New Information Technologies: what are we talking about?

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Presentation Overview

Public Health Infrastructure

- Why is information technology important to public health practice?

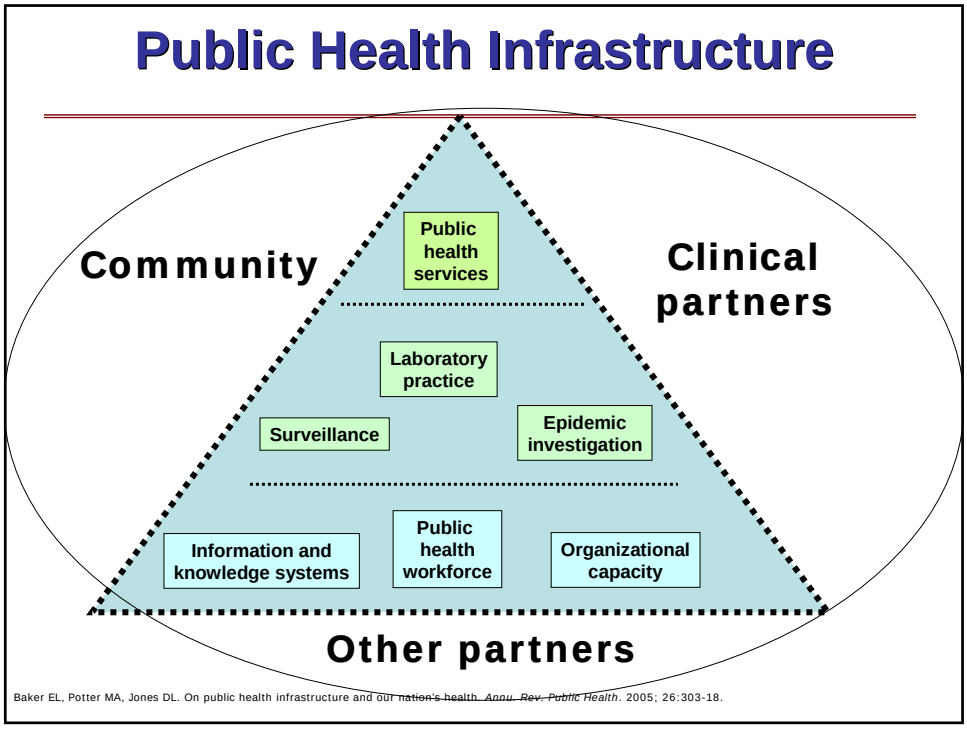
Health Information Exchange

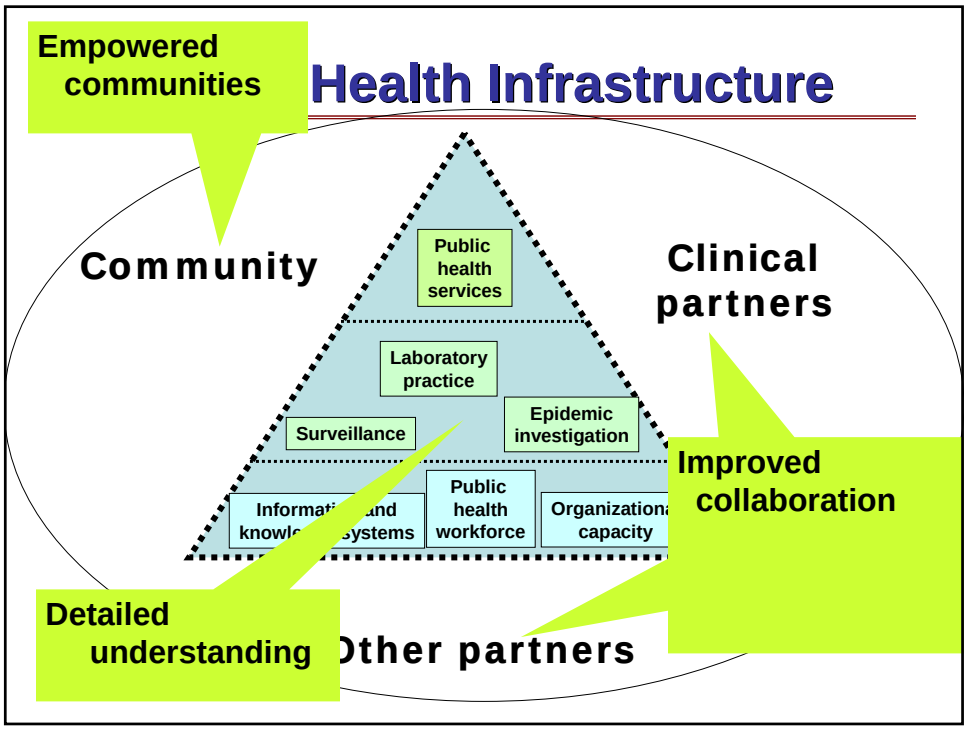
- How does health information exchange support public health practice?

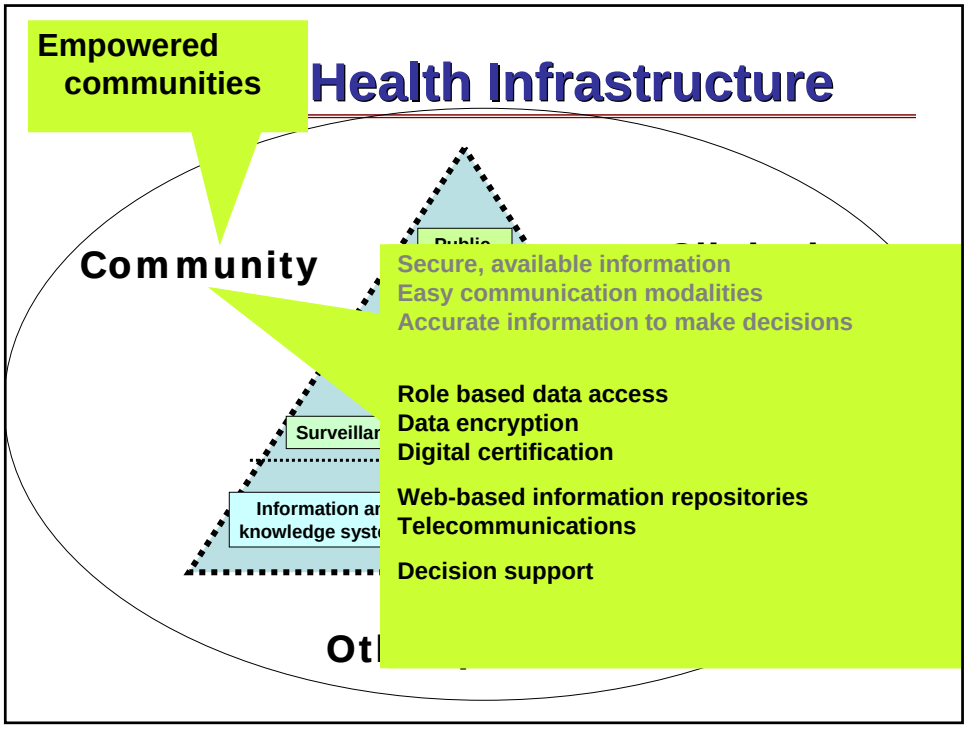
Supporting Health Information Exchange

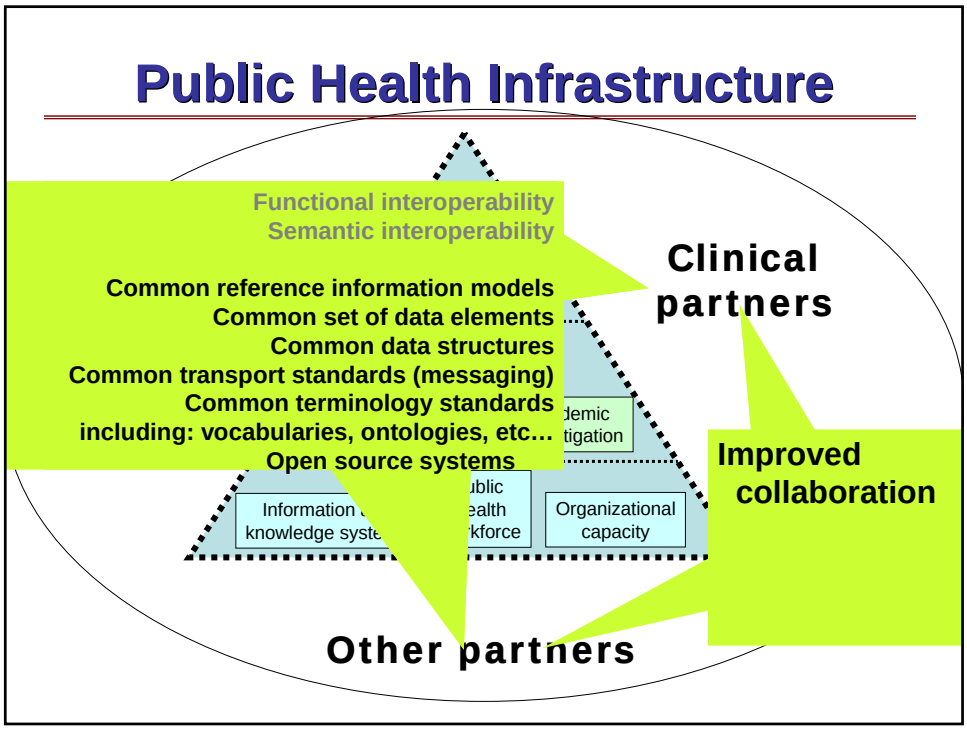
- What are some new information technologies in use?

Cette présentation a été effectuée le 26 octobre 2006, au cours du Symposium "Nouvelles technologies de l'information en santé publique : implications sur le terrain" dans le cadre des Journées annuelles de santé publique (JASP) 2006. L'ensemble des présentations est disponible sur le site Web des JASP, à l'adresse http://www.inspq.qc.ca/jasp.


Public Health Infrastructure
Community
Clinical partners
Public health services
Laboratory practice
Surveillance
Epidemic investigation
Information and knowledge systems
Public health workforce
Organizational capacity
Other partners
Baker EL, Potter MA, Jones DL. On public health infrastructure and our nation's health. Annu. Rev. Public Health. 2005; 26:303-18.


Empowered communities
Health Infrastructure
Community
Clinical partners
Public health services
Laboratory practice
Surveillance
Epidemic investigation
Public health workforce
Improved collaboration
Detailed understanding
Other partners


Empowered communities
Health Infrastructure
Community
Secure, available information
Easy communication modalities
Accurate information to make decisions
Role based data access
Data encryption
Digital certification
Web-based information repositories
Telecommunications
Decision support


Public Health Infrastructure
Functional interoperability
Semantic interoperability
Common reference information models
Common set of data elements
Common data structures
Common transport standards (messaging)
Common terminology standards
including: vocabularies, ontologies, etc…
Open source systems
Clinical partners
Improved collaboration
Organizational capacity
Other partners

Surveillance
Monitoring
Assessment
Analyzing
Visualizing
Reporting

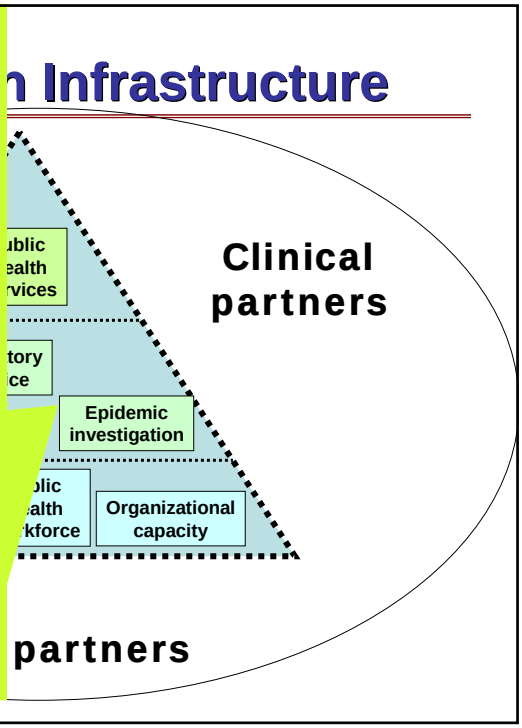
Policies, procedures and business processes

Information collection from disparate sources including:

clinical, laboratory, pharmacy, insurance, judicial, commerce, school, non-governmental organizations, and other governmental agencies, etc…

AVR Tools including:

data extraction, tabular and graphical reporting, statistical analysis, geographical information analysis and display, etc…

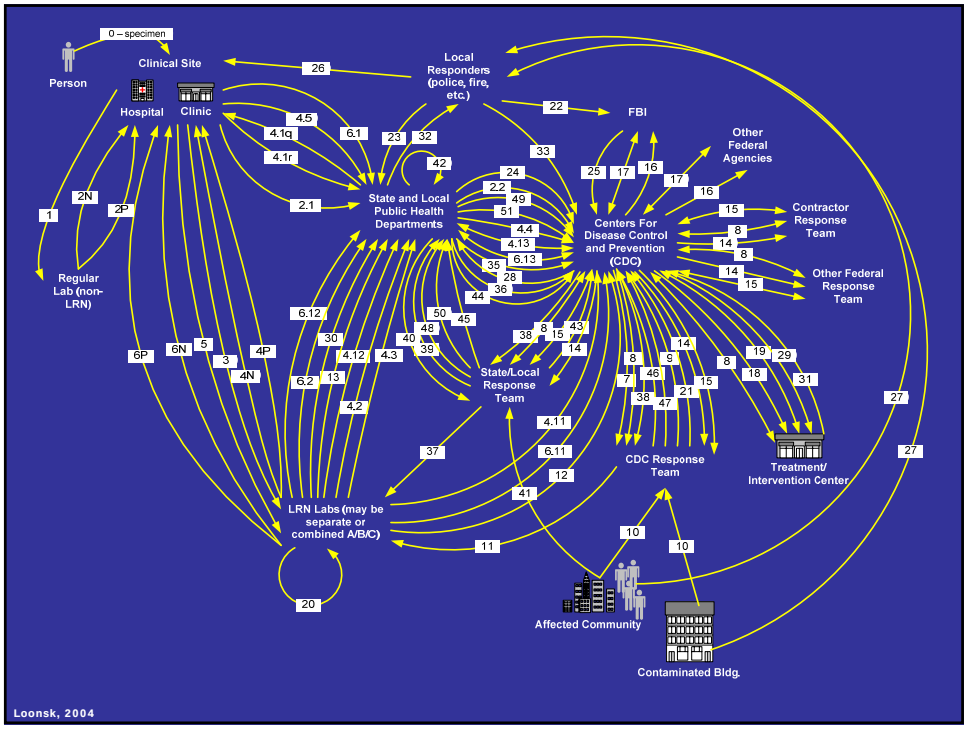


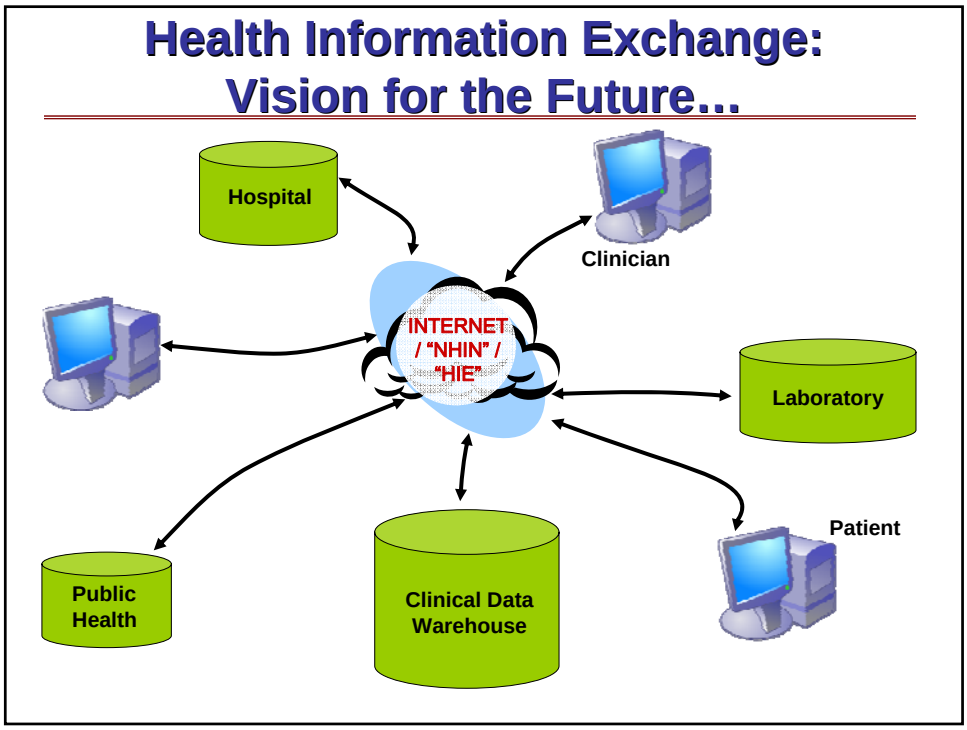
A Vision for Public Health Informatics

An information infrastructure that enhances and informs public health practice

Enabling seamless, timely flow of information

Sounds like an easy task given the technology available to us?


0 – specimen
Person
Clinical Site
Hospital
Clinic
Local Responders (police, fire, etc.)
FBI
Other Federal Agencies
State and Local Public Health Departments
Centers For Disease Control and Prevention (CDC)
Contractor Response Team
Other Federal Response Team
Regular Lab (non-LRN)
State/Local Response Team
CDC Response Team
Treatment/ Intervention Center
LRN Labs (may be separate or combined A/B/C)
Affected Community
Contaminated Bldg.
Loonsk, 2004


Health Information Exchange:
Vision for the Future…
Hospital
Clinician
INTERNET / "NHIN" / "HIE"
Laboratory
Public Health
Clinical Data Warehouse
Patient

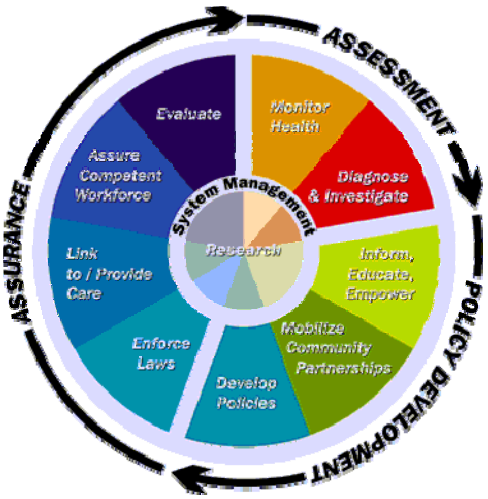
What is Public Health Informatics?

Public health informatics is the systematic application of information and computer science and technology to public health practice, research, and learning.

Deconstructing the informatics component in public health informatics

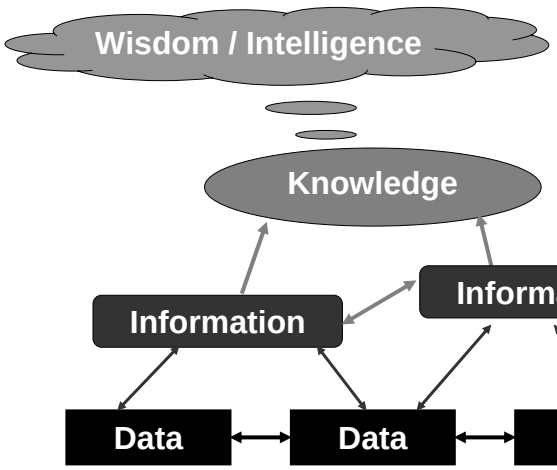
- **Information science** – examining the way to organize, store, retrieve, communicate and gather data and information
- **Computer science** – examining the way to develop the most efficient and effective way to electronically manipulate data and information
- **Information technology** – the technology underlying the computer and information science

Public Health Practice



Public Health Foundation, 2003

Issues in Information Science



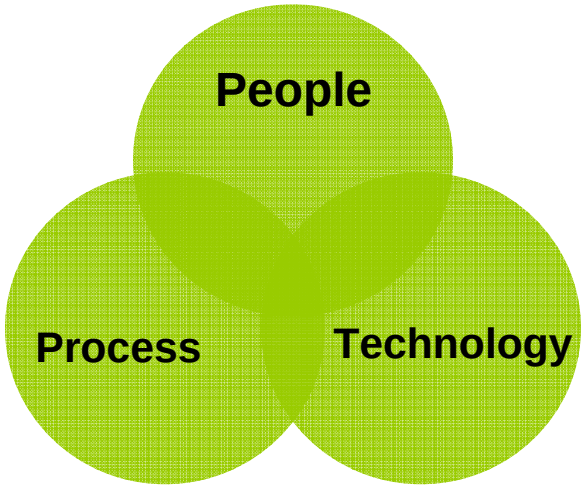
100º temp after hernia repair
Productive cough
Minimal use of Incentive Spirometer
= probable pneumonia

100º temp after hernia repair

100º oral temp

100

How does Public Health Informatics help?



Informatics: Standards

- What is a "Standard"?
  - A basis for comparison
  - A reference point against which other things can be evaluated
- What can a standard do?
  - Facilitate the sharing of information (e.g,. Clinical data, genomic data) among disparate systems (e.g., hospitals, clinics, labs, clinical data warehouses)…
- To achieve success:
  - There must be not only the development of standards…
  - …but, the usage of Informatics Standards as well

A Figure of Speech…

- Conversation
  - Vocabulary
    - The words you choose to use
    - Content standards
  - Grammar
    - The way you put the words together
    - Format standards
  - Context
    - The environment where you have the conversation
    - Software, hardware, and resources required for data exchange

Vocabulary

- Big tables of codes that describe things
  - Numbers as county codes
  - Reportable diseases as numbered codes
  - ICD-9 codes for underlying cause of death
- Vocabularies can be:
  - Locally-defined vs universally-defined
  - Lumpers vs splitters

Standard Vocabulary: Examples

- **LOINC-Logical Observation Identifiers Names and Codes** (www.regenstrief.org/loinc)
  - Gathers concepts into a single code
  - "13951-9" = "Serum EIA for Hep A Antibody"

- **SNOMED CT-Systematized Nomenclature of Medicine Clinical Terms** (www.snomed.org)
  - Teases out concepts into atomic elements
  - "Enzyme immunoassay", "Serum", "Hepatitis A Virus", "Antibody"

Standard Vocabulary: Examples

UMLS - Unified Medical Language System (1994-present) (http://www.nlm.nih.gov/research/umls/)

- **Goal:** To integrate systems by allowing the mapping of concepts to different standardized vocabularies and the development of vocabularies in biomedicine and health that have not been previously developed
- **Metathesaurus -** Very large, multi-purpose, and multi-lingual vocabulary database that links all included vocabularies
- **Lexicon –** A dictionary-like database organized by concept or meaning with attributes that help to define its meaning
- **Semantic Network –** A database of biomedical and health related concepts, their various names, and the relationships among them

Standard Vocabulary: Grammar

- The way you put words together is important
  - "The disinfectant is contaminated with blood"
  - "The blood is contaminated with disinfectant"
- Message: HL7-Health Level Seven (www.hl7.org)
  - Clinical and administrative data
  - Standardizes format and protocol
  - Defines the sequence in the message for data elements as well as the data type
  - Currently implemented in immunization and cancer registries, emergency department reporting, and lab reporting

Standard Vocabulary: Grammar

HL7 allows multiple patients per message, multiple orders per patient, multiple tests per order, multiple results per test, etc.

```
MSH|^~\&||LABMED-SOUTHWEST^68D089677^CLIA|…
PID|1||78893565||DOE^JOHN||490 Elm St^Phoenix^AZ
OBR|1||05099409000|220738^STD SCREEN^L|…
OBX|1|CE|5292-8^RPR-SYPHILIS^LN||G-A200^POSITIVE^SNM|
OBX|2|CE|6487-3^GONNORRHEA ANTIGEN^LN||G-A201^NEGATIVE
OBX|3|CE|14468-3^CHLAMYDIA ANTIGEN^LN||G-A201^NEGATIVE
```

Standard Vocabulary: Context

- Along with the vocabulary and format, there needs to be an infrastructure to support the data exchange
  - Data model (conceptual, logical)
  - Communication (business rules, protocols, etc.)
    - Semantics (content)
      - Controlled Vocabularies, Terminologies & Coding Systems
        - » CPT, ICD, LOINC, SNOMED, UMLS
    - Syntax (structure)
      - Markup Standards (data structure)
        - » XML
    - Web Services
  - Security (confidentiality, availability, integrity)
    - PKI, XML Encryption
  - Support staff

Open Source

Open Platform

- any specific hardware and operating system combination, such as the Windows/Intel platform or the Solaris/SPARC platform

Interface

- common boundary, a means to make a connection between two software components
- client presents an ordered set of parameters (with specific names and data types) and instructions (with specific names and functions) to an interface on the server.
- "build one, access many."

Open Format

- Non-proprietor based (published or un-published) standards . e.g. SHAPE, DXF v/s TIGER or VPF.
- Format not a major issue when systems communicate via open interfaces
- Mark-up Languages (ML) - Geography Markup Language (GML) – becoming standard XML encoding practice for geo-spatial information

Public Health Informatics In Action

on a small scale…

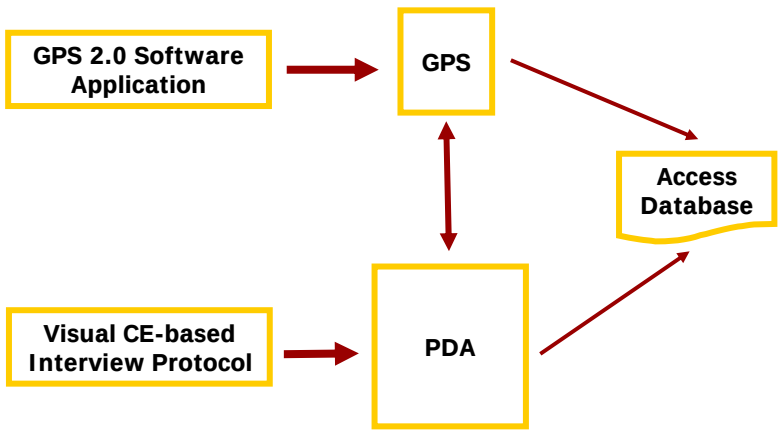
Use of PDAs and GPS in Mozambique

Krishnamurthy, 2006

Mission

- To work with partners to collect and to interpret desired information
- To provide better decision on distribution strategies and promotion of use of mosquito nets
- To collect reliable data in an expeditious manner

Design Components



GPS 2.0 Software Application

Use of PDAs and GPS in Mozambique

1	**MOZAMBIQUE BEDNET SURVEY - DATA DICTIONARY - FEBRUARY 2006**				
2	Variable Name	Type	Question (Portugues)	Skip Patterns	Question (English)
4	***Visual CE FileName*** **: MozHousehold.vce**		**Perguntas sobre Domicilio**		**Hosehold Questions**
5	Province	Text	Província	Must select one of the following two options	Province
6			1. Manica	If selected, go to "District"	1. Manica
7			2. Sofala	If selected, go to "District"	2. Sofala
8					
9	District	Number	Distrito	Must select one district. When selected, go to "EA"	District
10			Options from the randomization		Options from the randomization table
11					
12	EA	Number	Área de enumeração	Must select one option. When selected, will go to "District (Weird variable name)"	Enumeration area
13			_____ (drop down from randomization) Not in the drop down format	Populated from GPS 2.0?	Options from the randomization table
14					
15	District (Weird variable name)	Text	Comentário para localização (nome, ponto de referência)	Must select one option. When selected, will go to "SurveyAutho"	Hosehold comment
16			_____ (drop down from GPS randomization)		Options from the randomization table (GPS)
17					
18	SurveyAutho	Number	Bom dia (ou Boa tarde). A Cruz Vermelha e o Ministério da Saúde de Moçambique estão colhendo informação sobre a campanha de vacinação e o uso de redes mosquiteiras. Nós gostaríamos de fazer algumas perguntas a você. Isso deve levar mais ou menos 10 minutos. Você gostaria de participar?	Must select one of the following four option	Good day. The Red Cross and the Ministry of Health in Mozambique are collecting information on the vaccination campaign and use of bednets. We would like to aks you some questions. This will take around 10 minutes. Would you like to take part?

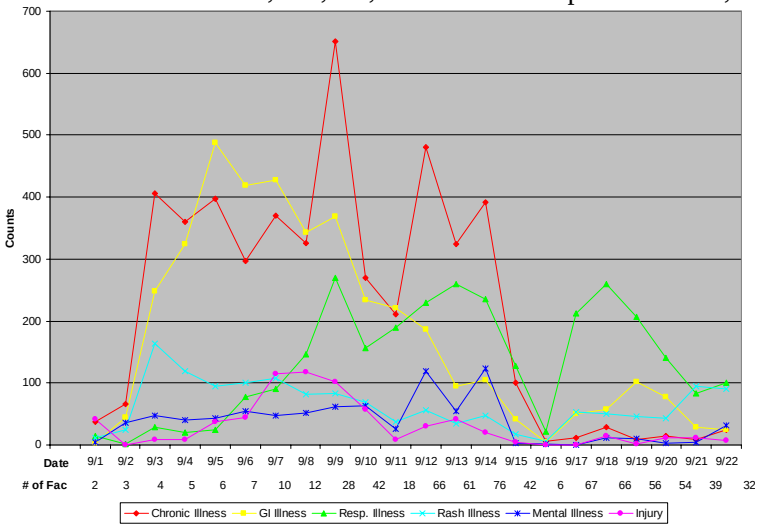
Public Health Informatics In Action

AVR – Katrina Examples*

*Informatics purposes not data analysis or results

Reporting Methods

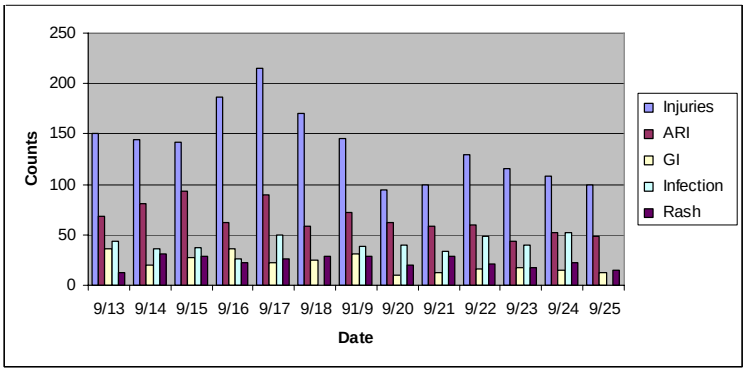
Daily Morbidity Distributions with Evacuation Centers & number of facilities in AR, MS, LA, and TX from September 1-22, 2005.



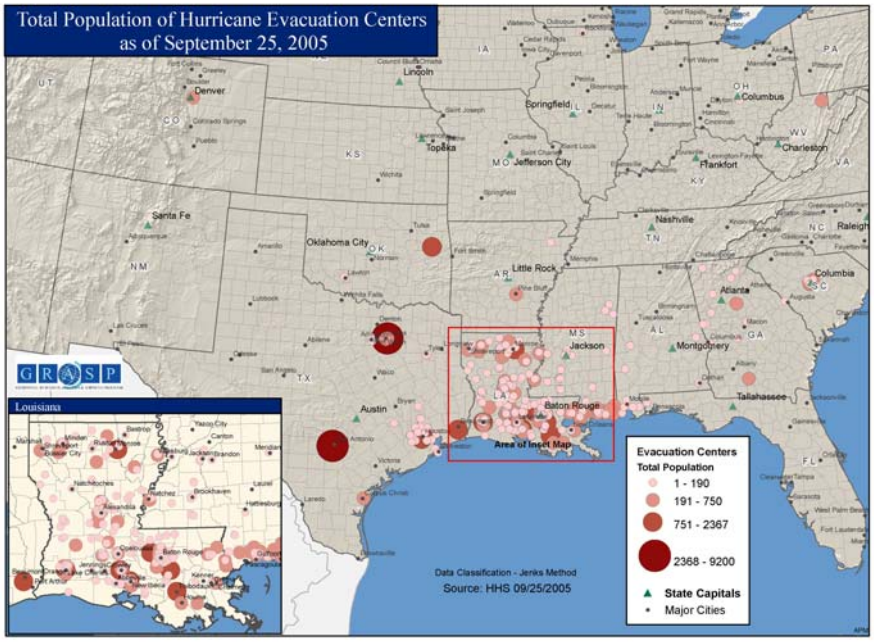
Jones, 2006

Reporting Methods

Syndromic Category Totals in 7 Mississippi Healthcare Facilities – September 13-25, 2005



Jones, 2006



Questions?

Thank you!

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The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the Centers for Disease Control and Prevention.