Global Access to Infectious Disease Information

Presenter Disclosures

I developed "IDdx: Infectious Disease Queries" which is currently a free download from *Apple Store* (*iPhone* or *iPad*) and *Google Play* (*Android* phone).

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Outline

- What is the public health informatics problem?

- What is the concept of knowledge mapping?

- What is an intelligent database?

Public Health Problem

1. About one half of all deaths in poor countries are caused by infectious diseases.

2. Infectious diseases are no longer confined by geographical boundaries.

Medical Informatics Problem

1. There is an explosion of information about infectious diseases.

2. How can we find the specific information we need when we need it?
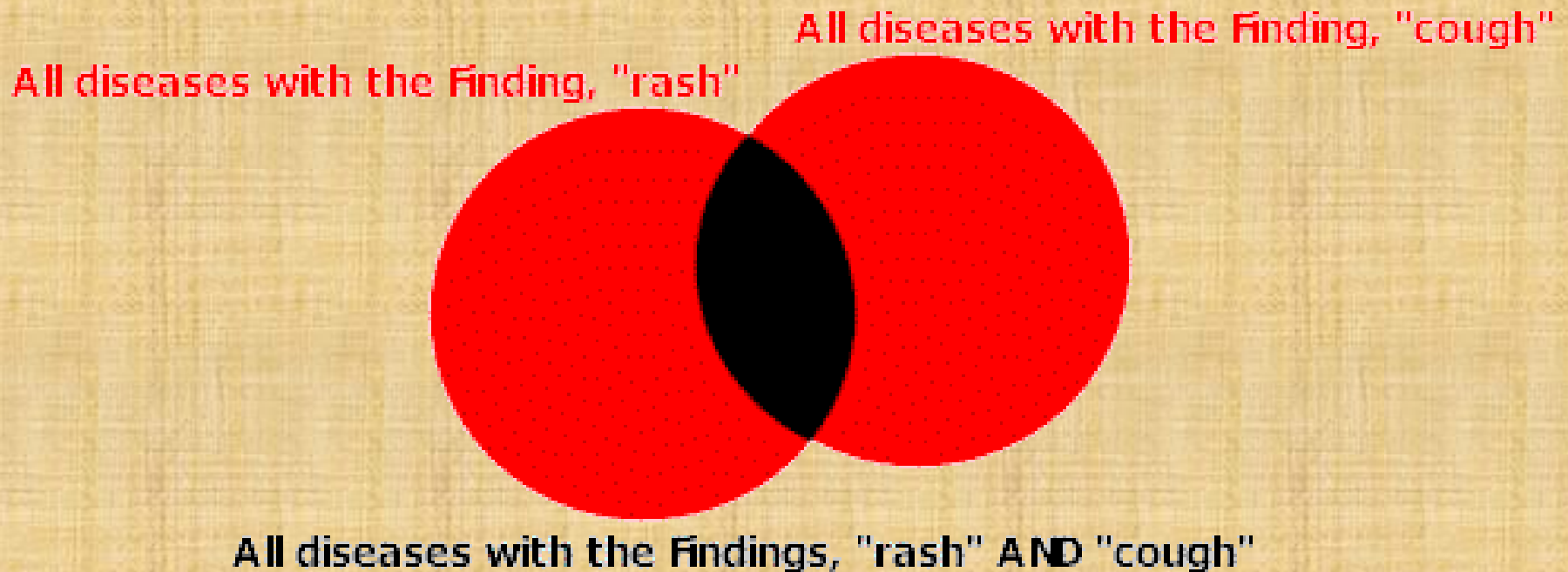
Public Health Informatics Solution

1. Use available technology.

2. Index and map the wealth of information.

3. Create an intelligent database to store the information in such a way that specific information can be easily retrieved.

4. Use the Internet and mobile Apps to disseminate the information for improvement of medical practice and prevention.

Relational Database: A New Tool for Indexing and Mapping Information

- Like a company database of employees, customers, products, and invoices, information is stored in tables that are linked together.

- Indexing is done first by developing a controlled vocabulary specific for the knowledge domain.

- Queries allow finding information by search criteria (the indexes) including "OR" and "AND" searches.

- Categories are used to "drill down" to find information.

How "AND" Queries Work

Indexing: At the Heart of Intelligence

- "Indexing is a major problem at the heart of intelligence." [Roger Schank. *Tell Me a Story*, p. 11]
- "No intelligent system is likely to function effectively if it cannot find what it knows when it needs to know it." [Schank, p. 112]
- Show all diseases that match one or more criteria:
  - Central Africa AND petechial rash;
  - Cat contact AND diarrhea;
  - Tick exposure AND anemia;

Indexes Used in IDdx

- Signs and Symptoms
- Endemic Regions of the World
- Epidemiological Factors
  - Entry
  - Source
  - Vector
  - Reservoir
- Occupations
- Incubation Periods

Sources of Information

- Best and most recent;

- Starting point is latest edition of *Control of Communicable Diseases Manua*l (CCDM);

- Now available for full-text online access are CCDM, Principles and Practice of Infectious Diseases (PPID), Infectious Diseases (Cohen), and Tropical Infectious Diseases (Guerrant);

- Disease findings in IDdx were checked by doing text searches for each finding in each of the online books.

References in IDdx

- For a full list of all references used in IDdx, see the bibliography page at http://www.iddx.com/bibliography.html

Knowledge Mapping

- "Decision support systems can provide preliminary analysis that allows scarce human resources to focus on the key problems while ignoring a vast sea of irrelevancy." [O'Carroll et al. 2003]

- Knowledge is information in context.

- Mapping means pulling together and sifting information from a lot of different sources.

- Knowledge mapping is comprehensively collecting and systematically indexing a knowledge domain.

Knowledge Mapping

- Begins with the big picture;
- Helps one not to get lost in the details;
- Keeps all information in context of the whole;
- Distills the facts from the vast sea of data;
- Most useful in information-intensive specialties;

What Is an Intelligent Database?

Intelligent databases are "databases that manage information in a natural way, making information easy to store, access and use."

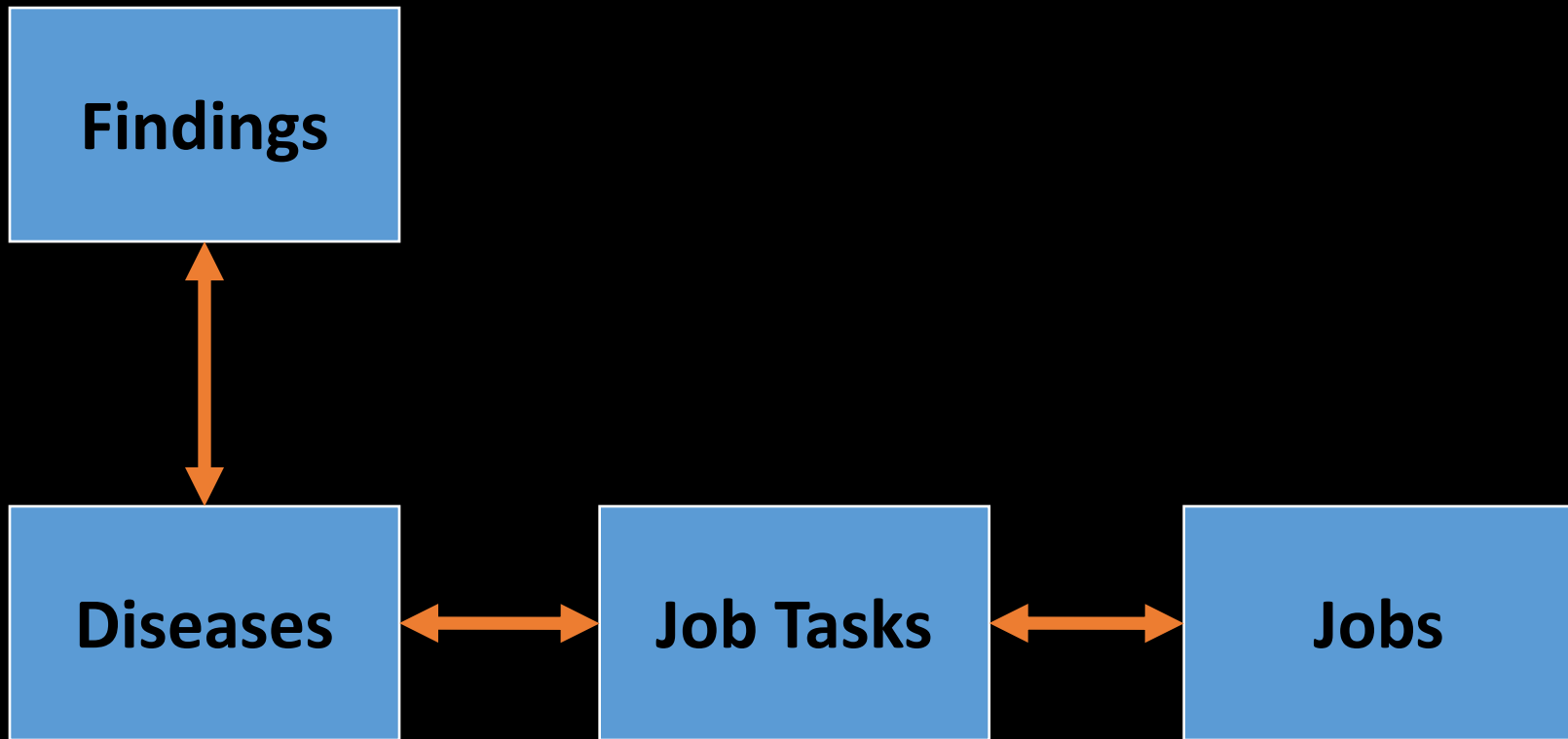*Intelligent Database Tools & Applications* by Parsaye and Chignell

Some Examples of Search Criteria

FINDINGS	ENTRY	VECTOR	RESERVOIR
Abdominal pain	Inhale	Biting flies	Birds
Encephalitis	Ingest	Fleas	Cats
Pneumonia	Animal bite	Lice	Cattle
Jaundice	Needle	Mosquitoes	Dogs
Stiff Neck	Sexual	Ticks	Fish

Categories of Findings

Prefix	Finding Category	Prefix	Finding Category
>	**General**	O	**Ophthalmologic**
C	**Cardiovascular**	R	**Respiratory**
E	**Ears, Nose & Throat**	S	**Skin**
G	**Gastrointestinal**	U	**Genitourinary**
H	**Hematologic**	X	**Chest X-ray**
M	**Musculoskeletal**	*	**Complication**

Four Major Tables in the Database

Each Table Contains Records

- 253 Diseases
- 99 Findings
- 63 Job Tasks
- 94 Jobs

Which Diseases Are Covered?

- The 253 diseases are very similar to those covered in the latest edition of *Control of Communicable Diseases Manual* (CCDM).

- Each disease is linked to high-risk job tasks (63), signs & symptoms (99), epidemiological factors (39), endemic regions of the world (16), and incubation periods (7).

- The ten categories of diseases are arthropod-borne, bioterrorism, childhood, community-acquired, foodborne, gastroenteritis, localized infections, sapronoses, sexually-transmitted, and zoonoses.

High-Risk Job Tasks and Prevention

- Identify high risk groups.
- What are the specific job tasks that put workers at risk for the disease?
- Each hazardous job task links to one or more disease and one or more jobs.

Examples of Hazardous Job Tasks

- Handle infected rodents (bite);
- Handle infected rodents (not bite);
- Handle dog or cat (bite or scratch);
- Have dog or cat contact (fecal-oral);
- Handle needles or surgical instruments;
- Care for patients (fecal-oral pathogens);
- Work in a medical or research lab;
- Live together in close quarters;

Examples of Hazardous Job Tasks

- Plow or excavate soil in endemic area;

- Raise dust of excreta from rodents;

- Travel to endemic area;

- Work in building infested with fleas;

- Work or play in tick-infested area;

- For a summary of how jobs relate to infectious diseases through job tasks, see these two pages on the Haz-Map website: Occupational Infections and Skin Infections.

Job Searches in IDdx

- Occupation is one of the criteria available for queries in Iddx.

- There are 94 jobs in 16 categories.

- When your query includes a job, then the results are sorted by hazardous job tasks that could be performed in this job.

- Results are displayed first as all matching diseases and then as all matching diseases sorted by category.

Decision-Support, Not Decision-Replacement

- More than one disease may be causing symptoms.
- The cause of the fever may be non-infectious.
- Symptoms may be missed or misnamed.
- Symptoms may be due to a complication of the infection rather than the infection itself.
- Disease may be endemic to only one part of a region or country.
- Situation awareness is critical for making the proper diagnosis with or without decision-support software.

For More Information

- See "Using a Relational Database to Index Infectious Disease Information" published in 2010 in the *Int. J. Environ. Res. Public Health*. The full-text article is available at: www.mdpi.com/1660-4601/7/5/2177/.

- See the IDdx website at www.iddx.com.