

Business intelligence: Transforming public health practice through information

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Presenter Disclosures



**Arthur Davidson, MD, MSPH
and colleagues**

No relationships to disclose

Objectives



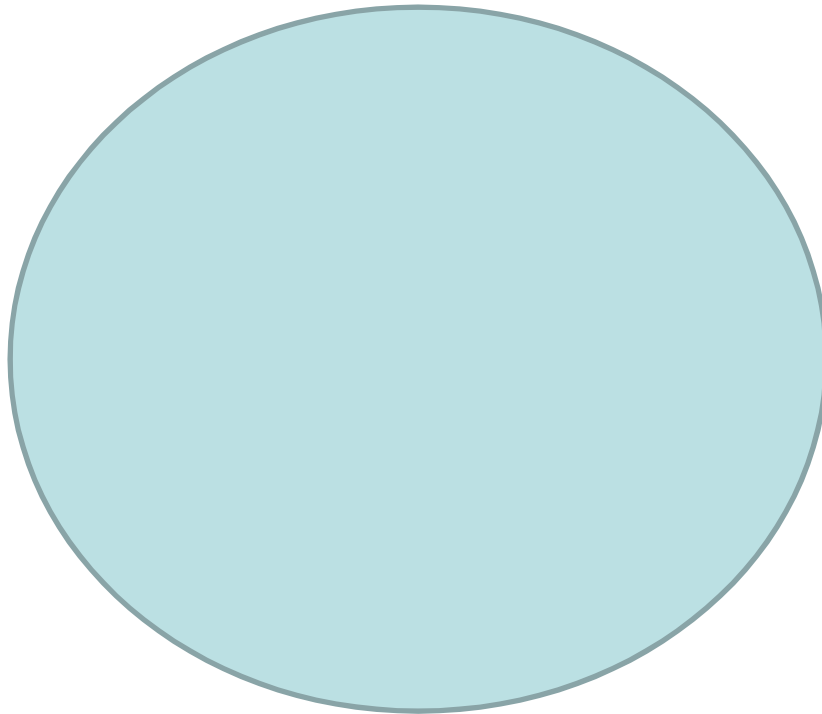
Session

1. Identify various bioethical issues in public health informatics and how they pose a barrier to effective data exchange
2. Demonstrate effective ways and means to appropriately deal with ethical issues in data sharing as they arise
3. Evaluate privacy and security issues common within the data sharing environment.

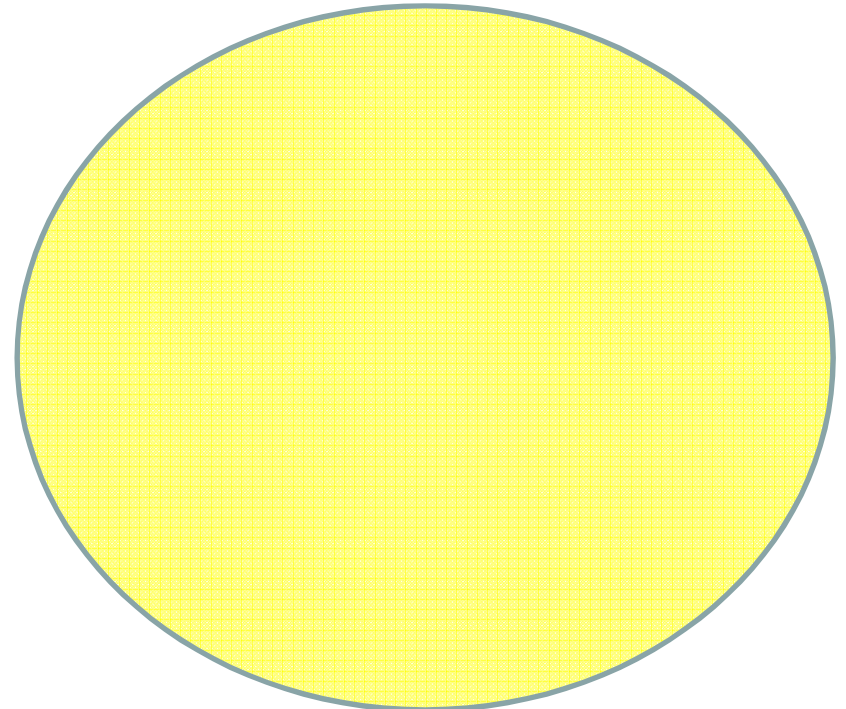
Learning

1. Discuss how business requirements may help drive successful public health informatics initiatives.
2. Describe fundamental components and value of a business intelligence project and compare them to their current public health information practices.

Challenge



**Session
Objectives
(bioethics)**



**Learning
Objectives
(business intelligence)**

Problems



- Too many data sources and too few analytic resources
- Too little ability to easily merge data within/across programs
- Little opportunity to use data to drive program actions, feedback, and evaluation
- No infrastructure to effectively communicate with community partners

Background



- Denver Public Health (DPH) is committed to improving the health and well-being of Denver's residents.
- Timely compilation and access to information can help public health officials better:
 - monitor the health of residents,
 - improve capacity to measure public health program impact,
 - increase focus on disease prevention, and
 - support strategic planning.

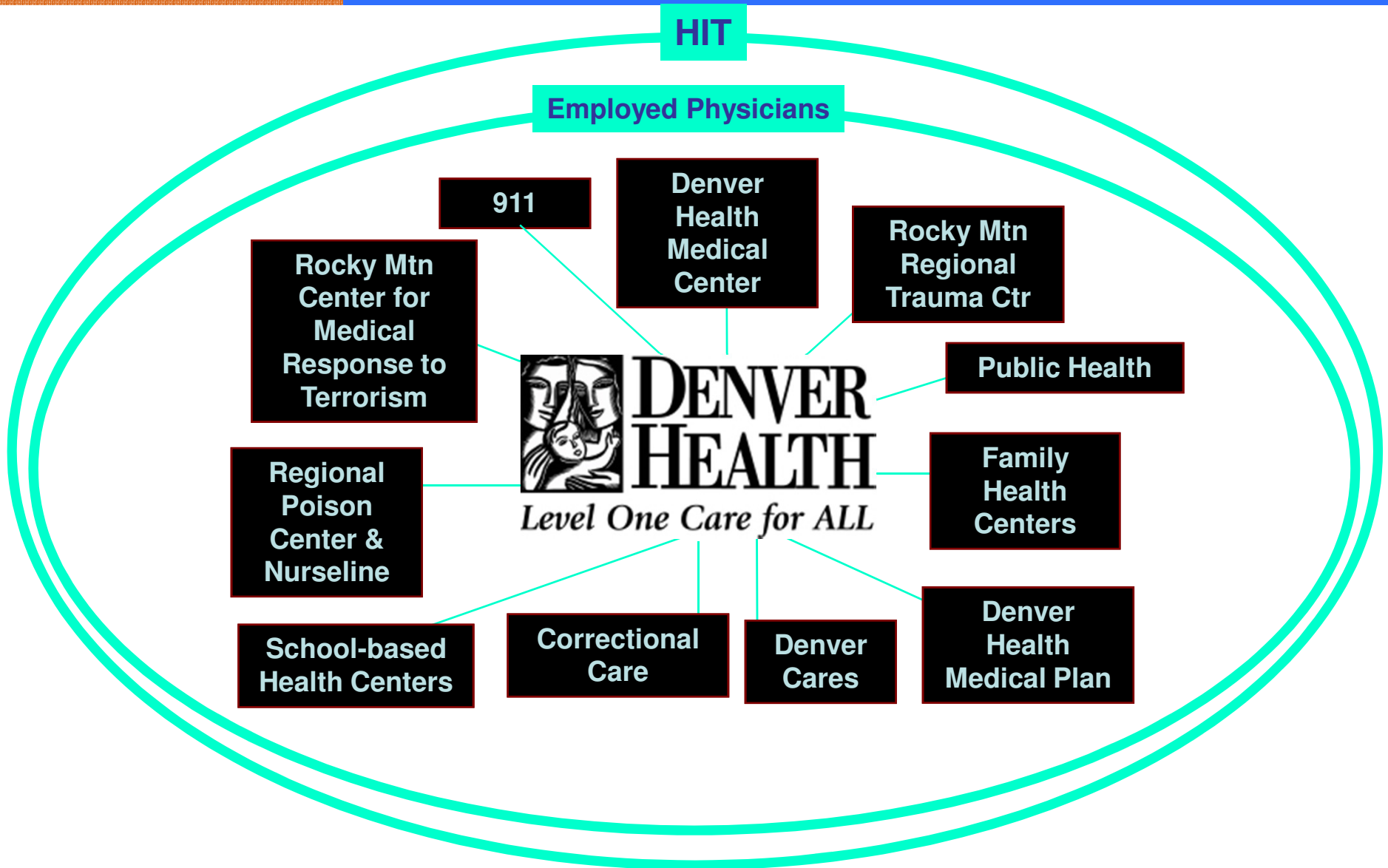
Business Intelligence (BI)



- Refers to computer-based techniques used to analyze business data (e.g., historic, current, and predictive).
- Includes online analytical processing, data mining, business performance management, and benchmarking, to support better business decision-making through decision support.

Organization: Denver Health

An Integrated Health Care System



Project Goals



- Develop and implement business intelligence (BI) tools to:
 - enhance surveillance activities,
 - accelerate identification of disease and intervention trends, and
 - provide real-time access to operational data.

Target Tools



1. Create an extensible “superset” Data Model
2. Create foundation for ongoing Business Intelligence analysis of Public Health Data
3. Integrate multiple data sources into Business Intelligence Solution
4. Create extract, transform and load (ETL) processes to bring new data into Denver Public Health Data Warehouse
5. Create a new Geo-coding Service available to by DPH and broader DH
6. Deploy ArcGIS Server to be used in conjunction with ArcGIS Desktop for mapping service with GIS data to end users
7. Create Dashboards, Reports, and Maps of relevant data

Methods



- In 2008, DPH conducted a series of requirements gathering sessions with each public health program area to document
 - current processes and methods for data collection, storage, and utilization, and
 - better understand future data needs.
- Requirements helped design and implement a BI solution to streamline processes while maximizing information gained from existing data sources.

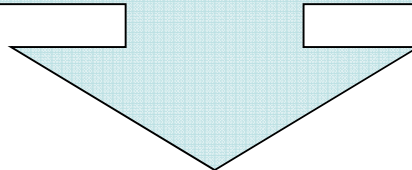
Applied PH informatics opportunity



2009 H1N1: from user needs to system development

Informatics Concepts: **Public Health Concepts**

- Problem / Domain: Flu surveillance
- Goal: Help coordinate response to 2009 H1N1 outbreak
- Stakeholders (Actors) Participants in information exchange
- Functions (Actions) Interactions among participants in the exchange
- Data: Cases by jurisdiction, lab data, vaccine supplies, etc.
- Information: Adverse event detection, disease monitoring, response
- Knowledge: Situational awareness
- Tool (Modeling): Workflow and dataflow



Flu Surveillance Information System

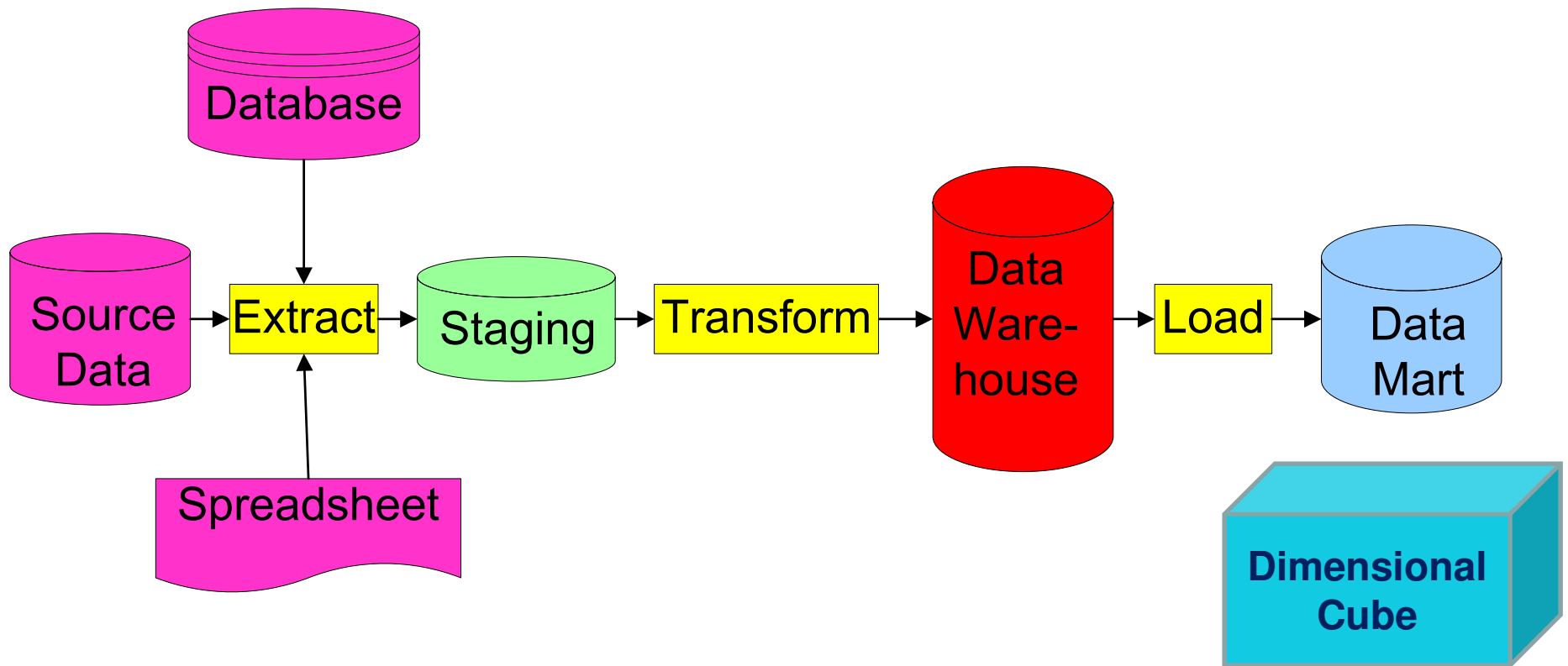
- Specifications
- Design
- Trial Implementation
- Deployment
- Evaluation

Results



- Comprehensive data model/warehouse developed
- Data mart utilizing various initial data sources implemented
- Role-based user access to self-service reporting tools
- Data organized into “dashboard” views for review of H1N1 surveillance and intervention activities.
- Increased access to high-value information
- Reduced dependency on manual data processing and *ad hoc* analyses

Extract-> Transform -> Load (ETL)



Legend

Source Systems

Processes

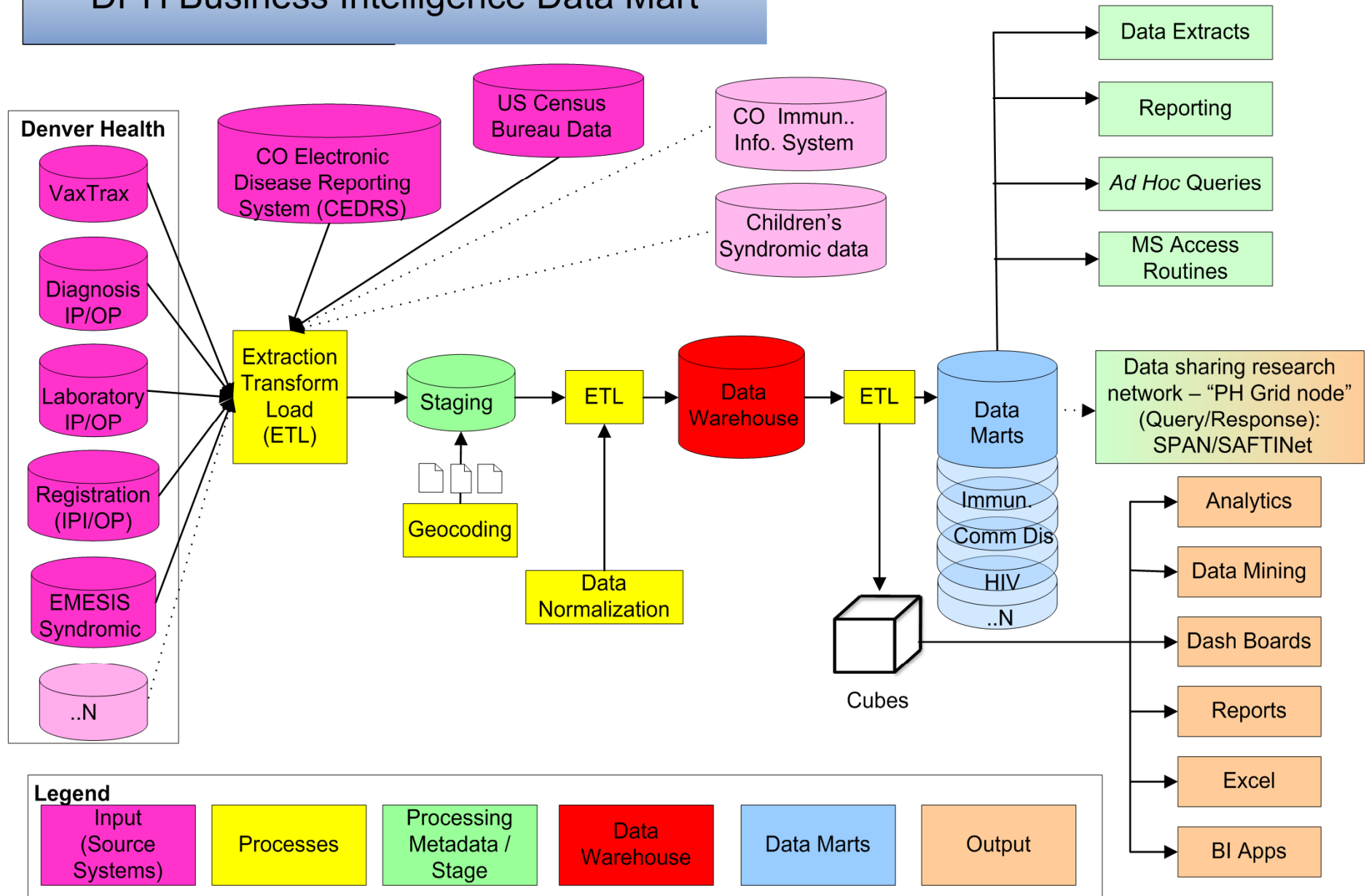
Metadata / Staging

Data Warehouse

Data Marts

Reports

DPH Business Intelligence Data Mart



DPH H1N1 Overview Dashboard



Public Health Testing

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PH H1N1 Overview Test

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- Shared Documents

Lists

- Calendar
- Tasks

Discussions

- Team Discussion

People and Groups

- Recycle Bin

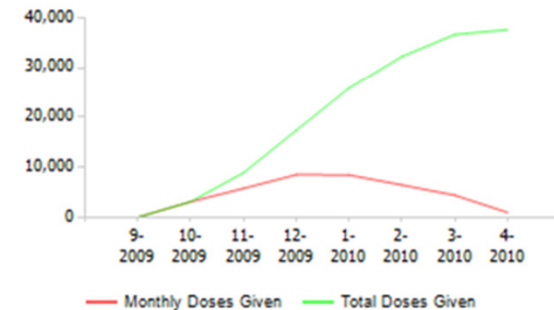
Public Health Testing > PH H1N1 Overview Test

H1N1- Vaccine Doses Given (Previous Week)

Clinic / Site	Given to Patient	Current Inventory	Availability Status
CHS/SBHC	547	1,453	●
DPH	95	820	●
DPH/DPS Outreach	1	-46	●
IP	24	2,611	●
OHSC	1	111	●
Total	668	4,950	

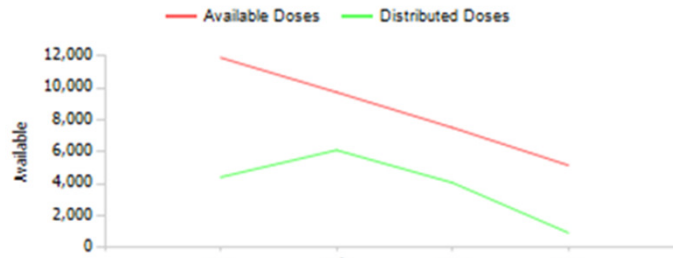
Description: This report displays inventory levels and vaccine doses given, by clinic, for the previous week (Sunday through Saturday). Data was last refreshed on: 4/11/2010

H1N1 - Cumulative Vaccine Doses Given to Patients (Flu Season)

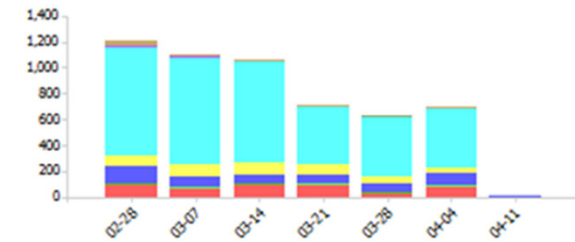


Description: This report displays vaccine doses given, by month and cumulative, for the entire flu season. Data was last refreshed on: 4/11/2010

H1N1 - Vaccine Availability (Rolling 90 Day Window)



H1N1 - Doses Given by Risk Category (Rolling 6 Weeks)



Community Health System H1N1 Overview Dashboard



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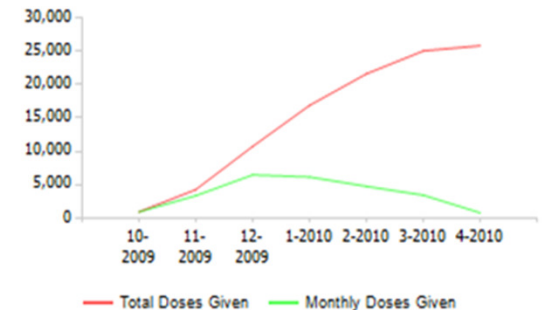
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H1N1- Vaccine Doses Given

(Previous Week)

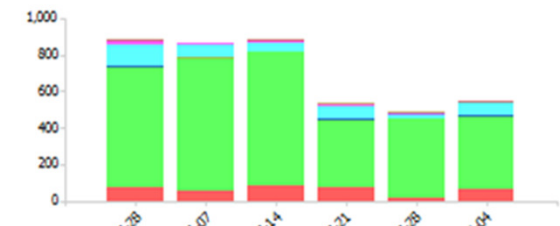
Clinic / Site	Given to Patient	Current Inventory	Availability Status
Bruce Randolph SBHC	0	3	●
Denver Health Medical Plan Clinic	0	1	●
Eastside/Adult	4	44	●
Eastside/EIS	0	27	●
Eastside/Peds	50	63	●
Eastside/Teen	0	18	●
Eastside/Women's Care	0	9	●
Family Crisis Center	0	5	●
JFK SBHC	0	0	●
Kepner SBHC	0	0	●
Kunsmiller SBHC	0	0	●
La Casa - Quigg Newton	52	125	●
Lake SBHC	0	-3	●
Lincoln SBHC	0	-1	●
Lowry Health Center	43	158	●
MLK SBHC	0	45	●

H1N1 - Cumulative Vaccine Doses Given to Patients (Flu Season)



Description: This report displays vaccine doses given, by month and cumulative, for the entire flu season. Data was last refreshed on: 4/11/2010

H1N1 - Doses Given by Risk Category (Rolling 6 Weeks)



Done



Internet | Protected Mode: On

Immunization Clinic Report



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DPH Immunization Clinic Report

Year	Quarter	Month	Imm Cnt	Adult Imm	Ped Imm	Outreach Imm	Travel Imm	Visits	Adult Visits	Ped Visits	Outreach Clnc Visits	Travel Visits	STD Visits
2009	Annual Total		25,981	9,471	16,510	4,393	5,217	13,259	5,996	7,263	1,505	2,758	38
	1	Quarter Total	5,467	1,834	3,633	974	1,183	2,454	1,024	1,430	309	588	11
		January	1,784	587	1,197	332	349	818	348	470	120	178	7
		February	1,574	533	1,041	245	340	749	308	441	75	182	2
		March	2,109	714	1,395	397	494	887	368	519	114	228	2
	2	Quarter Total	5,090	2,166	2,924	759	1,653	2,523	1,245	1,278	250	915	7
		April	1,909	689	1,220	361	441	846	384	462	105	230	4
		May	1,573	717	856	154	607	855	434	421	55	362	1
		June	1,608	760	848	244	605	822	427	395	90	323	2
	3	Quarter Total	6,448	1,984	4,464	1,274	1,077	2,909	1,180	1,729	377	561	10
		July	1,525	617	908	323	372	725	342	383	108	188	4
		August	2,733	623	2,110	465	321	1,174	383	791	141	180	3
		September	2,190	744	1,446	486	384	1,010	455	555	128	193	3

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Immunization County Report



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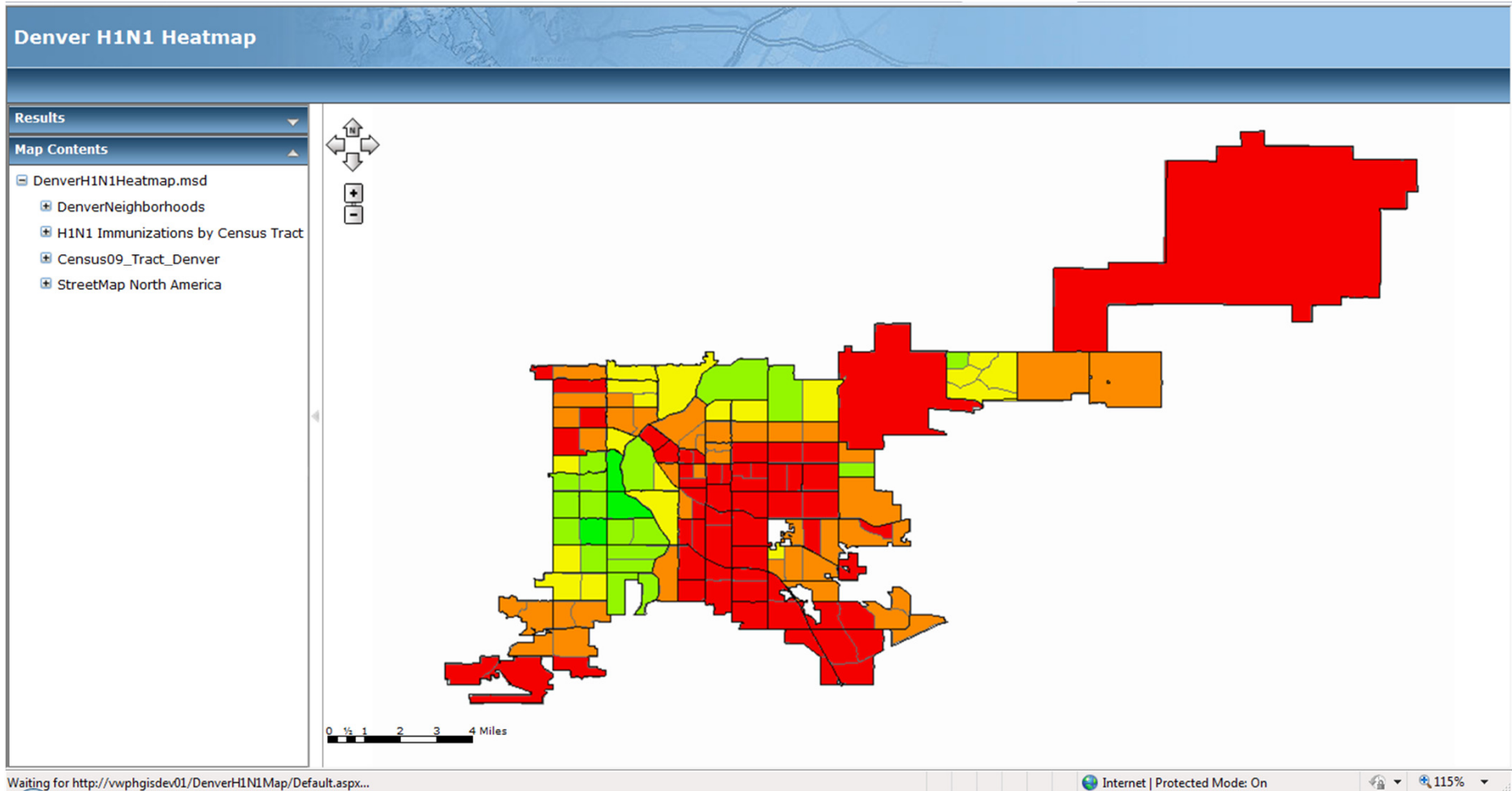
Recycle Bin

DPH Immunization County Report

County	Year	Quarter	Month	Imm Cnt	Adult Imm	Ped Imm	Outreach Imm	Travel Imm	Visits	Adult Visits	Ped Visits	Outreach Clinic Visits	Travel Visits	STD Visits	
▣ Adams County	▣ 2010	Annual Total		514	172	342	184	38	222	100	122	54	16	0	
		▣ 1 Quarter Total		471	153	318	184	36	202	89	113	54	15	0	
		March		128	48	80	54	10	64	31	33	23	5	0	
		January		218	56	162	81	19	86	31	55	17	7	0	
		February		125	49	76	49	7	52	27	25	14	3	0	
		▣ 2 Quarter Total		43	19	24	0	2	20	11	9	0	1	0	
	April		43	19	24	0	2	20	11	9	0	1	0		
	▣ 2009	Annual Total			1,725	550	1,175	309	183	838	366	472	119	90	2
		▣ 1 Quarter Total			449	129	320	63	43	189	70	119	25	18	0
		January			155	39	116	39	11	71	27	44	17	6	0
March				170	26	144	18	9	60	14	46	4	4	0	
February				124	64	60	6	23	58	29	29	4	8	0	

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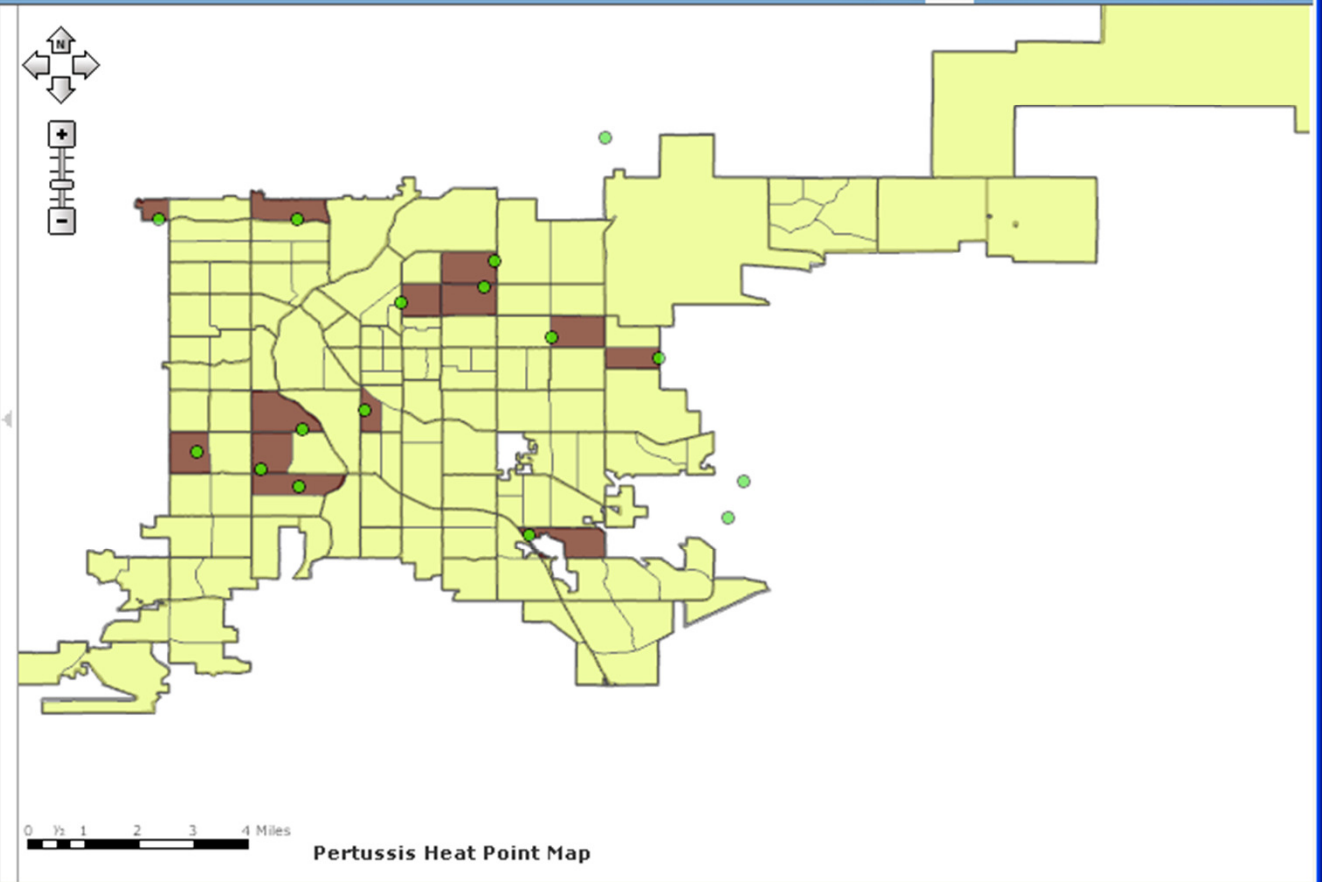
Denver H1N1 Immunization Map



Pertussis Heat Point Map



- Results**
- Map Contents**
- Pertussis_Denver_MASTER
 - Pertussis Cases
 - Pertussis Cases by CensusTract
 - 0
 - 1
 - Denver Neighborhoods
 - Census Tract Denver 2009



PH and Bioethics



- Public health can also greatly benefit the field of bioethics by broadening the primary focus of bioethics:
 - from individual autonomy and clinical care to include the contextual issues in health care decision making,
 - the value conflicts inherent in population-based programs, and
 - the social and structural determinants of population health.

Wolder Levin B, Fleischman AR , 2002; 92:165-67,
American Journal of Public Health

PH Ethical Issues



- **Appropriate distribution of societal resources.** To what extent should resources be devoted to health as opposed to other human goals?
- **Relative distribution of societal resources within health domain** (i.e., between health care delivery and public health endeavors).
- **Value conflicts** regarding ensuring equitable access to health care, reducing the risk of disease, or addressing fundamental determinants of health.
- **Relative amount of financial and human resources** to devote to each public health issue.

Wolder Levin B, Fleischman AR , 2002; 92:165-67,
American Journal of Public Health

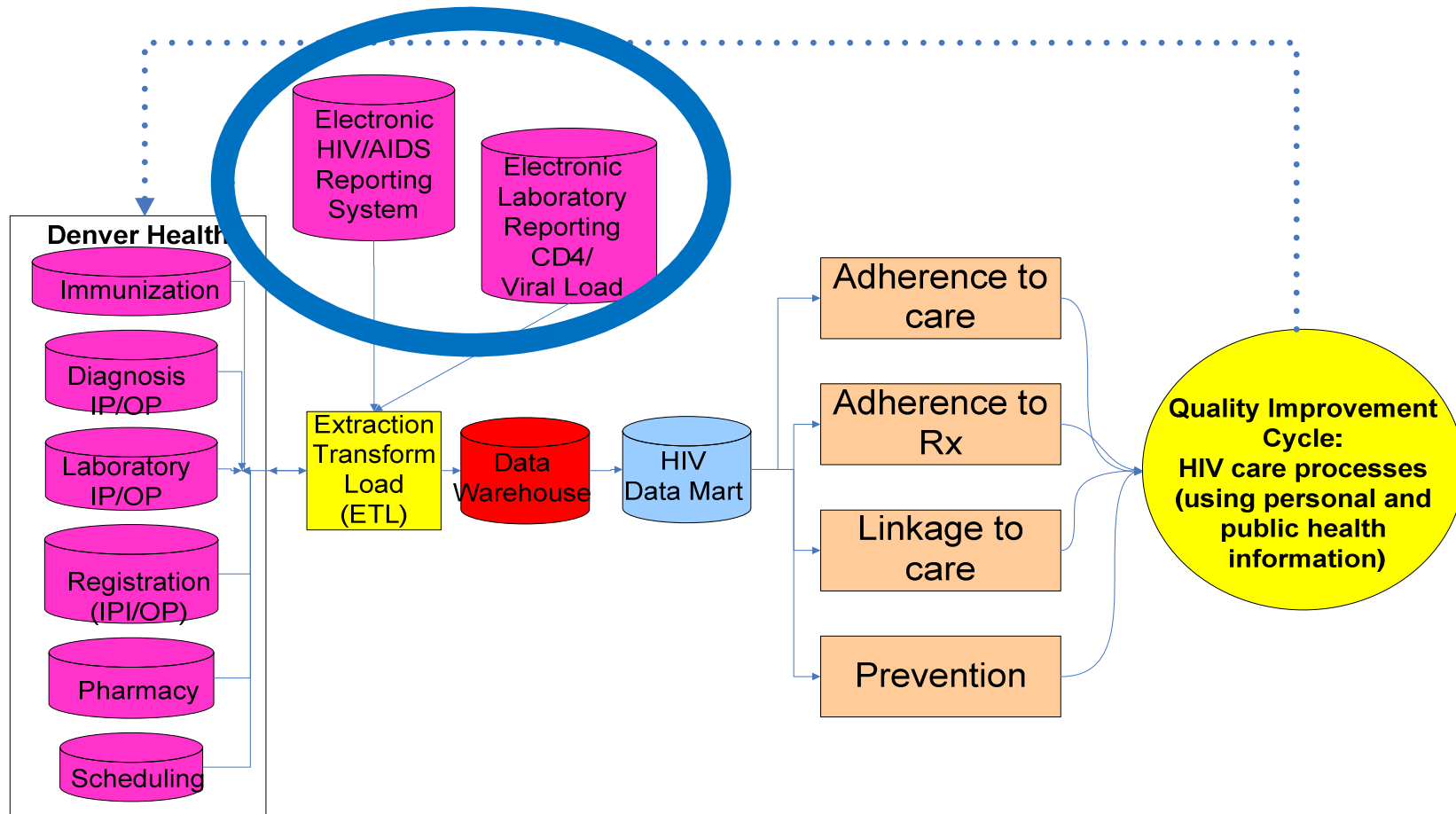
Evidence-based Practice



- The conscientious use of current best evidence in making decisions about the care of individual patients or the delivery of health services.
- Current best evidence is up-to-date information from relevant, valid research [surveillance/monitoring] about the effects of different forms of healthcare, the potential for harm from exposure to particular agents, the accuracy of diagnostic tests, and the predictive power of prognostic factors.

First Annual Nordic Workshop on how to critically appraise and use evidence in decisions about healthcare, National Institute of Public Health, Oslo, Norway, 1996, see: <http://www.shef.ac.uk/scharr/ir/def.html>

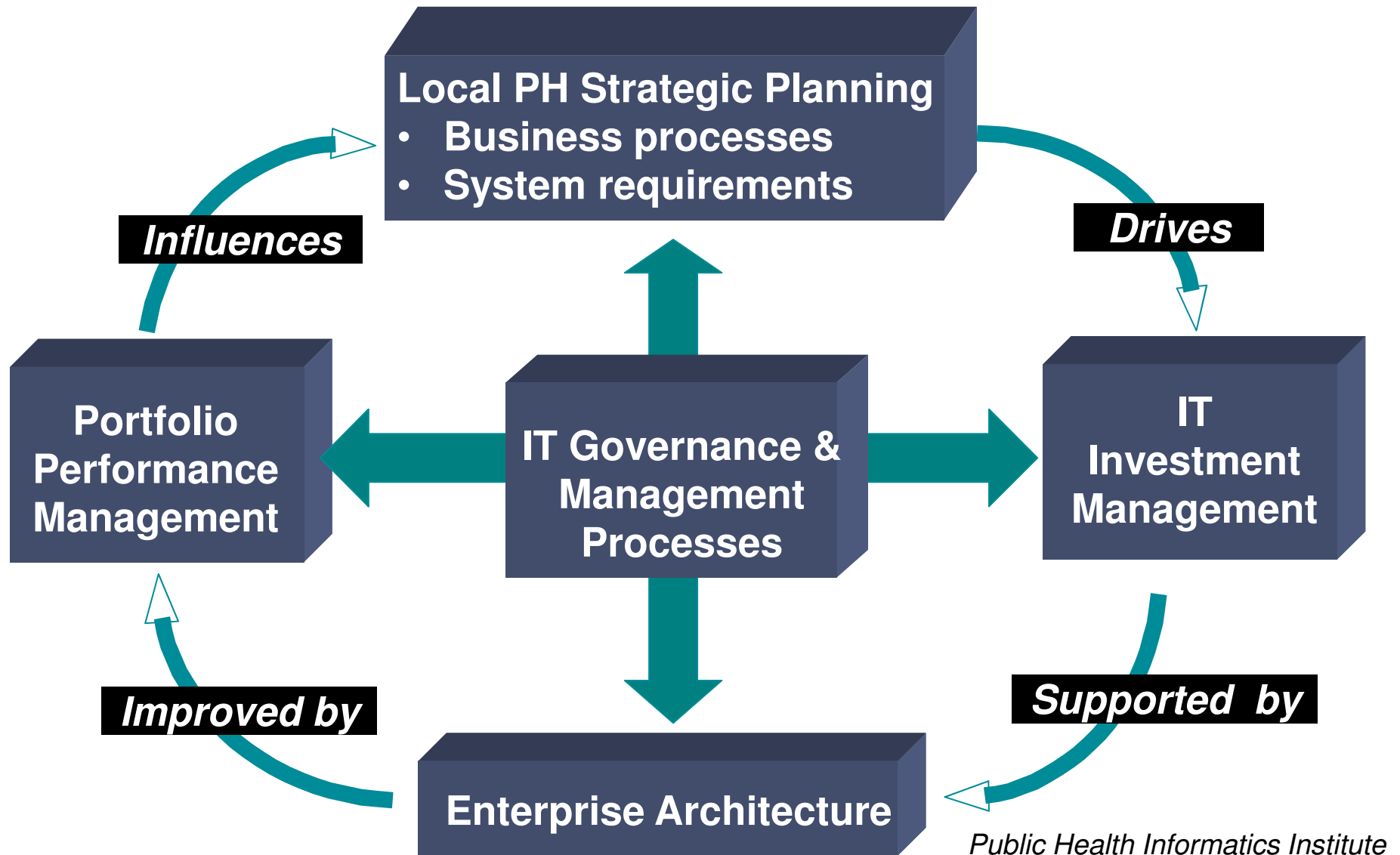
HIV Data Mart Development



Legend



Informatics planning: an ethical opportunity



Conclusions



- Substantial PH informatics outlays require constant feedback to assure valued return on investment
 - Ethical choices regarding use of limited funds
- While costly, BI technology has the potential to fundamentally transform public health practice through informatics.
 - Ethical choices regarding evidence-based practice
- By reducing barriers to information derived from existing and future data sources, public health practitioners have increased opportunities to proactively promote healthy living and prevent disease.
 - Ethical choices regarding collaborative decision-making and transparent information use

Questions - Discussion



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“...the only purpose for which power can be rightfully exercised over any member of a civilized community, against his will, is to prevent harm to others.”

*John Stuart Mill
On Liberty, 1859*