



CrowdHEALTH

Holistic Health Records and Big Data Analytics for Health Policy Making & Personalized Health

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WS3-Big Data For Precision Medicine Symposium

Agenda

- ▶ Vision
- ▶ The CrowdHEALTH story
- ▶ Key enabler
- ▶ Objectives & propositions
- ▶ CrowdHEALTH architecture
- ▶ Use cases
- ▶ Summary



“Collective wisdom driving public health policies”

Today

- ▶ Numerous health ICT services
 - Several health services
 - Limited data exploitation
 - Inefficient personalization in health care provisioning
 - Health records (EHRs & PHRs) of specific value
 - Ineffective, untargeted, and fragmented health policies

Tomorrow

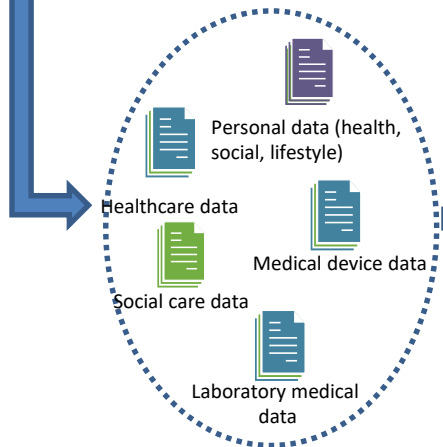
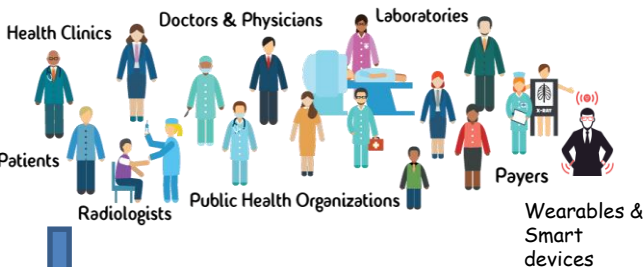
- ▶ Health policies exploiting big data
 - Heterogeneous data sources integration
 - Holistic health records (HHRs)
 - Data analytics on aggregated data
 - Collective knowledge exploitation
 - Multi-modal targeted policies



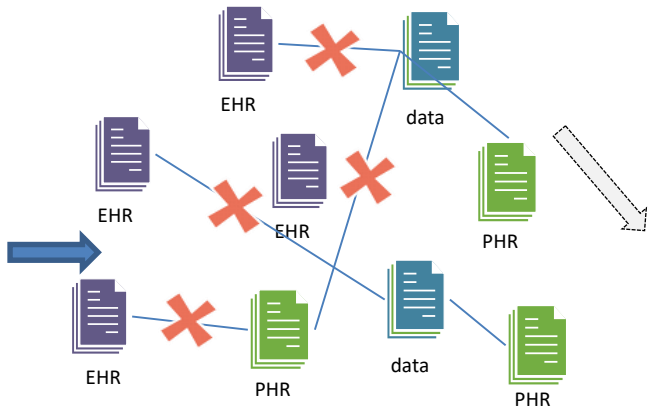
CrowdHEALTH



The CrowdHEALTH Story



Current Approaches



- **Independent and heterogeneous** services
- **Limited** data exploitation
- Health Records (EHRs & PHRs) of **limited value**

(a) **Fragmented** Health Strategies

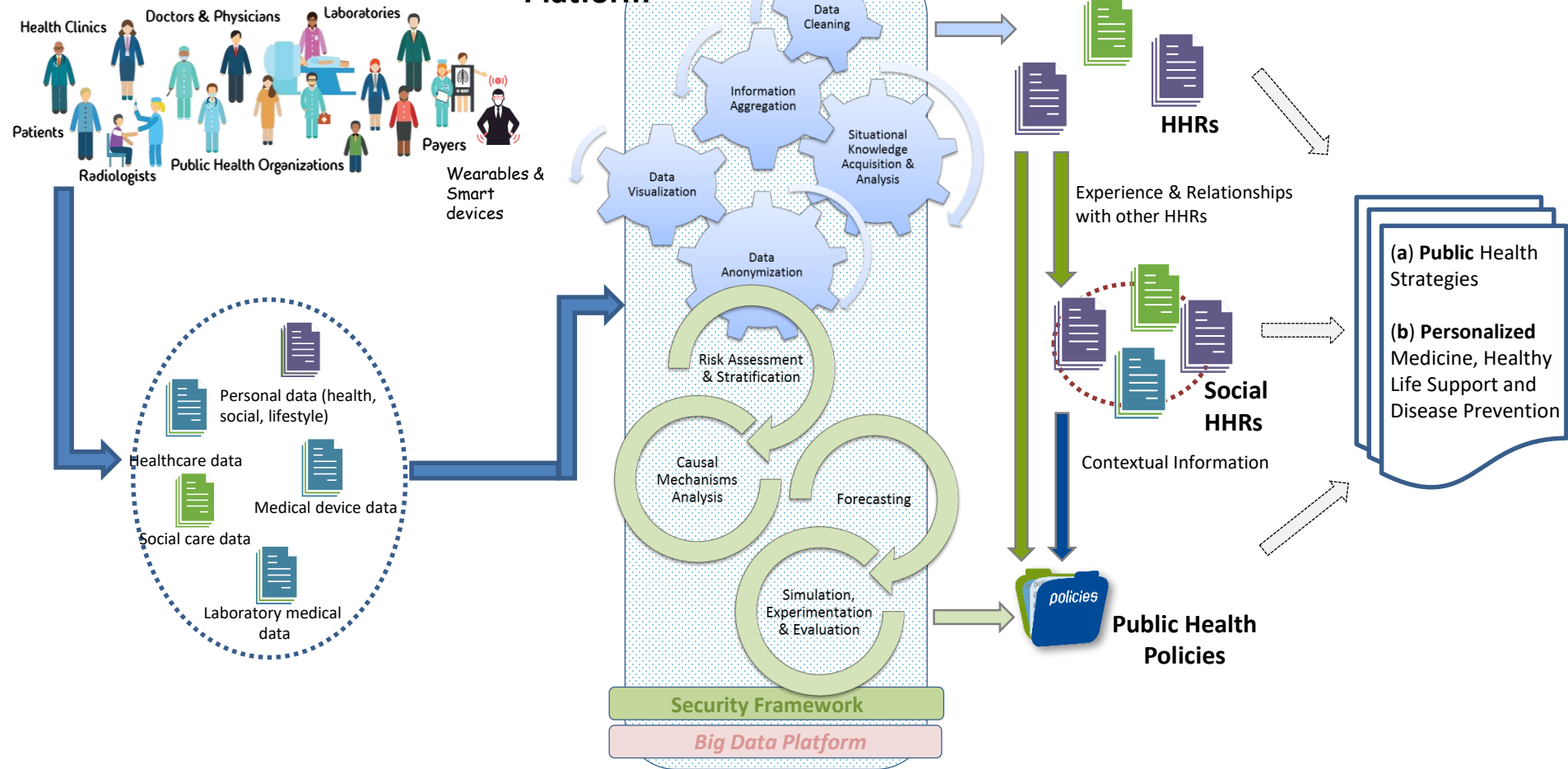
(b) **Inefficient** personalized health care



- **Ineffective** and **untargeted** health policies

The CrowdHEALTH Story

CrowdHEALTH Platform



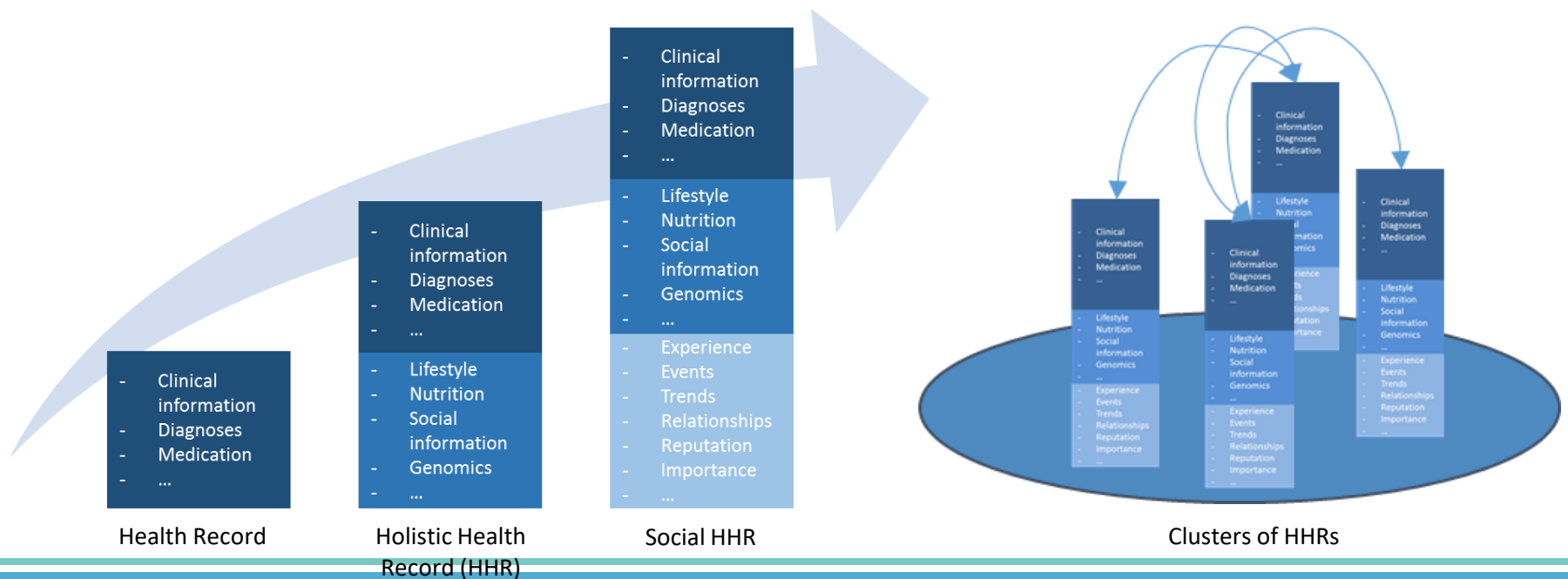
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Evolution of health records

- ▶ **Social HHRs** mean HHRs that are enriched / updated with information from other HHRs (their “experiences”) in order to propose health-oriented activities.
- ▶ **Exploitation of collective knowledge** by adopting partially or completely elements (care plans, practices, activities, etc) included in other HHRs
 - Based on clusters of different elements – e.g. nutrition-related



Objectives, Innovations & Propositions (1/3)

HHRs & Social HHRs



▶ Objectives:

- Exploitation of heterogeneous data sources and compilation of collective knowledge through Social HHRs.
- Ensuring secure cross-sector and multi-actor data exchange.

▶ Innovations:

- Compilation of collective knowledge for the provision of efficient public health policies and services.
- Creation of a security framework for trust management, adaptive selections, data anonymization, access control, and authorization.

Propositions

- HHR structures enabling capturing of different data
- Contextual analysis tools
- Clustering / classification technologies for analyzing HHRs and their networks / HHRs clusters
- Users' preservation, and data integrity techniques
- Access control schemes

Objectives, Innovations & Propositions (2/3)

Data Management



▶ Objectives:

- Facilitating new insights to healthcare by exploiting all available data sources.
- Data visualization for analyzing outcomes in a meaningful and proficient way.

▶ Innovations:

- Provision of added value real-time HHRs and health policies.
- Incremental data visualization techniques delivering data analytics outcomes.

Propositions

- Big data LeanXscale platform
- Dynamic data sources integration technologies
- Data cleaning and sources reliability techniques
- Data aggregation mechanisms (feeding HHRs)
- Data monitoring and visualization workbench



Objectives, Innovations & Propositions (3/3)

Health Policies



► Objectives:

- Modelling, creation and co-innovation of multi-modal health policies.
- Evaluation and adaptation of cross-domain policies.

► Innovations:

- Dynamic knowledge extraction through data deriving from data sources, social HHR networks, and predictive risk/causal analysis, with respect to all health determinants.
- Dynamic knowledge extraction through the outcomes of simulations and evidence based approaches.

Propositions

- Structural representation including several KPIs
- Health analytics (algorithms)
 - Prediction / forecasting
 - Clinical pathways
 - Risk identification
 - Causes analysis
- Identification of closed groups for simulations
- Evaluation of policies from closed groups

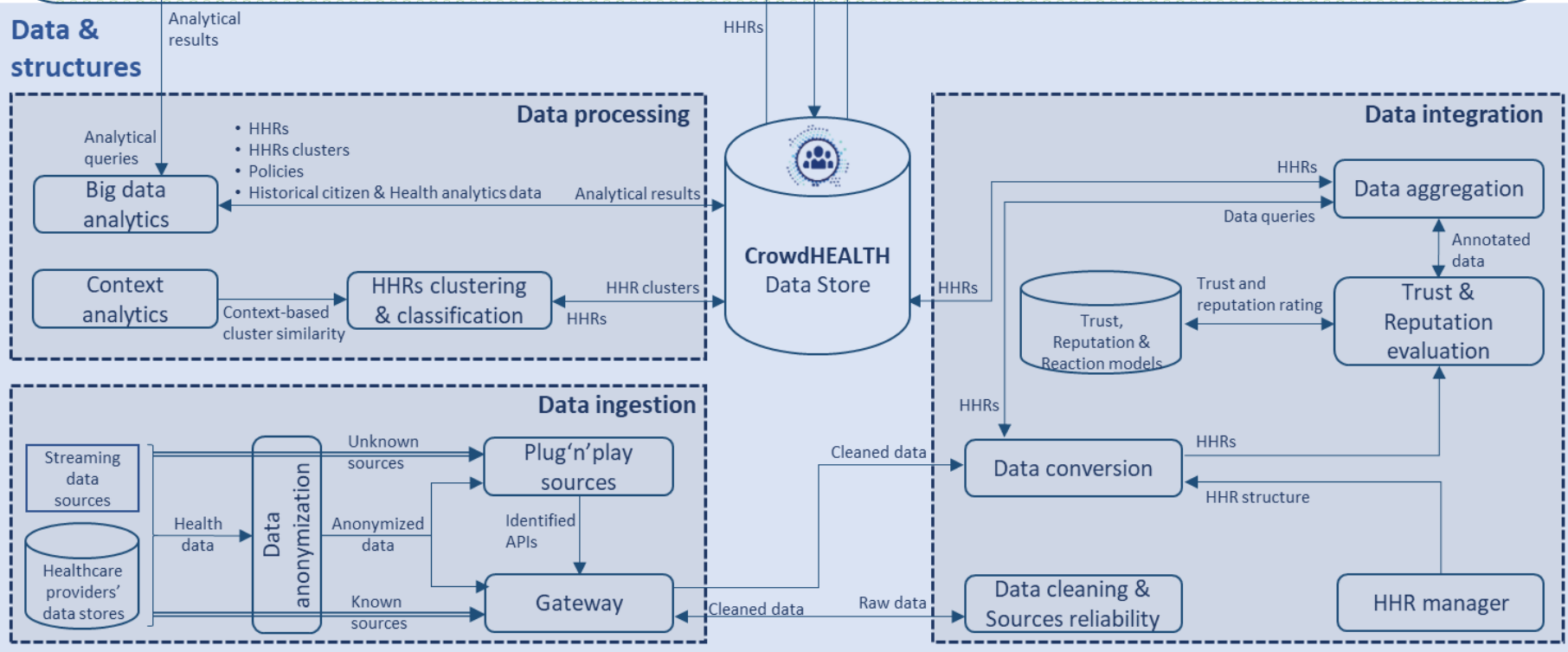
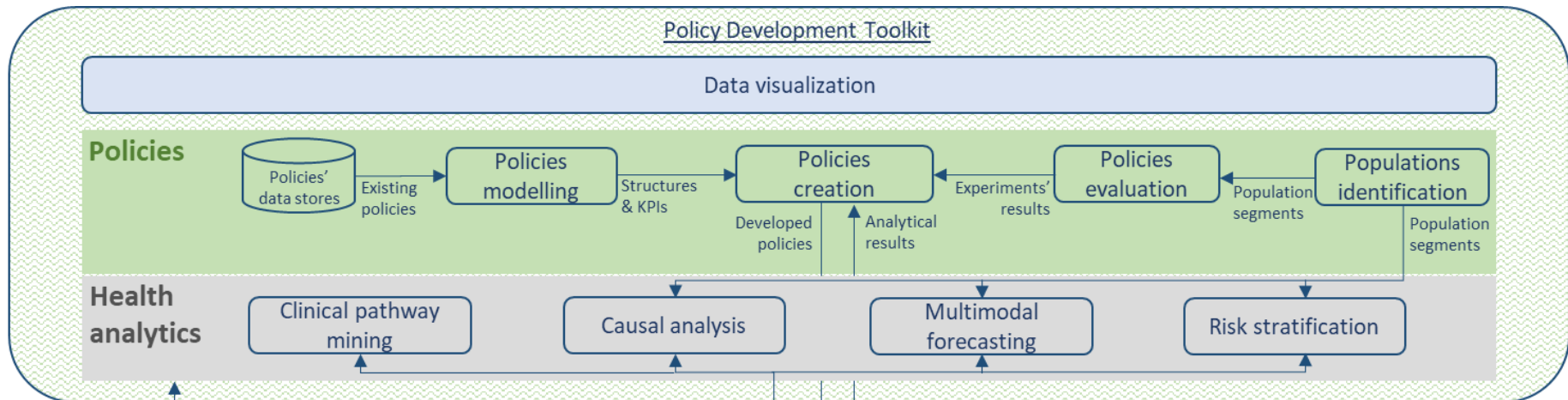


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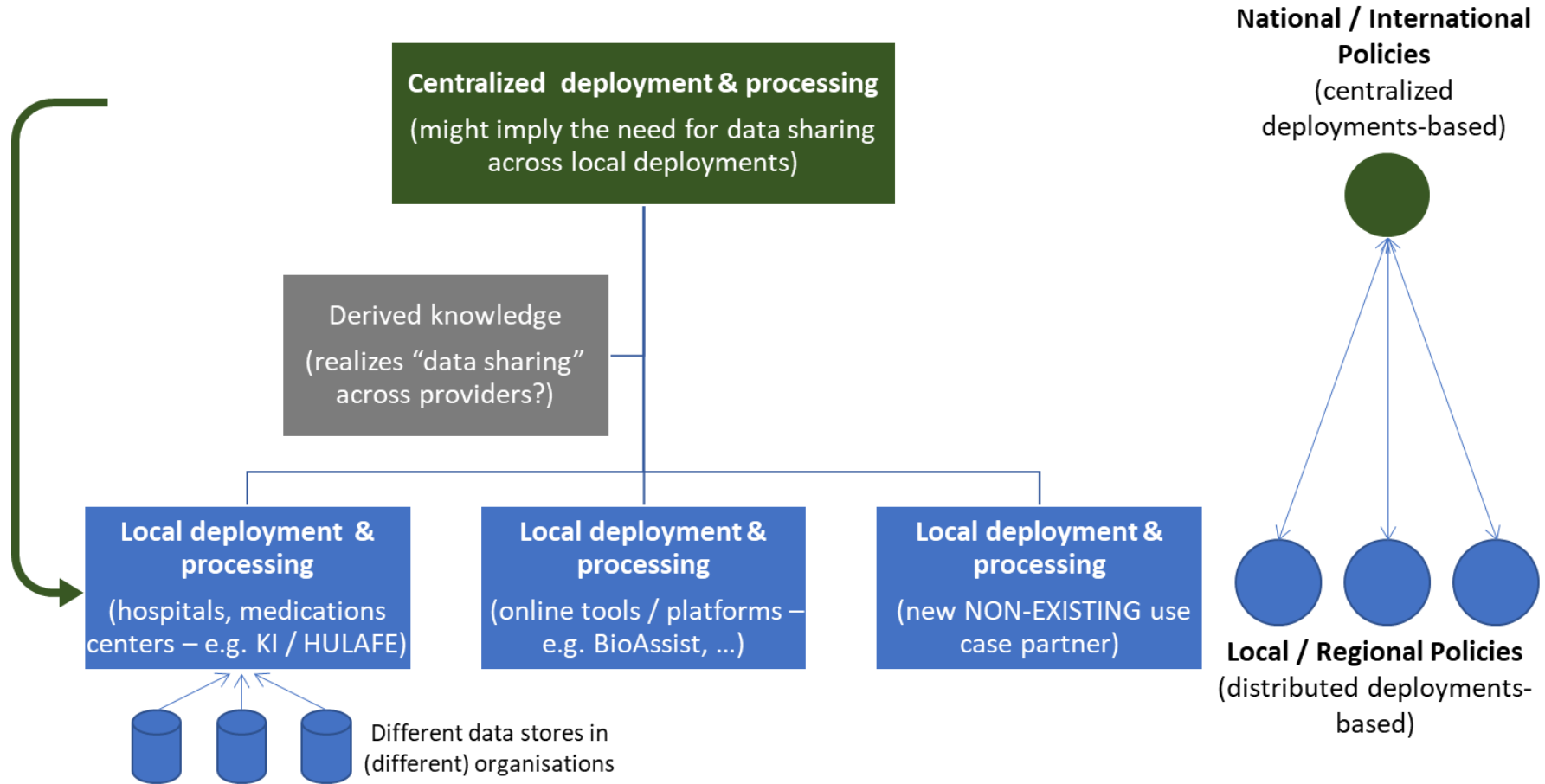
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Policy Development Toolkit



Various deployment patterns / multi-modal policies



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5 Use Cases – 6 Pilots

- ▶ Medication centres
 - HULAFE & KAROLINSKA
- ▶ Monitoring of Chronic diseases
 - BIOASSIST
- ▶ Social networks
 - CARE ACROSS
- ▶ Living labs
 - DFKI
- ▶ Public environments
 - UNI LJUBLJANA



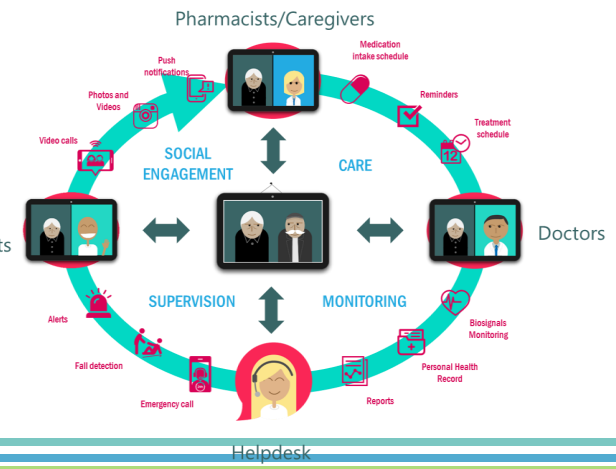
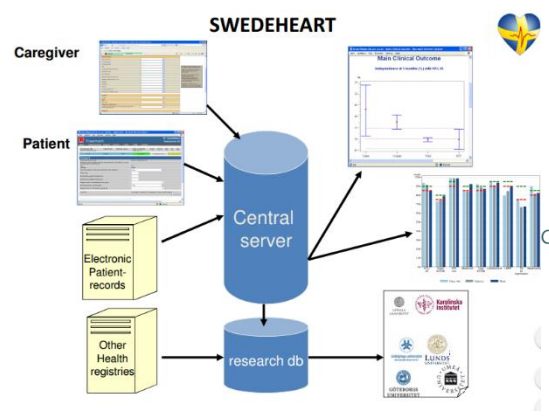
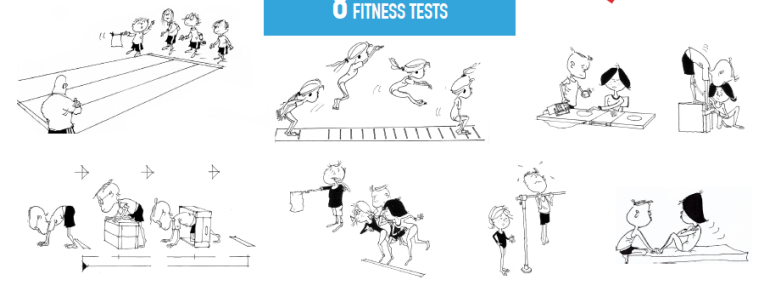
WHAT IS SLOfit?
every April

3 ANTHROPOMETRIC MEASUREMENTS



all Schools
one Protocol

8 FITNESS TESTS



Medication centres – EHR data

▶ Health Department of La Fe in Valencia - Overweight and obesity

- Obesity prevalence of 15% in the region -> 45,000 people who could benefit from more efficient policies and interventions.
- HHR Clinical Attributes:
 - Laboratory test results
 - Hospital resource utilisation: outpatient consultation, emergency room visits, hospitalizations, hospital at home episodes
 - Morbidities
- Mobile App for measuring body parameters (Height, Weight, BMI, and others).

▶ Karolinska – CVD

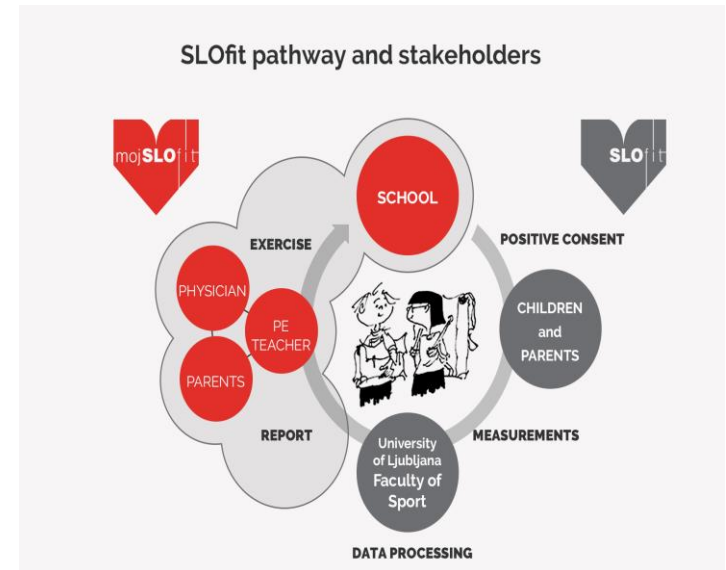
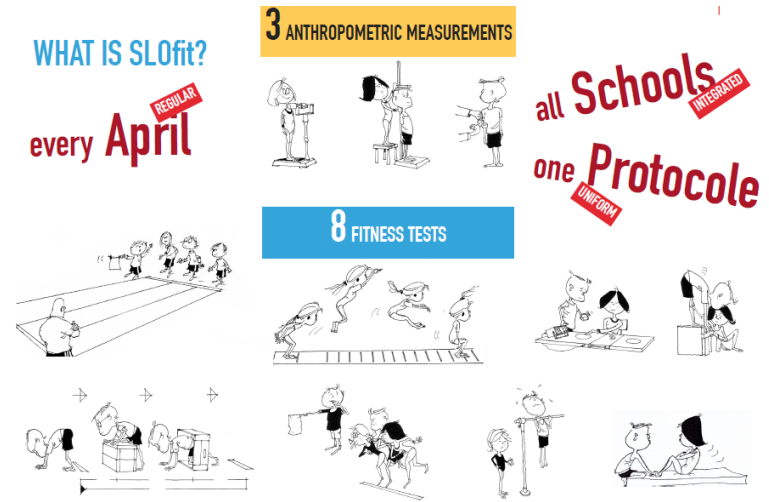
- VAL database: EHRs from all the registered hospitals in Stockholm.
- SwedeHeart quality registry which contains EHRs only for patients diagnosed with cardiovascular disease.

SwedeHeart quality registry (<http://www.ucr.uu.se/swedeheart/>)



Public health data

- ▶ **SLOfit** is implemented in all Slovenian schools
- ▶ Covers the entire population of children from age 6 to 18: In practice, over 220,000 children are measured every year in April
- ▶ SLOfit database today includes over 7.5 million sets of measurements of around 1,000,000 people, which is a half of entire population of Slovenia.
- ▶ The SLOfit test battery includes 3 anthropometric measurements and 8 motor tests.
- ▶ Based on the results of the 8 motor tests, Physical Fitness Index is calculated as a measure of overall physical effectiveness of every child.

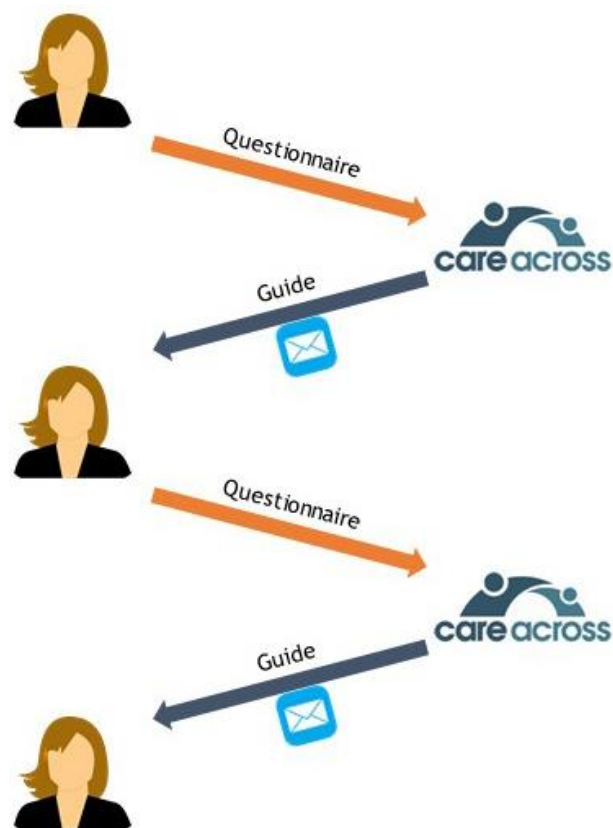


“What is SLOfit | SLOfit.” [Online]. Available: <http://en.slofit.org/what-is-SLOfit>.

Social Data

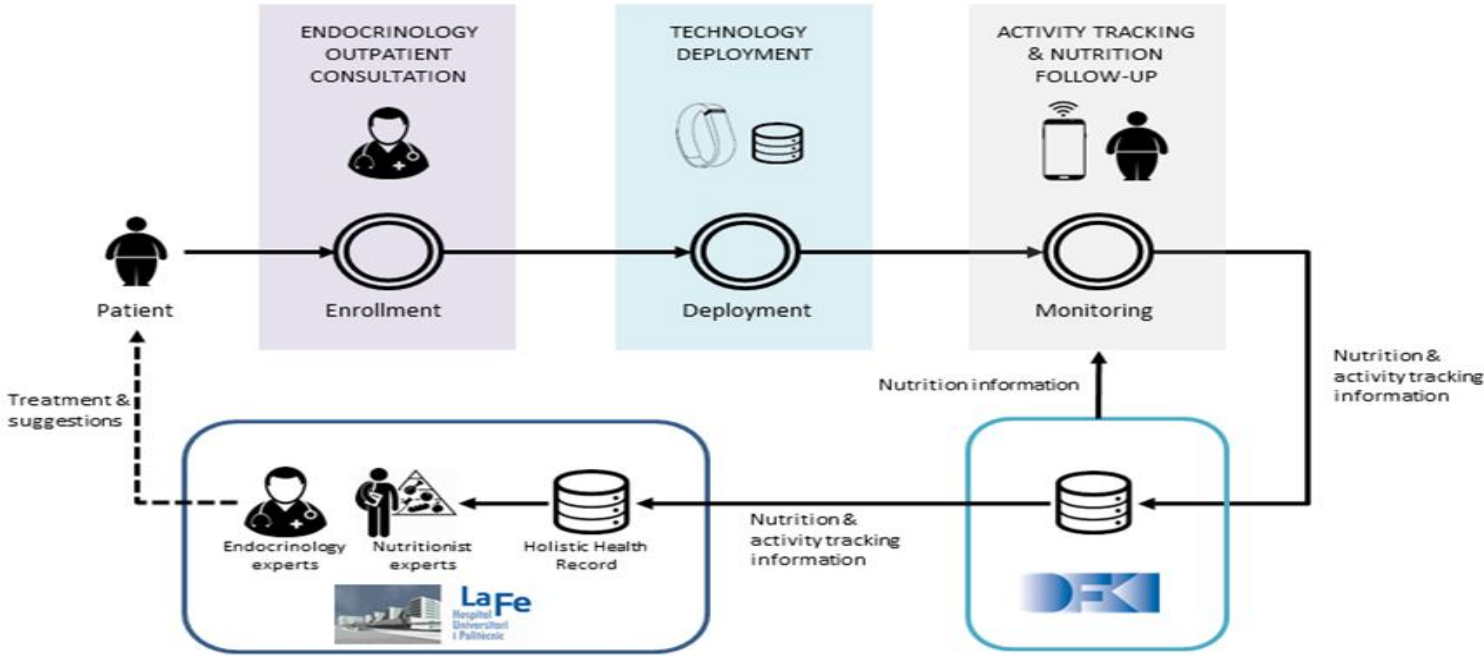
► CareAcross – On line Coaching for cancer patients

- Driven by the data entered by cancer patients on the secure CareAcross web platform
- Information on their diagnosis, treatment, co-morbidities, health behaviours and side-effects.
- The platform then provides medical information based on this input, and attempts to “coach” the patients into behaviour change based on medical research.
- Examples of aggregated Data
 - % of users who adhere to the coaching advice
 - % of users who remain engaged with the platform
 - % of users who report specific side-effects



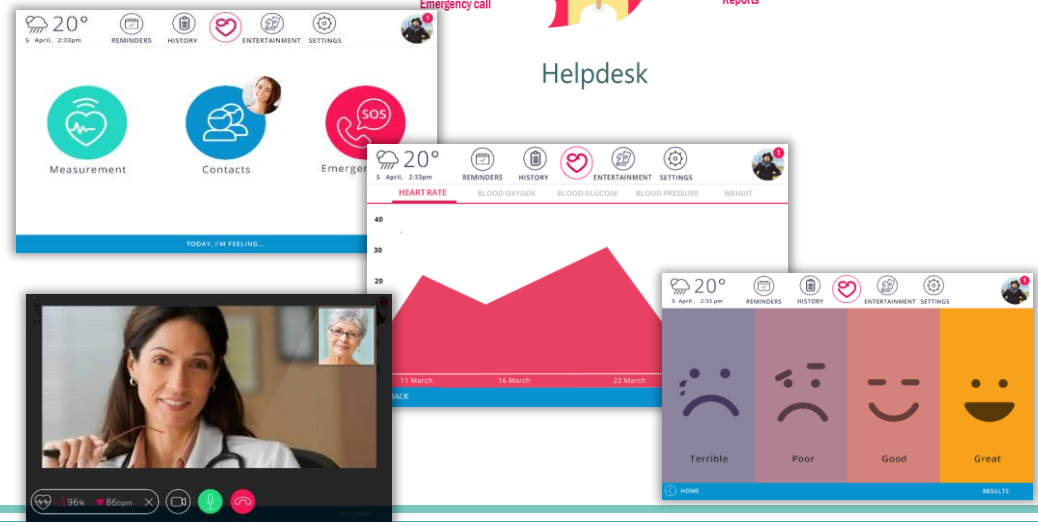
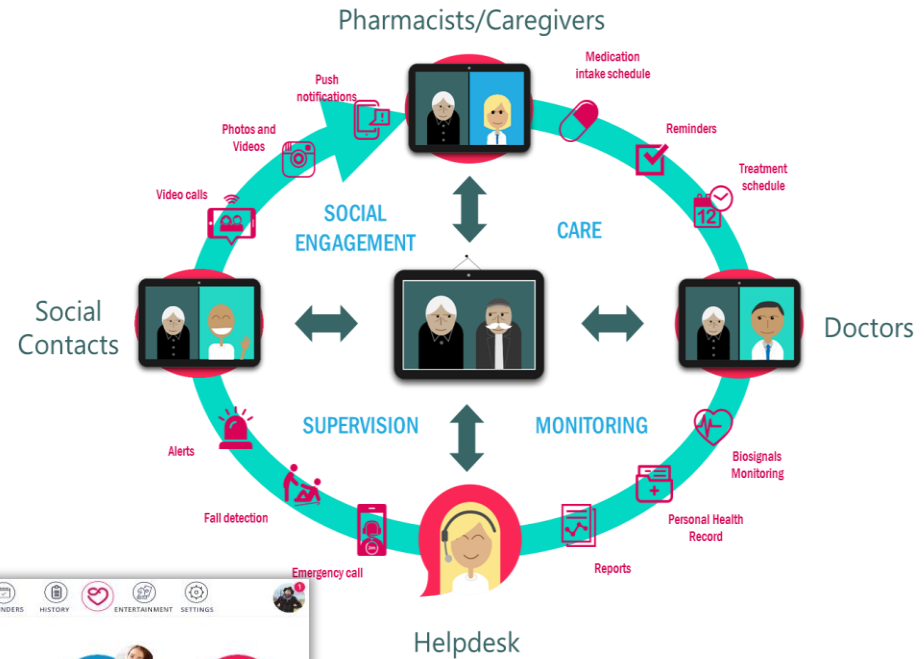
Lifestyle data – Combined with EHR and Social data

- ▶ Activity and nutrition tracking devices developed and provided by **DFKI**
- ▶ Complementing the health records kept at HULAFE



Chronic Disease Monitoring Data

- ▶ Supported by the Heartaround app provided by BioAssist
 - Biosignal Collection and Homecare Telemonitoring
 - State of the Art Communication Facilities
 - Emergency Response
- ▶ User friendly UI (contactless measurements)
- ▶ Involvement of multiple stakeholders, incl. Attending doctors, Relatives, Friends, Pharmacists, etc.
- ▶ Integration with EHR - Associated with Bioiatriki SA (2M EHRs)



Supported Wearable Devices in Heart Around App

Oximeters

Jumper JPD-500F



BP Monitors

Beurer BM85,
iHealth Track
A&D UA-651BLE



Spirometer

MIR Smart One



Weighing Scales

iHealth lite,
Beurer BF800



Activity Tracker

H10Pro



Glucose meters

iHealth BG5,
Contour
NextOne
Philips DL8740



Body
Temperature



Available: <http://www.heartaround.com>

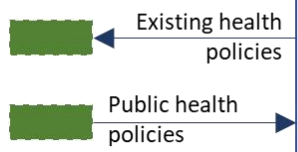
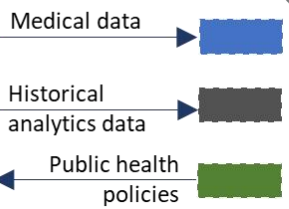
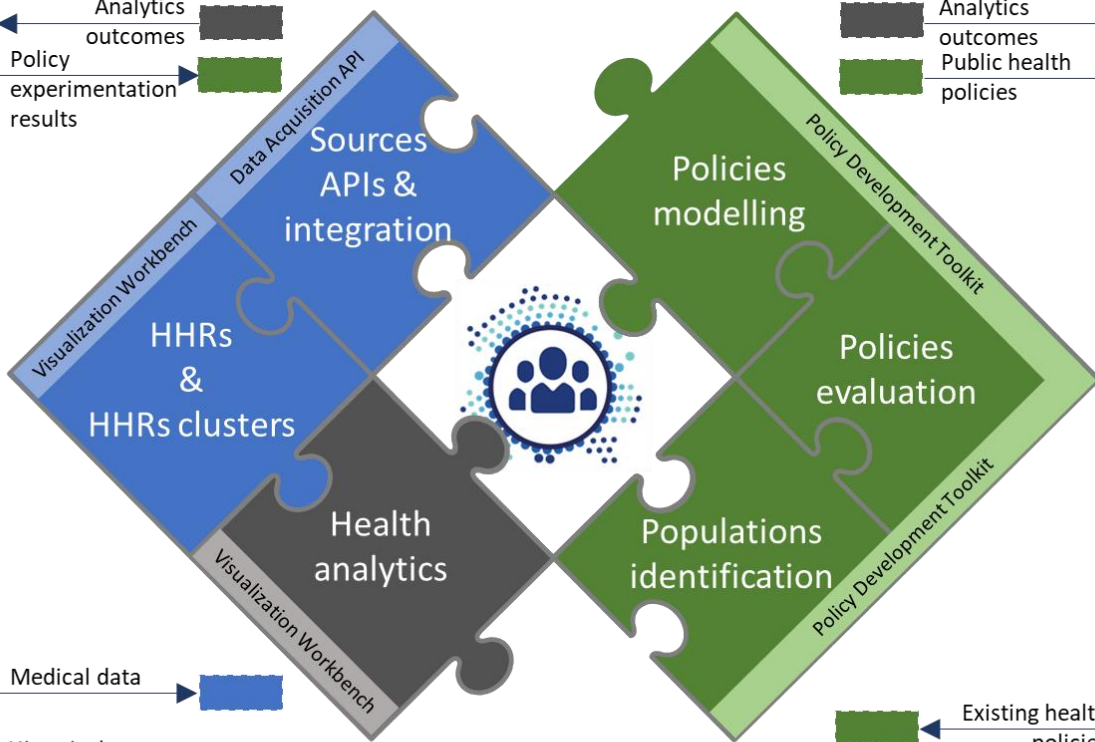
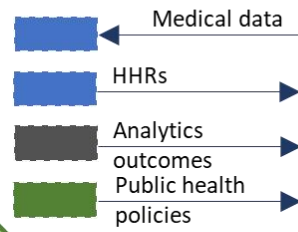
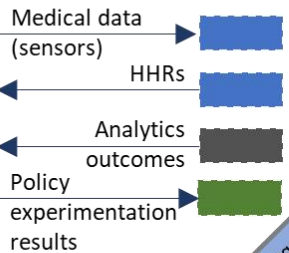
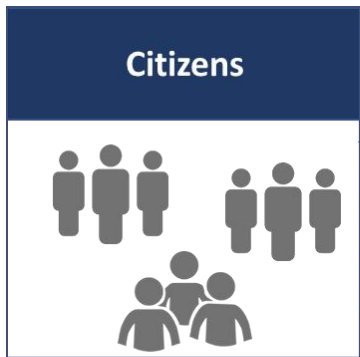


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Thank you!



University of Piraeus

SIEMENS



ENGINEERING



LEAN  CALE

Singular Logic



Jožef Stefan Institute

 BioAssist



University of Ljubljana

NIJZ
National Institute of Public Health



 Instituto de Investigación Sanitaria La Fe



 EFMI
EUROPEAN FEDERATION
for MEDICAL INFORMATICS

