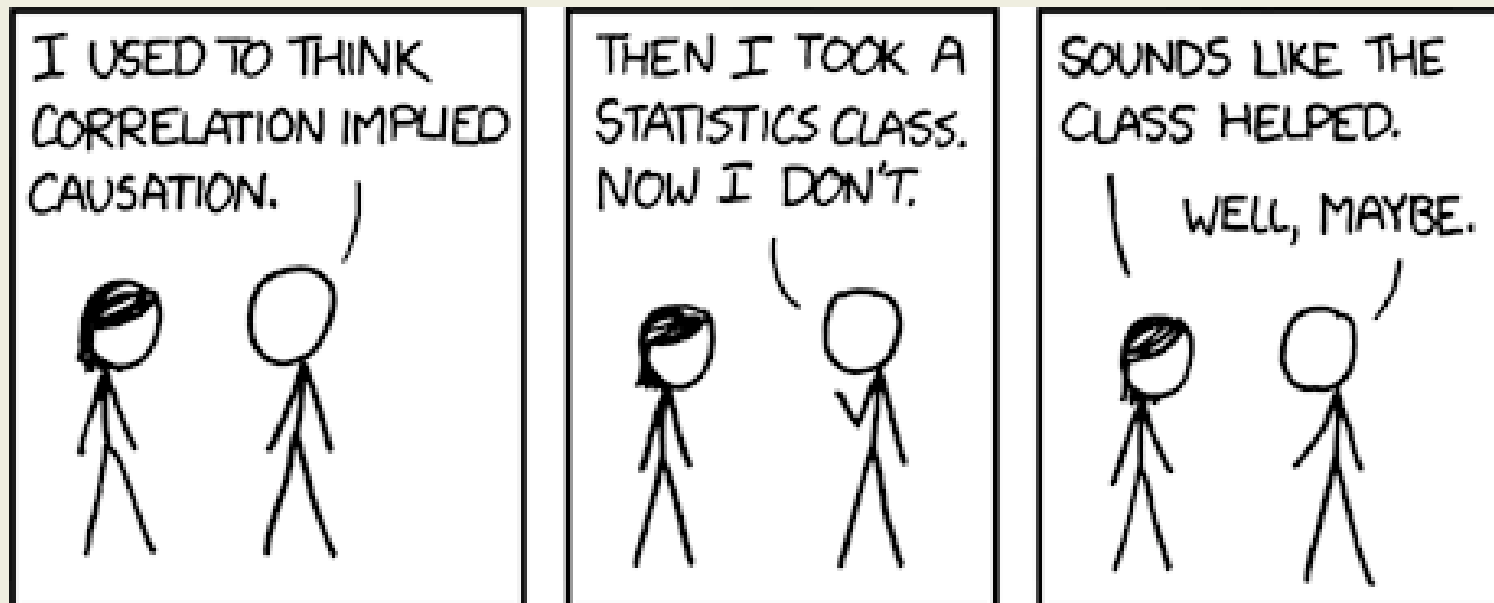


Change in Paradigm.....

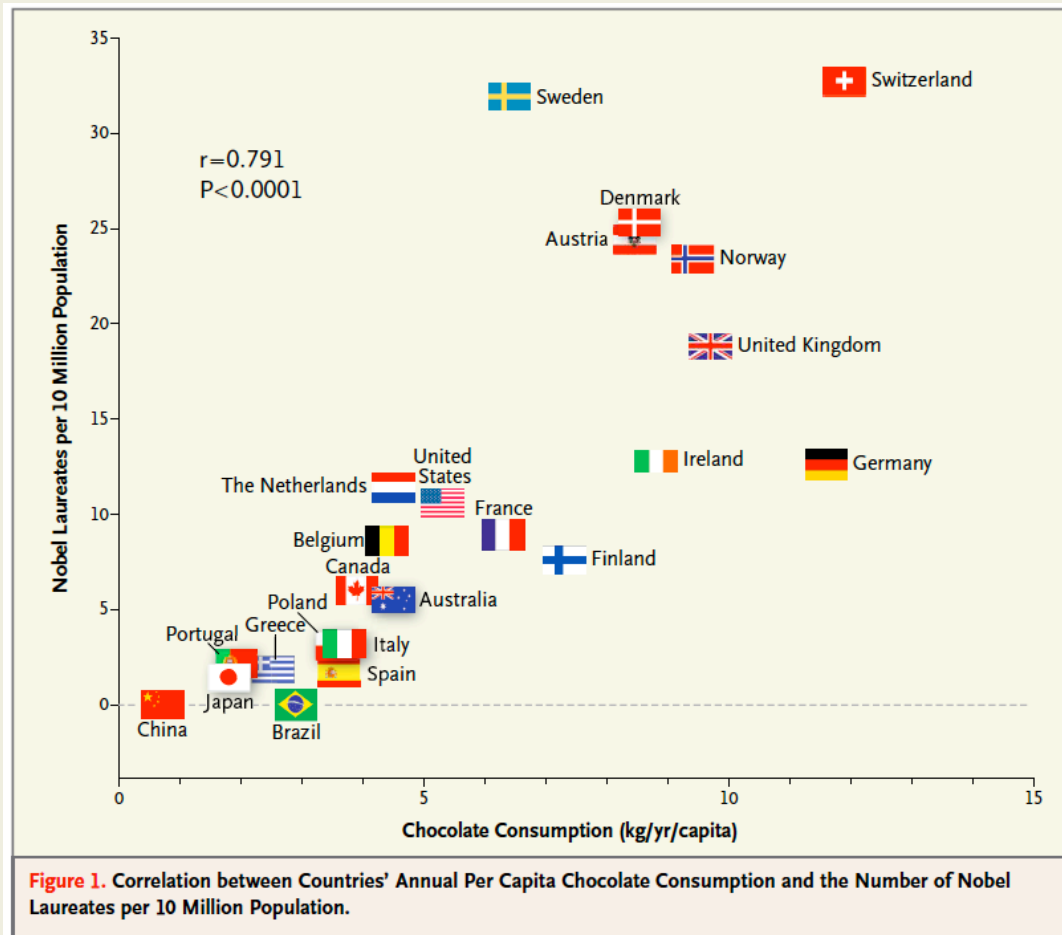
*„From Hypothesis
to
Data driven Research“*

..... leads to Myriads of Association
and Correlation Studies !?

„Correlation does not imply causation“

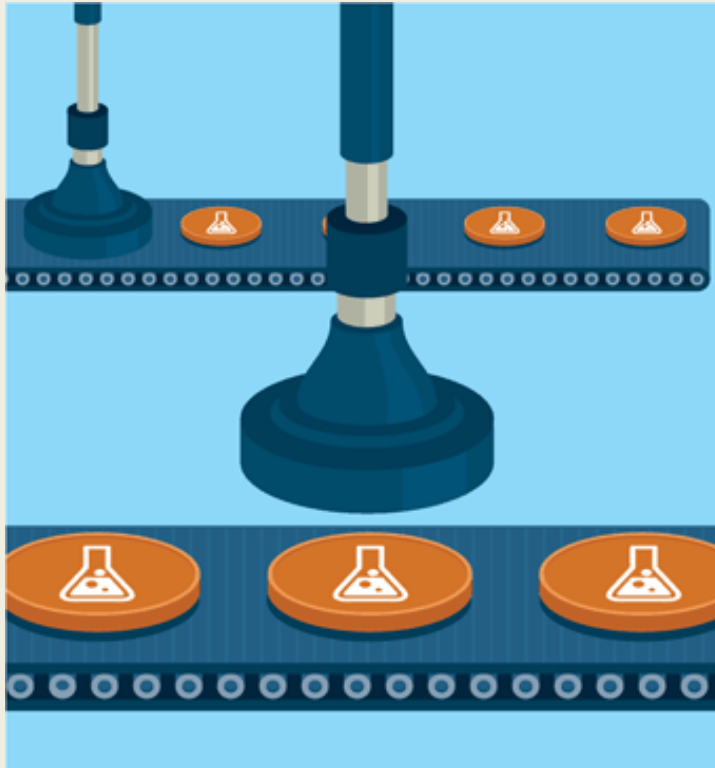


„Correlation does not imply causation“



Journals unite for reproducibility

[Marcia McNutt](#)



“...scientific journals are standing together in their conviction that reproducibility and transparency are important...”

Science 346, 679, 2014



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Transforming Health Care Through Big Data

Strategies for leveraging big data in the health care industry

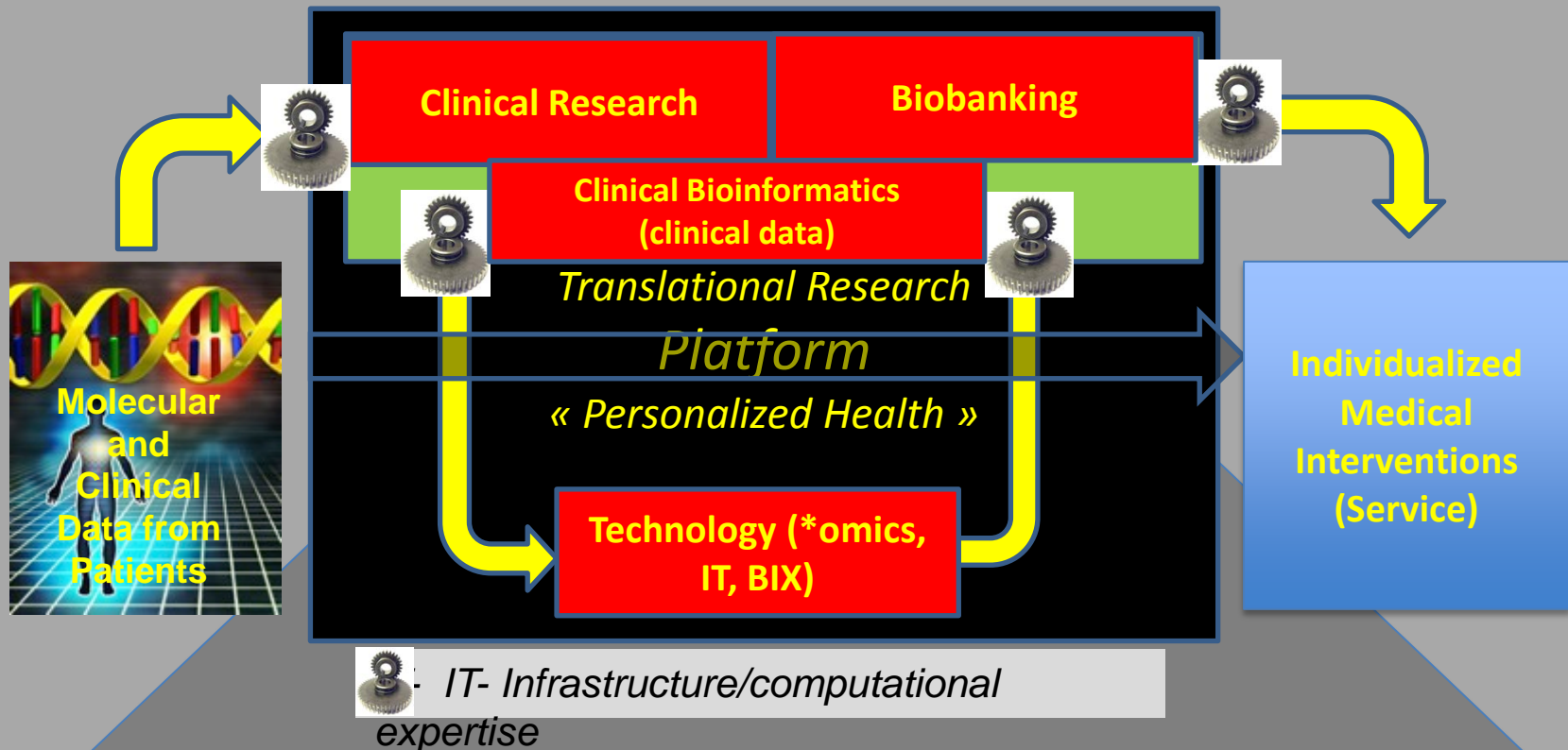
Clinical Bioinformatics !!!!



Swiss Institute of
Bioinformatics

Vision: Integrated **Personalized Health** Platforms between University Hospitals and Universities/ETH

University (or other Research) Hospital



University/ETH or other Research Institutions

(modified from V. Mooser)

Vision: Swiss Personalized Health Network (sPHNet)

Interdisciplinary Steering Board
(Central Administration Office)

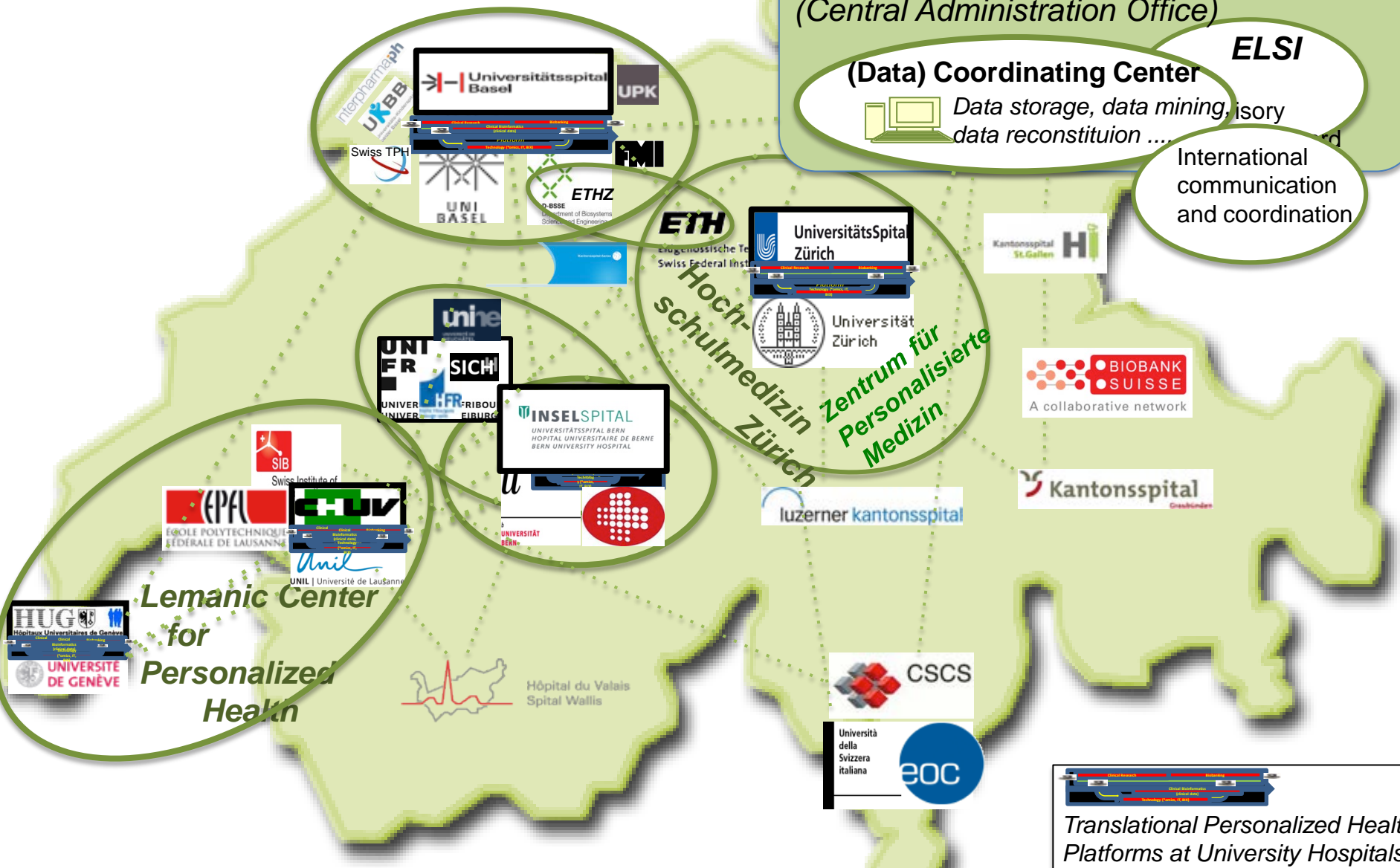
(Data) Coordinating Center



Data storage, data mining, advisory
data reconstitution ...

ELSI

International
communication
and coordination

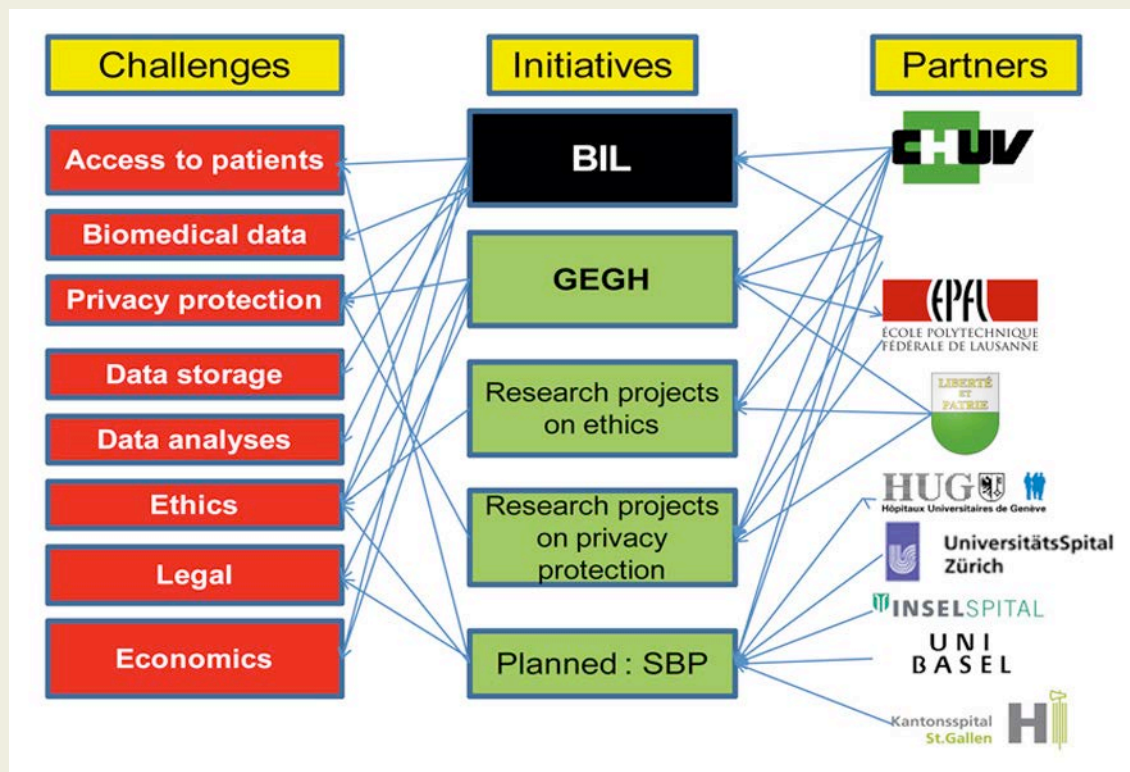


Lemanic Center
for
Personalized Health

Hochschulmedizin Zürich
Zentrum für Personalisierte Medizin

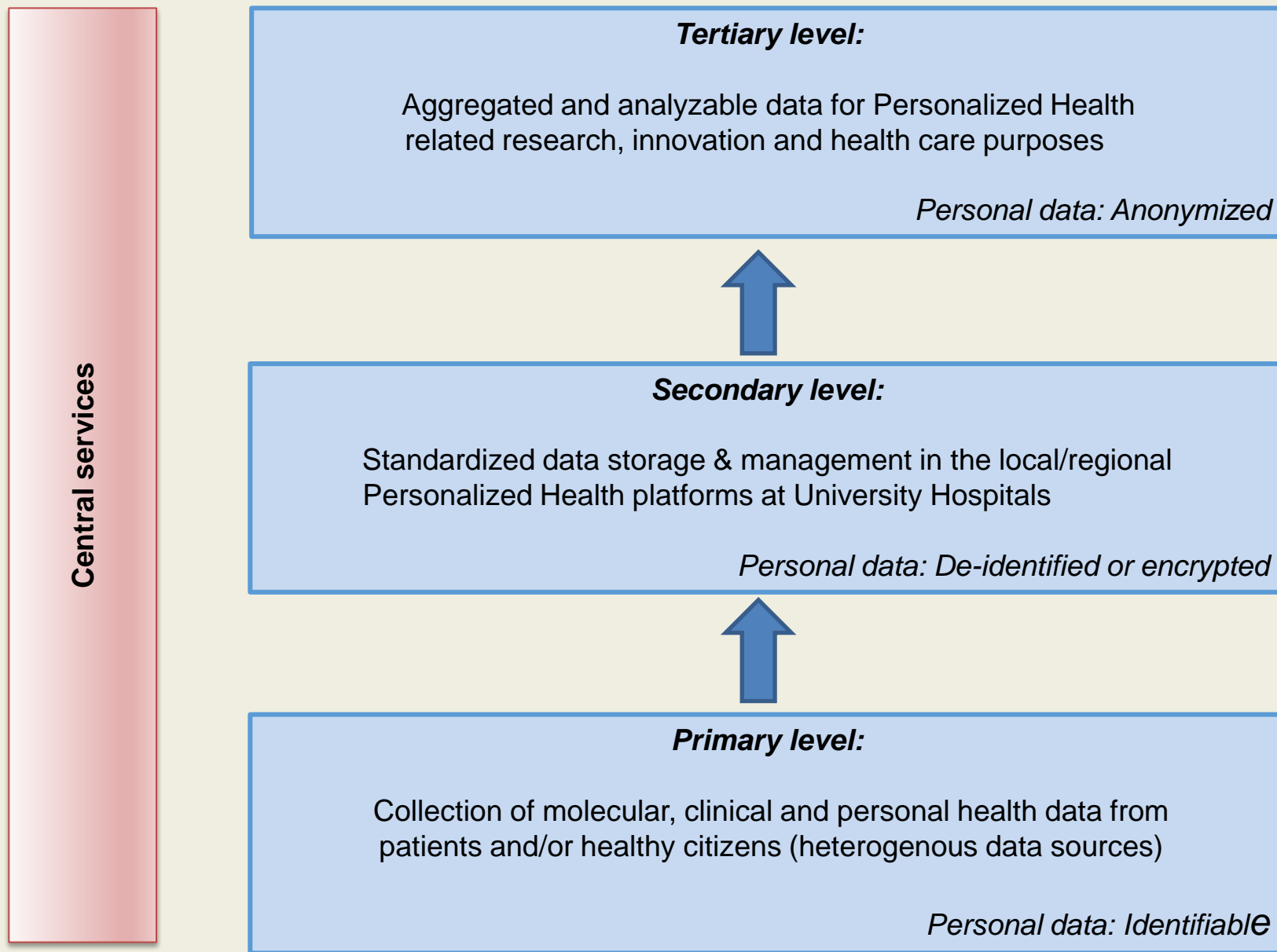
Translational Personalized Health Platforms at University Hospitals

From the Lausanne Institutional Biobank (BIL) to the Swiss Biobank Platform (SBP)



V. Mooser and Chr. Currat, *Swiss Med Wkly.* 2014;144:w14033

Data Management Hierarchy for Personalized Health related Research



Informed consent



Request for a Nationwide Harmonized General Consent Procedure for Use of Biological Material and Health-Related Personal Data for further Use for Research.

For further use for research of biological material sampled or health-related personal data collected we need a nationwide harmonized interinstitutional General Consent procedure that can be taken at the first contact of each individual with the health system in Switzerland.

To Master New Challenges !

Informed consent



Components of the Swiss Personalized Health (PH) Initiative

Swiss Personalized Health Network (sPHNet)

Interdisciplinary Steering Board

Central Administration Office

ELSI Advisory Board

(Data) Coordinating Center

Local/Regional
**Translational PH Platforms
at University Hospitals**

&

Partners: Other Hospitals;
General Practitioners; Healthy
Citizens.

- Clinical Research
- Biobanking
- Clinical Bioinformatics
- Big Data mining etc.
- Education/Training

PH Biomedical Resource (PHBR)
(nationwide coordinated bio- and data banks)

Research Projects
(bottom-up defined)



Potential Priorities:

- Cancer
- Microbiomics
- Rare diseases
- Comorbidities

A stylized, colorful map of Europe is shown, overlaid with a blue network of lines and nodes, representing a research network. The map uses various colors like green, yellow, orange, and red to represent different regions. The network lines are thick and blue, connecting various points across the continent.

Networking the European Research Area

Thank you for your attention !