Utrecht University

Faculty of Science
Department of Information and Computing Science
Master of Business Informatics

Seminar Medical Informatics

Medical informatics and the health care sector

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Agenda for today

About health care and health care systems

- What is health? What is health care?
- Healthcare domains
- Benefits and performances of health care

About Medical Informatics

- What is (bio)medical informatics?
- Computer Science applications in medical field

Homework assignment

Food for further thought

What is health?

“Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1948)

"A resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities” (WHO, 1986)

Physical Health

In a person who experiences physical health, **bodily functions are working at peak performance**, due not only to a lack of disease, but also to regular exercise, balanced nutrition, and adequate rest.

Mental Health

Mental health refers to **a person's emotional, social, and psychological well-being**. Mental health is as important as physical health to a full, active lifestyle.

Nordqvist, C. (2017, July 31). "Health: What does good health really mean?."

What is health care?

“Health care is defined as activities aimed at alleviating, reducing, compensating and/or preventing deficiencies in the health status or autonomy of individuals“

“Health care is the diagnosis, treatment, and prevention of disease, illness, injury, and other physical and mental impairments in humans“

Health care domains clustered by ‘life cycle’

- Public health
- Primary care
- Secondary Care
- Tertiary care
- Home and community care

Health care domains clustered by 'life cycle'

Public health

"Science and art of preventing disease, prolonging life and promoting human health through organized efforts and informed choices of society, organizations, public and private, communities and individuals."

- Analyze the health and the threats (surveillance and health indicators)
- Disciplines (some examples):
  - Epidemiology
  - Biostatistics
  - Environmental health
  - Community health
  - Behavioral health
  - Public policy
  - Occupational safety
  - Mental health

Initiatives:

- Promoting handwashing
- Promoting breastfeeding
- Delivery of vaccinations
- Suicide prevention
- Actions to prevent transmissible diseases
- Disaster actions management

Health care domains clustered by 'life cycle'

Primary care

"Health care provided by a medical with whom a patient has initial contact"
"It is first-contact, accessible, continued, comprehensive and coordinated care"

- General practitioner or pediatrician
- Previous appointment or emergency situation
- Involves de widest scope of healthcare: consultations for optimal health or for physical and mental health issues
- Treatment of chronic diseases.
- Outpatient

Some examples

- General practitioner
- Pediatrician
- Physiotherapist
- Nurse
- Pharmacist

Health care domains clustered by 'life cycle'

Secondary care

"Medical care that is provided by a specialist or facility upon referral by a primary care physician and that requires more specialized knowledge, skill, or equipment than the primary care physician can provide"

- Specialized care
- Use to be referred from Primary care
- "Hospital care" + "External care" (such as psychiatrist, clinical psychologists, dental specialties or physiotherapists)
- Outpatient and inpatient

Some examples

- Neurologist
- Traumatologist
- Otolaryngologist
- Cardiologist
- Gynecologist
- Urology
- Nephrologist
- Gastroenterologist

Health care domains clustered by ‘life cycle’

Tertiary care

“Specialized consultative care by specialists working in a center that has personnel and facilities for special investigation and treatment.”

- Acute and very specific care
- Use to be referred from Primary care or Secondary care
- “Hospital care”
- Inpatient

Some examples

- Oncology
- Neurosurgery
- Cardiac surgery
- Plastic surgery
- Burns Unit
- Neonatology
- Palliative Care
- Hemodynamic Unit

Health care domains clustered by ‘life cycle’

Home and community care

“Is a coordinated system of services that enables people of all ages with disabilities, chronic or acute illnesses to receive needed care in their homes and communities. ”

- External care
- Outpatient

Some examples

- Self care
- Home care
- Long-term care
- Assisted living
- Treatment for substance use disorders
- Rehabilitation

Work in pairs: How informatics could help in these healthcare domains?

Public health
- Prevention, maternity and child care
- Surveillance, disaster, infection disease management

Primary care
- First point of consultation
- Outpatient

Secondary Care
- Specialized
- Outpatient and inpatient

Tertiary care
- Specialized consultative health care
- Inpatient

Home and community care
- Self care, long-term care, assisted living, substance use disorders, rehabilitation
- Residential, community and palliative

Health care domains clustered by ‘treatment’

Cure
“restoration to health, soundness, or normality”

Care
“provision of what is necessary for the health, welfare, maintenance, and protection of someone or something”

- Preventive Care
- Palliative Care
- Primary Care
- Emergency Care
- Long-term Care
- Informal Care
- Dental Care
- Specialized Care
- Complementary and alternative treatments
- Pharmaceutical Care
- Mental health Care

Some facts about the Dutch health care sector

- Headcount: 1.2 million are working in the health care sector
- Financial: 90 billion Euro yearly spending
- Largest sectors: long-term care, home care and social work
- Largest professions: nurses and nursing assistants, 13% doctors
- Nurses to population density is above EU-average
- Doctor to population density is on EU-average
- Strong primary care
- Social security health care system (‘Bismarkian system’)

Types of Health Care Models

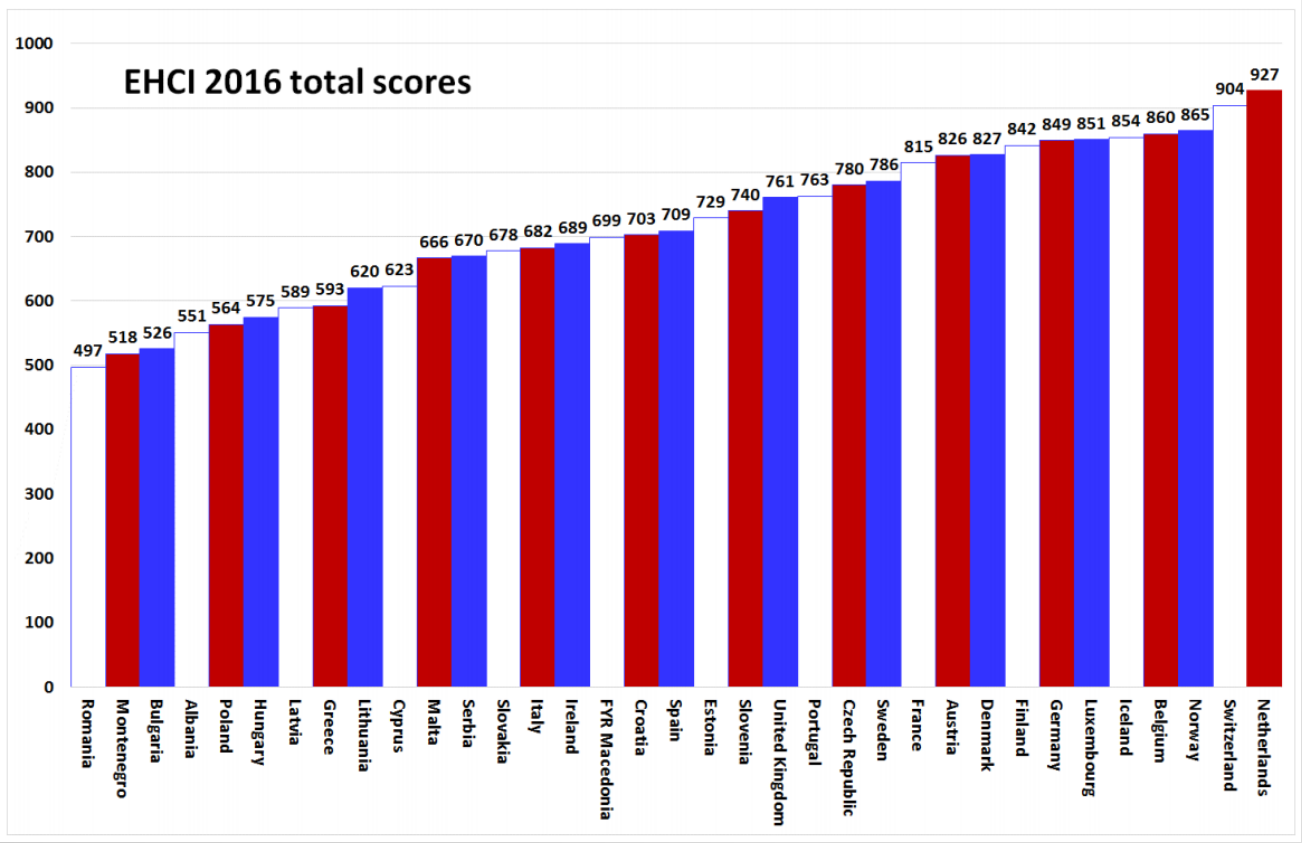
The Beveridge Model: provided and financed by the government through tax payments.

The Bismarck Model: uses an insurance system usually financed jointly by employers and employees through payroll deduction.

The National Health Insurance Model: uses private-sector providers, but payment comes from a government-run insurance program that every citizen pays into.

The Out-of-Pocket Model: patient pays healthcare service directly to providers or via insurance company.

NL = the best in Europe?



Weaknesses:

- Accessibility
- Prevention
- High *per capita* spend
- Over-use of in-patient care

Benefits and performance indicators of health care

Quality of care
– Effectiveness, Safety, Patient-centered, Co-ordination, Responsiveness

Accessibility of care
– Financial access, Geographical access, Timeliness, Availability of personnel, Freedom of choice

Efficiency of care
– Cost-effective use of resources, customized/care, financial position of care providers and health insurers

Quality of care

The Institute of Medicine (IOM) defines quality as “doing the right thing, at the right time, in the right way, for the right person, and having the best possible results”

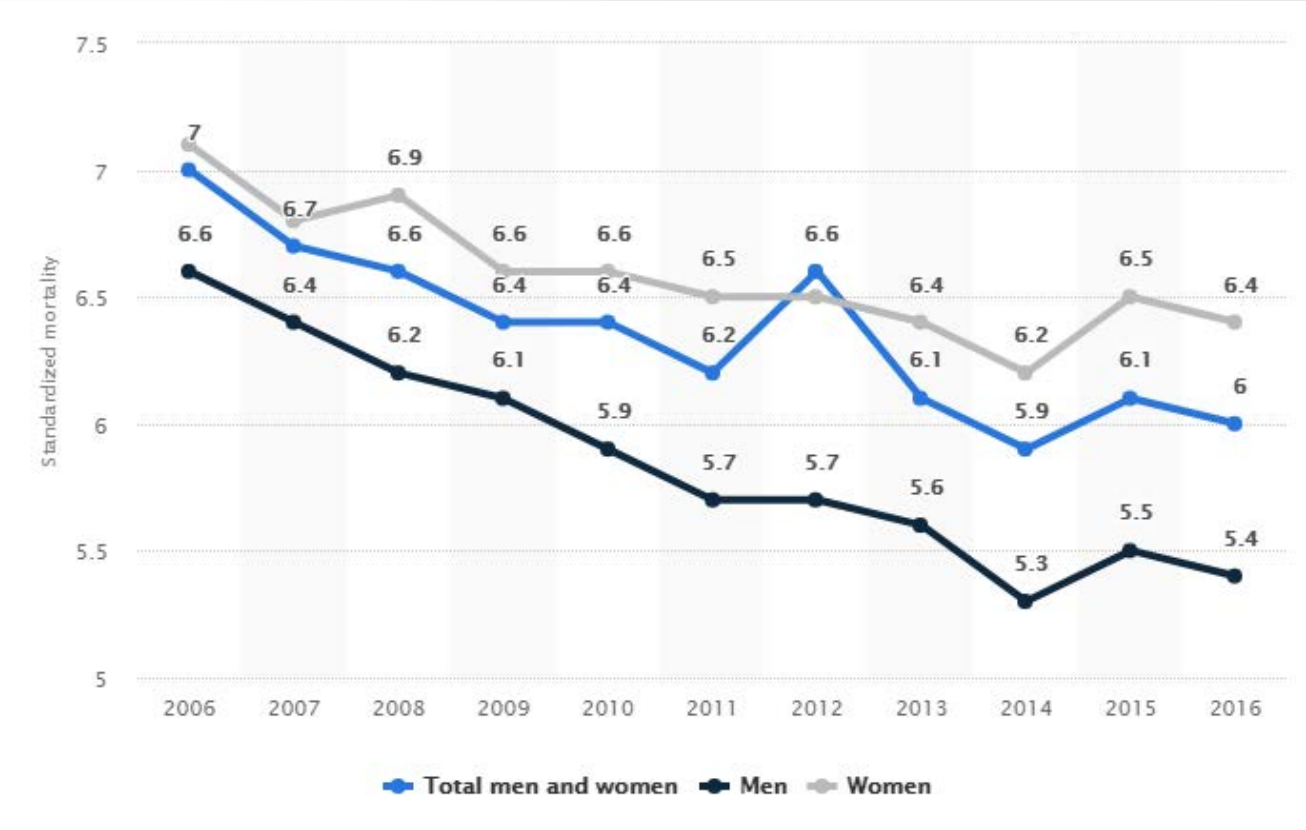
Government

- Safeguard the public interest of a good-quality health care

Health care providers / professionals

- Provide appropriate care, i.e. organize their work, provide personnel and equipment and allocate responsibilities
- Systematically monitor, control and improve quality of care
- Account for their actions

Quality as safety: Standardized mortality rate in the Netherlands from 2006 to 2016



Accessibility of care

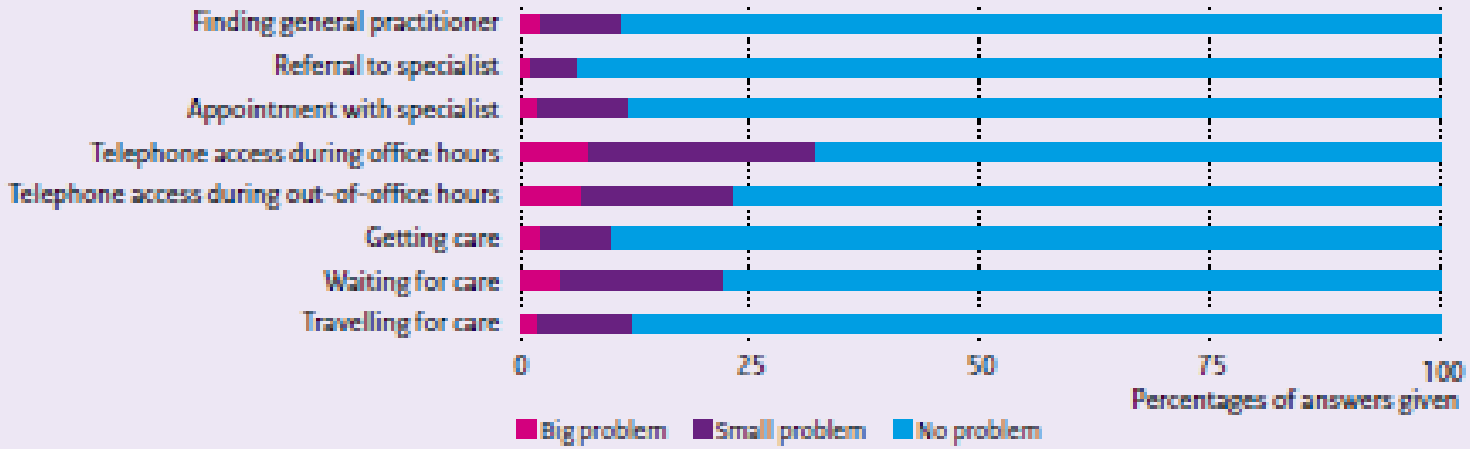
"Accessible care implies that people, who need care, can access care in a timely manner and without great barriers" (Smits et al., 2002).

Government

- Committed to equal access to health care for all people irrespective of their lifestyle

Access as in waiting times

Figure 4: Patients who reported that they experienced problems with access to health care in eight areas (%), 2008



(Source: CKZ / NIVEL, 2010)

Efficiency of care

"The health care system should not waste resources or patient time, including waste of equipment, supplies, ideas, and energy." (Institute of Medicine Report, 2001).

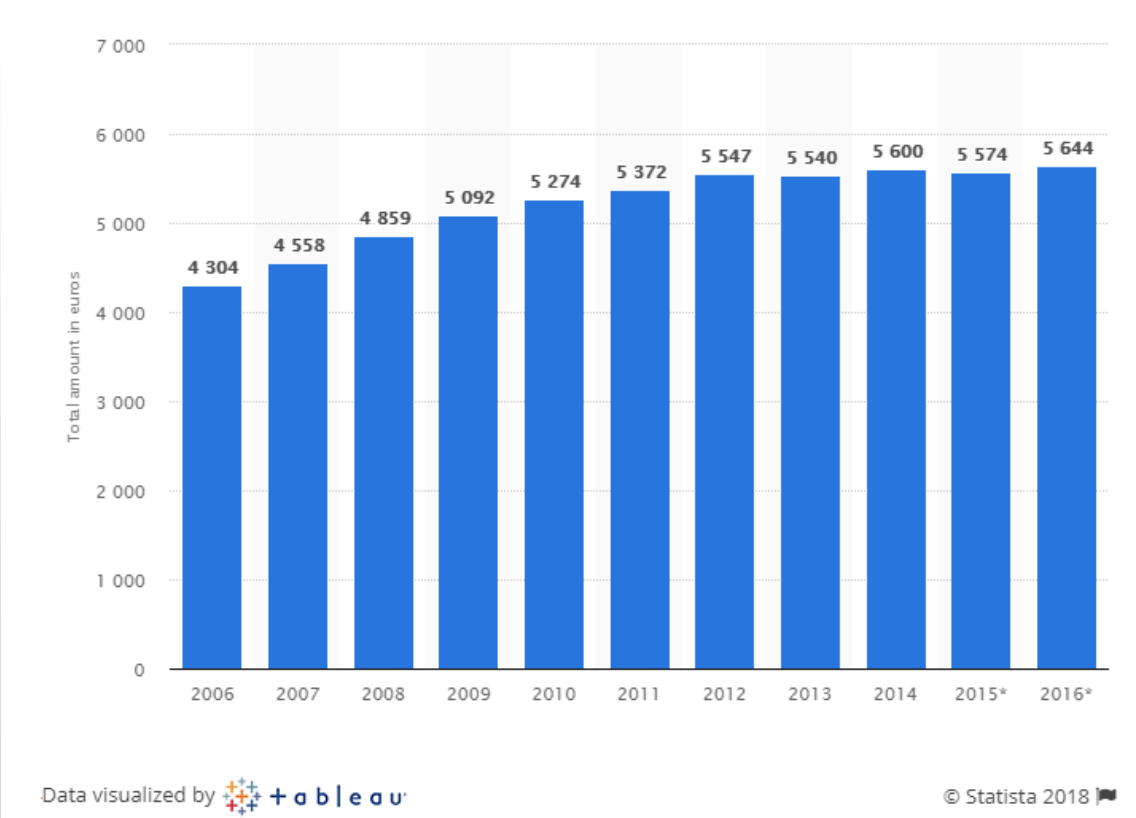
Government

- Responsible expenditure growth; ensures that health care remains affordable for society and does not heap pressure on public resources
- Improved efficiency; can help to control expenditure, but is mainly about the relationship between the costs and revenues of the care provided

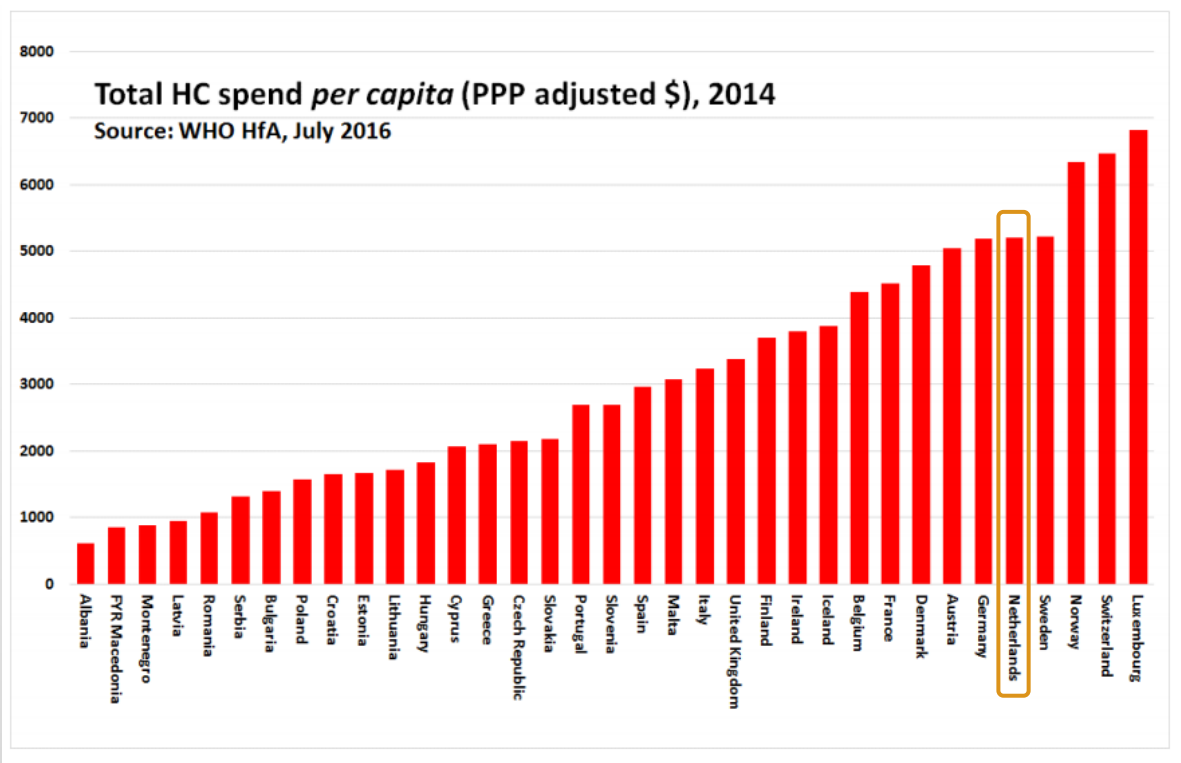
The insured and insurers

- Choose care with the most favorable price-quality ratio

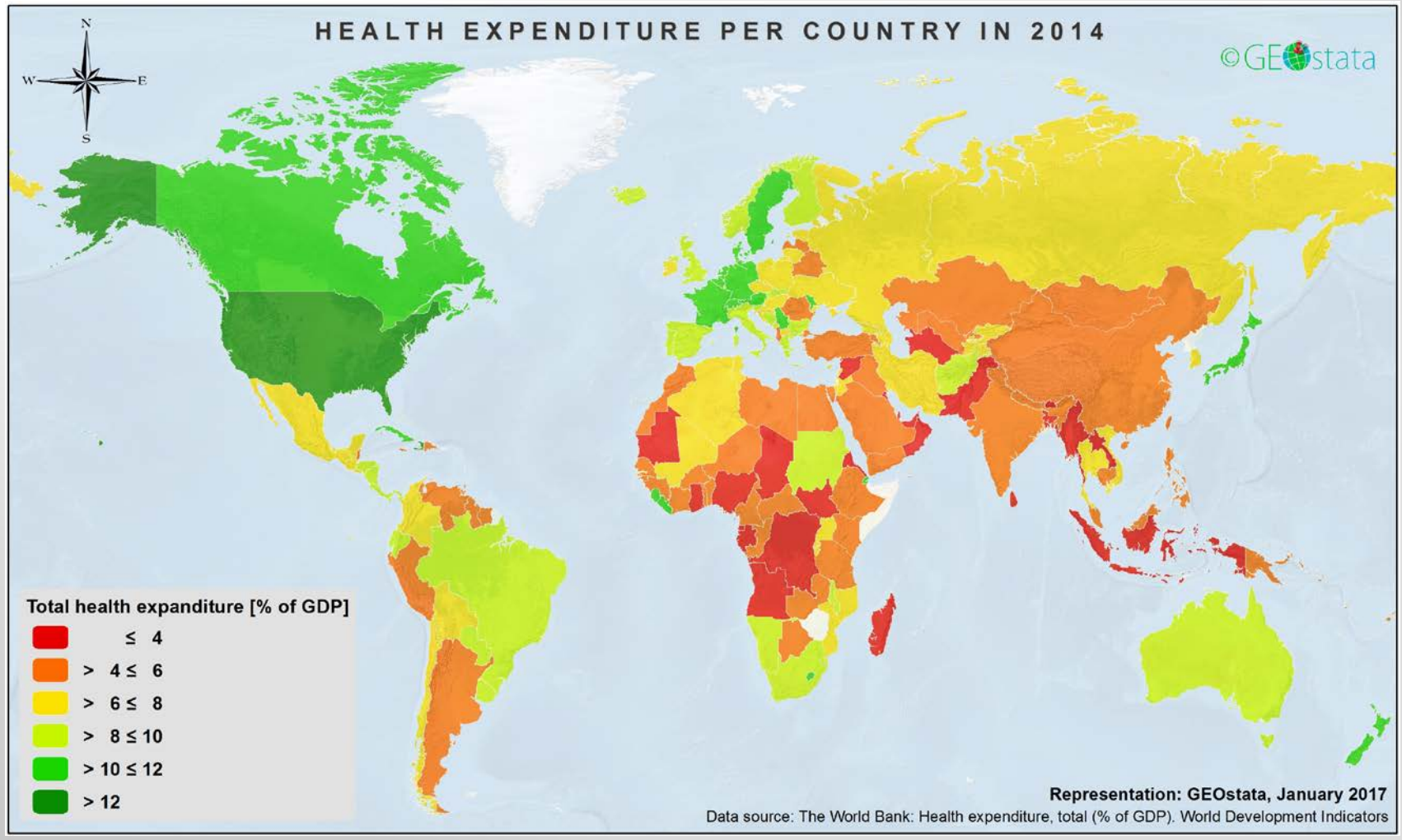
Health expenditure *per capita* in NL



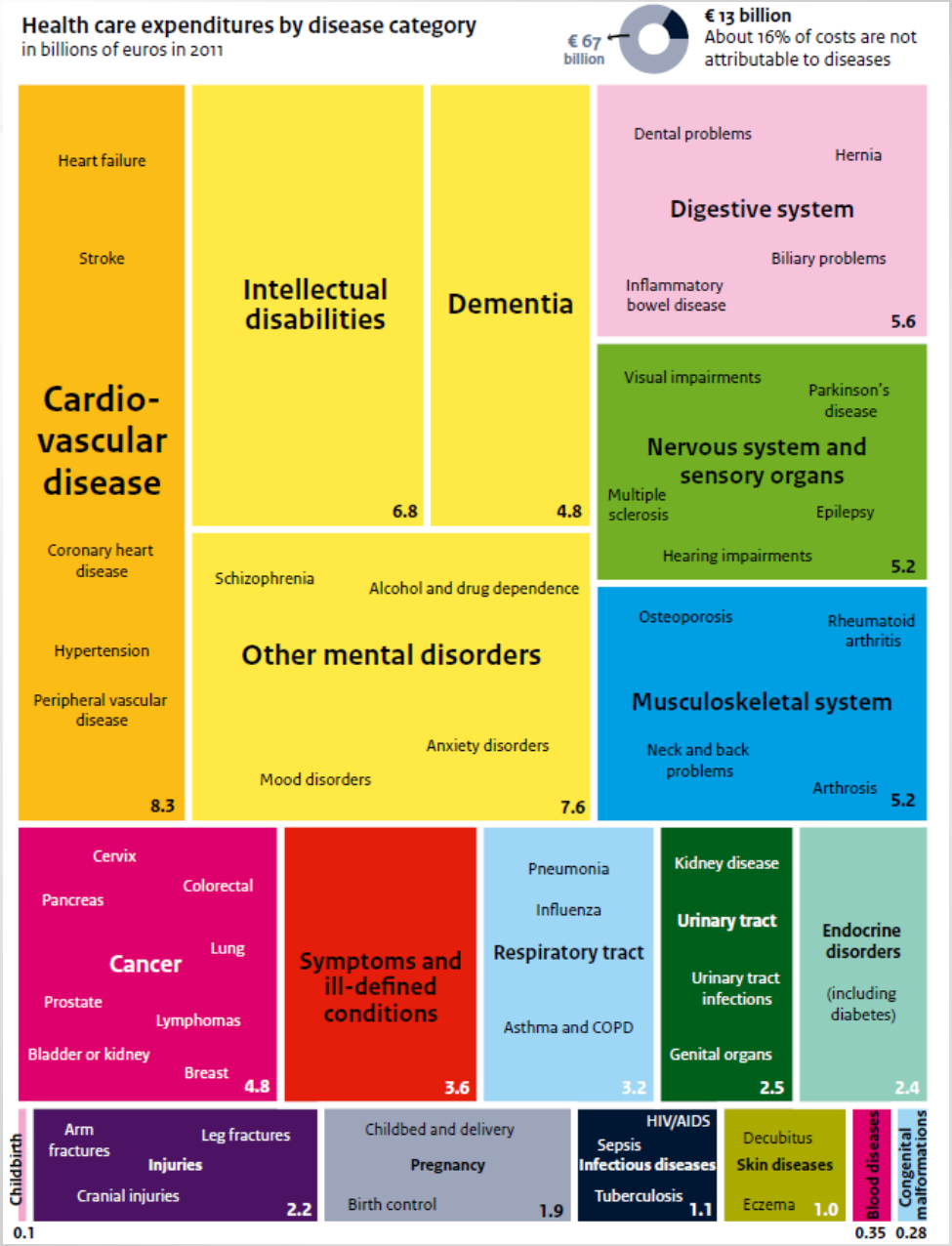
Health expenditure



Health expenditure

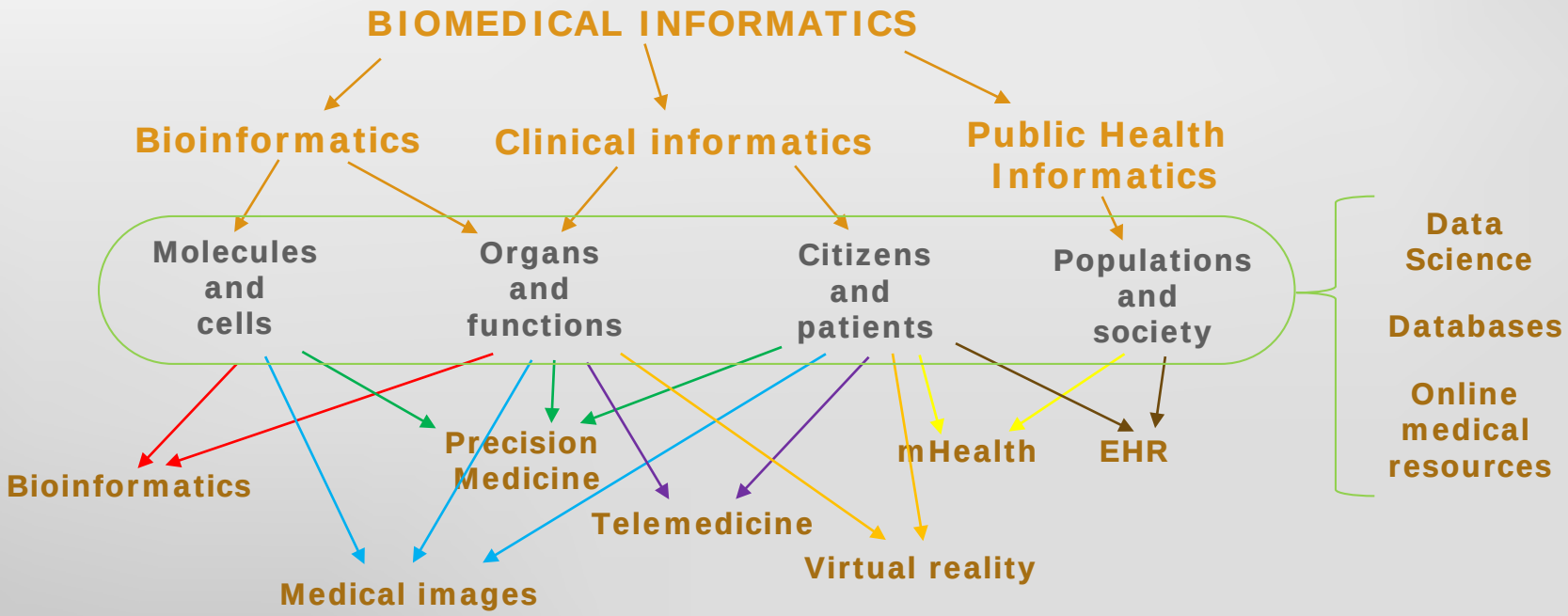


Health expenditure by disease in NL



What is Biomedical Informatics?

"Biomedical informatics is the interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving, and decision making, motivated by efforts to improve human health."
(American Medical Informatics Association, 2013)



Computer Science applications in medical field

- Databases – Medical Records, Medical Information Databases
- Artificial intelligence – Decision support systems, Medical Data Mining, Language processing
- Networks – Data exchange
- Automatic processing and analysis of images – Medical images, 2D or 3D reconstruction
- Methods for geographic information systems – Epidemiological surveillance systems
- Statistical methods – Biostatistics
- Device engineering – Surgical robots, signal processing

Take home assignment for next Monday February 18th

Read the Green Paper on mHealth by the European Commission:

http://ec.europa.eu/digital-agenda/en/news/green-paper-mobile-health-mhealth

Prepare your answers on the questions in the paper.

We will discuss it in the next class.

Food for further thought:

Leveraging mobile devices to improve healthcare
Mohammed Dalwai | TEDxCapeTown

https://www.youtube.com/watch?v=m-7ozul1tt8

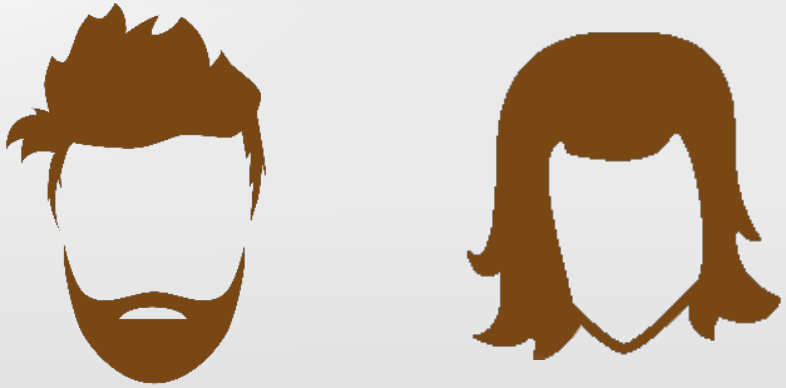
1. What do you think about the argumentation lines of Mohammed Dalwai? Is the collaboration between engineers and clinicians so important? Is it easy?

2. How can you argue in opposite of his argumentation? Try to find any negative point.

3. What do you learn from his argumentation? How can we as m-health researchers take his argumentation into account?

We will discuss it in the next class!

Please, send me your photo!



Workshop sessions schedule

Fill the form https://goo.gl/forms/Fxn6YpMGbkPtxxZM2 **before February 12th at 16.00** with your preferences (sort them by order of preference) and schedule restrictions (if any):

- Mobile Apps for Health
- Telemedicine
- Electronic Health Record
- Data Science in health care
- Bioinformatics

NOTE: In order to follow the GDPR regulations, please **use your SMI ID instead of your name**. To know your SMI ID check the Students' list available in this Blackboard side.

SMI 2019: Course's Slack space!

https://join.slack.com/t/smi2019/shared_invite/enQtNTQ5NTk1Njg0OTY3LWEzOTY0YmEwNWUwMTM5NzhmZDJjNGZiMGFlMmUxOThmZTA1YjIyOGYyMTg5ZWI0MmRjNDIwYjhkNWU3M2JhOTE

You can use this space to:

- Ask questions to your mates or me about lectures and workshops
- Find a partner to the final project
- Any other contact related to the course

See you on Monday!