

# Small Data and Big Ideas: Lake Nona and Learning Health System

Ralph I Horwitz

May 12, 2014

# Roundtable Charter

“We seek the development of a **learning health system** in which science, informatics, incentives, and culture are aligned for continuous improvement and innovation—with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral by-product of the delivery experience.”

- **“Digital health data are the lifeblood of a continuous learning health system...”**

**- IOM, 2012**

# Big Data in Learning Health System

- Insurance claims
  - Pharmacy utilization
  - EHR
  - Care management systems
- (data typically distant from patient)

# Building Learning Health System

- System focus and big data
- Individual focus and small data

# Small Data in Learning Health System

- Mobile devices
- Email/social media
- Consumer purchases
- Biometric sensors
- Deep sequencing and -omics  
(typically close to the individual)

# Challenges

- Standardization vs personalization
- RCTs vs Observational Research
- Integration of Biology and Biography
- Scientific Inference

# Individual vs. Population Thinking

“...A great surgeon performs operations for stone; later he makes a statistical summary...and concludes from these statistics that the mortality law for this operation is two out of five. Well, I say this ratio means literally nothing scientifically...What should be done, instead of gathering facts empirically, is to study them more accurately, each in its special determinism. We must study cases of death with great care and try to discover in them the cause of mortal accidents so as to master the cause and avoid the accident.”

- Claude Bernard  
(1813-1878)





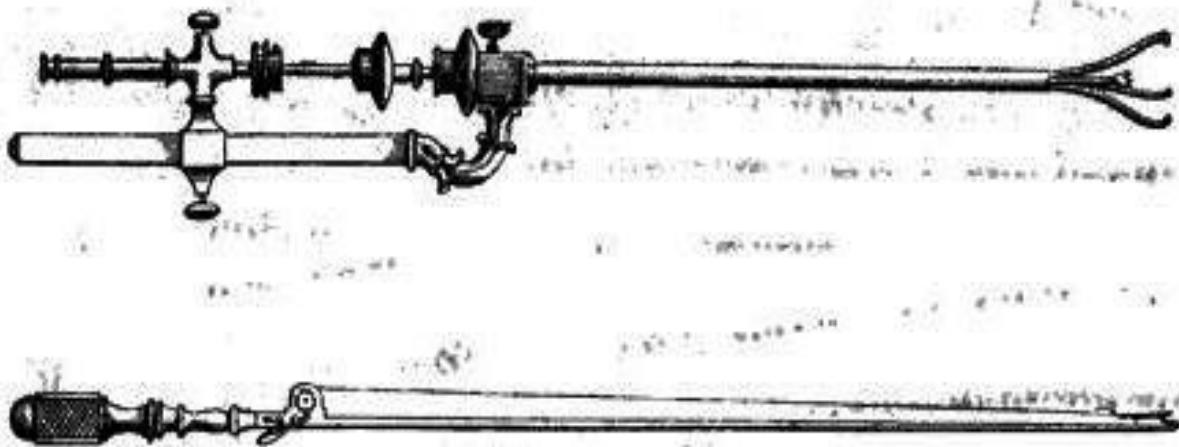


Fig. 2.

**Statistical (Wo)Man**  
*(Individual vs. Average)*

1835, French surgeon  
(Jean Civiale)  
97% survival rate for  
new method of bladder  
stone removal vs. 78%  
for traditional method

# Individual vs. Population Thinking

“...A great surgeon performs operations for stone; later he makes a statistical summary...and concludes from these statistics that the mortality law for this operation is two out of five. Well, I say this ratio means literally nothing scientifically...What should be done, instead of gathering facts empirically, is to study them more accurately, each in its special determinism. We must study cases of death with great care and try to discover in them the cause of mortal accidents so as to master the cause and avoid the accident.”

- Claude Bernard  
(1813-1878)



Maurin  
d'après nature.

Lith. Delpech.

## **French Academy of Sciences and Simeon Poisson (1835)**

In statistical affairs...the first care...is to lose sight of the man...in order to consider him as only a fraction of a species. It is necessary to strip him of his individuality...to eliminate all accidental effects that individuality would have been able to introduce into the question...it is altogether different in the domain of medicine.

- Poisson

# Reconciling Bernard and Poisson

- Knowledge from small data not just statistical associations from big data
- Individual as unit of analysis
- Bridge between small and big data