
WP5: Public Health and "Secondary Uses"

T. Bedirhan Üstün
World Health Organization

EU SemanticHEALTH Specific Support Action:
*Semantic Interoperability Deployment and
Research Roadmap*

Gothenburg s 2008-05-27

Overview

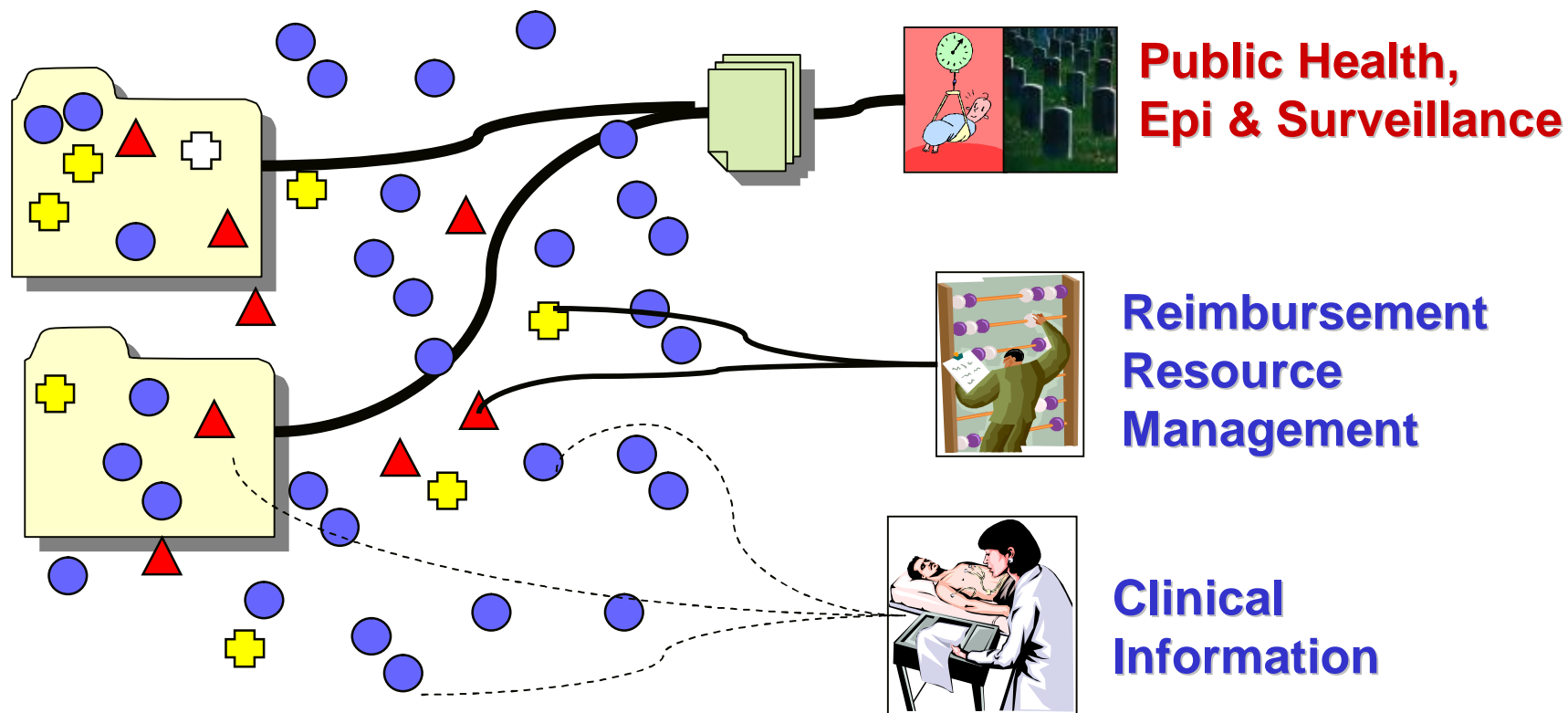
- **Objective:**
 - Semantic interoperability in **population-based data compilations** from individual e-health records for **public health** ("secondary use")
- **Vision: Digital Public Health & e-pidemiology**
 - **"Aggregation Process/Logic"** over cases, populations...
 - Operationalization: *Rules, Formalisms, Norms, Standards*
 - Tools: *Automated statistics; Groupers, GIS...*
- **Key findings to date:** a large spectrum of needs exist
 - **Fragmented** data collection à **Integrated systems**
 - **Communicable disease** reporting à **Digital Public Health**
- **Implications for the Semantic Interoperability Roadmap**
 - **USE CASES: Key Informants Survey** for feasibility, priority & utility

"Added-value" of digitalization of health information

- search functionality, text mining, data mining
- ability to exchange information among different providers and other authorized bodies in real time,
- compiling the complete health record of an individual from multiple sources as personal health records (e.g. episode based, lifelong)
- **Decision-support:** assisting providers to make fact-based decisions towards better outcomes with reduced medical errors
- cost-effective and timely data collection for monitoring and evaluation, surveillance, clinical and services research
- **COMBINATION at POPULATION level:**
 - compute various indicators and norms
 - Populations, groups
 - Settings, facilities
 - Regions, Geographic Units
 - Environmental variables

Real Time Public Health

Rule-based Aggregation @ Individual, Facility, Population levels



● Findings ▲ Events + Interventions

From Chris Chute, Mayo

Public Health Informatics

Dimensions relevant for Semantic Interoperability

- **Individual Data**
 - Clinical Records
 - Disease Data
 - Laboratory Data
 - Medication Data
 - Medical Images
 - Genetic Data
- **Population Level Information**
 - Mortality Information
 - Morbidity Information
 - Disability Information
 - Risk Factors
- **Health Care Resources**
 - Health Settings (type)
 - Health Facilities
 - Health Workers - Human Resources
- **Health System Parameters**
 - Coverage of key interventions: immunization, antenatal care, eyesight, etc.
 - Patient Safety (adverse reactions, errors, etc)
 - Effectiveness of care
- **Financial Parameters**
 - Costs
 - DRGs or similar case mix systems
 - Payment systems – Insurance vs. Out of Pocket expenses

Public Health Informatics

Technical Requirements relevant for Semantic Interoperability

- **Technical Standards**
 - *Exchange*
 - *Content*
- Linkage and congruence of Biomedical terminologies
 - from genomics to population health (*multilevel ontologies*)
- **Multilingual Representations**
 - Common definitions based on language independent constructs
 - **Common definitions across countries**
- **Privacy, Security, Confidentiality**
- **Identity management in community populations**
- **Geographical Information Systems**
- **Metadata about services**
- **Environmental Health Variables** (air, water, sanitation, chemicals...)

Activities undertaken during 2007

- **Stakeholders and requirements**
 - **Global Public Health Initiative** Conference on Public Health Informatics, Seattle 17-20 September 2007
 - Planning of next conference in New Delhi, India November 2008
 - **Global Health Data Standards** Meeting, Nairobi, Kenya 1-5 December 2007
- **Review of other published requirements**
 - Academic searches: NLM Bibliography, **WHO Bibliography**
- **Formalisms, standards, tools**
 - **IHTSDO – WHO Harmonization activities** for SNOMED-ICD mappings
 - **ICD-11 Revision activities** – started in earnest 17 April 2007
 - Linkage with ISO, CEN, HL-7 and others
- **Existing systems, e-Health programmes**
 - EU colleagues, GPHI, ECDC, CDC (USA), one major US HMO,
 - technical contributions from RIDE deliverables

Current "Digital-Public Health" Emphasis

- Bio-terrorism / surveillance

- Anthrax
- SARS
- Pandemic Flu
- West Nile Virus
- Antimicrobial resistance
- ... others

à *communicable disease control*

- Infrastructure (*terminology, messaging, tools*) is being developed

- GPHIN
- Promed
- GOARN
- GIDEON
- RODS
- ...

à *Early Warning Response Systems*

Neglected Digital-Public Health issues

- Aggregation and analysis of routine health data and indicators
 - **Routine service statistics**: Timely aggregation and analysis routine data
 - Online epidemiology à real time public health
 - Risk monitoring /**surveillance**
 - **Comparability**
 - **Shared standards** for secondary use and public health indicators
- **Geo-coding of data**
 - Standards – especially for aggregation
 - Confidentiality, privacy issues

Semantic interoperability: requirements for Digital Public Health Record

- Underlying individual eHR records
 - Coverage across whole population at facility, region, nation and international level
 - Technical Interoperability
 - Semantic Interoperability: meaningful aggregation of individual health record across a given population
 - semantic equivalence of different expression styles
 - consistent use of terminology and classification systems
 - consistent data (and meta-data) structure
 - Equivalent multilingual representations
- Aggregation process: Linking individual data to public health indicators
 - aggregation of data within the appropriate framework
 - use of relevant **Public Health standards** - terminology, archetypes
 - **Ontology of public health indicators** : Entities – Relations
 - **Safety Check Mechanisms**: Aggregation bears risk of introducing inconsistent representations
- Exchange across various HIS architectures
 - **Comparability across EU – global indicators**
 - **Meta-data about differences between HIS architectures**

Beyond Google:

Semantic Interoperability for Public Health

to exchange, compile and understand exactly what that data means

- Search using "Concepts" above Words:
 - How many patients do have diabetes mellitus type II?
- Extraction of Concepts from Documents
 - Automated extraction of Hb1Ac results from PHRs of all patients with DM type II from lab reports within last year
- Statistical Index on Community Collections
 - Calculation of coverage gap for treatment need for diabetes mellitus: how many patients are not treated adequately?
- Concept Navigation across Collections
 - Comparison of region A with region B etc

USE CASES

for PUBLIC HEALTH INFORMATICS Survey

- **Mortality :**
 - Electronic death certificates and automatic compilation of cause of death statistics
- **Epidemiology:**
 - a. Diabetes: Proportion of diabetic patients treated effectively (e.g. levels of hemoglobin A1c: *HbA1c*)
 - b. Obesity: Body- Mass Index (BMI) applications from clinical records and national health examination surveys
 - c. Depression: Data from clinical electronic health records in in comparison with population surveys and clinical trials
- **Patient safety :**
 - WHO International Classification for Patient Safety application on electronic health records
- **Adverse drug reaction monitoring**
 - WHO Drug Dictionary and ATC classification application on electronic health records
- **Emergency response and preparedness:**
 - reportable diseases by International Health Regulations
- **Health care facilities management:**
 - aggregation statistics for patient flow
- **Health financing :**
 - Calculation of case-mix groupings using ICD, ICF and grouping algorithms from diagnosis related groupings (DRGs);
- **Costs and Benefits :**
 - modeling cost-savings associated with these type of e-health applications rather than conventional data compilation.

USE CASES: Methods

- **Key Opinion Leaders Meeting – 2007** in Seattle, Kenya and Geneva
 - Common Strategy and Key Roadmap elements
 - Live discussion of Use Cases in focus groups
- **Key Informant Survey**
 - **Multiple Stakeholders**
 - Public
 - Policy Makers
 - Public Health experts
 - Clinicians

Ø Utility

Ø Feasibility

Ø Priority

Public Health Informatics Key Informant Survey

- WEB Survey:

<http://www.who.int/classifications/phi-kis>

- *English*
- *Arabic*
- *Russian*
- *Chinese*
- *French*
- *Spanish*

- 10-20 Minutes

- Practical focus on USE Cases:

- Your own opinion as a key informant on:
 - Feasibility
 - Utility
 - Priority

Public Health Informatics: Short- Mid- Long-term Goals

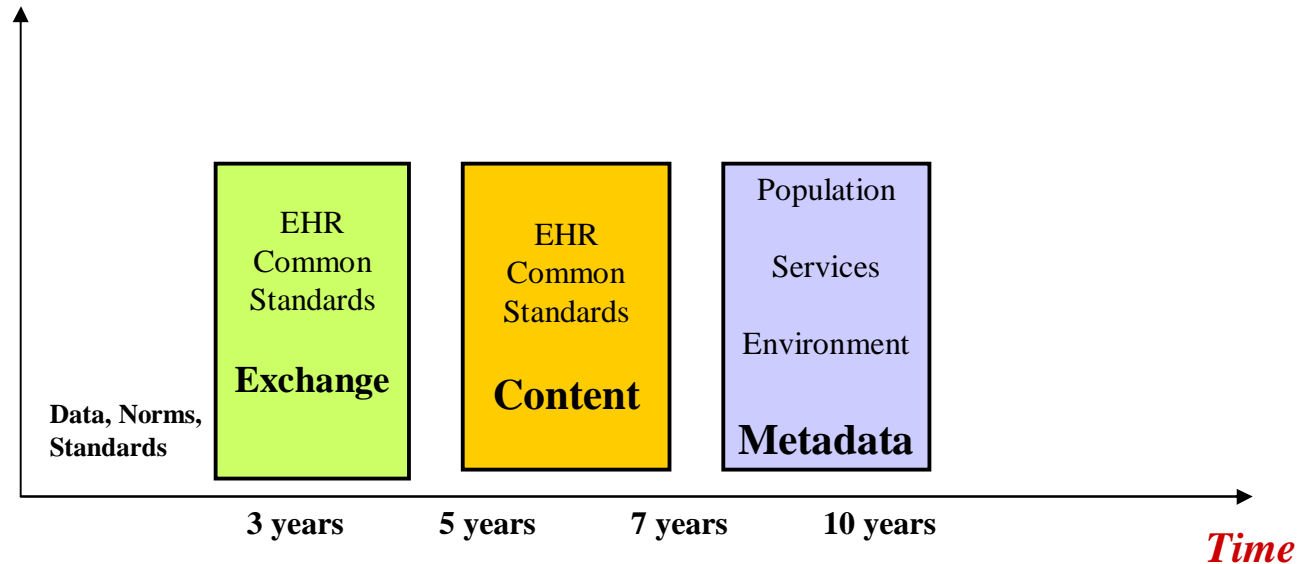
Interoperability Levels

FULL Semantic Interoperability

Some Semantic Interoperability

Technical Interoperability

NO Interoperability



Knowledge Organization

Multilevel Ontologies

Linguistic Representations

Multiple Languages

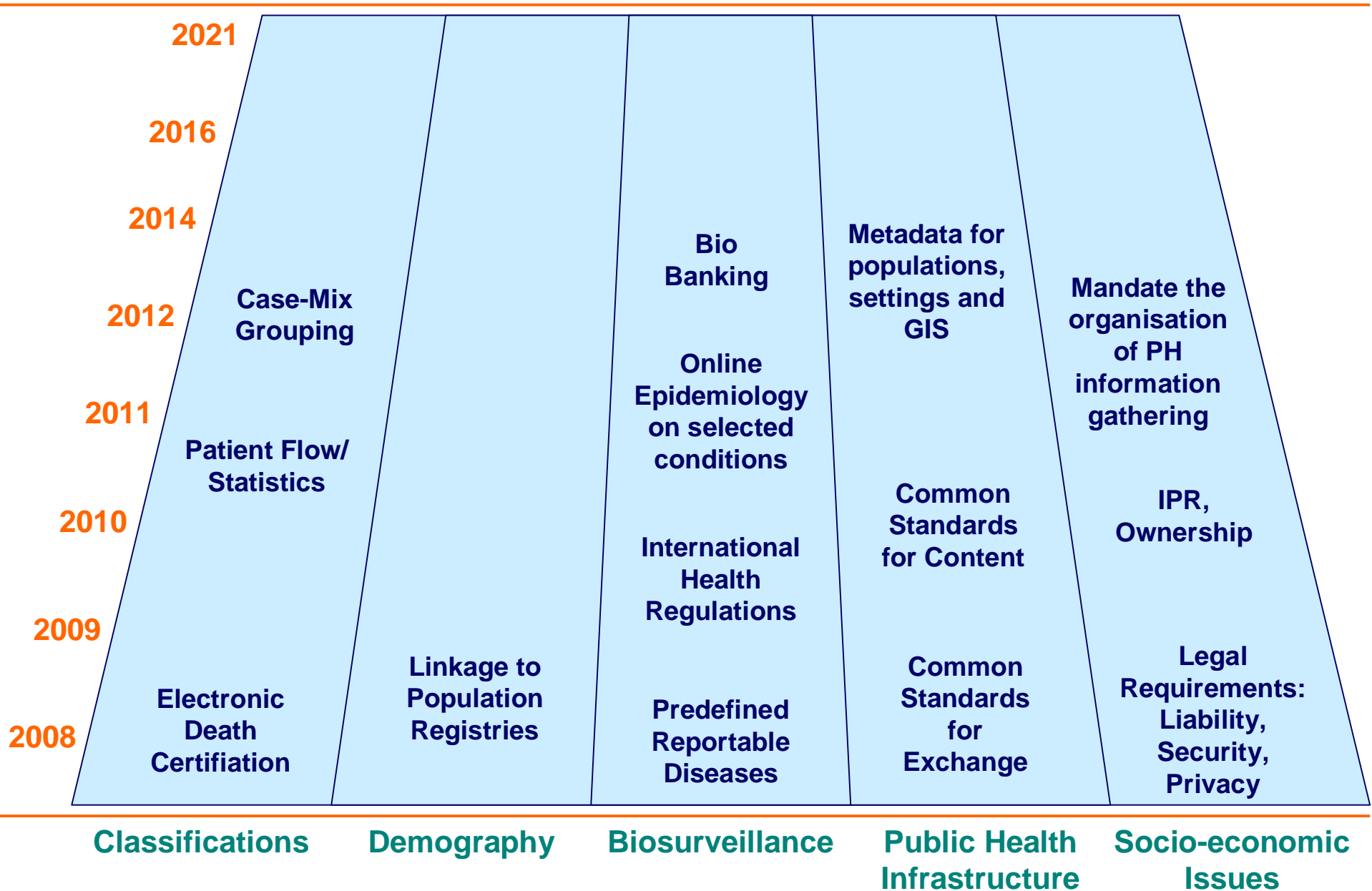
Legal Requirements

**Liability
Security
Privacy**

**Ownership
Intellectual
Property**

**Mandate
Organization**

Roadmap for SI Op Deployment & Research – Public Health



Prerequisites for Digital Public Health

- **consistent use** of electronic health /person-based health records
- **interconnecting health service providers** so health information can be exchanged through interoperable digital means in a standard fashion
- Information on structure of **populations** is available so that the methods could be applied in a consistent manner to:
 - aggregate data across populations
 - Health care settings
 - Geographical units
- Research to prove the **comparability of digital information** with analog traditional measures used **for monitoring and evaluation** in various health information systems
 - adopting a standardized approach for representing and sharing of **public health indicators** (e.g. rates for mortality, morbidity, vaccinations to be expressed as **public health archetypes**)
 - **Costs & benefits** of Digital Public Health implementation

Acknowledgements



Specific Support Action co-funded by the European Commission SIXTH FRAMEWORK PROGRAMME



Communication & Technology Research
Germany



World Health Organisation
Dept. Of Measurement & Health Information Systems, Switzerland



Uppsala University
Nordic Centre for Classifications in Health Care, Sweden



University of St. Etienne
Department of Public Health & Medical Informatics, France



University College London
Centre for Health Informatics, UK



University of Manchester
Health and Bioinformatics Group, UK



National Institute for Strategic Health Research
Hungary



Radboud University Nijmegen Medical Center
The Netherlands