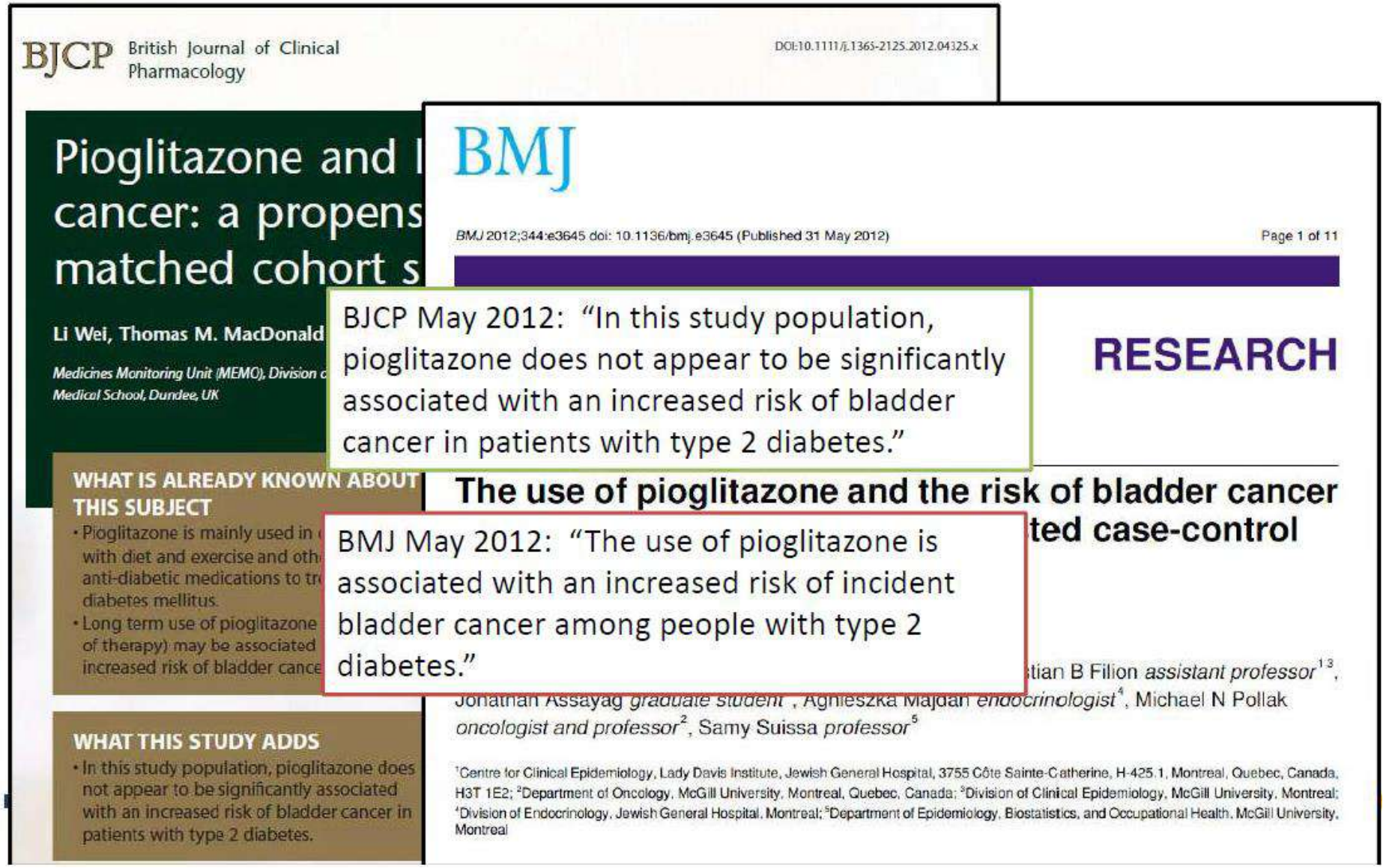
Social Determinants and EHR Data: Analytic Decision Support

Harold P. Lehmann MD PhD

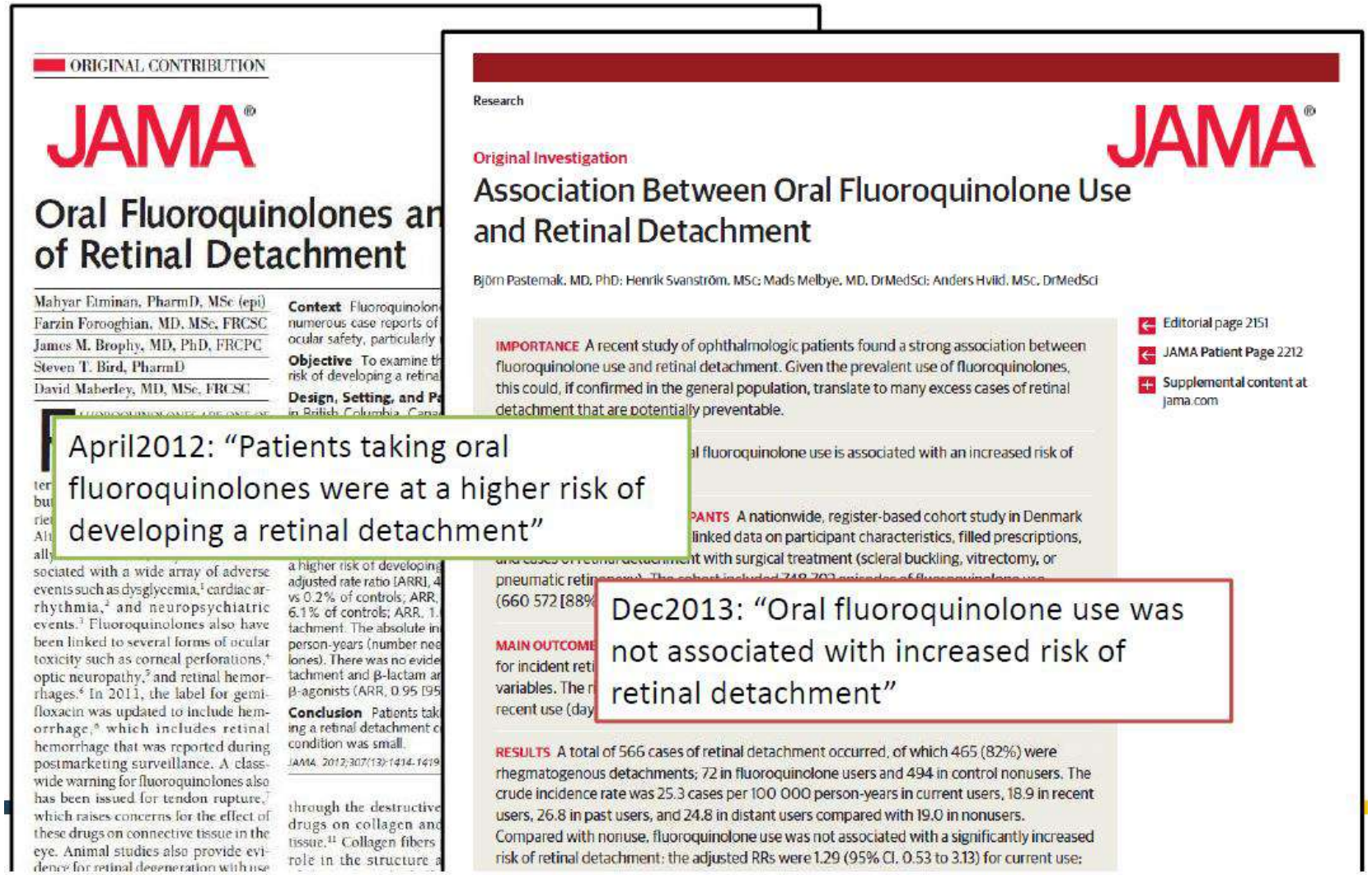
The PaTH Clinical Data Research Network

Patrick Ryan, Observational Health Data Sciences and Informatics (OHDSI) Overview, 5/14/14



Courtesy Kelly Gleason

Patrick Ryan, Observational Health Data Sciences and Informatics (OHDSI) Overview, 5/14/14



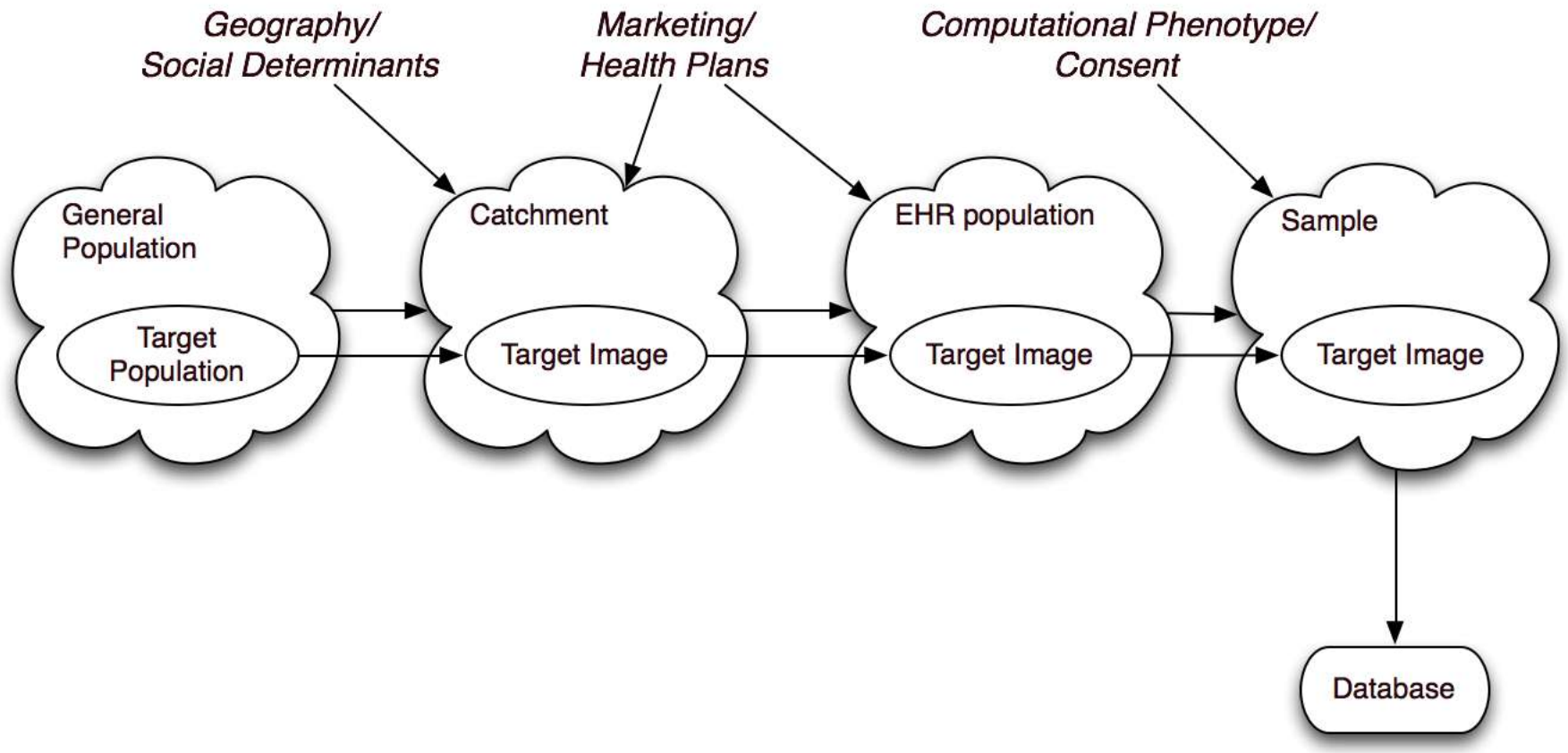
Courtesy Kelly Gleason

Challenge

> How do I convince hard-boiled researchers that our results are as trustworthy and believable as the best epidemiological data?
>
> ➢ Dan Ford

http://skepticwiki.org/

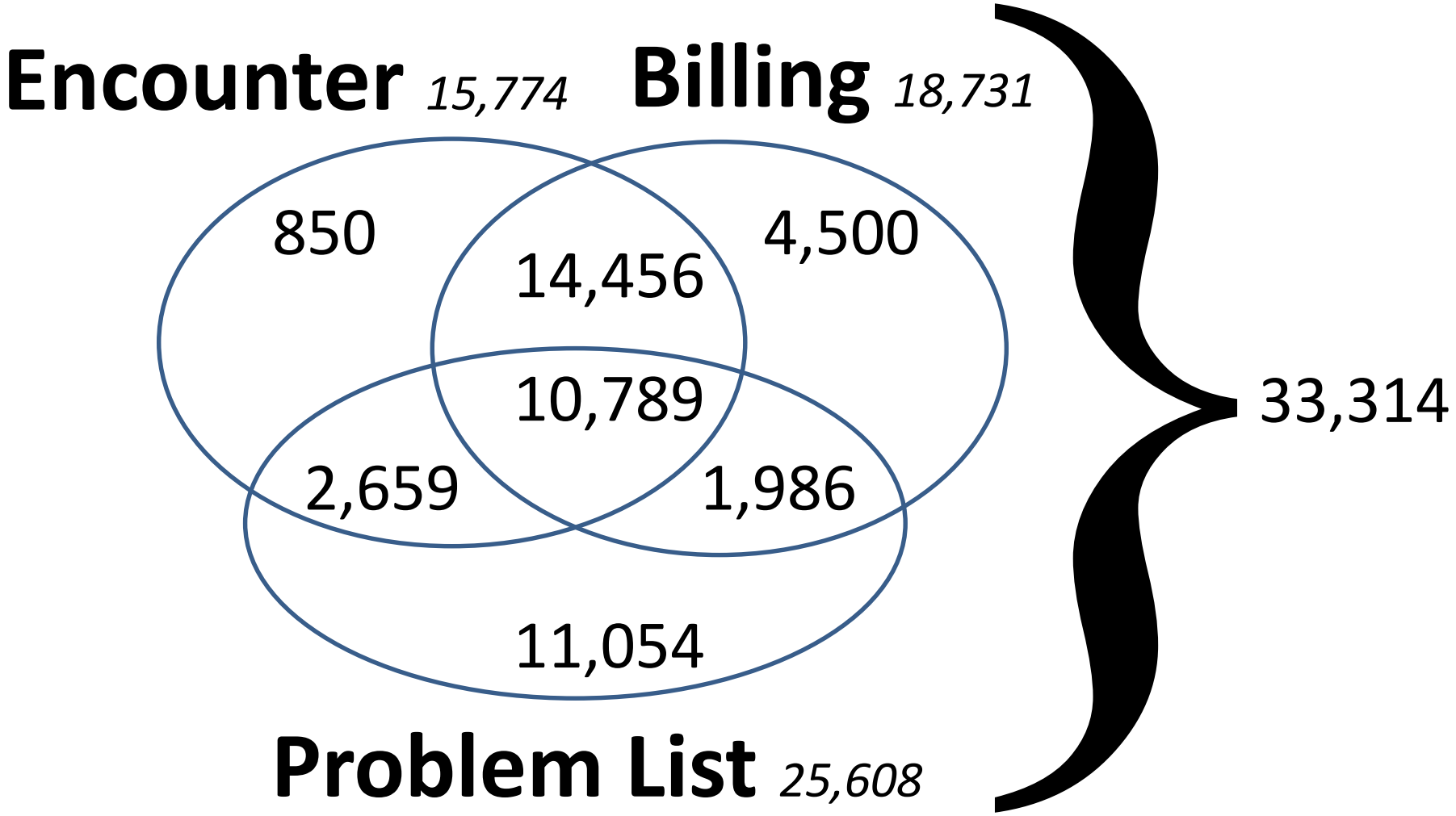
Where's the Population?



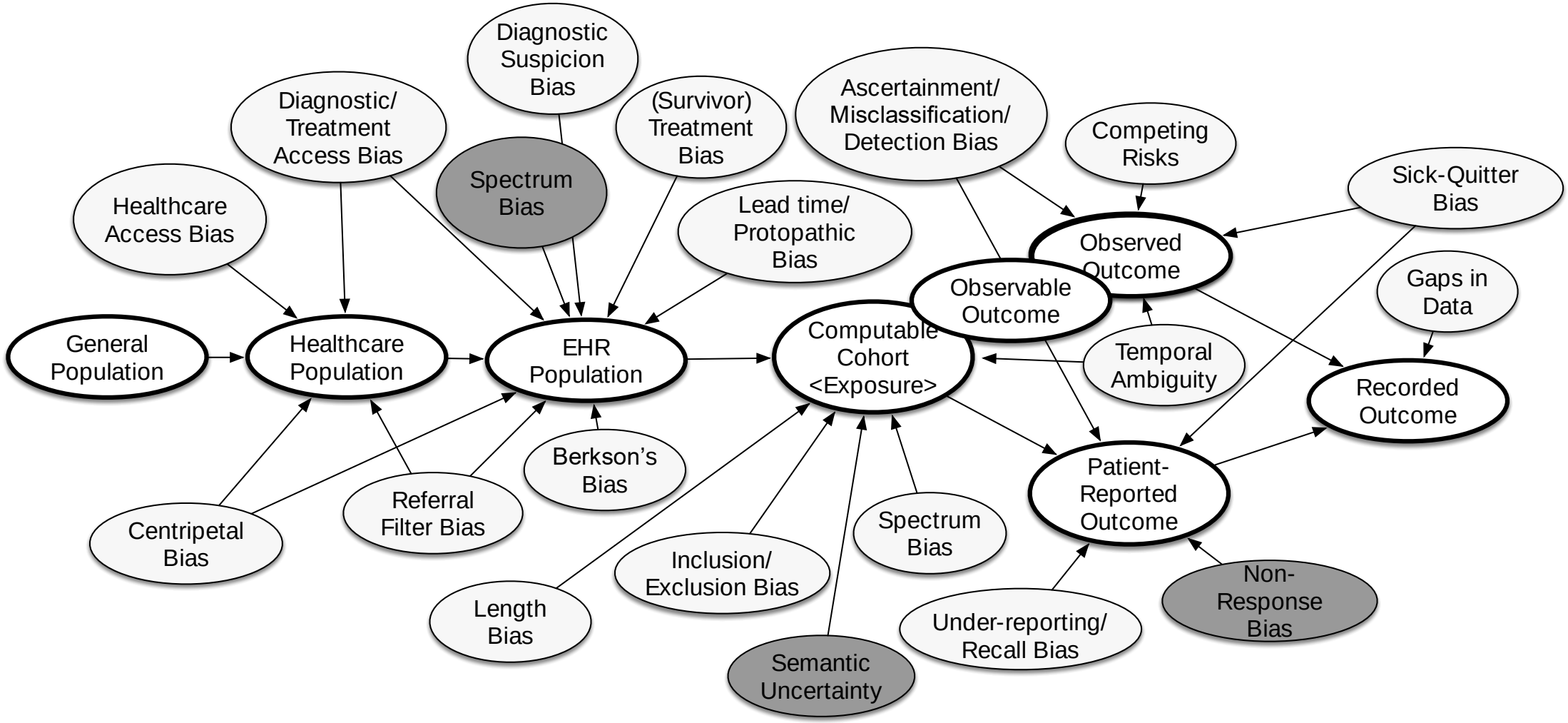
Sen A, et al. GIST 2.0: A scalable multi-trait metric for quantifying population representativeness of individual clinical studies. J Biomed Inform. 2016 Oct;63:325-336.

What's the "diagnosis"? The case atrial fibrillation

- Do all the fields with the same name mean the same thing?

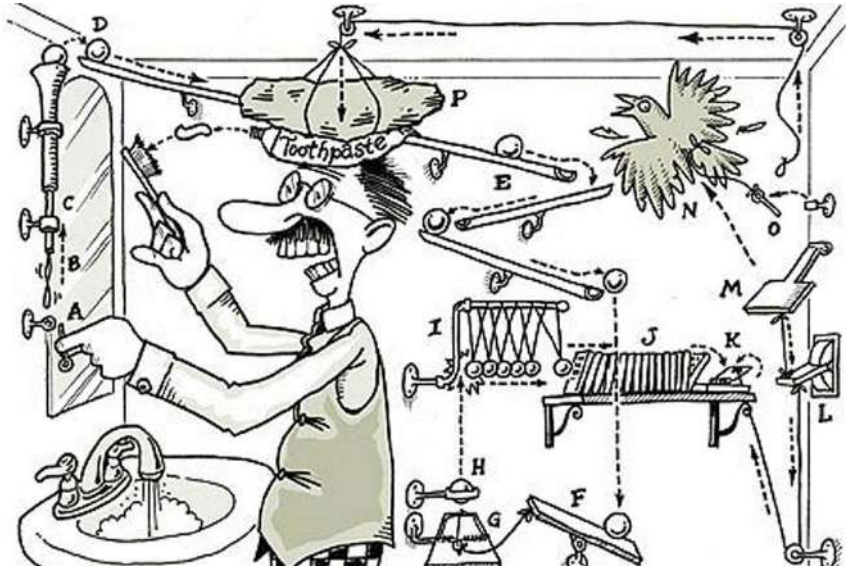


Some Potential Biases



Amateur Analysts

- Too many analysts to train them all at the level we want
  - MACRA, eCQM, Pop Health, PMI, …
- Analyses are the most complicated
- No funds for proper statistical analysis
- Statistical-analytic decision support is needed
- We need to convert methodological knowledge into computer-readable form



Rube Goldberg

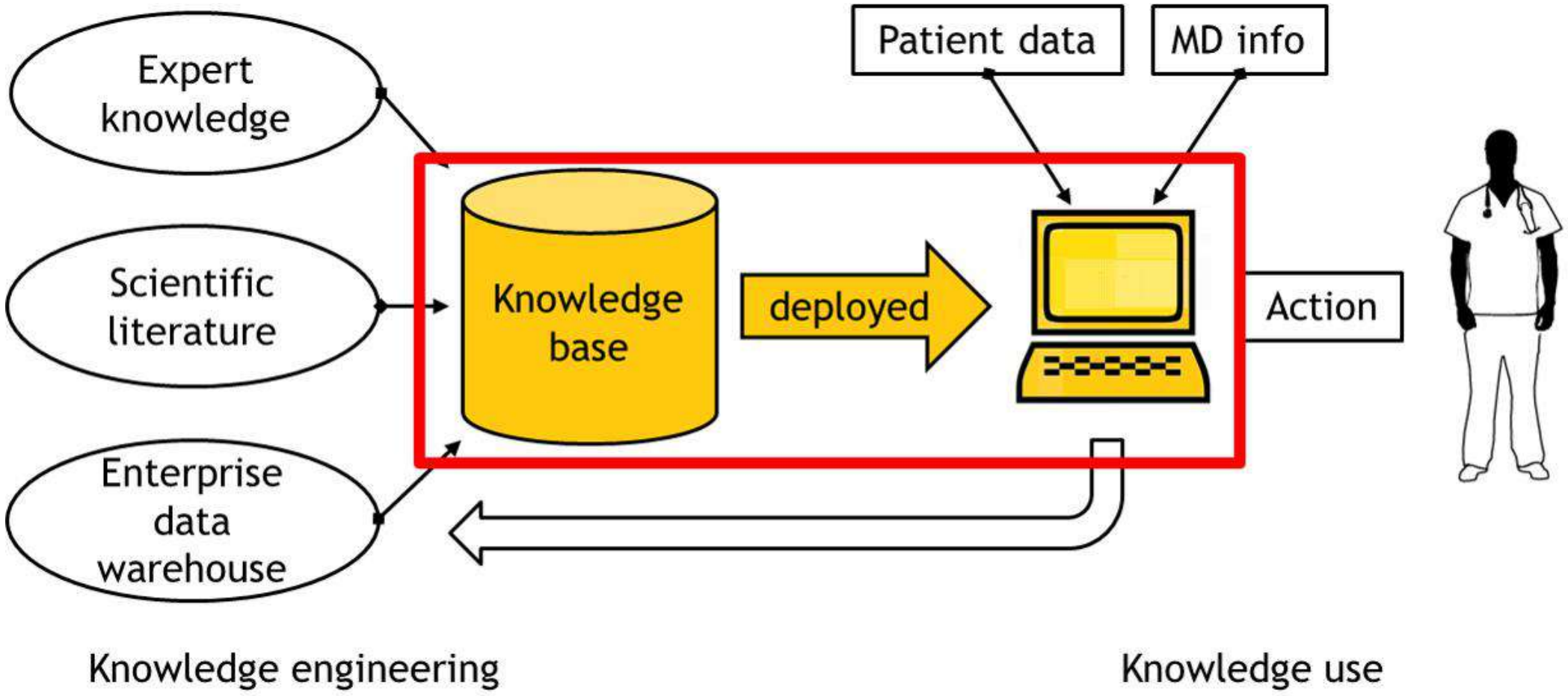
Workforce

"According to the McKinsey report, the United States will need an additional 140,000 to 190,000 data science experts with "deep analytical skills," plus 1.5 million managers capable of using data analytics in decision making.

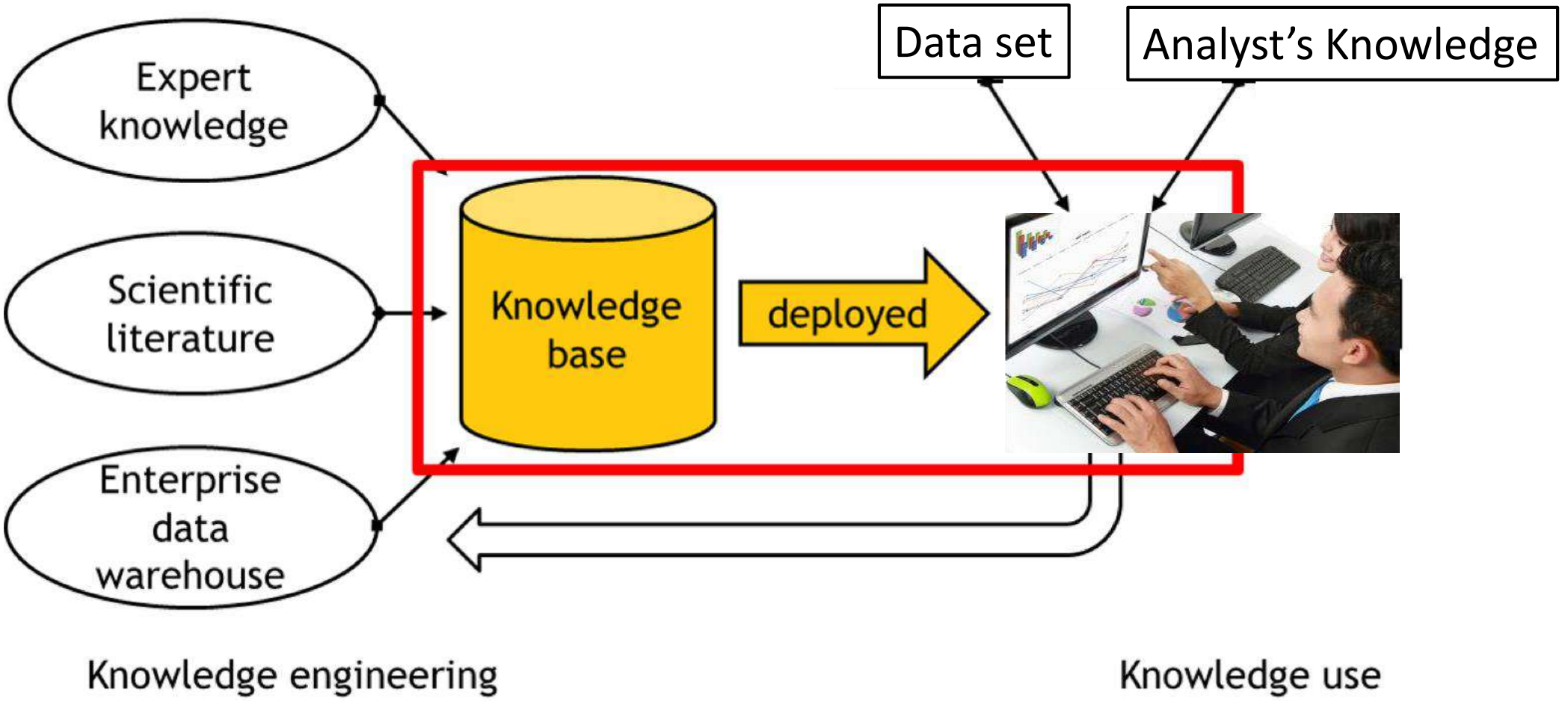
BHEF Issue Brief . 2014
http://files.eric.ed.gov/fulltext/ED559640.pdf

klipd.com

Decision Support Cycle



Decision Support Cycle



Intelligent Assistance and Data Analysis

“By 1995 or so, the largest single driving force in guiding general work on data analysis and statistics [will be] to understand and improve data-analytic expert systems…”

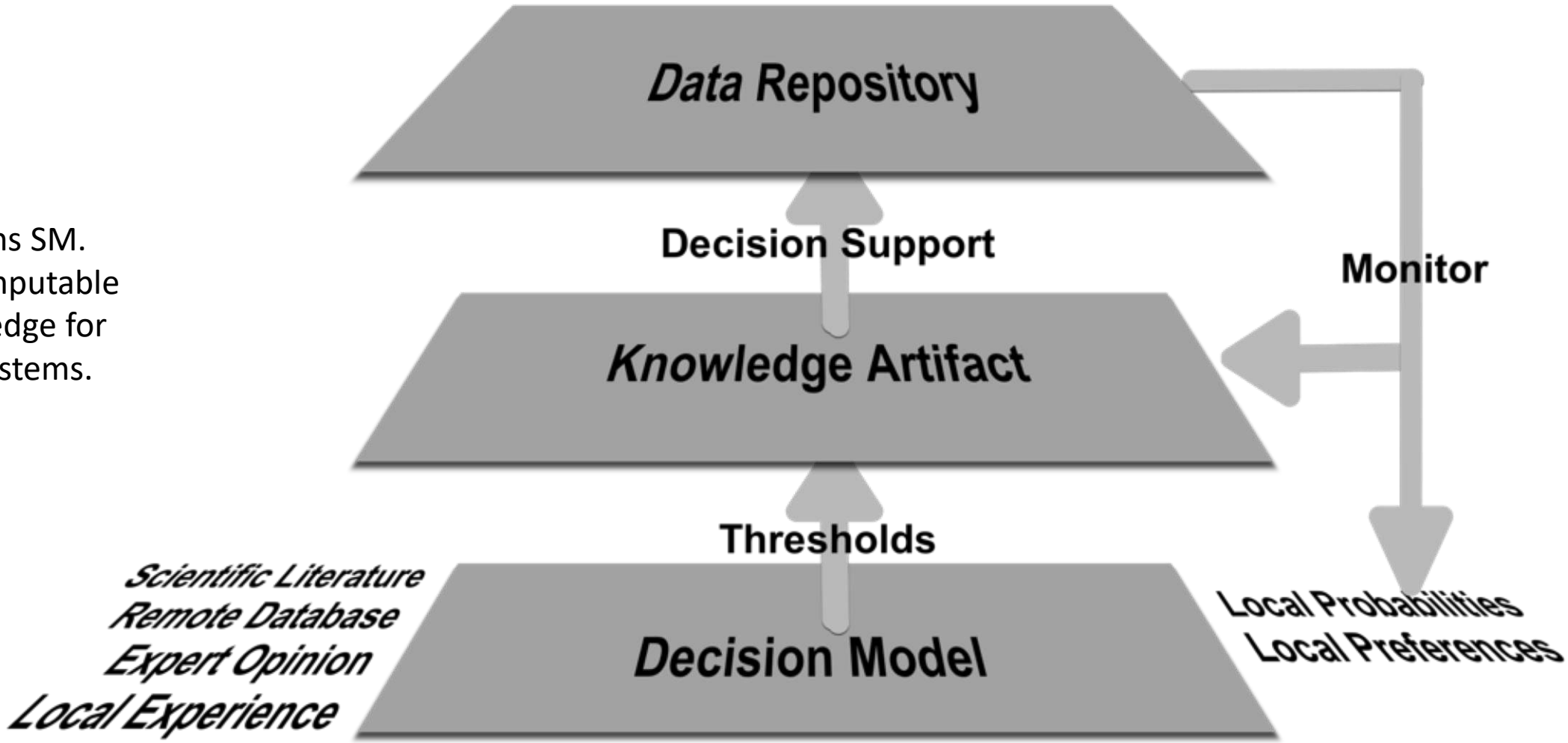
- John Tukey, 1986

Early History

- 1983: Nedler: Front-end system (for GLIM)
- 1984: Gale, Pregiborn: REX: Advise on linear regression
- 1985: Hahn defines levels of intelligence: simple computerized answering→automated statistical consulting
- 1988: Duijsens: PRINCE helps naïve users formulate analysis options
- 1988: Oldford & Peters: DINDE: graphical environment tracks steps
- 1989: Chowdury: MAXITAB for inexperienced users for data analysis and interpretation
- 1994: Silvers et al.: PROPHET: Beyond Anova
- Silvers, 1994

Knowledge Cycle

Lehmann HP, Downs SM. Desiderata for Computable Biomedical Knowledge for Learning Health Systems. Learn Heal Syst. 2018;e10065:1–9.

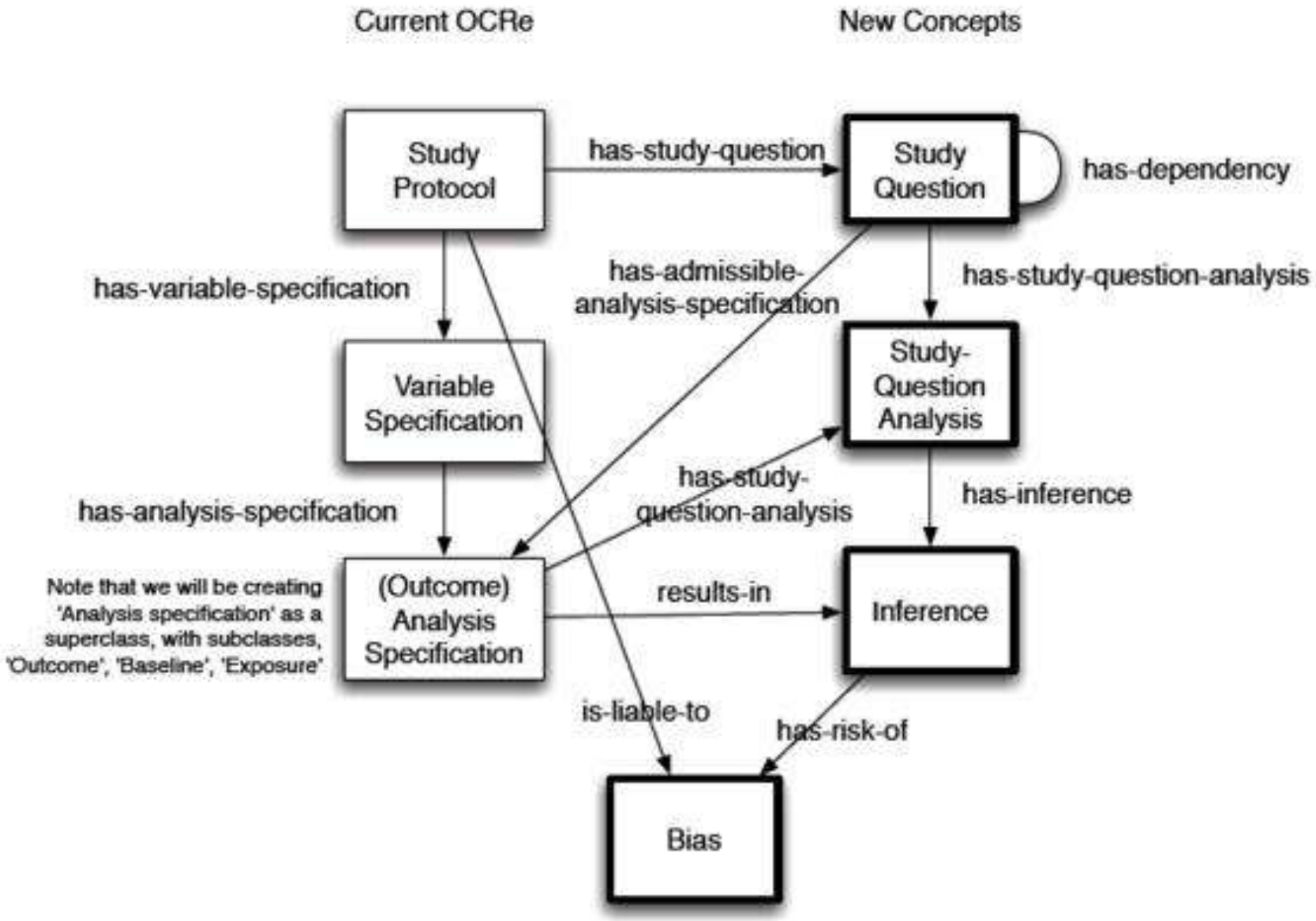


Desiderata for Computable Biomedical Knowledge for Learning Health Systems

Lehmann HP, Downs SM. Desiderata for Computable Biomedical Knowledge for Learning Health Systems. Learn Heal Syst. 2018;e10065:1–9.

Desiderata	Development Work to Be Done
1. Discrimination	• Measures that take clinical thresholds into account[70,71] • Elicitation and articulation of those thresholds • Methods for recalculating local discrimination
2. Local Recalibration	• Application of calibration based on thresholds[17]
3. Thresholds & Local Preferences	• Elicitation, articulation of preferences • Local calculation of thresholds
4. Explanation	• Deployment
5. Monitoring	• Choose variables based on value of information[72]
6. Debiasing	• Creation and curation of debiasing models • Application of debiasing models
7. Generalizability	• Calculation of distance[62] • Adding to the Knowledge Artifact the meta data required to choose the calculation
8. Semantic Uncertainty	• Derivation of the epistemic confidence interval
9. Findable	• Articulation of the full ontology required to index a Knowledge Artifact at all its multiple levels • Tagging KO with that ontology
10. Other Commandments as necessary and proper	• Continuous monitoring and improvement of these desiderata

Ontology for Biases: Extensions to OCRe



H Lehmann, T Darden, G Williams. 2014. Unpublished.

To Do

- Methodology for the analysts
- Knowledge tools to store the knowledge
- Knowledge tools to apply the knowledge
- Combine JH/PaTH/Israeli expertise