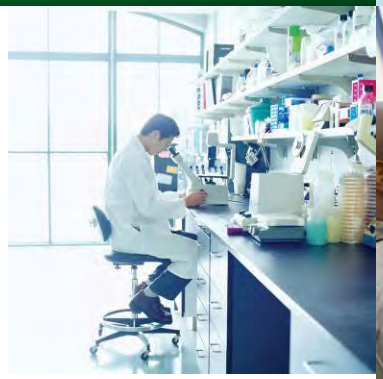
BCCDC Informatics Activities



BC Centre for Disease Control

An agency of the Provincial Health Services Authority

Environmental Health Surveillance Workshop

February 26, 2013

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Public Health Informatics

- Application of key disciplines to Public Health
  - information science
  - computer science
  - cognitive or social sciences
  - supplemented as needed by other domains including mathematics, engineering, biostatistics, and GIS
- A multidisciplinary approach to solving complex informational, analytical, and technical problems, guided by scientific principles and applied systematically.

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Data Warehouse

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BCCDC Context

- 2007 MOU identifies data linkage as key BCCDC function
- 2008 BCCDC Surveillance Workshop identifies centralization of data as priority theme
    - Common data standards
    - Centralized data cleaning
    - Linkage of all data sets within BCCDC

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Public Health Reporting Data Warehouse

- Automated and standardized:
  - Data integration
  - Patient-matching; case-matching
  - Geo-coding (health boundaries and derivation of address at time of event)
  - Episode date derivation
- Patient- and specimen-centric data views
- Data provided to end users anonymized or audited

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Principles

- Analyses run on real-time data to support surveillance
- Data source cooperation
  - Joint access to marts
- Improved Privacy
  - De-identified data in marts; line lists audited
  - Copies of data are minimized
  - Analyses exported, but data is not

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Advantages

- Time savings from automated data reconciliation
- Standardization and data quality
- On-going access to health outcomes data to evaluate PH programs

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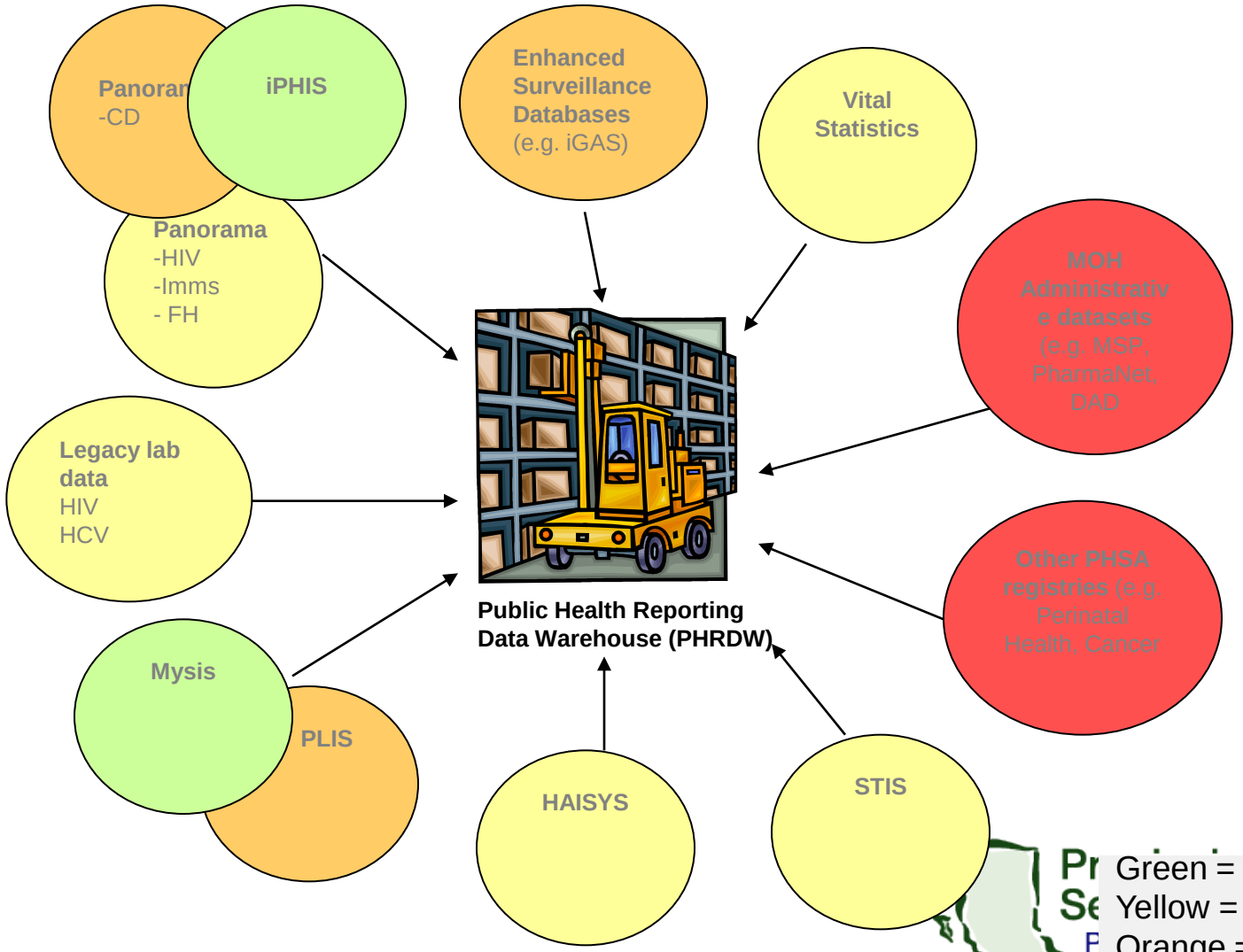
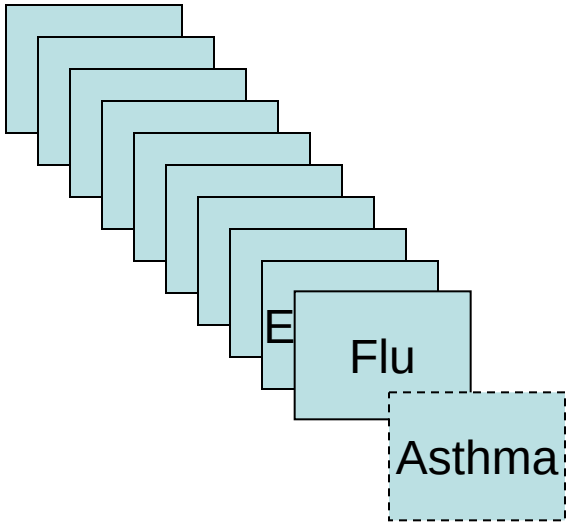
Data Sources



Data Marts

Public Health Reporting Data Warehouse (PHRDW)



Subset of data for a specific surveillance purpose

- Automated algorithms applied (e.g. lab interpretation, case definitions)
- Mart-specific dimensions created (e.g., age groups)

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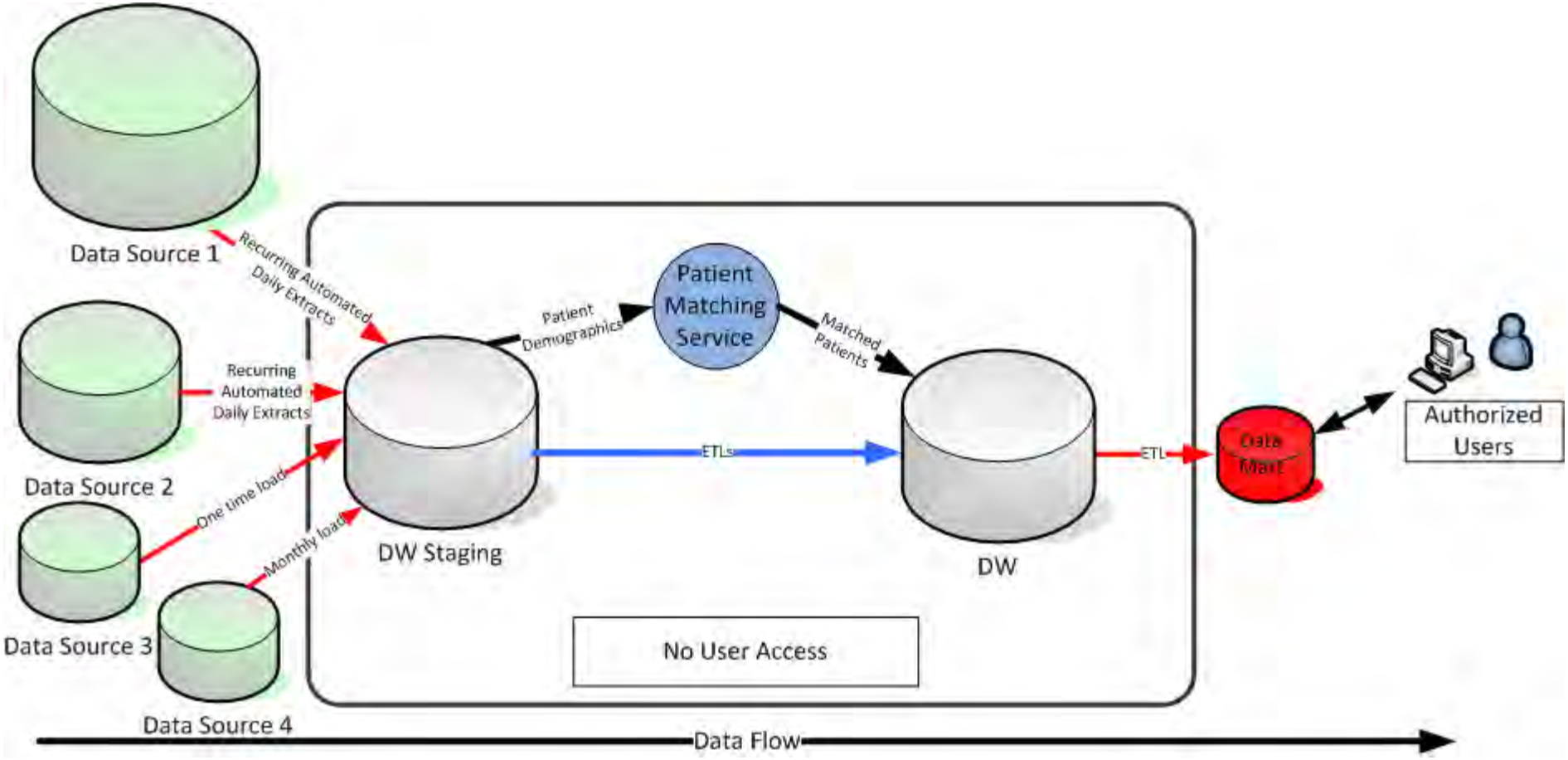
Architecture



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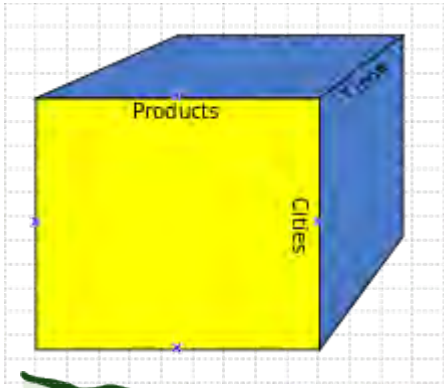
What is a Cube?

Data cube

- a three- (or higher) dimensional array of values
  <http://en.wikipedia.org/wiki/Data_cube>

OLAP cube

- a set of data organized in a way that facilitates non-predetermined queries for aggregated information
- a tool for Online Analytical Processing
  <http://en.wikipedia.org/wiki/OLAP_cube>



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Transformation of source data for cube creation

Variables are grouped into dimensions

Gender	Age	Health Authority	HSDA
F	15	Vancouver Coastal	Vancouver
M	25	Fraser	Fraser North
M	19	Vancouver Coastal	Vancouver
F	22	Fraser	Fraser South

Values become their members (categories)

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Data presented in a Cube format – Example 1

Gender	Age	Health Authority	HSDA
F	15	Vancouver Coastal	Vancouver
M	25	Fraser	Fraser North
M	19	Vancouver Coastal	Vancouver
F	22	Fraser	Fraser South

	15-19	20-24	25-29	Age Group
F	1	1		2
M	1		1	2
Gender	2	1	1	4

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Data presented in a Cube format – Example 2

Gender	Age	Health Authority	HSDA
F	15	Vancouver Coastal	Vancouver
M	25	Fraser	Fraser North
M	19	Vancouver Coastal	Vancouver
F	22	Fraser	Fraser South

	Vancouver	Fraser South	Fraser North	HSDA
F	1	1		2
M	1		1	2
Gender	2	1	1	4

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The Structure of a Cube

- Measures

  e.g. # of patients, # of cases, # of tests, Rate of cases,
  Average age, Median turn-around-time

- Dimensions

  e.g. Patient, Reported Date, Diagnosis, Health Authority

  - Attributes

    e.g. Gender, Ethnicity

  - Hierarchies

    e.g. Year-Month-Day, HA-HSDA-LHA

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Access Methods for Data Mart Cubes

1. Pivot Tables
   - Client identifiers removed
2. Line List Reports
   - Identifiers viewable; users audited
3. Direct SAS script
   - Analytic code

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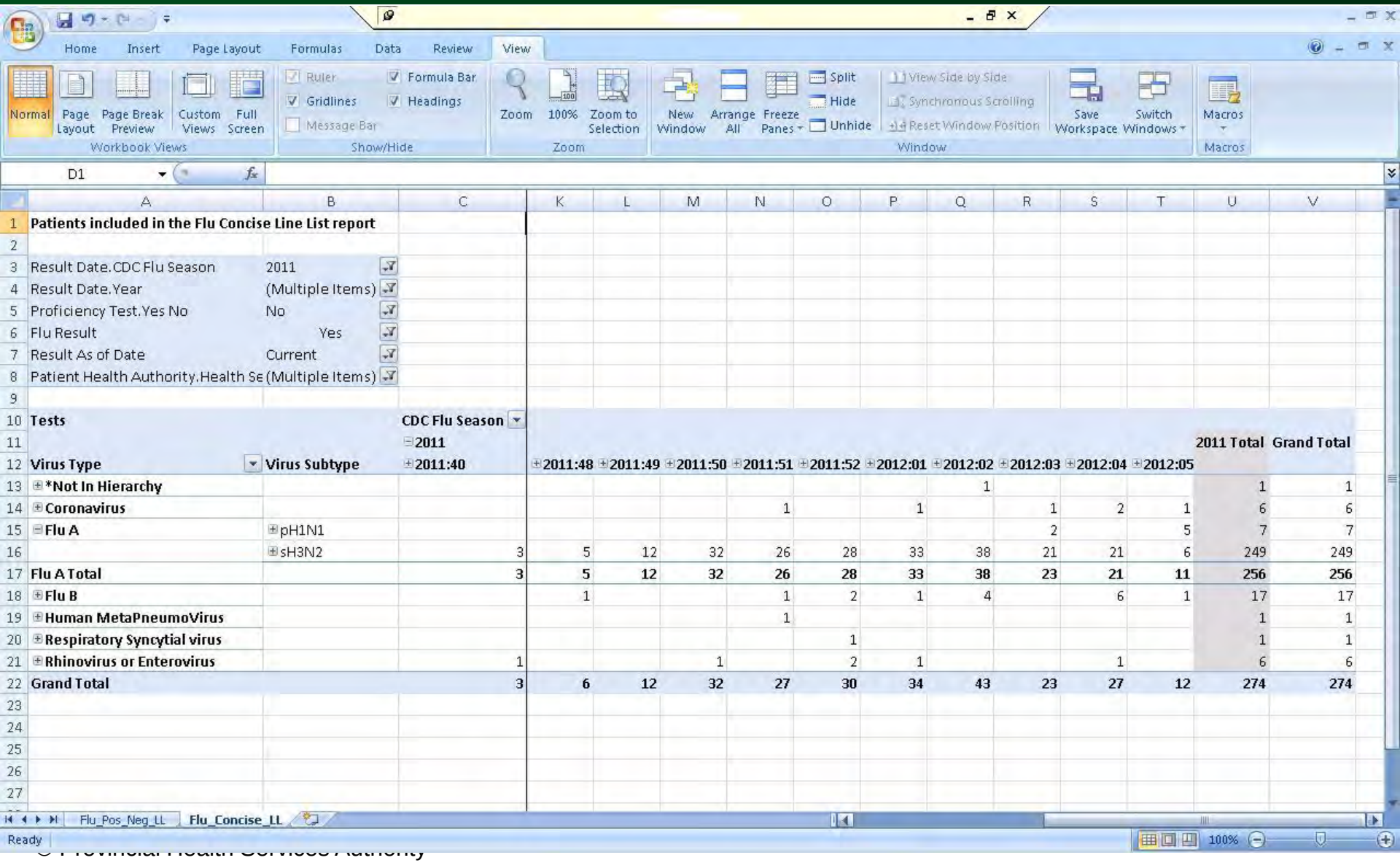
Pivot Table



Patients included in the Flu Concise Line List report

Result Date.CDC Flu Season	2011
Result Date.Year	(Multiple Items)
Proficiency Test.Yes No	No
Flu Result	Yes
Result As of Date	Current
Patient Health Authority.Health Se	(Multiple Items)

Tests		CDC Flu Season											
		2011										2011 Total	Grand Total
Virus Type	Virus Subtype	2011:40	2011:48	2011:49	2011:50	2011:51	2011:52	2012:01	2012:02	2012:03	2012:04	2012:05	
*Not In Hierarchy									1				1	1
Coronavirus						1		1		1	2	1	6	6
Flu A	pH1N1									2		5	7	7
	sH3N2	3	5	12	32	26	28	33	38	21	21	6	249	249
Flu A Total		3	5	12	32	26	28	33	38	23	21	11	256	256
Flu B			1			1	2	1	4		6	1	17	17
Human MetaPneumoVirus						1							1	1
Respiratory Syncytial virus							1						1	1
Rhinovirus or Enterovirus		1			1		2	1			1		6	6
Grand Total		3	6	12	32	27	30	34	43	23	27	12	274	274

Online Data Visualization

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Data Visualization

- The main goal is to communicate quantitative information clearly and effectively through graphical means.
- As data becomes more widely available and online tools evolve to manipulate, compare, and overlay data, visualizations offer opportunities for:
  - stakeholder engagement
  - situational awareness
  - rapid decision-making
  - advocacy
  - policy support
  - open data

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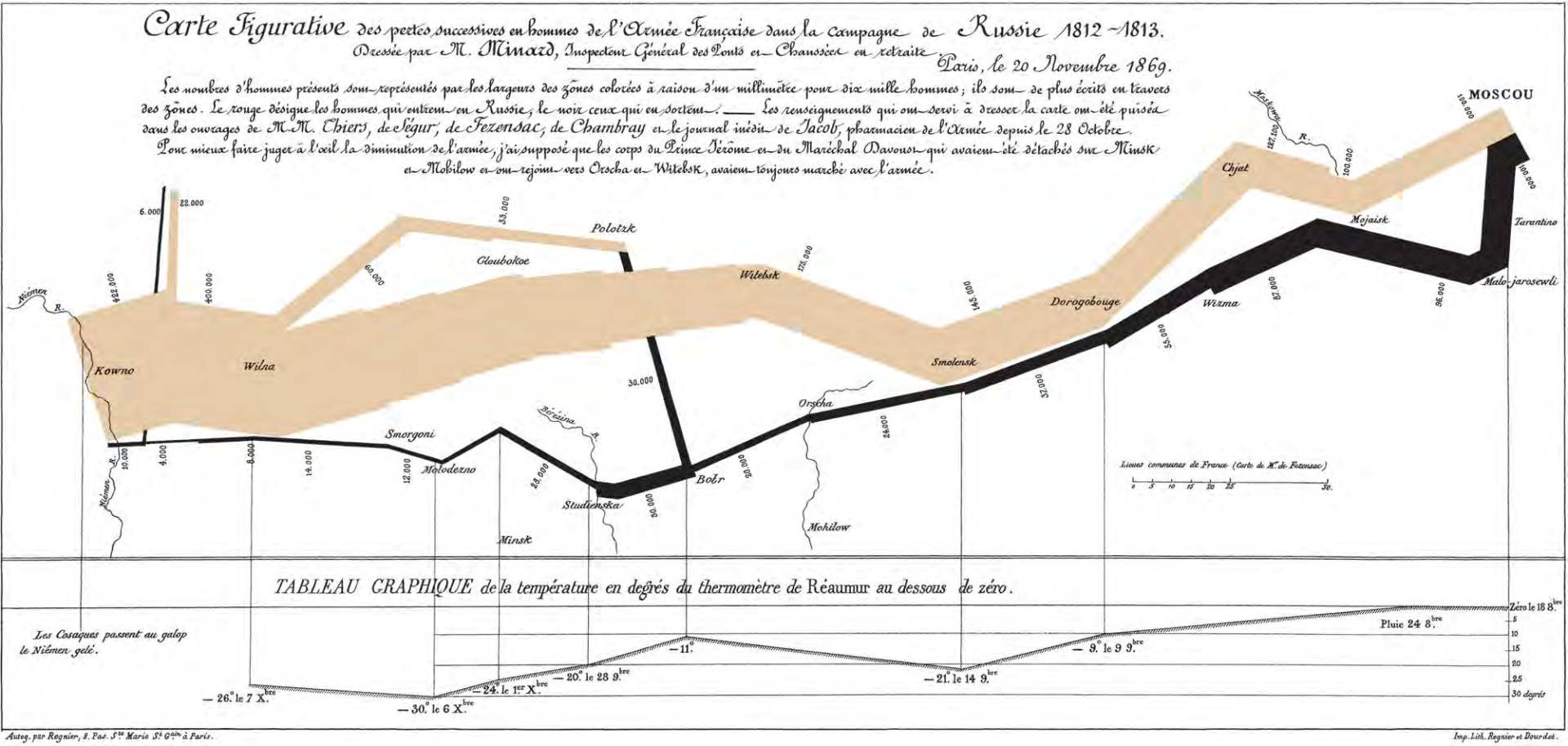
Impact



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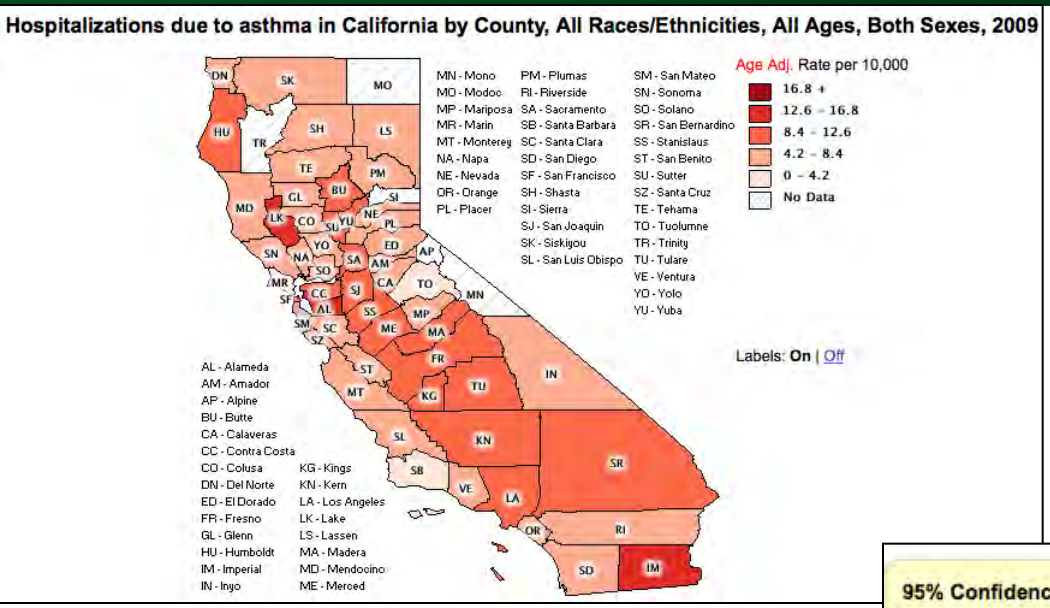
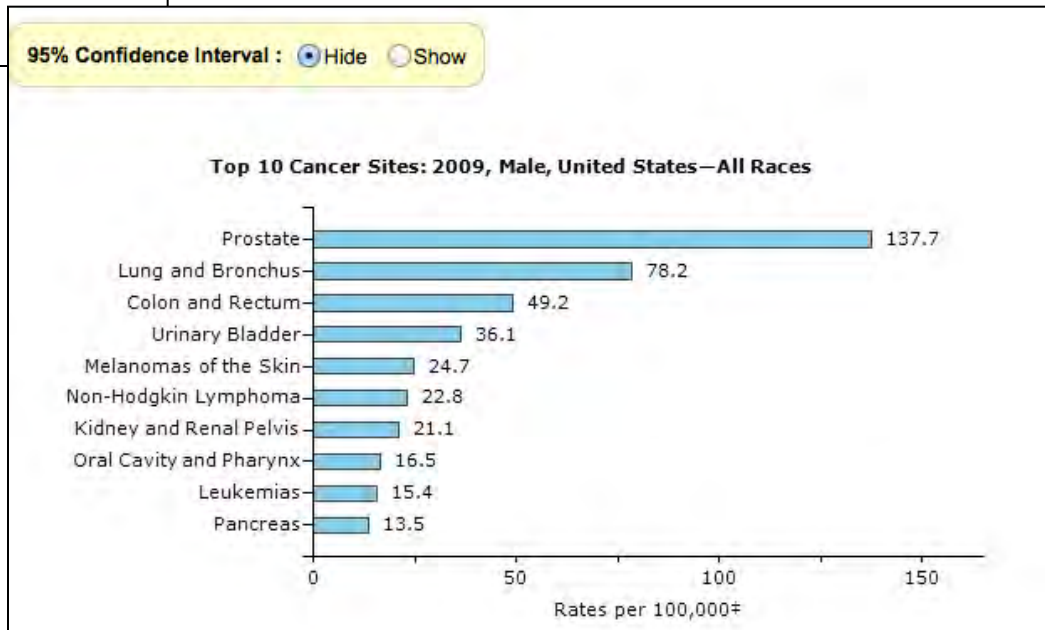
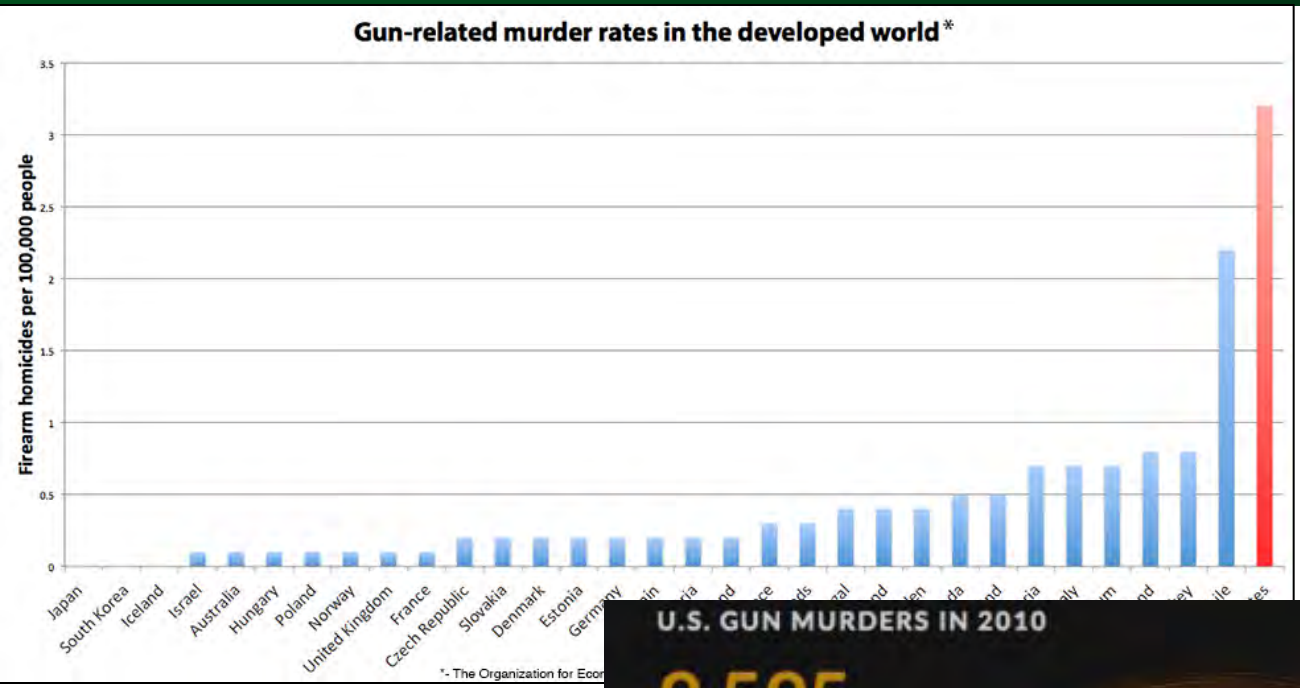
Exploratory vs. Explanatory

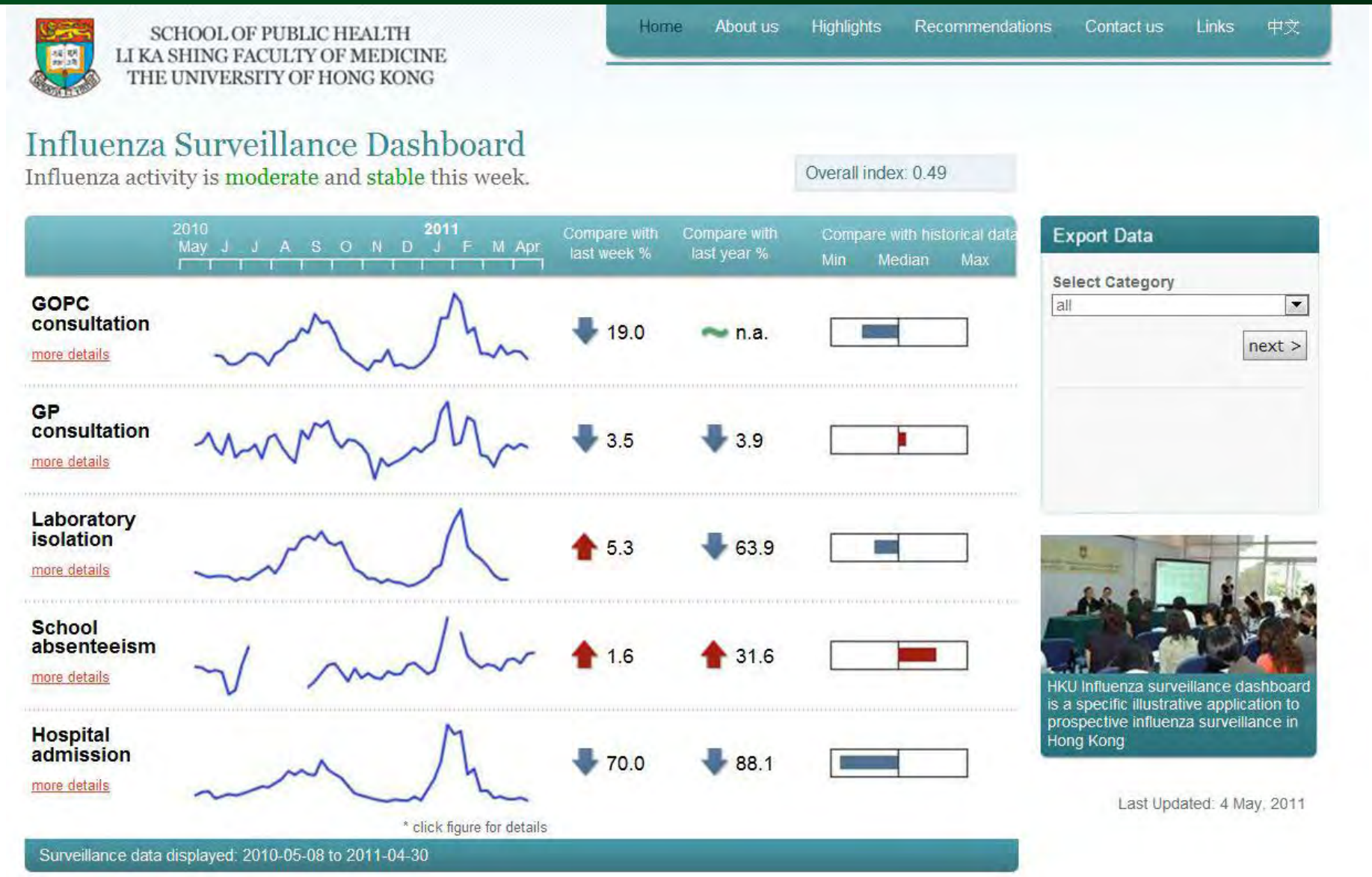




Informative vs. Persuasive



Dashboards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Influenza Surveillance Dashboard
Influenza activity is moderate and stable this week.
Overall index: 0.49
2010
May J J A S O N D
2011
J F M Apr
Compare with last week %
Compare with last year %
Compare with historical data
Min Median Max
GOPC consultation
more details
19.0
n.a.
GP consultation
more details
3.5
3.9
Laboratory isolation
more details
5.3
63.9
School absenteeism
more details
1.6
31.6
Hospital admission
more details
70.0
88.1
* click figure for details
Surveillance data displayed: 2010-05-08 to 2011-04-30
Export Data
Select Category
all
next >
HKU Influenza surveillance dashboard is a specific illustrative application to prospective influenza surveillance in Hong Kong
Last Updated: 4 May, 2011

Data Visualization Concepts

- Data dimensions, for example
  - disease
  - time
  - age
  - sex
  - geography
- Visual encodings, for example
  - position
  - colour
  - length
  - size

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Project Overview

- Goal: To facilitate members of the public, including health care professionals based outside of the BCCDC, to prepare tables and figures that communicate information regarding diseases and public health interventions in British Columbia in a manner that is clear and meaningful.

- Audiences: public, media, researchers, students

- Phase 1 scope: CD Annual Report

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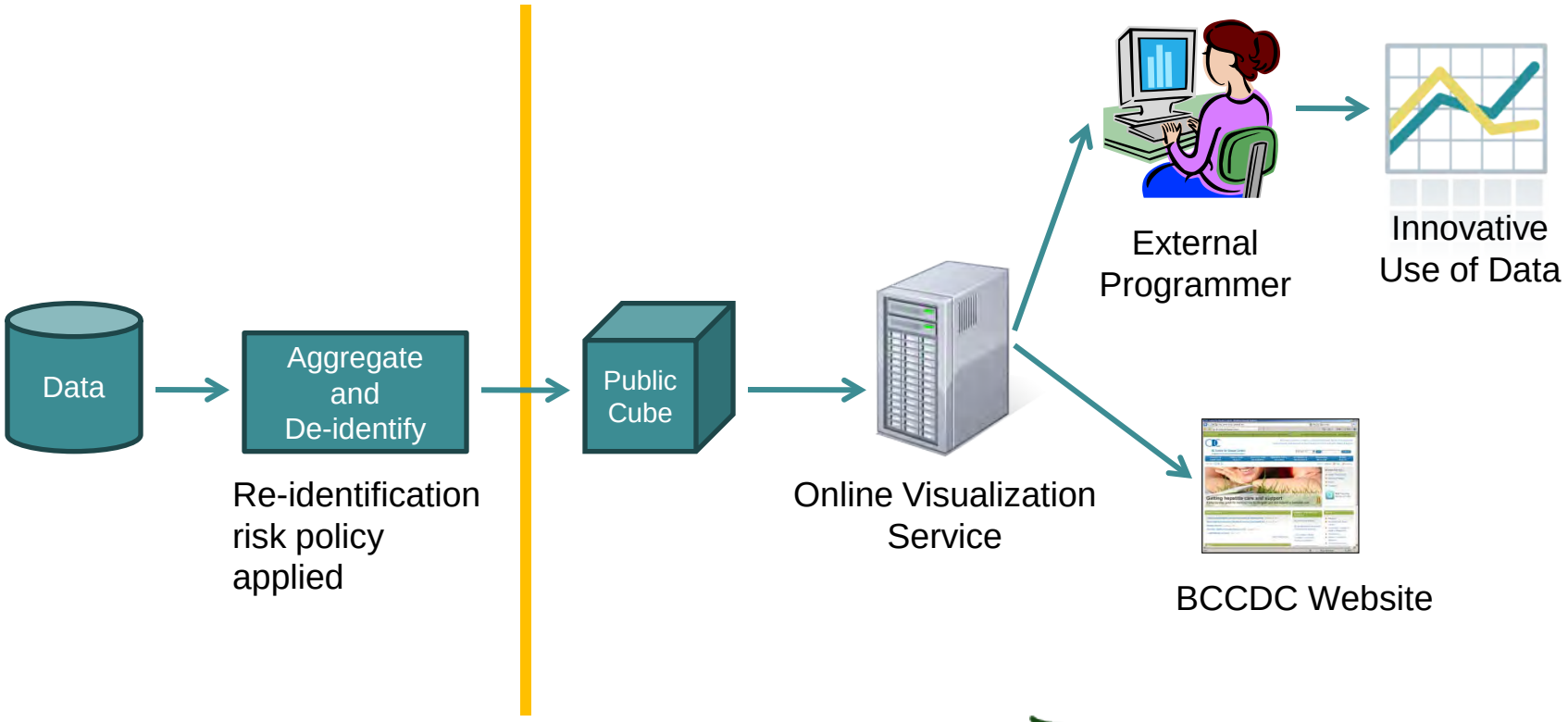
Online Data Architecture



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Privacy

- A public-use data file of aggregate information will be created and will adhere to the re-identification risk policy (comparable to data available in annual reports).
- No personal information will be stored on the site. Only the public-use file will be uploaded.
- The site has no access to internal resources or line-level data.
- A process will be developed to ensure all data is de-identified and that no identifying or quasi-identifying information is ever posted.

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Proof of Concept

Health Authority solutions.