

**Mapping Architecture  
Proposals/Solutions:  
The Role of the  
Unified Medical Language System**

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On the edge of the sea,  
On the brink of the future

OR

Between the Devil and  
the Deep Blue Sea

# What is Mapping?

- Computable Links Between Controlled Vocabularies
- Enabling Reuse of Data
  - Captured in One Terminology
  - Reported (or Used) in Another
- Unlikely to be 100 % Accurate
  - Bloisian View - Cooperative Computation

# Why Mapping?

- Primary motivation: Reuse of Data
- Increasing Amounts Captured Electronically
- Administrative Reasons
  - Reduce Errors
  - Increase Consistency
  - Reduce Costs

# Interterminology Mapping Uses

Primary purpose	Secondary use	Mapping
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Clinical problems list	Literature search for decision support	SNOMED CT => MeSH



# A Historical View

- Twenty Years Ago
  - Few Data Silos
  - No Comparability
  - No Reuse
  - Multiple Stand-Alone Systems
  - Lindberg's Idea – The UMLS (1986)

# UMILS Purpose

- Retrieve and Integrate Relevant Information from:
  - Computer-based Patient Records
  - Factual Databanks
  - Bibliographic Databases
  - Full-text Sources
  - Expert Systems
- Vocabulary Key Aspect of the Problem

# How to Build It?

- Combinatorial Explosion
- Build a New Vocabulary
  - Reference Terminology Approaches
  - Slots and Frames
- The Metathesaurus (1990)
  - Combine Existing Vocabularies
  - Organize By Semantic Locality

# UMLS® Metathesaurus®

- Concept-oriented
  - Terms Meaning the Same in Same Concept
- Source Transparency
  - Preserves Meanings and Relationships Within Source
- Added Value
  - Basic Definitional Information
  - New Relationships Between Concepts and Terms from Different Sources

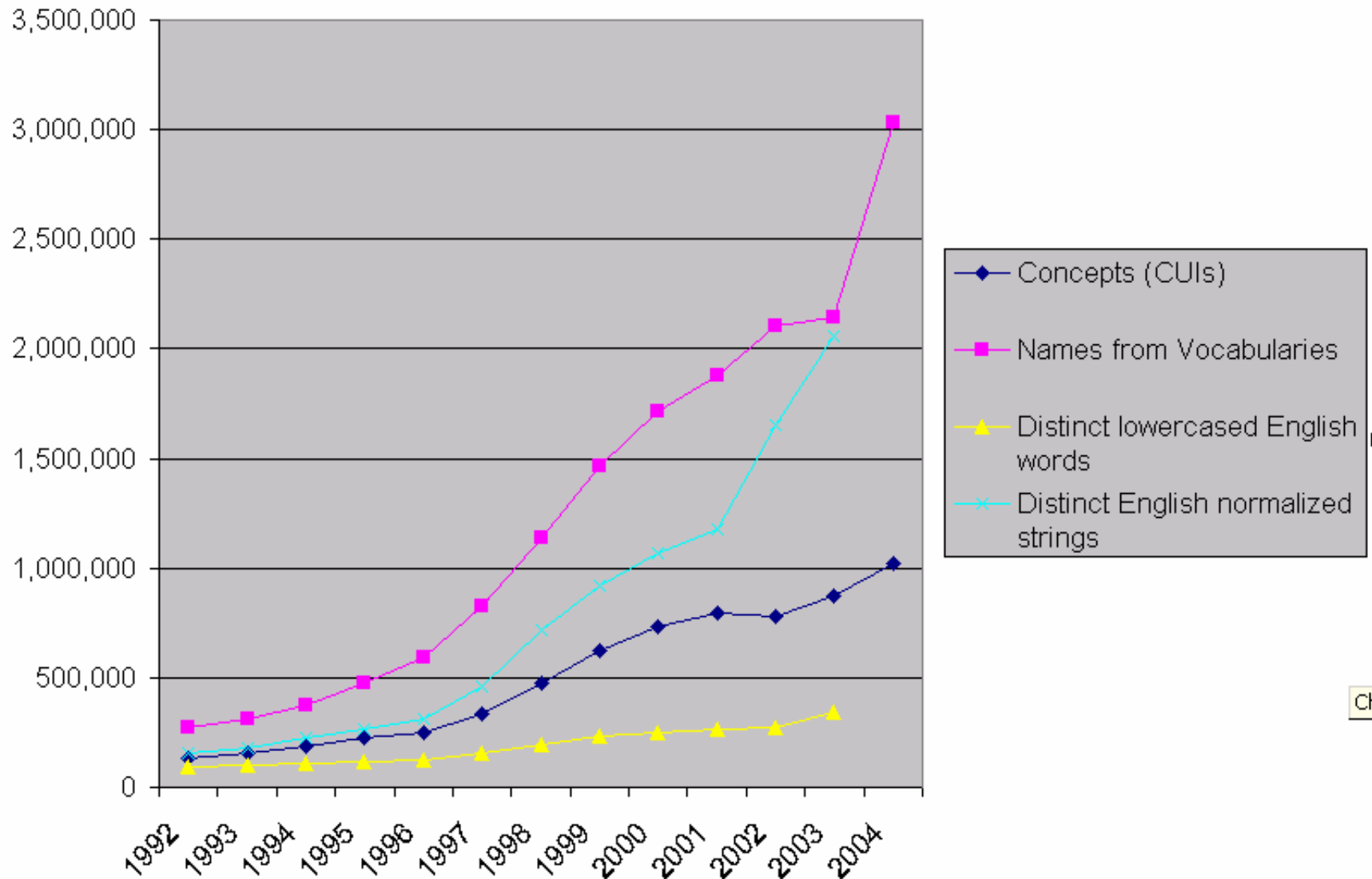
# UMLS Source “Vocabularies”

- Varying Purposes, Structures, Properties
- “Sets of Valid Values” for Data Elements
  - HIPAA Code Sets, e.g., ICD-9-CM, CPT
  - NCVHS and CHI Recommended Clinical Vocabularies, e.g., SNOMED CT, LOINC, RxNorm
  - Other Codes in Message Standards, e.g., HL7 value sets
  - Thesauri for Biomedical Literature, e.g., MeSH

# Adding Vocabulary (or Update) to the Metathesaurus

- Primary Goal - Link New Terms to Concepts in the Metathesaurus
- Steps:
  - Selection
  - Acquisition and permission
  - Analysis and inversion
  - Insertion
  - Editing by Human Subject Experts
  - Quality Assurance

# Recent Metathesaurus Growth



# What Has Been Learned?

- Semantic Locality Hard to Exploit
  - No Computable Distance Measures
  - Navigating to Appropriate Vocabulary Purposeful
- Concept of Concepts
  - Extensional/Denotational
  - Intensional/Connotational



# Current National Directions

- Patient Safety
- Electronic Records
- Shared Data
  - Electronic Prescriptions
  - Transferable Records
  - Biosurveillance
- Standards for Vocabulary and for Messaging

# Important Proviso

- Message Standards
- Terminology Standards
- What Happens When They Collide?
- Needs Coordination

# NLM Assumptions about Vocabulary and Health Data

- “Standard” Health Vocabulary is PART of a National EHR
- Based on a Combination of Existing Terminologies
- Statistical and Billing codes not Specific Enough
- Clinical Vocabulary will Need to Map to Important Codes

# The UMLS as a Resource

- Metathesaurus
- Rich Network of Relations  
(Semantic Locality)
  - Hierarchies
  - Associations
    - Empirical
    - Asserted
- Lexical Resources and Tools

# NLM Assumptions re: Mappings

- Participants Must Include:
  - Producers of Vocabularies (validate meanings)
  - Prospective Users and Recipients (testers and validators)
- Changes in Content will Result
- Updating With Every Vocab Update
  - May Require Altered Update Schedules
  - Alignment of Schedules May Be Critical
- Mappings in the UMLS (not exclusively)
- Appropriate Licenses From Vocabularies
- Mapping Remains an R & D problem

# Out With the Old, In With the New

- MRATX
  - Single Expression
  - Linked to Boolean Combination
- MRMAP
  - Complex Expression on Either End
  - Allows Computable Rules
  - Evolutionary Replacement

# Intervocabulary Mapping Projects

- CHI standards to HIPAA code sets:
  - SNOMED CT to ICD-9-CM, ICD-10-CM
  - SNOMED CT to CPT
  - LOINC to CPT

# Intervocabulary Mapping Projects

- SNOMED CT to “other” vocabularies:
  - Medical Dictionary for Regulatory Affairs (MedDRA)
  - International Classification of Primary Care (ICPC)
  - Medcin
  - Medical Subject Headings (MeSH®)
  - Nursing Vocabularies (NIC, NOC, NANDA)



# Current SNOMED CT “Mapping” Status

- *Synonymous* “Mapping” in UMLS
  - 60% of ICD-9 codes Use Occurrences have SNOMED SY
  - 15% of CT Disease Concepts with ICD-9 SY
  - BUT Non-synonymous (for Specific Purposes) are the *Really* Hard Part
- CAP’s Mapping to ICD-9-CM in UMLS
  - An Aggregation Map

# Aggregation Maps v. Billing Maps

- Aggregation Map
  - Statistical Reporting
  - No Conditional Mappings (e.g., in Pregnancy, Co-Occurring Conditions)
- Billing Map
  - Conditions Included
  - May Require Interpretation By Coder

# First Draft of Mappings (MRMAP.RRF)

- MAPSETCUI – Identifies Specific Mapping
  - Motivation Implied or an Attribute?
- Target and Source IDs
- Rules if Computable (From and To)
- Restrictions
- Expressions
  - Boolean
  - Multiple Identifiers
  - Punctuation

# UMLS Metathesaurus

## A Vehicle For

- Distribution of Vocabularies in a Common Format
- Distribution of Maps
- Other Semantic Links Between Vocabularies
- Representing Multiple Subsets and Hierarchies
- Ensuring a Forward Migration Path



Clinical Vocabulary Mapping Methods Institute  
Saturday, October 15, 2005