



Public Health Informatics Fellowship Program  
February 23, 2007

Public Health Ontology  
vs. Ontology for Public Health



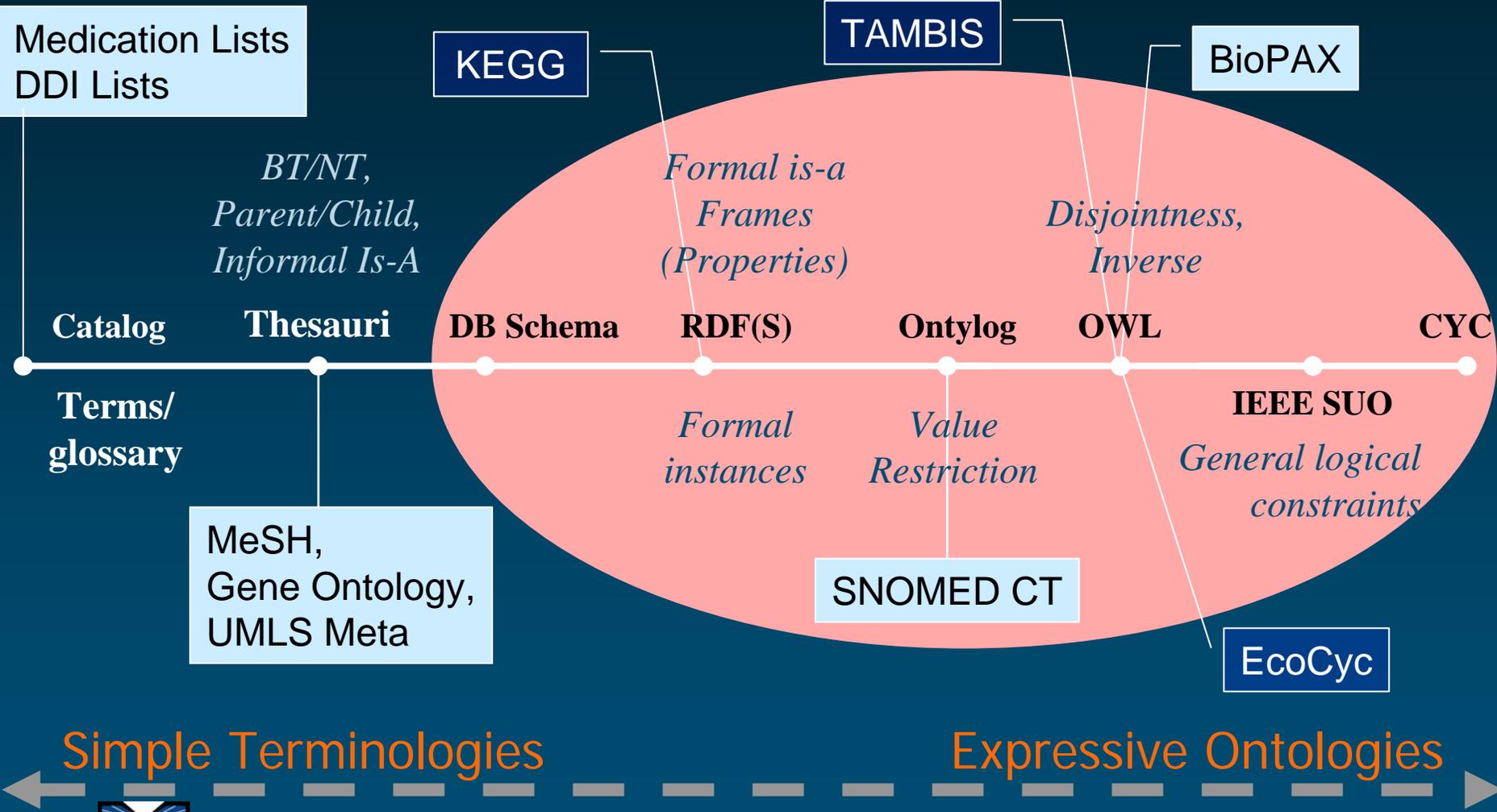
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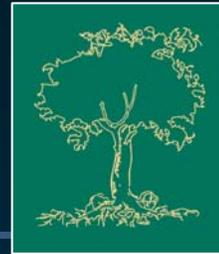
# Introduction Ontologies

- ◆ Formal representation of a domain modeling the things in that domain and the relationships between those things
- ◆ A set of logical axioms designed to account for the intended meaning of a vocabulary [Guarino, FOIS 1998]

# Introduction *Ontology spectrum*



# Unified Medical Language System



## ◆ SPECIALIST Lexicon

- 200,000 lexical items
- Part of speech and variant information

Lexical  
resources

## ◆ Metathesaurus

- 5M names from over 100 terminologies
- 1M concepts
- 16M relations

Terminological  
resources

## ◆ Semantic Network

- 135 high-level categories
- 7000 relations among them

Ontological  
resources

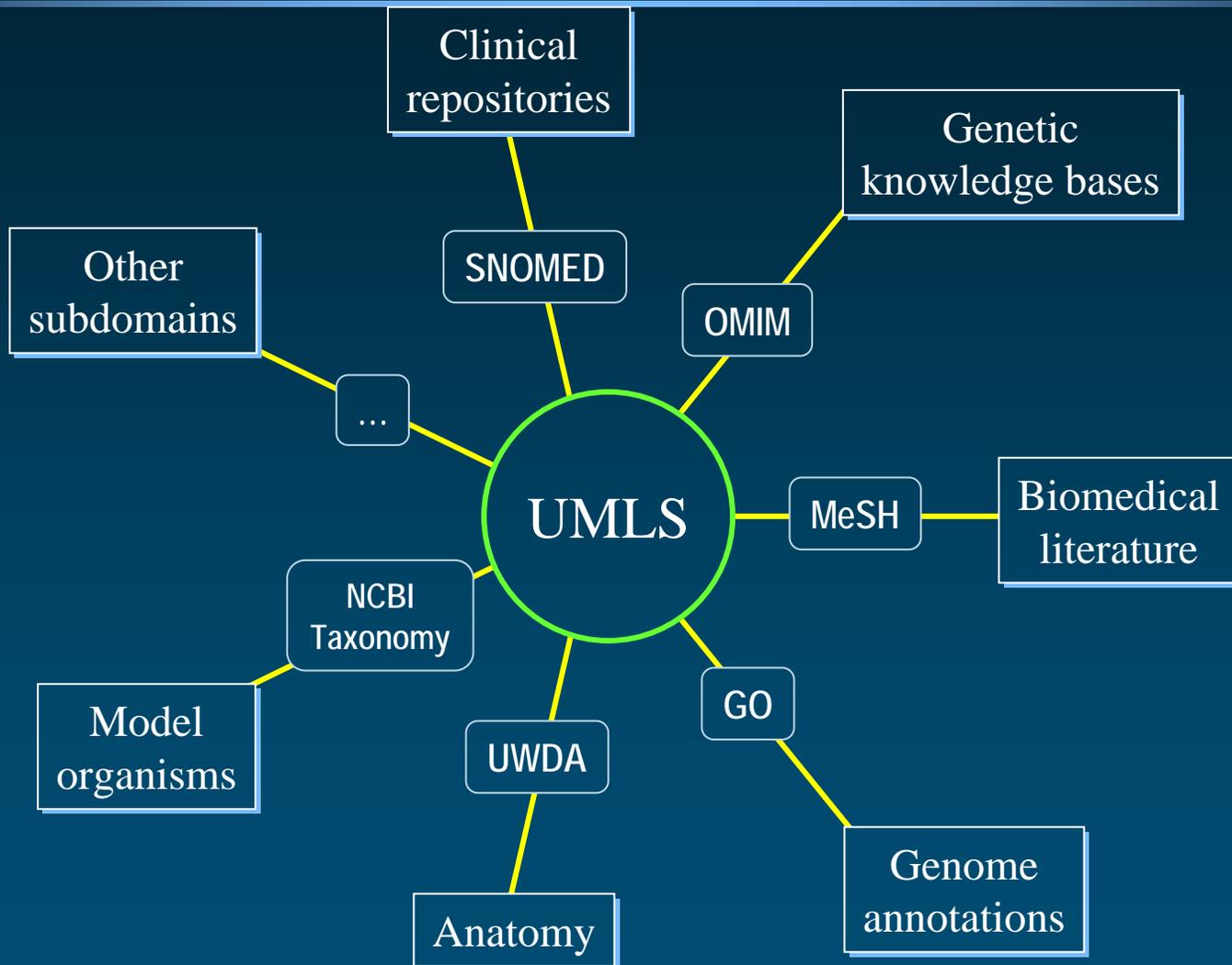


# Source Vocabularies

(2007AA)

- ◆ 139 source vocabularies
  - 17 languages
- ◆ Broad coverage of biomedicine
  - 5.5M names
  - 1.4M concepts
  - 16M relations
- ◆ Common presentation

# Integrating subdomains



# Overview

- ◆ Why biomedical ontologies?
- ◆ What is the difference between cardiology and public health?
- ◆ Approaches to defining public health ontology
  - Bottom-up approach
  - Top-down approach
- ◆ Value sets for public health
  - Sources
  - Selection criteria

Why biomedical ontologies?

# Why biomedical terminologies?

- ◆ To support a theory of diseases
- ◆ To classify diseases
- ◆ To support epidemiology
- ◆ To index and retrieve information
- ◆ To serve as a reference

# To support a theory of diseases

## ◆ Hippocrates

- Dismisses superstition
- Four humors
  - Blood
  - Phlegm
  - Yellow bile
  - Black bile

## ◆ Thomas Sydenham (1624-1689)

- *Medical observations on the history and cure of acute diseases (1676)*

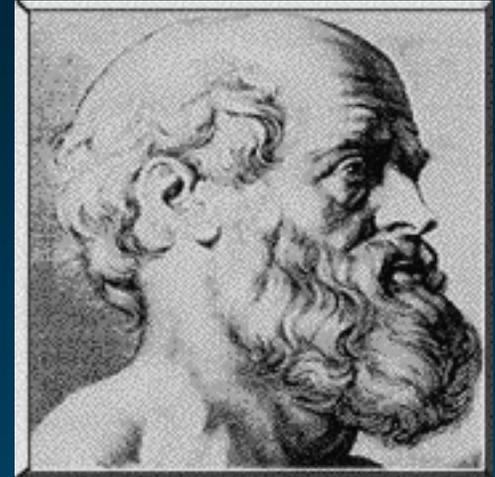
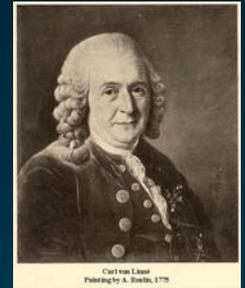


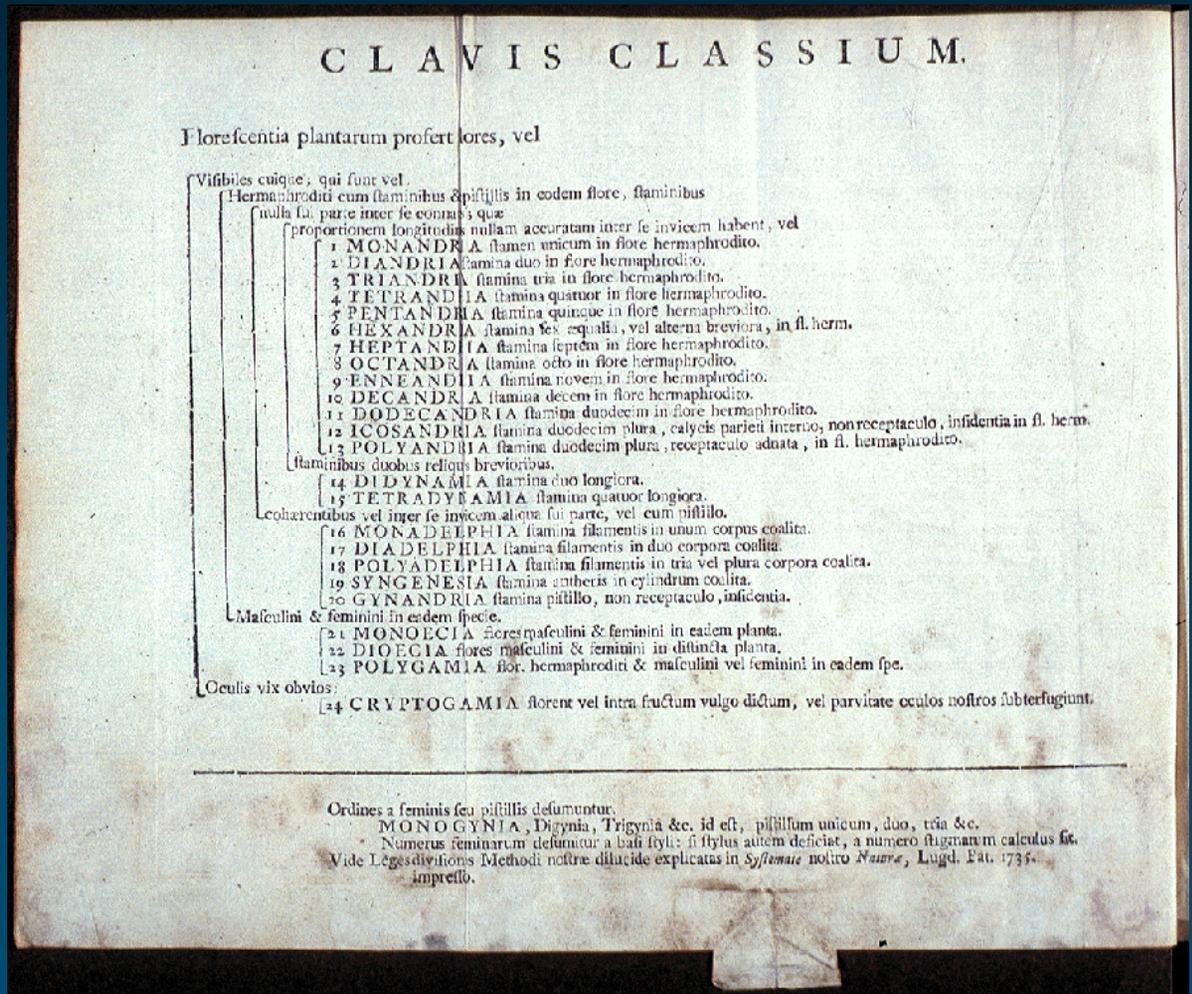
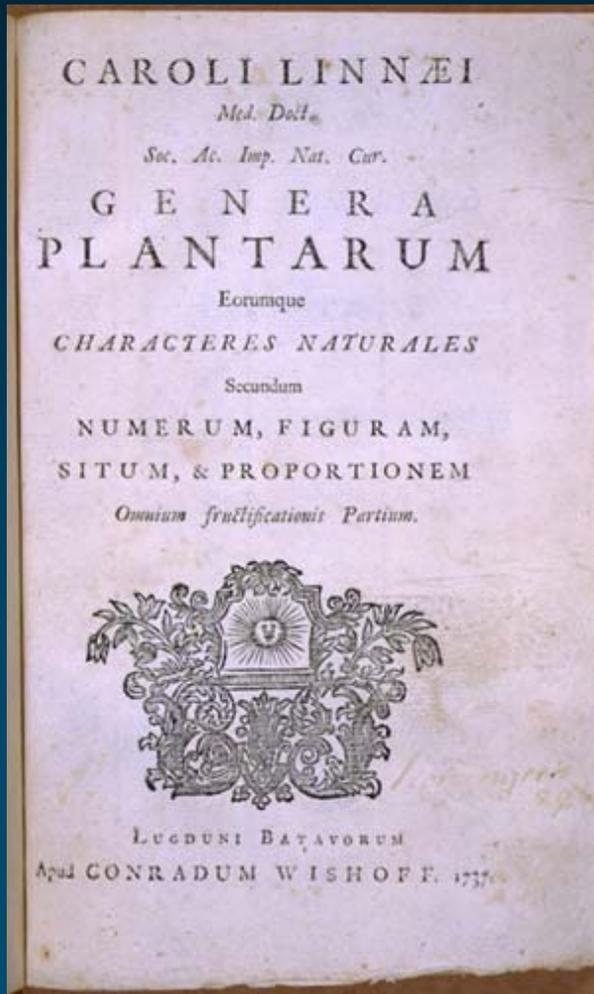
Figure 36 Thomas Sydenham (1624-1689)

# To classify diseases (and plants)

- ◆ Carolus Linnaeus (1707-1778)
  - *Genera Plantarum* (1737)
  - *Genera Morborum* (1763)
- ◆ François Boissier de La Croix  
a.k.a. F. B. de Sauvages (1706-1767)
  - *Methodus Foliorum* (1751)
  - *Nosologia Methodica* (1763/68)
- ◆ William Cullen (1710-1790)
  - *Synopsis Nosologiae Methodicae* (1785)



# From plants...



# ... to diseases

## ◆ Four categories (W. Cullen)

- Fevers
- Nervous disorders
- Cachexias
- Local diseases

“The distinction of the genera of diseases, the distinction of the species of each, and often even that of the varieties, I hold to be a necessary foundation of every plan of physic, whether dogmatical or empirical.”

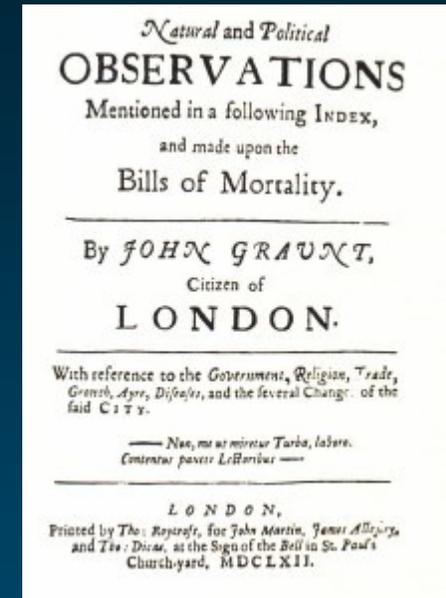
– William Cullen, Edinburgh, 1785

*Synopsis Nosologia Methodicae*

(Cited by Chris Chute)

# To support epidemiology

- ◆ John Graunt (1620-1674)
  - Analyzes the vital statistics of the citizens of London
- ◆ William Farr (1807-1883)
  - Medical statistician
  - Improves Cullen's classification
  - Contributes to creating ICD
- ◆ Jacques Berthillon (1851-1922)
  - Chief of the statistical services (Paris)
  - Classification of causes of death (161 rubrics)



# London Bills of Mortality

**LONDON'S Dreadful Visitation:**  
*Or, A COLLECTION of All the*  
**Bills of Mortality**  
 For this Present Year:  
 Beginning the 27<sup>th</sup> of December 1664. and  
 ending the 19<sup>th</sup> of December following:  
 As also, The GENERAL or whole years BILL:  
 According to the Report made to the  
 KING'S Most Excellent Majesty,  
 By the Company of Parish-Clerks of London. &c

LONDON:  
 Printed and are to be sold by E. Coles living in Aldersgate-street.  
 Printer to the said Company 1665.

**A general Bill for this present year,**  
 ending the 19 of December 1665. according to  
 the Report made to the KING'S most Excellent Majesty.  
 By the Company of Parish Clerks of London, &c.

*The Diseases and Casualties this year.*

<b>A</b> Abortive and Stillborne	517	Executed	21	Palfie	30
Aged	1545	Flux and Small Pox	655	Plague	68398
Aque and Peaver	5257	Found dead in Streets, fields, &c.	20	Plasme	6
Apoplex and Suddenly	116	French Pox	86	Plurisie	19
Bedrick	10	Frighted	23	Posticous	4
Bisard	1	Gout and Sciatica	27	Quintic	35
Bleeding	16	Grief	46	Rickets	157
Bloody Flux, Scouring & Flux	185	Gripping in the Guts	228	Killing of the Lights	157
Burnt and Scalded	8	Hanged & made away themselves	7	Leprotic	14
Colicure	3	Headmolested & Meale fallen	14	Scurvy	127
Cancer, Gangrene and Fillula	56	Jaundies	120	Singles and Swine pox	2
Canker, and Thrush	121	Imposiume	227	Sores, Ulcers, broken and healed	82
Childbed	623	Killed by severall accidents	46	Limbs	82
Christomes and Infants	1258	Kings Evil	88	Spleen	14
Cold and Cough	62	Leprotic	2	Spotted Fever and Purples	1929
Collick and Winde	124	Lechary	14	Scopping of the forehead	32
Consumption and Tiflick	4808	Livergown	21	Stone and Strangury	68
Convulsion and Morice	1052	Meagrom and Headach	1	Sutlet	121
Distracted	3	Mealles	7	Teeth and Worns	1614
Drownd and Tempany	1476	Mothered and Shot	9	Worming	51
Drownd	3	Overjaid & Starved	45	Vinn	7
Emales	5114				
Emales of Females	4853	Buried	48569		
In all	9567	In all	87320	Of the Plague	68398

Increased in the Burials in the 120 Parishes and at the Pest-house this year. 79009  
 Increased of the Plague in the 120 Parishes and at the Pest-house this year. 68398

# Limitations of existing classifications

“The advantages of a uniform statistical nomenclature, however imperfect, are so obvious, that it is surprising no attention has been paid to its enforcement in Bills of Mortality. Each disease has, in many instances, been denoted by three or four terms, and each term has been applied to as many different diseases: vague, inconvenient names have been employed, or complications have been registered instead of primary diseases. The nomenclature is of as much importance in this department of inquiry as weights and measures in the physical sciences, and should be settled without delay.”

– William Farr

*First annual report.*

London, Registrar General of England and Wales, 1839, p. 99.

# To index and retrieve information

- ◆ Biomedical literature
  - MEDLINE (18M citations from 5000 journals)
  - Manually indexed
  - Medical Subject Headings (MeSH)
- ◆ Genome
  - Model organism databases (Fly, Mouse, Yeast, ...)
  - Manually / semi-automatically curated
  - Gene Ontology

# To serve as a reference

- ◆ Reference terminology/ontology
  - Universally needed
  - Developed independently of any purposes
  - Reusable by many applications
- ◆ Examples
  - VA National Drug File (NDF)
  - Foundational Model of Anatomy (FMA)
  - SNOMED CT

# Administrative terminologies

- ◆ Coding patient records
  - International Classification of Primary Care (ICPC)
  - SNOMED
  - Read Codes
- ◆ Reporting claims to health insurance companies
  - Current Procedural Terminology (CPT)
  - International Classification of Diseases (ICD-9 CM)
  - Healthcare Common Procedure Coding System (HCPCS)

# Contemporary public health perspective

- ◆ The automated exchange of data between public health partners
- ◆ The use of electronic clinical data for event detection
- ◆ Specimen and lab result information management and exchange
- ◆ Analysis of public health data
- ◆ Public health information dissemination and alerting



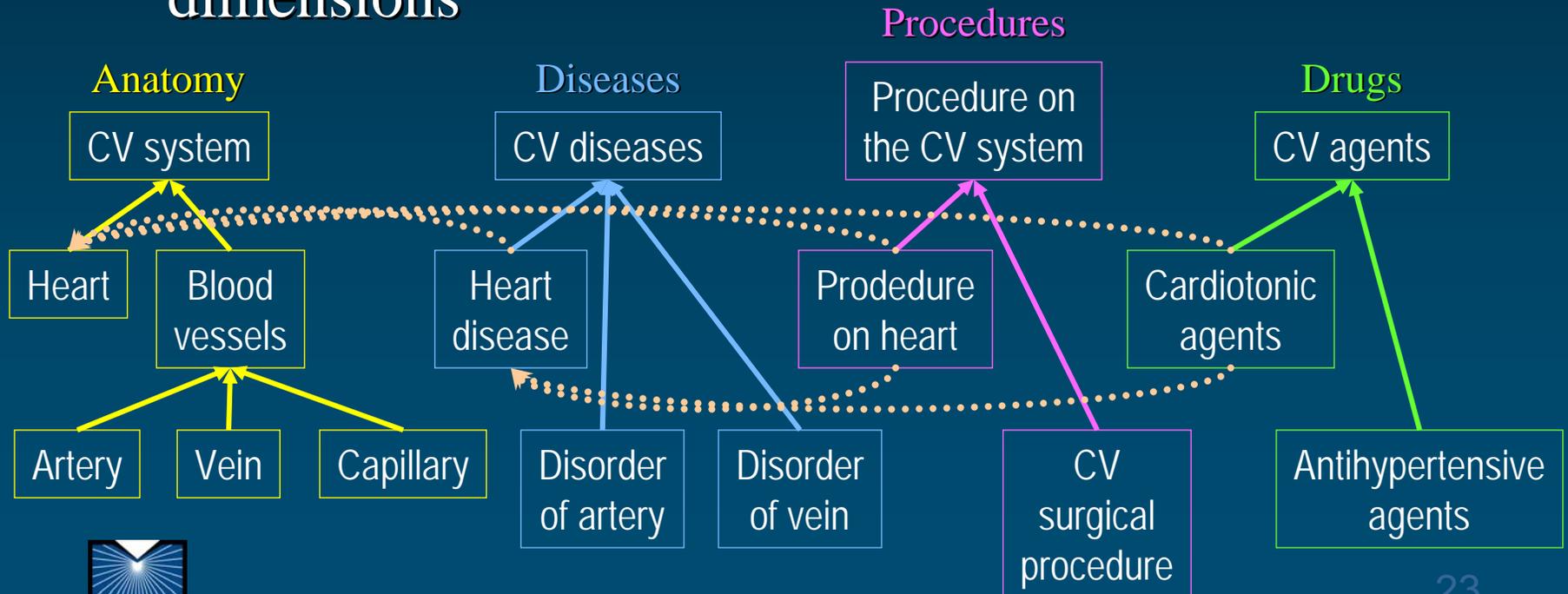
What is the difference  
between cardiology  
and public health?

# Anatomy-based medical disciplines

- ◆ A limited number of relatively obvious dimensions of description
- ◆ Cardiology
  - Anatomy: Cardiovascular system
  - Diseases: Cardiovascular diseases
  - Procedures: Procedure on the cardiovascular system
  - Drugs: Cardiovascular agents
  - ...

# Anatomy-based medical disciplines

- ◆ Concepts in each dimension can be represented in hierarchies
- ◆ Associative relations between concepts across dimensions



# “Transversal” disciplines

- ◆ Oncology (pathologic process) Diseases
- ◆ Infectiology (agent) Anatomy
- ◆ Radiology (technique) Drugs Procedures
- ◆ Pediatrics (age group)
- ◆ Emergency medicine
- ◆ Public health

*Cardiology and public health  
in the  
Medical Subject Headings (MeSH)*

[Health Occupations \[G02\]](#)

[Medicine \[G02.403\]](#)

[Specialties, Medical \[G02.403.776\]](#)

[Aerospace Medicine \[G02.403.776.014\]](#)

[Allergy and Immunology \[G02.403.776.030\]](#)

[Anesthesiology \[G02.403.776.050\]](#)

[Dermatology \[G02.403.776.185\]](#)

[Emergency Medicine \[G02.403.776.200\]](#)

[Family Practice \[G02.403.776.230\]](#)

[Forensic Medicine \[G02.403.776.240\] +](#)

[Hospitalists \[G02.403.776.324\]](#)

▶ [Internal Medicine \[G02.403.776.409\]](#)

[Cardiology \[G02.403.776.409.163\]](#)

[Endocrinology \[G02.403.776.409.323\]](#)

[Gastroenterology \[G02.403.776.409.405\]](#)

[Hematology \[G02.403.776.409.445\]](#)

[Medical Oncology \[G02.403.776.409.515\] +](#)

[Nephrology \[G02.403.776.409.580\]](#)

[Pulmonary Disease \(Specialty\) \[G02.403.776.409.675\]](#)

[Rheumatology \[G02.403.776.409.730\]](#)

[Neurology \[G02.403.776.550\]](#)

[Pathology \[G02.403.776.600\] +](#)

[Pediatrics \[G02.403.776.610\] +](#)

[Physical Medicine \[G02.403.776.620\] +](#)

[Preventive Medicine \[G02.403.776.630\] +](#)

[Psychiatry \[G02.403.776.640\] +](#)

[Public Health \[G02.403.776.670\]](#)

[Radiology \[G02.403.776.700\] +](#)

[Reproductive Medicine \[G02.403.776.710\]](#)

[Venereology \[G02.403.776.880\]](#)

# MeSH

[Health Occupations \[G02\]](#)

[Medicine \[G02.403\]](#)

[Specialties, Medical \[G02.403.776\]](#)

[Aerospace Medicine \[G02.403.776.014\]](#)

[Allergy and Immunology \[G02.403.776.030\]](#)

[Anesthesiology \[G02.403.776.050\]](#)

[Dermatology \[G02.403.776.185\]](#)

[Emergency Medicine \[G02.403.776.200\]](#)

[Family Practice \[G02.403.776.230\]](#)

[Forensic Medicine \[G02.403.776.240\] +](#)

[Hospitalists \[G02.403.776.324\]](#)

▶ [Internal Medicine \[G02.403.776.409\]](#)

[Cardiology \[G02.403.776.409.163\]](#)

[Endocrinology \[G02.403.776.409.3\]](#)

[Gastroenterology \[G02.403.776.409.40\]](#)

[Hematology \[G02.403.776.409.44\]](#)

[Medical Oncology \[G02.403.776.409.44.4\]](#)

[Nephrology \[G02.403.776.409.580\]](#)

[Pulmonary Disease \(Specialty\) \[G02.403.776.409.580.4\]](#)

[Rheumatology \[G02.403.776.409.7\]](#)

[Neurology \[G02.403.776.550\]](#)

[Pathology \[G02.403.776.600\] +](#)

[Pediatrics \[G02.403.776.610\] - \[Environment and Public Health \\[G03\\]\]\(#\)](#)

[Physical Medicine \[G02.403.776.640\]](#)

[Preventive Medicine \[G02.403.776.640.4\]](#)

[Psychiatry \[G02.403.776.640\]](#)

[Public Health \[G02.403.776.670\]](#)

[Radiology \[G02.403.776.700\] -](#)

[Reproductive Medicine \[G02.403.776.700.4\]](#)

[Venereology \[G02.403.776.880\]](#)

[Population Characteristics \[N01\]](#)

[Health \[N01.400\]](#)

[Family Health \[N01.400.300\]](#)

[Holistic Health \[N01.400.350\]](#)

[Mental Health \[N01.400.500\]](#)

[Occupational Health \[N01.400.525\]](#)

[Oral Health \[N01.400.535\]](#)

[Physical Fitness \[N01.400.545\]](#)

▶ [Public Health \[N01.400.550\]](#)

[Rural Health \[N01.400.650\]](#)

[Environment \[G03.230\] +](#)

▶ [Public Health \[G03.850\]](#)

[Accidents \[G03.850.110\] +](#)

[Carrier State \[G03.850.160\]](#)

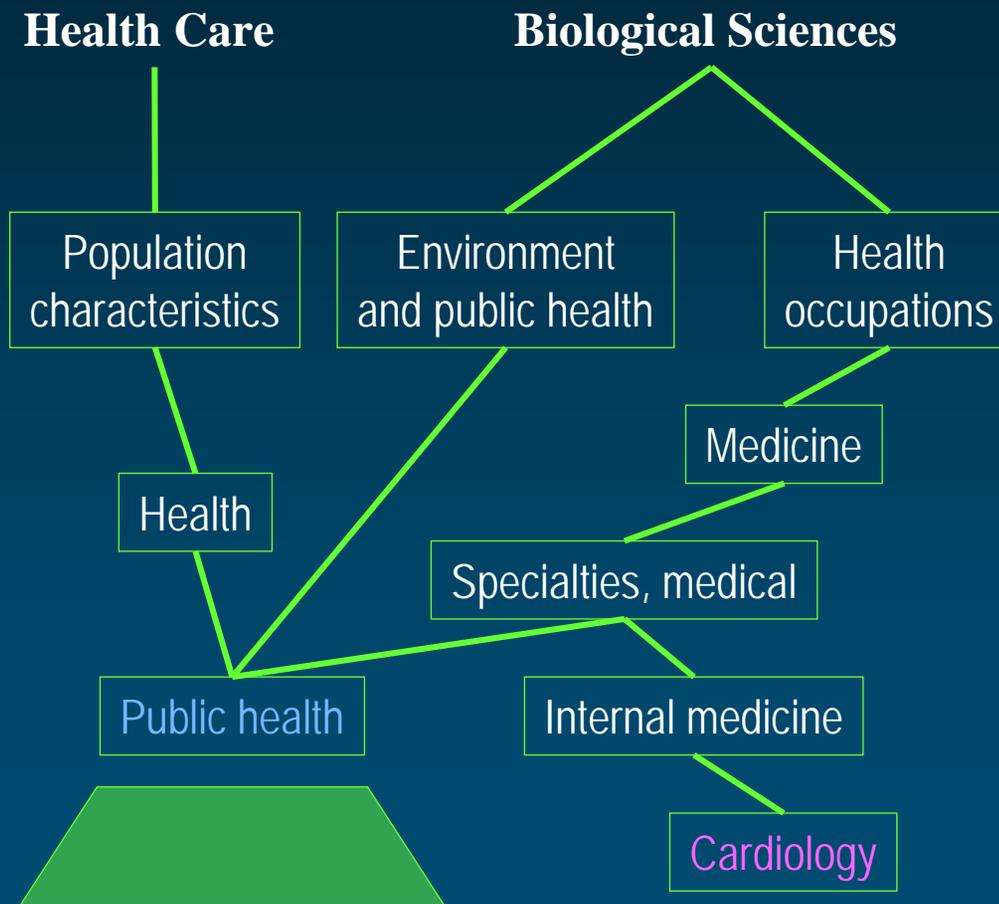
[Consumer Product Safety \[G03.850.210\] +](#)

[Disease Outbreaks \[G03.850.290\]](#)

[Disease Reservoirs \[G03.850.295\] +](#)

# MeSH

# Public health in MeSH



[Accidents \[G03.850.110\] +](#)

[Carrier State \[G03.850.160\]](#)

[Consumer Product Safety \[G03.850.210\] +](#)

[Disease Outbreaks \[G03.850.290\]](#)

[Disease Reservoirs \[G03.850.295\] +](#)

[Disease Transmission \[G03.850.310\] +](#)

[Drug Contamination \[G03.850.360\]](#)

[Endemic Diseases \[G03.850.392\]](#)

[Environmental Medicine \[G03.850.420\]](#)

[Environmental Microbiology \[G03.850.425\] +](#)

[Environmental Pollution \[G03.850.460\] +](#)

[Epidemiologic Factors \[G03.850.490\] +](#)

[Epidemiologic Measurements \[G03.850.505\] +](#)

[Epidemiologic Methods \[G03.850.520\] +](#)

[Equipment Contamination \[G03.850.540\]](#)

[Equipment Reuse \[G03.850.585\]](#)

[Health Education \[G03.850.630\]](#)

[Health Transition \[G03.850.650\]](#)

[Hygiene \[G03.850.670\] +](#)

[Public Health Practice \[G03.850.780\] +](#)

[Radiologic Health \[G03.850.810\] +](#)

[Sanitation \[G03.850.860\] +](#)

[Public Health Dentistry \[G03.890\] +](#)

*Public health  
in other biomedical terminologies*

### Siblings

### Activities & Behaviors

- ◆ Activities of Daily Living ☐

### Concepts & Ideas

- ◆ Child and Teen Health ☐
- ◆ Environment ☐
- ◆ Family health status ☐
- ◆ Holistic Health ☐
- ◆ Men's Health ☐
- ◆ mental health ☐
- ◆ Oral health ☐
- ◆ Physical Fitness ☐
- ◆ rural health ☐
- ◆ Seniors' Health ☐
- ◆ Suburban Health ☐
- ◆ Urban Health ☐
- ◆ World Health ☐

### Disorders

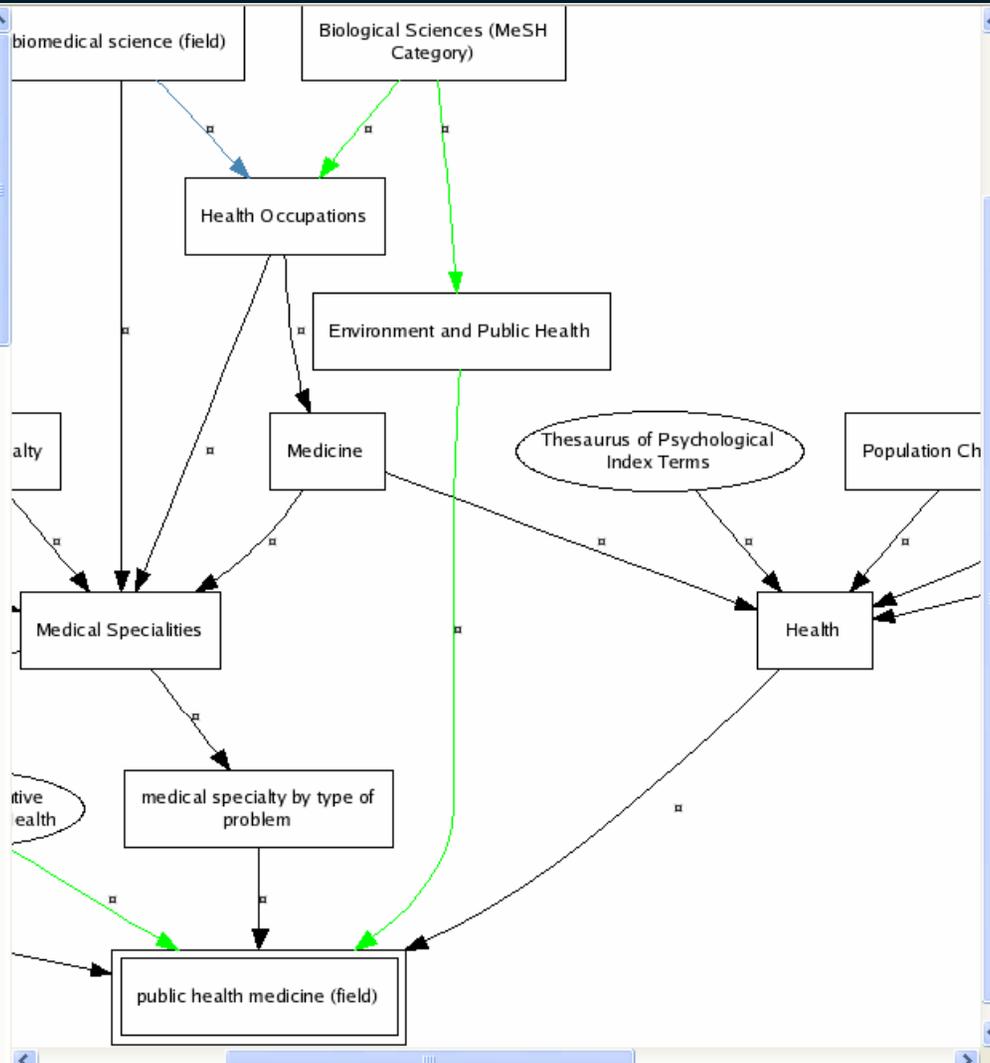
- ◆ Perceived quality of life ☐
- ◆ Personal Satisfaction ☐

### Living Beings

- ◆ Hospitalists ☐
- ◆ Physicians ☐

### Occupations

- ◆ Aerospace Medicine ☐
- ◆ Allergy and Immunology ☐
- ◆ Anesthesiology ☐



### Descendants (first generation)

#### Activities & Behaviors

- ◆ Consumer Product Safety ☐
- ◆ Equipment Reuse ☐

#### Concepts & Ideas

- ◆ Disease Reservoirs ☐
- ◆ epidemic aspects ☐
- ◆ Epidemiologic Factors ☐
- ◆ Epidemiologic Measurements ☐
- ◆ Patterns of Care ☐

#### Disorders

- ◆ Carrier of disorder ☐
- ◆ disease transmission ☐
- ◆ Endemic Diseases ☐

#### Occupations

- ◆ community health discipline ☐
- ◆ Environmental Medicine ☐
- ◆ Hygiene ☐
- ◆ occupational health specialty ☐
- ◆ Radiologic Health ☐
- ◆ Sanitation ☐

### Other Related Concepts

#### Concepts & Ideas

- ◆ public service announcement ☐

#### Disorders

- ◆ Zoonoses ☐

#### Living Beings

- ◆ Public Health Podiatrist ☐

#### Occupations

- ◆ preventive medicine specialty ☐
- ◆ Social Medicine ☐

### Co-occurring Concepts

#### Activities & Behaviors

- ◆ Adolescent Behavior [8] ☐
- ◆ Advertising [35] ☐
- ◆ Advisory Committees [10] ☐
- ◆ Alcohol consumption [35] ☐
- ◆ Altruism [13] ☐
- ◆ Animal Welfare [10] ☐
- ◆ Attitude to Health [52] ☐
- ◆ Automobile

BCI public health medicine (field) LEGEND

Highlight vocabulary:

UMLS data:

Type of hierarchical rel.:  All  Parent/Child only

Transitive reduction:  yes  no

### Similar Concepts

(none)

### Allegedly Synonyms

(none)

### Closest MeSH Terms

#### Main Headings

- ◆ Public Health

# Public health in the UMLS

## ◆ C0034019

## ◆ Sources

- AOD Alcohol and Other Drug Thesaurus
- CSP CRISP Thesaurus
- LCH Library of Congress Subject Headings
- MSH Medical Subject Headings
- NCI National Cancer Institute Thesaurus
- PSY Thesaurus of Psychological Index Terms

### Identifiers:

name	Public_Health
code	C17039

### Information about this concept:

ALT_DEFINITION	MSH2001 Branch of medicine concerned with the prevention and control of disease and disability, and the promotion of physical and mental health of the population on the international, national, state, or municipal level.
DEFINITION	NCI The science and practice of protecting and improving the health of a community, as by preventive medicine, health education, control of communicable diseases, application of sanitary measures, and monitoring of environmental hazards. Disability History Museum glossary; <a href="http://www.disabilitymuseum.org/glossary.php">http://www.disabilitymuseum.org/glossary.php</a>
Synonym with source data	Public Health PT NCI
Preferred_Name	Public Health
Semantic_Type	Biomedical Occupation or Discipline
Synonym	Public Health
Unified Medical Language System Concept Identifier	<u>C0034019</u>

### Superconcepts

-   Medical Specialty

### Subconcepts

-   Arctic Research
-   Community Health
-   Occupational Health
-   Patterns of Care
-   Women's Health

# Associative relations Symbolic

- ◆ Concepts & Ideas
  - public service announcement
- ◆ Disorders
  - Zoonoses
- ◆ Living Beings
  - Public Health Podiatrist
- ◆ Occupations
  - preventive medicine specialty
  - Social Medicine
- ◆ Organizations
  - United States Public Health Service
- ◆ Procedures
  - Communicable Disease Control
  - Education, Public Health Professional
  - Health Promotion
  - Public Health Administration
  - Public health service
  - Screening procedure
  - Study of epidemiology

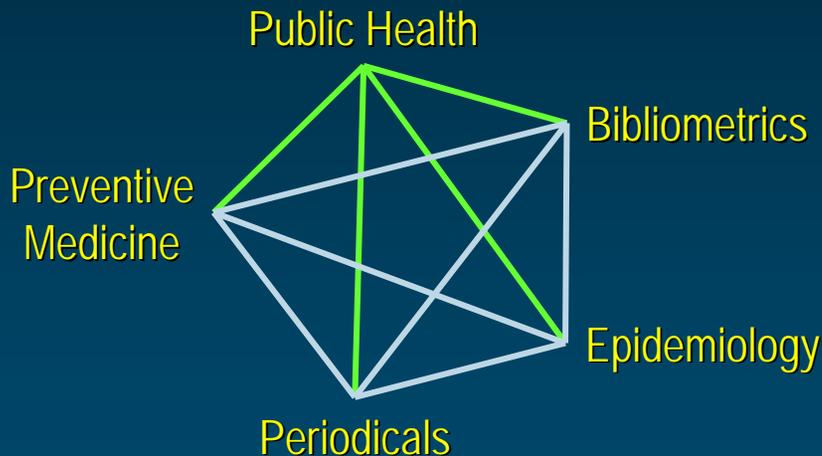
# MEDLINE citations

- ◆ BMC Public Health. 2006 Dec 15;6:301.
- ◆ *A bibliometric analysis in the fields of preventive medicine, occupational and environmental medicine, epidemiology, and public health*
- ◆ Soteriades ES, Falagas ME.
- ◆ [...] CONCLUSION: USA researchers maintain a leadership position in the production of scientific articles in the fields of Preventive Medicine, Occupational/Environmental Medicine and Epidemiology, at a level similar to other scientific disciplines, while USA contribution to science in the field of Public Health is by all means outstanding. Less developed regions would need to support their researchers in the above fields in order to improve scientific production and advancement of knowledge in their countries.

- ◆ **Bibliometrics\***
- ◆ Environmental Medicine /statistics & numerical data
- ◆ **Epidemiology** /statistics & numerical data\*
- ◆ Geography
- ◆ Humans
- ◆ Occupational Medicine /statistics & numerical data
- ◆ **Periodicals** /statistics & numerical data\*
- ◆ **Preventive Medicine** /statistics & numerical data\*
- ◆ **Public Health** /statistics & numerical data\*
- ◆ Research /statistics & numerical data
- ◆ World Health



# Associative relations Statistical



- ◆ Bibliometrics\*
- ◆ Environmental Medicine /statistics & numerical data
- ◆ Epidemiology /statistics & numerical data\*
- ◆ Geography
- ◆ Humans
- ◆ Occupational Medicine /statistics & numerical data
- ◆ Periodicals /statistics & numerical data\*
- ◆ Preventive Medicine /statistics & numerical data\*
- ◆ Public Health /statistics & numerical data\*
- ◆ Research /statistics & numerical data
- ◆ World Health

# Public health Co-occurrences

◆ Health Policy	475	◆ Health Care Reform	133
◆ Health Promotion	321	◆ Developing Countries	133
◆ World Health	228	◆ Health Care Reform	133
◆ Environmental Health	187	◆ Communicable Disease Control	131
◆ Environmental Exposure	186	◆ Politics	125
◆ Delivery of Health Care	179	◆ Research	122
◆ Disease Outbreaks	168	◆ Health education	117
◆ Epidemiology	166	◆ Violence	110
◆ Smoking	164	◆ Disaster Planning	104
◆ Health Status	163	◆ National Health Programs	102
◆ Public Policy	160	◆ [...]	
◆ Bioterrorism	158		
◆ Public Health Administration	144		
◆ HIV Infections	138		
◆ International Cooperation	136		

*2,453 co-occurring concepts (2006AA)  
[538 concepts cover 79%]*

# Public health vs. Cardiology Summary

- ◆ Transversal discipline
  - Many dimensions of description
    - MeSH
    - Co-occurring concepts in MEDLINE
- ◆ Represented in several terminologies
  - Mostly “information sciences” terminologies
  - Often a leaf node

# Approaches to defining public health ontology

*Bottom-up approach*

# Controlled Health Thesaurus (CHT)

- ◆ Under the umbrella of PHIN
- ◆ Developed for indexing / retrieval purposes (CDC website)
- ◆ Borrows from the UMLS Metathesaurus
- ◆ 40,000+ terms
- ◆ Polyhierarchical structure

# CHT Bottom-up approach

- ◆ Original data: CDC public website
- ◆ Term extraction: Metaphrase (Apelon)
  - Mapping to the UMLS Metathesaurus
- ◆ Manual curation (Kevric)
  - Frequent terms added when absent from the UMLS Metathesaurus

# CHT Analysis of non-UMLS terms

- ◆ With Ed Bunker (summer 2005)
- ◆ 42,639 terms
  - 12,000 having no associated UMLS CUI
    - 7,257 with semantic type  
**Geographic area** or **Partner organization** (not analyzed)
    - 4,743 terms analyzed
      - 843 terms mapped to UMLS
        - » 408 semantically valid mappings (resynchronization)
      - 3,900 terms with no mapping to UMLS

<http://mor.nlm.nih.gov/pubs/alum/2005-bunker.pdf>



# Examples of terms not in UMLS

- ◆ All Other Legal Services
- ◆ Beet Sugar Manufacturing
- ◆ Environmental respiratory disease
- ◆ Greeting Card Publishers
- ◆ Latin American
- ◆ Mycobacteriology
- ◆ Office of the Director
- ◆ Quarantine facilities
- ◆ Septic Tank Servicers and Sewer Pipe Cleaners
- ◆ Temporary Shelters
- ◆ Waist circumference measurement
- ◆ Youth smoking rate

*Top-down approach*

# Domains of interest for public health

- ◆ Disease / Clinical History / Observation (Finding)
- ◆ **Anatomy (Body Sites)**
- ◆ **Procedures (Non-Laboratory)**
- ◆ **Laboratory Tests / Results**
- ◆ **Medications (Drugs)**
- ◆ **Immunization (Vaccine)**
- ◆ Clinical Encounters (ADT)
- ◆ Demographics
- ◆ Modifier / Qualifier (Coded Answers / Results)
- ◆ Organism (including Animals)
- ◆ Public or Population Health
- ◆ Substance / Devices / Object
- ◆ Units of Measure

Anatomy

Diseases

Drugs

Procedures

Property Name	Property Value
<i>CHI Domain Recommendation Report Hyperlink</i>	<a href="http://www.cdc.gov/phn/vocabulary/index.html">http://www.cdc.gov/phn/vocabulary/index.html</a>
<i>Child Domains</i>	<a href="#">Demographics</a>
	<a href="#">Clinical Encounters (ADT)</a>
	<a href="#">Laboratory Tests / Results</a>
	<a href="#">Organism (including Animals)</a>
	<a href="#">Units of Measure</a>
	<a href="#">Anatomy (Body Sites)</a>
	<a href="#">Modifier / Qualifier (Coded Answers / Results)</a>
	<a href="#">Disease / Clinical History / Observation (Finding)</a>
	<a href="#">Procedures (Non-Laboratory)</a>
	<a href="#">Medications (Drugs)</a>
	<a href="#">Substance / Devices / Object</a>
	<a href="#">Public or Population Health</a>
	<a href="#">Immunization (Vaccine)</a>
<i>Date Created</i>	8/9/2006
<i>Date Revised</i>	8/9/2006
<i>Definition</i>	PHIN Vocabulary Domains / Categories are based on PHIN Vocabulary domains and are used to group the value sets. Usage of PHIN Vocabulary Domains : (1) PHIN vocabulary Domains / Categories can be used in PHIN VADS Advanced Search efficiently to retrieve the value sets in groups. (2) PHIN VADS would allow to browse the PHIN Vocabulary Domains and its metadata. PHIN Vocabulary Domain metadata would include the following: (a) Description of the PHIN Vocabulary Domain. (b) Other related PHIN Vocabulary Domain. (c) Associated Value Sets. Note: For detailed hierarchy of PHIN Vocabulary Domains and its associated code system, please download the PHIN Vocabulary Domain Finder from the PHIN Vocabulary Services website at <a href="http://www.cdc.gov/phn/vocabulary/index.html">www.cdc.gov/phn/vocabulary/index.html</a>
<i>Parent Domain</i>	<a href="#">PHIN Vocabulary Domains</a>
<i>Status</i>	Active



## PHIN Vocabulary Domains

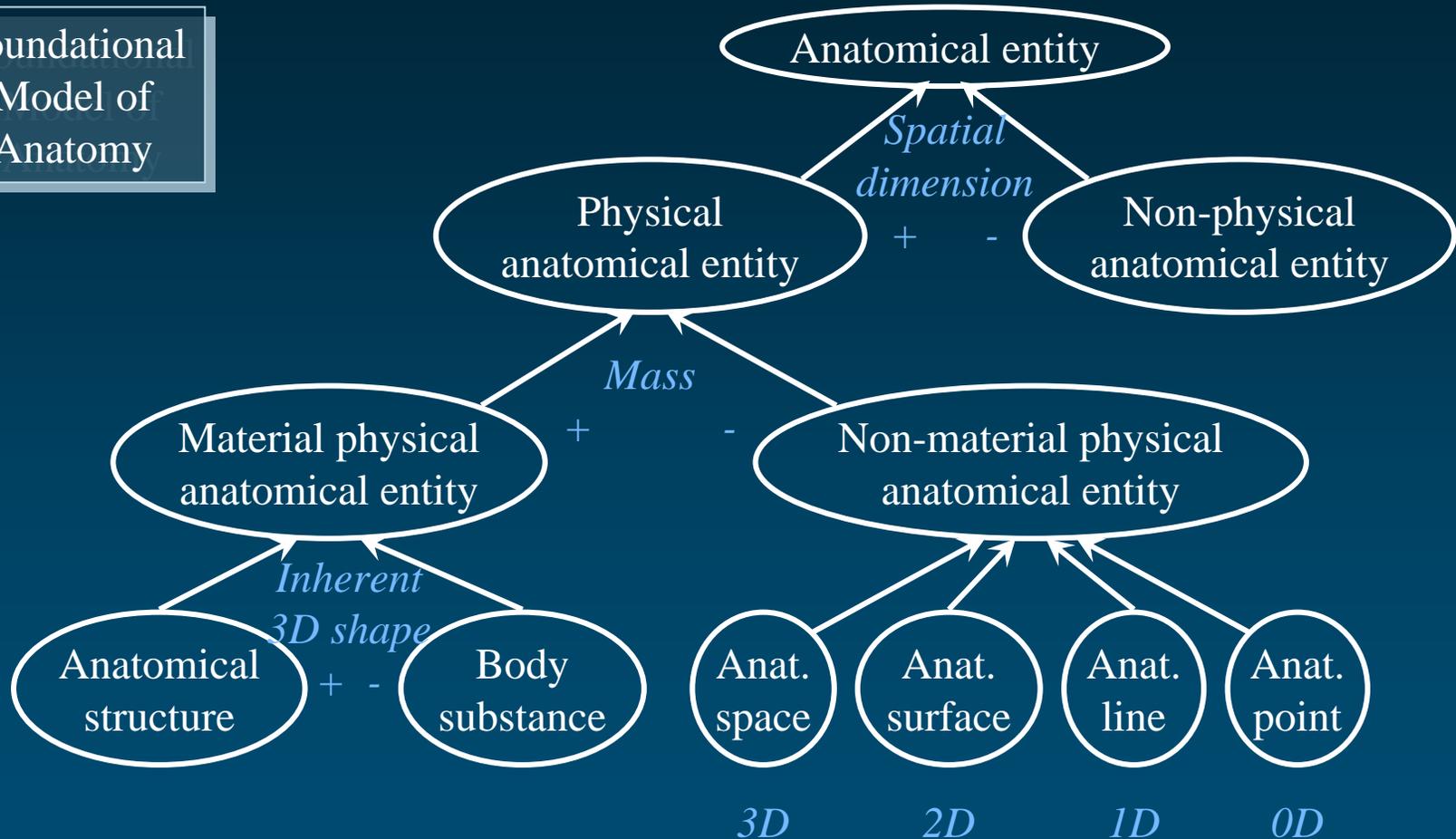
# Populating the domains

## Ontology approach

- ◆ Identify classificatory principles
  - Typically “jointly exhaustive and pairwise disjoint”
  - Organize concepts along these dimensions
  - E.g., anatomy (FMA tree)
    - Spatial dimension
    - Mass
    - Inherent 3D shape
    - ...
  - E.g., cancer (polyhierarchy)
    - By topography
    - By morphology

# Explicit classificatory principle

Foundational  
Model of  
Anatomy



# Populating the domains

## Information model approach

- ◆ Identify value sets
  - For each (sub)domain
    - List of **diseases**
    - **Anatomy** vocabulary
    - Values for **EKG observations**
  - For each data element
    - Allowable values for **gender**
    - List of **occupations**
    - List of **geographical locations**

# Value sets for public health

# Value sets Sources

- ◆ Biomedical vocabularies  
(terminologies, ontologies)
  - UMLS
  - Others (ICD-O3, CTCAE, ChEBI, RadLex,...)
- ◆ Metadata registries
  - Cancer Data Standards Repository (caDSR)
- ◆ Already identified value sets
  - PHIN
  - HL7

# Value sets Selection criteria

## ◆ “Technical”

- Coverage
- Formalism for representation (standards)
- ...

## ◆ “Political”

- Intellectual property restrictions
- Mandated use
  - Consolidated Health Informatics (CHI)
- Governance
  - SDO for SNOMED CT

<http://www.hhs.gov/healthit/chi.html>

# Related efforts Health

## ◆ HL7

- <http://www.hl7.org/>



## ◆ National Center for Biomedical Ontology

- <http://bioontology.org/>



## ◆ caBIG

- <http://cabig.cancer.gov/>



## ◆ Clinical Data Interchange Standards Consortium

- <http://www.cdisc.org/>

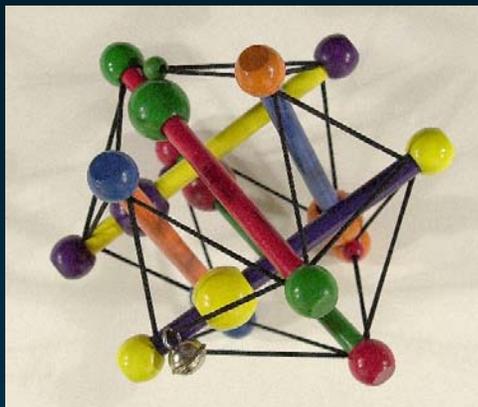


# Related efforts Others

- ◆ Federal Enterprise Architecture Reference Model Ontology (FEA-RMO)
  - <http://www.web-services.gov/fea-rmo.html>
- ◆ W3C Health Care and Life Sciences Interest Group
  - <http://www.w3.org/2001/sw/hcls/>

# Conclusions

- ◆ Public health is a “transversal” discipline
  - No specific ontology / terminology
  - Borrows from multiple domains
    - Both within and outside biomedicine
- ◆ Interoperability of health-related systems
  - Information models
  - Standard vocabularies / value sets
  - Technical and political issues



# Medical Ontology Research

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# References UMLS

- ◆ UMLS

[umlsinfo.nlm.nih.gov](http://umlsinfo.nlm.nih.gov)

- ◆ UMLS browsers

(free, but UMLS license required)

- Knowledge Source Server: [umlsks.nlm.nih.gov](http://umlsks.nlm.nih.gov)

- Semantic Navigator:

<http://mor.nlm.nih.gov/perl/semnav.pl>

- RRF browser

(standalone application distributed with the UMLS)



# References UMLS

## ◆ Recent overviews

- Bodenreider O. (2004). The Unified Medical Language System (UMLS): Integrating biomedical terminology. *Nucleic Acids Research*; D267-D270.
- Nelson, S. J., Powell, T. & Humphreys, B. L. (2002). The Unified Medical Language System (UMLS) Project. In: Kent, Allen; Hall, Carolyn M., editors. *Encyclopedia of Library and Information Science*. New York: Marcel Dekker. p.369-378.

# References Others

- ◆ Giannangelo, K., ed. (2006). Healthcare code sets, clinical terminologies, and classification systems. Chicago: AHIMA.