

From Worker Health To “Citizen Health”: Roles of Health Care Delivery, Public Health and Big Data Transformations

College of Public Health
University of Iowa
November 29, 2012



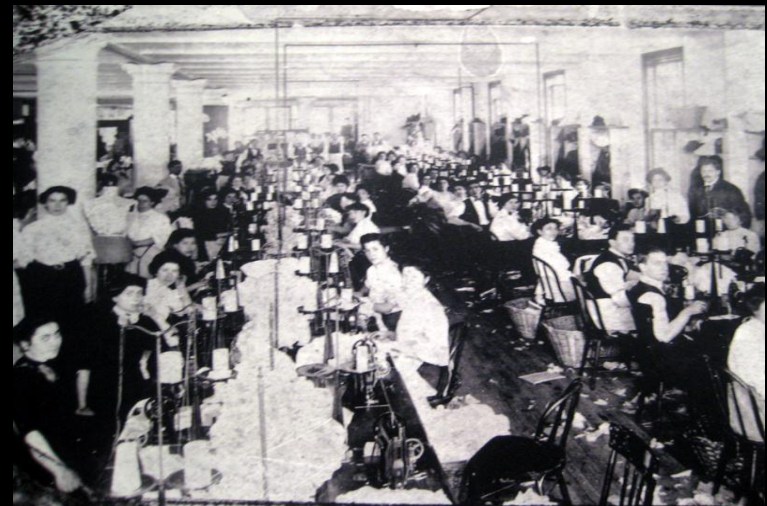
M-J. Sepúlveda, MD FACP
IBM Fellow & Vice President

Safety First

November 24, 2012
Tazreen Factory Fire
Dhaka, Bangladesh



March 25, 1911
Triangle Shirtwaist Factory Fire
New York City, USA



Content

- **Purpose:** discuss transformations in health care, population health and “Big Data” and implications for occupational health

- **Objective:** provoke thinking
 - 1. What are the implications of these transformations for current approaches to worker health
 - 2. Are there opportunities in these transformations to advance the integration and delivery of occupational health and safety services to workers
 - 3. Do we have the leadership and relevant skills to capitalize on these opportunities

Real transformation is accelerating - driven by a combination of market, technology and legislative forces on access, cost, quality and equity



Value (cost, quality) and outcomes: expectations for improved performance



Non Communicable Diseases: prevalence rate, economic impact



Demographics and lifestyles



Globalization of "it all" (climate, networking, work, health, markets)



Critical resource shortages (water, energy, food, skills)

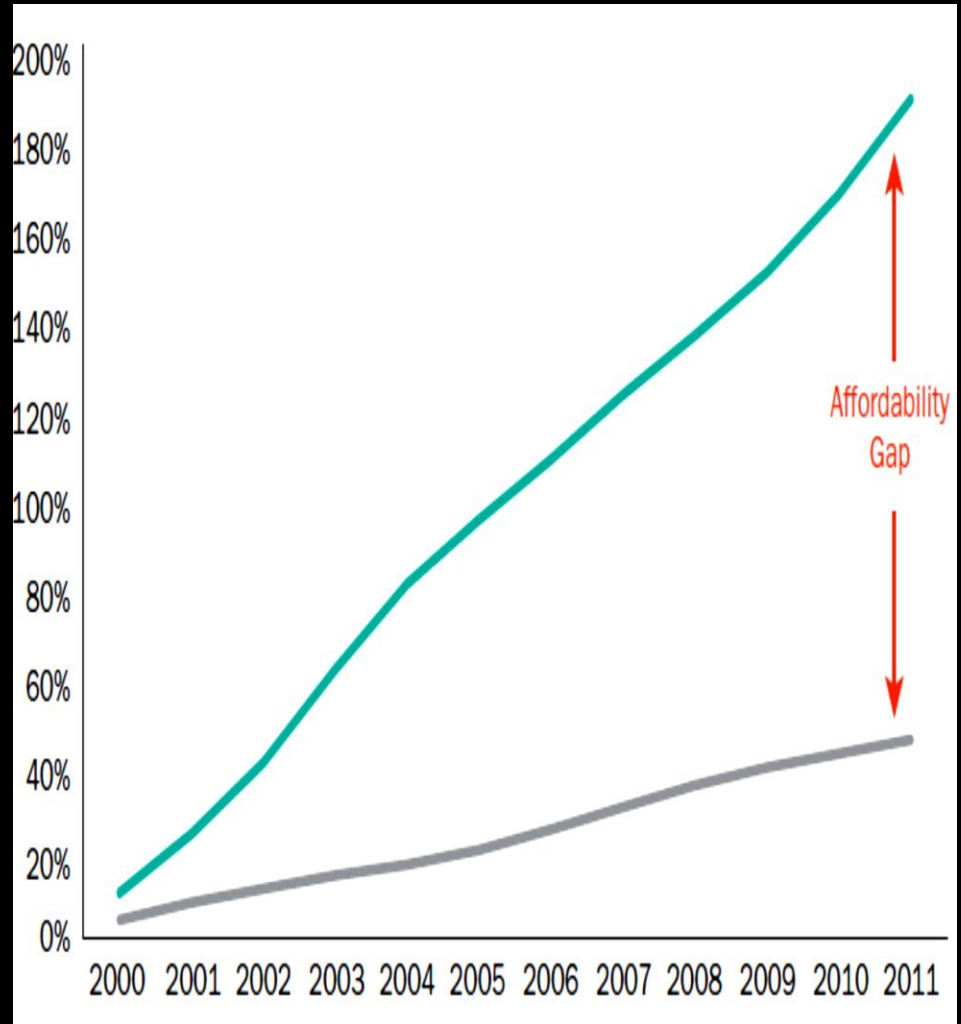
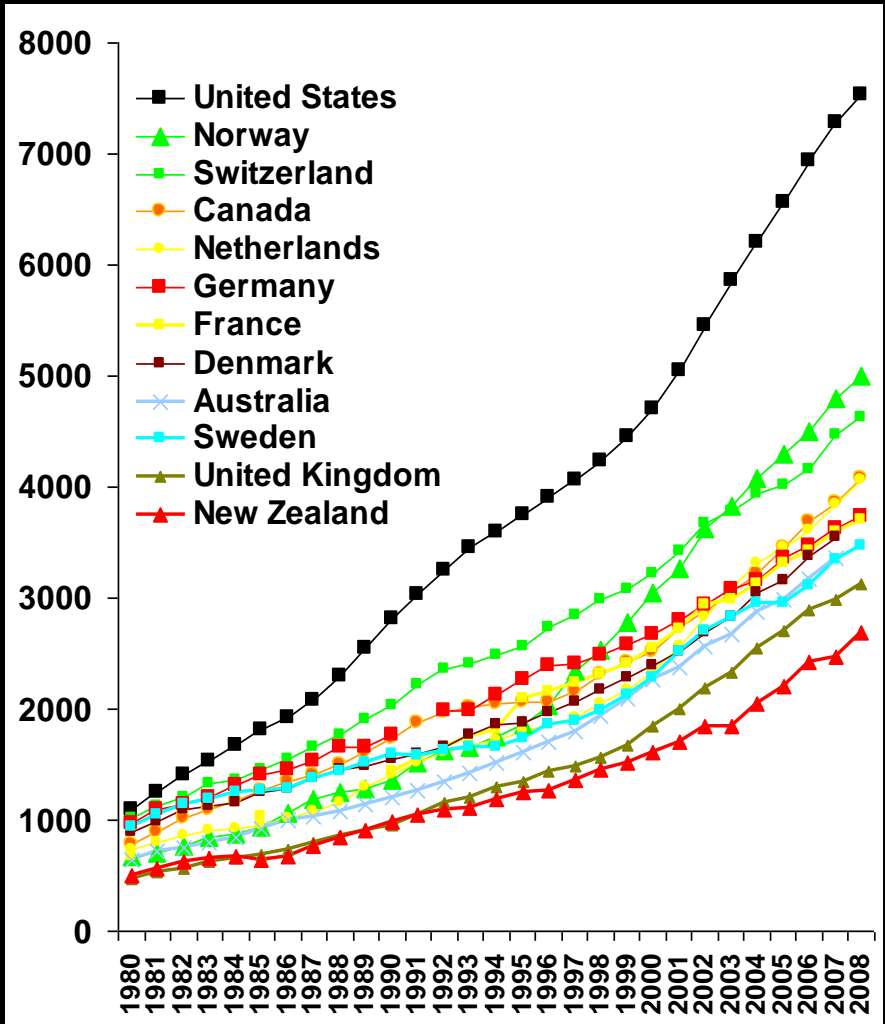


Increased competition and new entrants

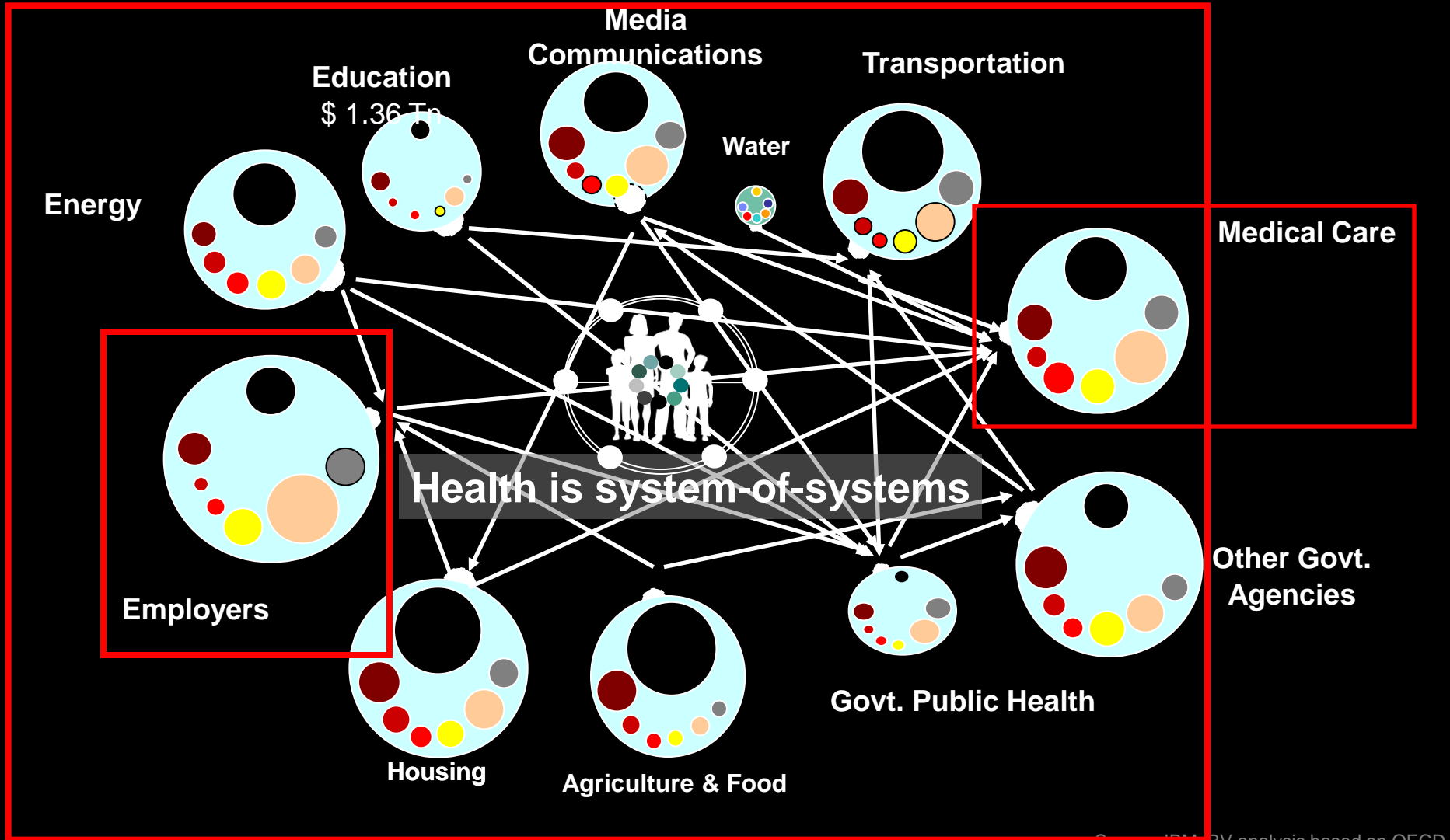


Data: instrumentation, connectivity, intelligence and Big Data

Our Costs Are High and Affordability Low



Health is an outcome of nature, mothers, families, communities and behaviors in a complex, dynamic, and highly interrelated system-of-systems. ---MJS, IBM



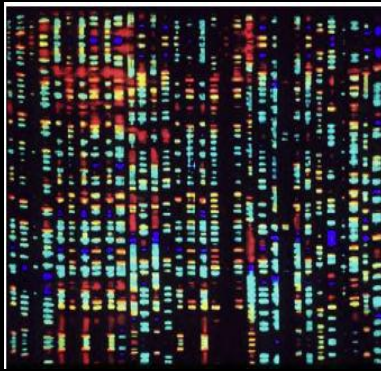
Source: IBM IBV analysis based on OECD

Health is an outcome of “exposures” and behavior in complex systems



Health is Complex, Continuous, Dynamic

“...the EXPOSOME encompasses life-course environmental exposures (including lifestyle factors), from the prenatal period onwards...” C.P. Wild



Genome



Exposome

Together these lead to whether health is promoted or Injury, disease or impairment occurs



In utero...



In childhood



In adolescence...

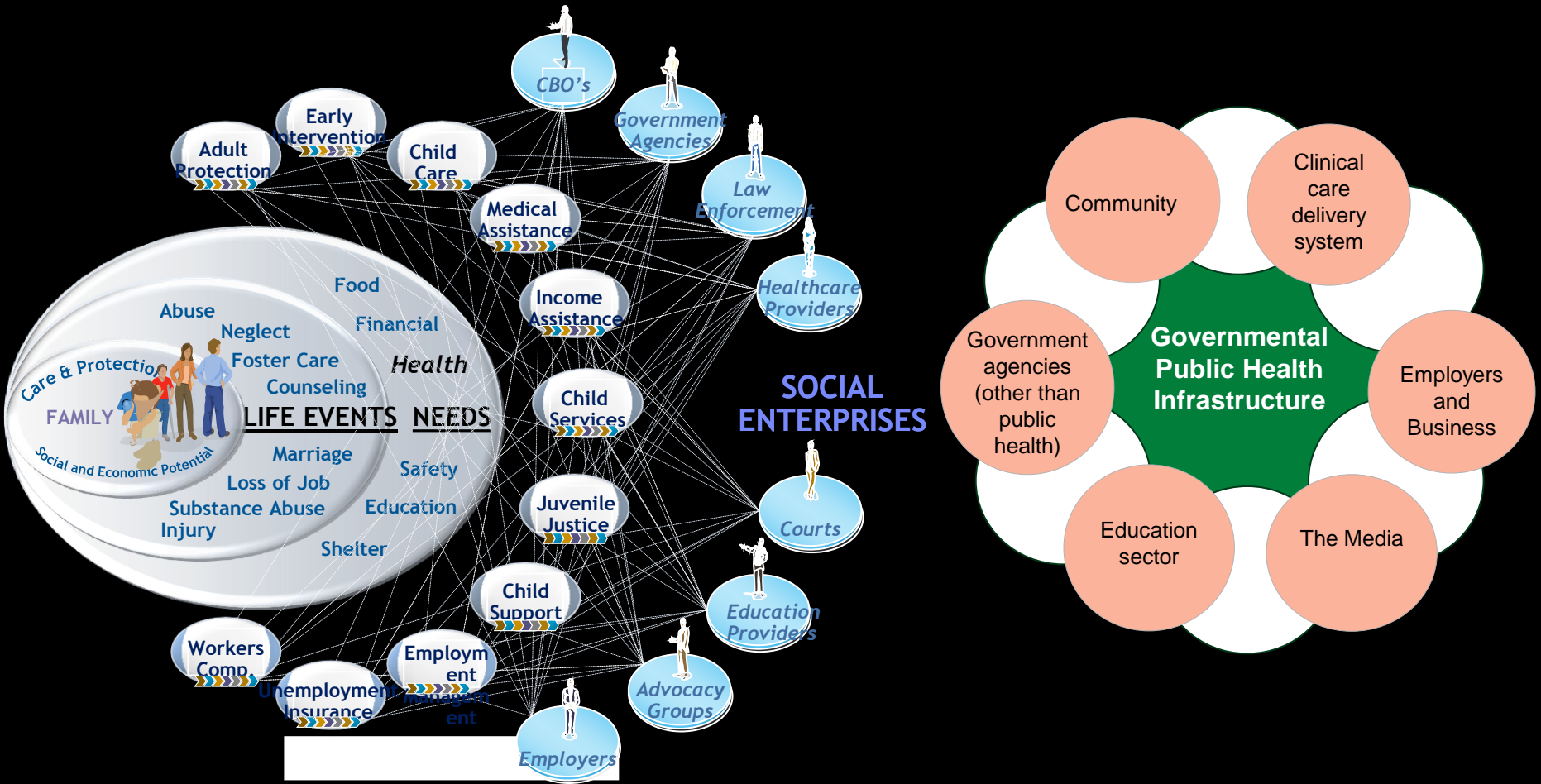


In adulthood...



In old age...

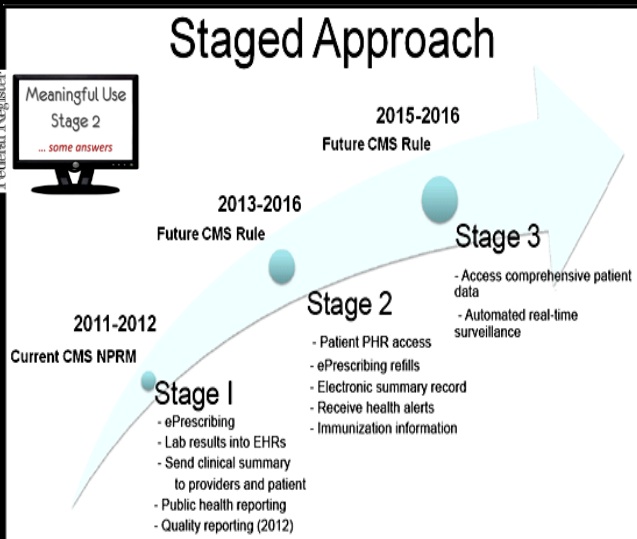
Systems Integrator



Health Care Transformation



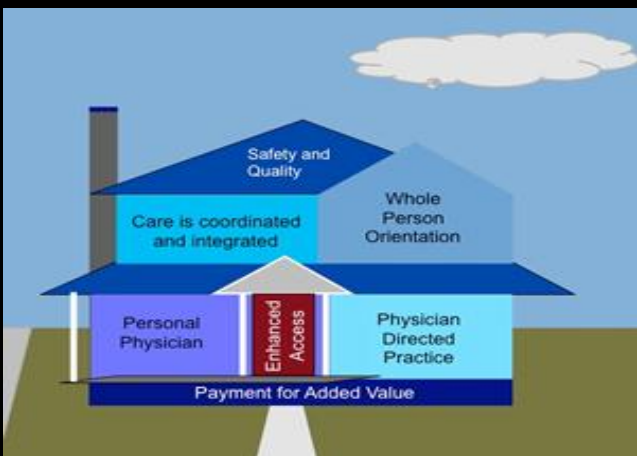
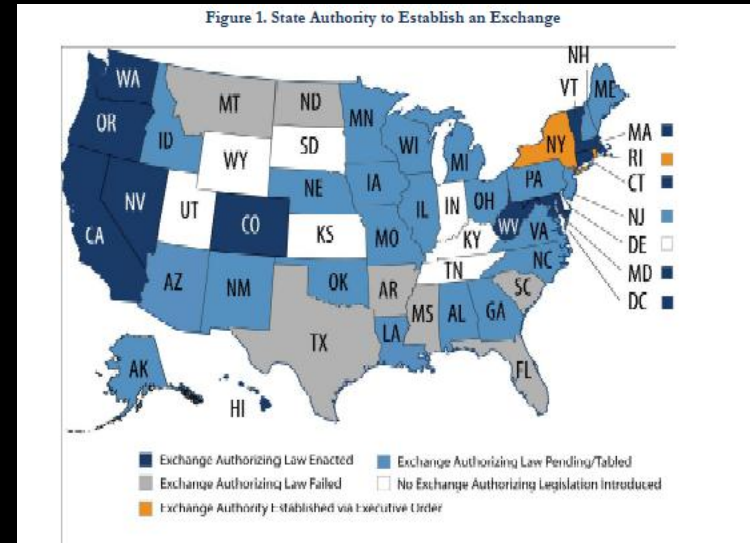
Data & Information



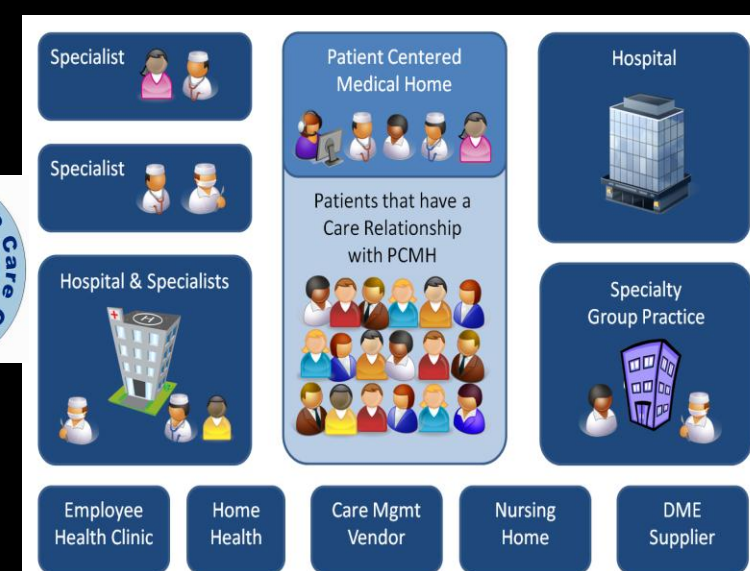
Finances



Health Exchanges



Delivery System



On site clinics



Top Reasons for On-Ste Clinics

- 1- 62% Enhance worker productivity
- 2- 56% Reduce medical costs
- 3- 52% Create center to integrate all health productivity efforts
- 4- 38% Improve access to care
- 5- 32% Occupational health and safety

Top Services Provided @On-Site Clinics

- 1- 88% Occupational health
- 2- 61% Health improvement
- 3- 38% Primary care
- 4- 35% Chronic care management
- 5- 30% Employee assistance programs

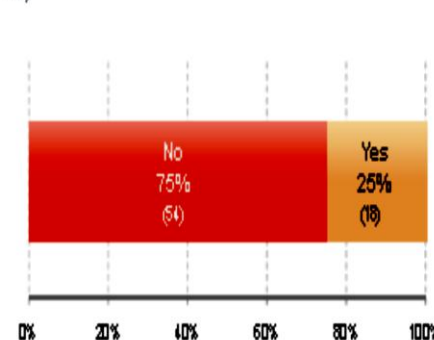


“Person-centric”
“Technology leveraged”
“Frictionless”
“Redefined experience”



Figure 1: Prevalence of On-Site Clinics

"Do you currently offer an on-site health clinic for your employees at one or more of your locations?" (n=72)



Retail Clinics

From

Services

- Immunizations
- acute non-urgent care: URI, UTI, allergy
- Exams: well exams

To

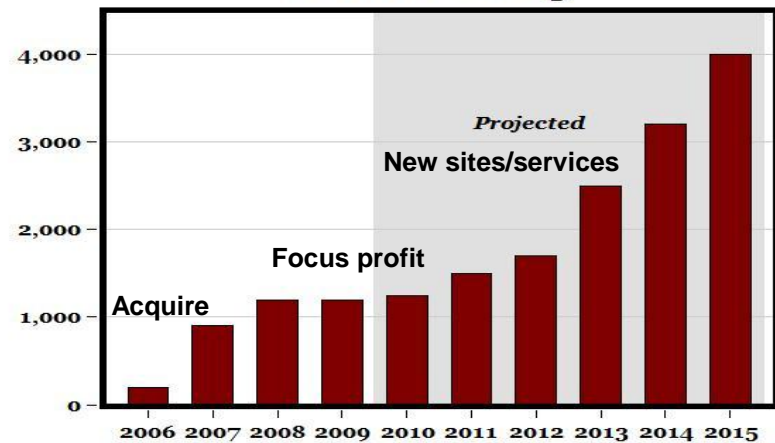


Same Services Plus

- Other preventive services
- Exams: follow up
- Chronic care management
- Rx adherence, management support
- Health coaching
- Corporate wellness services
- On site services: pharmacy, clinical
- Telemedicine



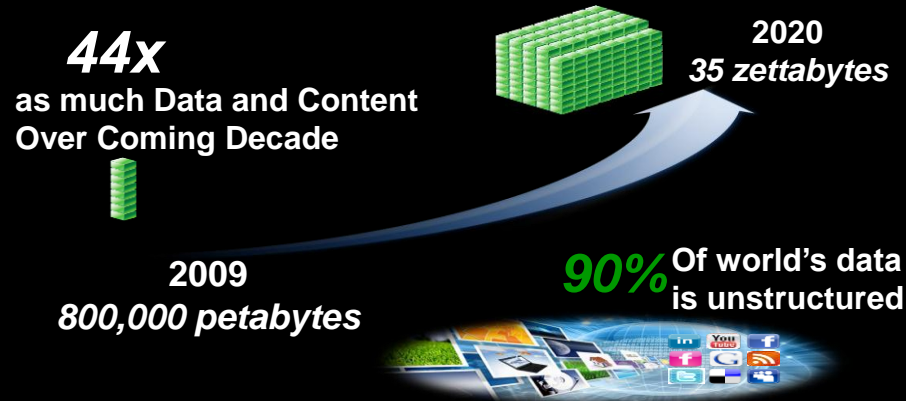
Retail Clinics in the U.S. 2006-2015



Source: Merchant Medicine

What is Big Data?

Everyday, we produce 2.5 Quintillion bytes of data...from sensors, social media, transactional data, etc.



Volume

Data at Rest
Terabytes to Exabytes of
existing data to process

Velocity

Data in Motion
Streaming data, milliseconds
to seconds to respond

Variety

Data in Many Forms
Structured, unstructured,
text, multimedia

Veracity

Data in Doubt
Uncertainty due to
inconsistency &
incompleteness,
ambiguities, latency, model
approximations

Instrumentation, Interconnected, Intelligent



SenseCam

- Vicon Revue
 - camera, accelerometer, temperature, infrared motion detector, compass
 - Takes about 5,500 photos per day
 - Pending: incorporation of GPS and Bluetooth



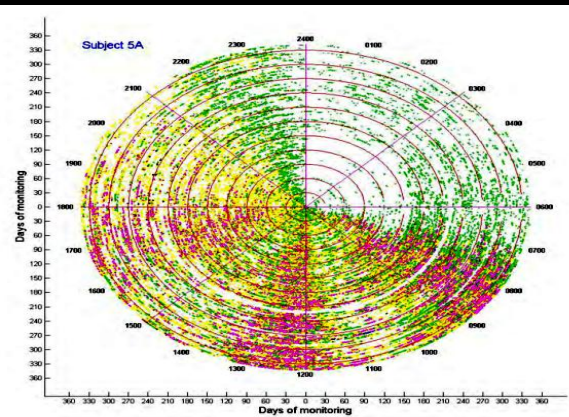
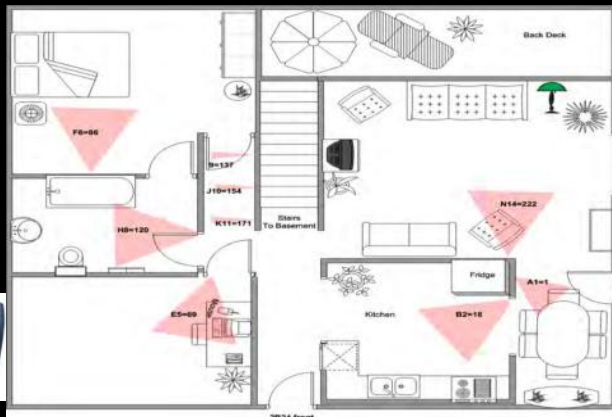
Wearable Chemical Sensor System

- Selective detection of VOCs (hydrocarbon and acid vapors)
Sensitive: ppb – ppm; Real-time: sec. – min.
Spatially resolved; wearable: cell phone size
Nongjian Tao, Arizona State University: www.airnow.gov
Cell phone based interface



Activity Monitoring in the Home

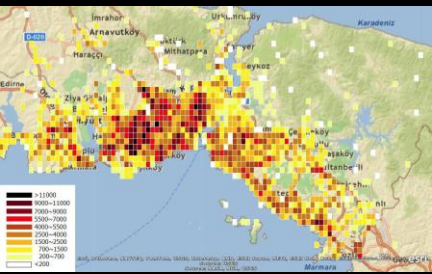
- Behavioral models = Continuous monitoring + Computational modeling



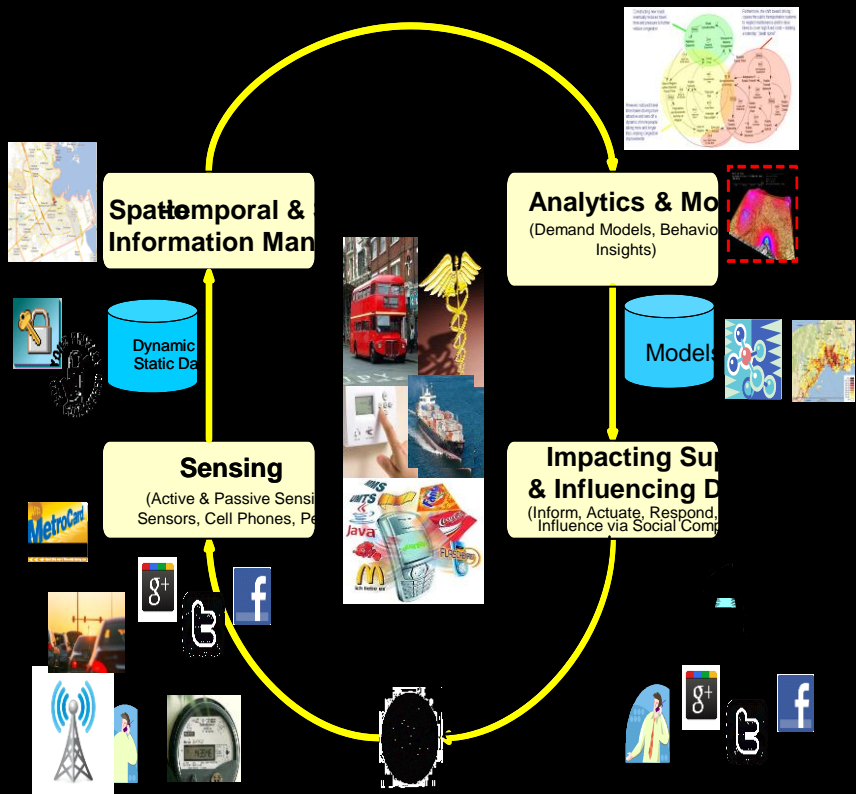
Cell levels evening commute

- Bedroom
- Bathroom
- Living room
- Front Door
- Kitchen

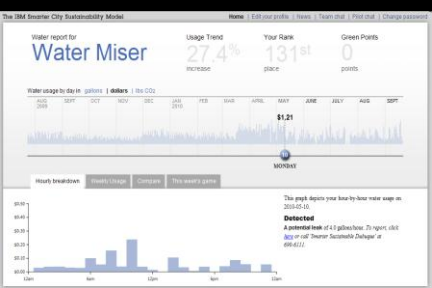
Smart Cities Dubuque Iowa



City in Motion: Making sense of billions of telco events in conjunction with transportation data



Citizen Engagement Platform: Coupling social profiles (Lotus Connections) with Spatial data (IOC) in a 2-way city-citizen communication platform



Smart Water Meter Analytics: Analyzing smart meter data for leaks, anomalies, and consumption patterns

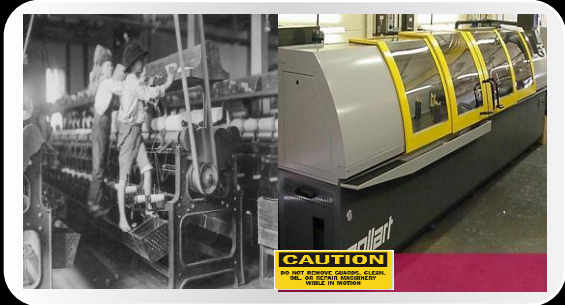


Smart Electric Meter Analytics: Analyzing smart meter data for anomalies, and consumption patterns and sharing information

From Worker To Citizen Health

Citizen-focused

Workplace-focused
Industrial Medicine
IH & Safety



- **What happened?**
- When and where?
- How much?

Worker-focused
Occupational &
Environmental Health



- **What will happen?**
- What will the impact be?
- How to prevent adverse outcomes?
- What is the value?



- **What is the best choice?**
- What are the relevant dynamics?
- How to change other systems?

Value and Sustainability Migration

Incidents
Case Reporting

- **Occupational deaths, accidents, injuries**
- Procedures, processes, inspection, audits, penalties
- Physical, chemical exposure controls
- Basic reporting, spreadsheets

Teams, Quality
Data integration

- **Work Organization**
- Quality improvement
- Teams
- H&S Management Systems
- Dashboards: targets, objectives
- Clinical data repositories
- Departmental data marts

Engagement,
Activation, Analytics

- **Non-Occ. illness and injury**
- **Preventive services**
- Health risk assessments
- Disability, case management, health care costs
- Outcomes, ROI, predictive analytics

Systems & Communities
Complexity Science

- **Exposome**
- Health care delivery system
- Physical and built environment
- Multi-sectoral, PPP's
- Life Course