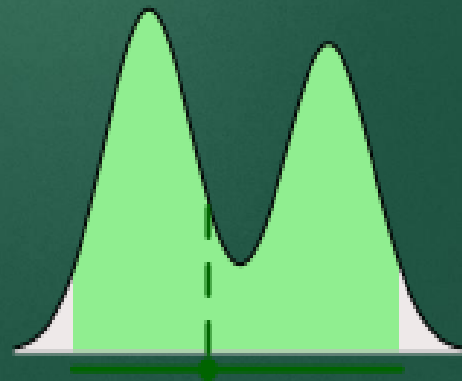
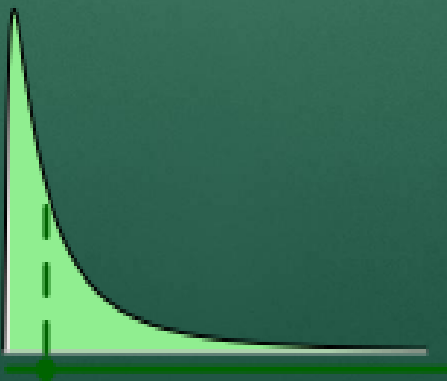
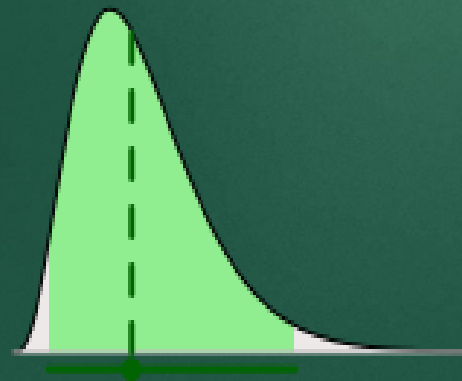
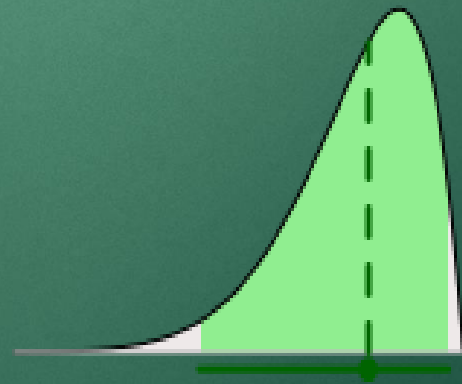
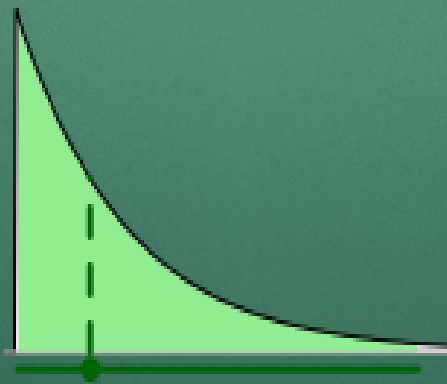
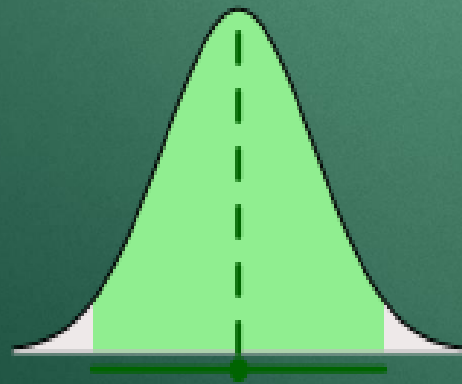


Outcomes Variation and Healthcare Evolution ICHOM

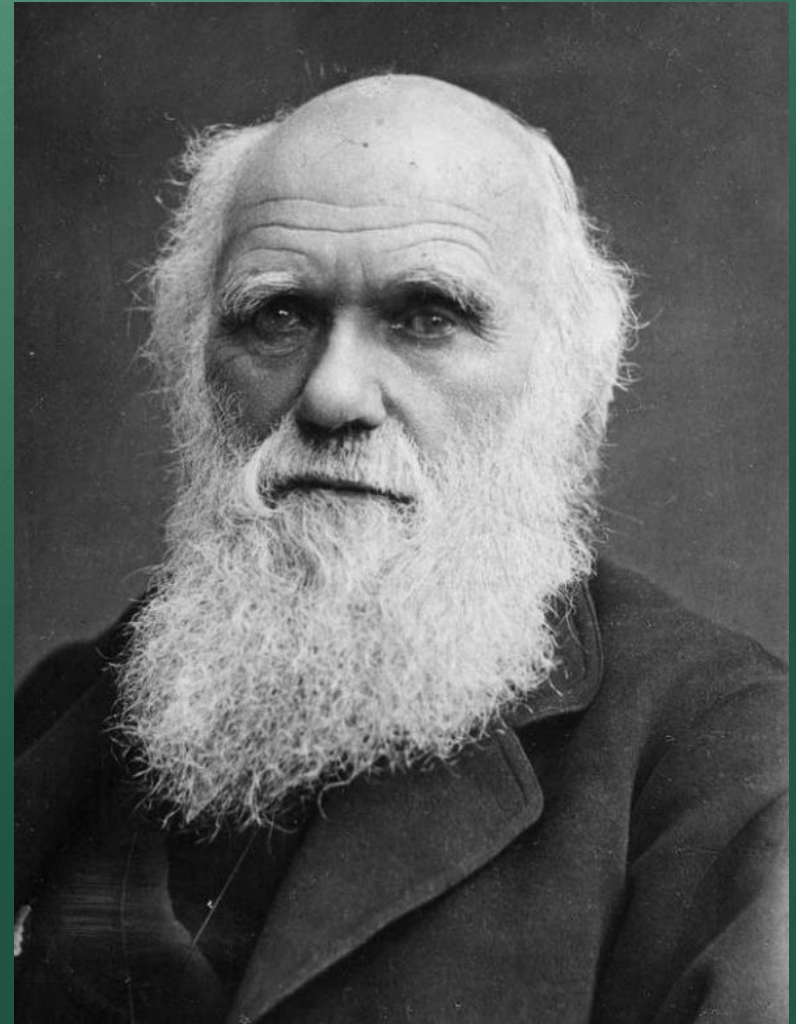
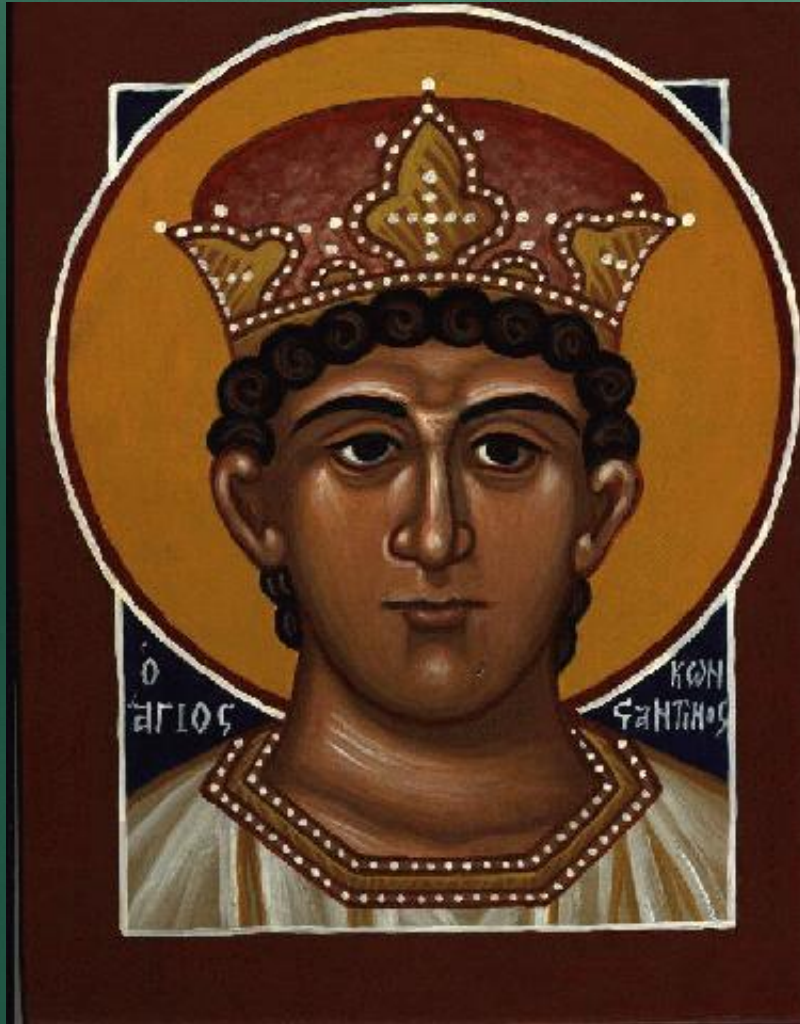
May 16, 2016

BCG

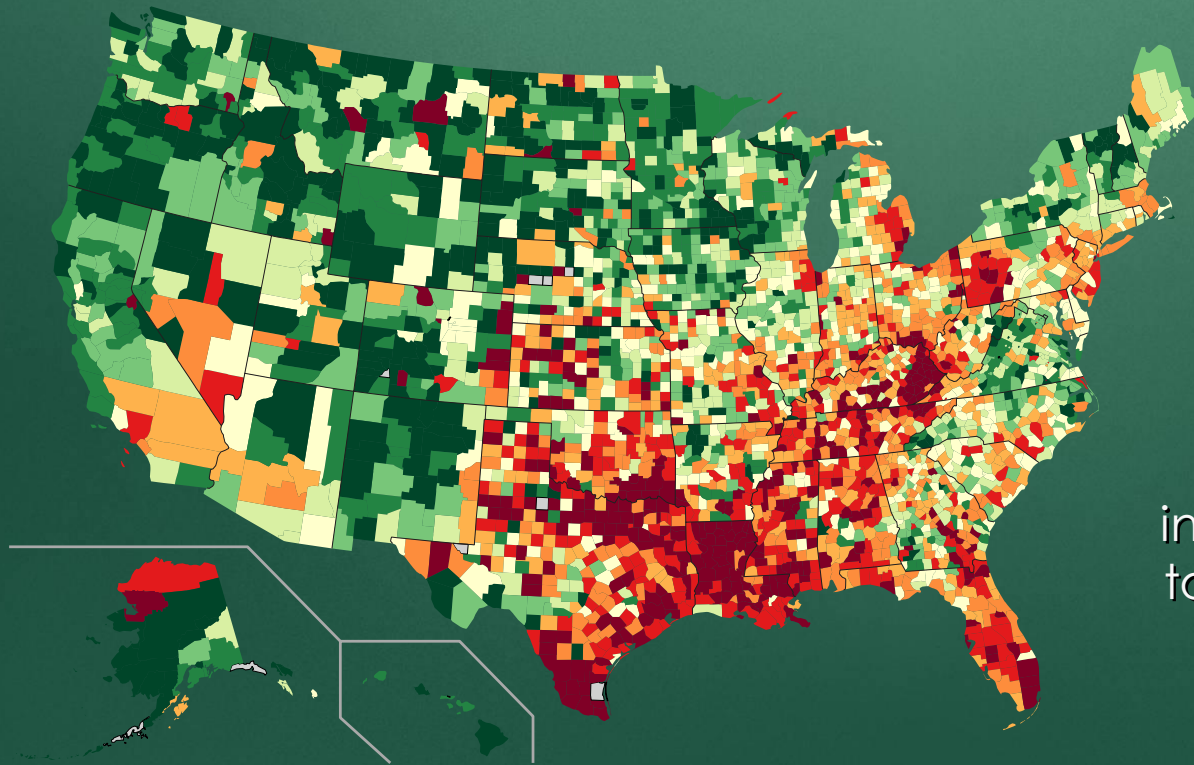
THE BOSTON CONSULTING GROUP



Variation - Friend or Foe



Variation in Procedures and Health Care Spend



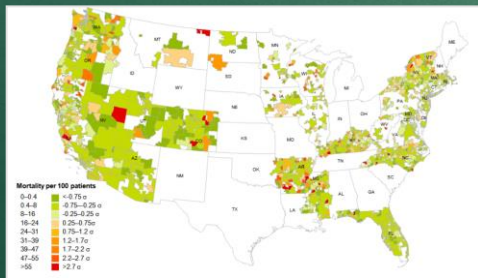
1.7x

in cost variation between
top 10% and bottom 10%
Hospital Service Areas

Note: difference in life expectancy is calculated by county life expectancy minus (A) OECD median or (B) U.S. mean for males and females.
Source: Institute for Health Metrics and Evaluation, World Health Organization Data Repository, Dartmouth Atlas

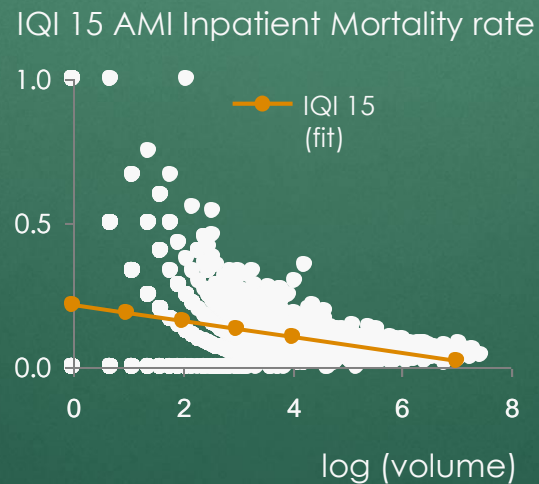
We examined variation in health outcomes

Collect raw data



Examine raw variation for 24 distinct AHRQ & NQF validated health outcomes for which geographically identifiable data is publically available (~50% of US)

Correct for low-volume noise



Correct for statistical noise by using a Bayesian shrinkage estimator, that leverages the strongly observed volume-outcome curve

Risk-adjustment

Population factors

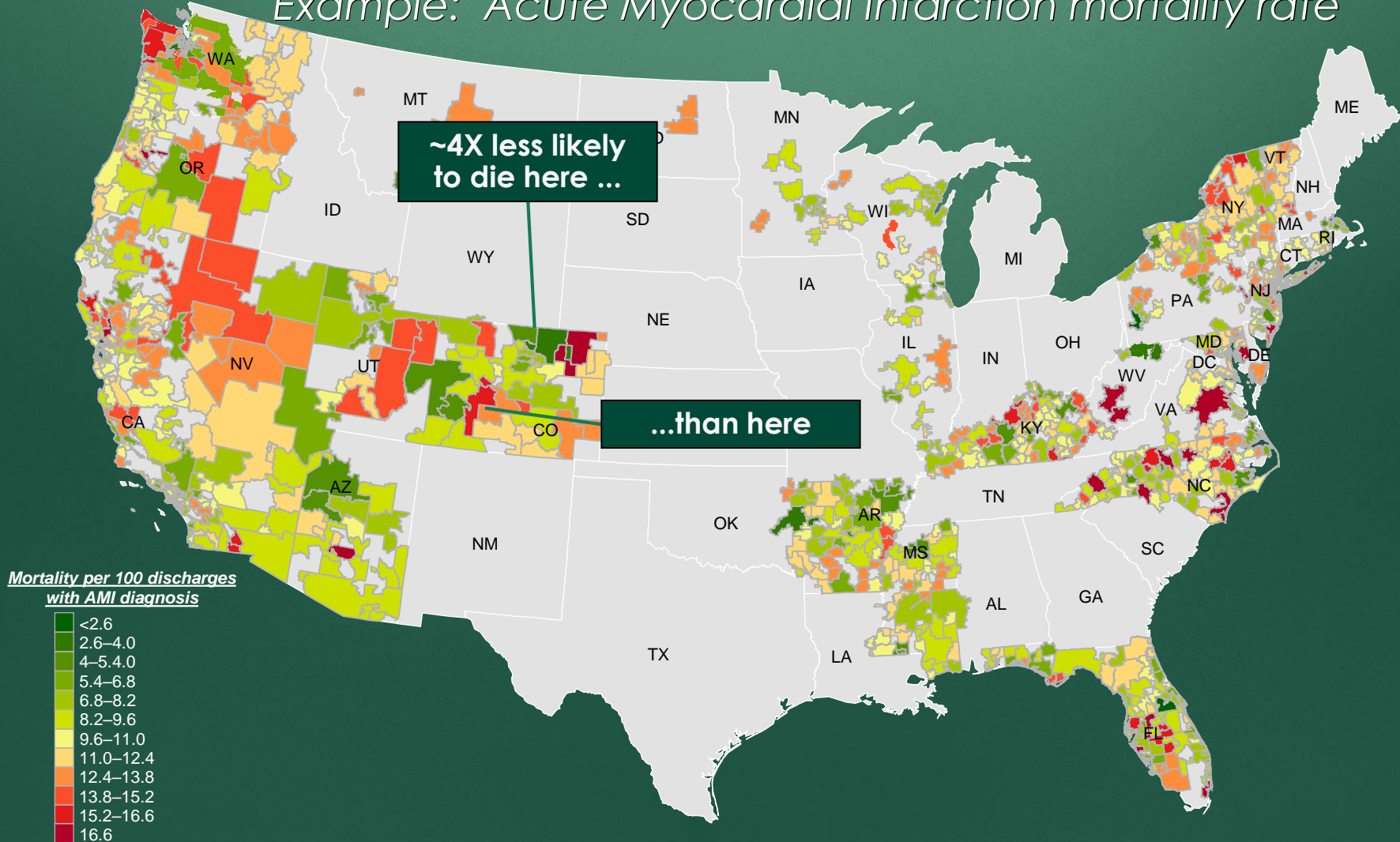
Co-morbidities

Health System factors

Step-by-step risk-adjustment considering nearly 100 distinct factors across population (demographic and socioeconomic), patient co-morbidities, and health system factors

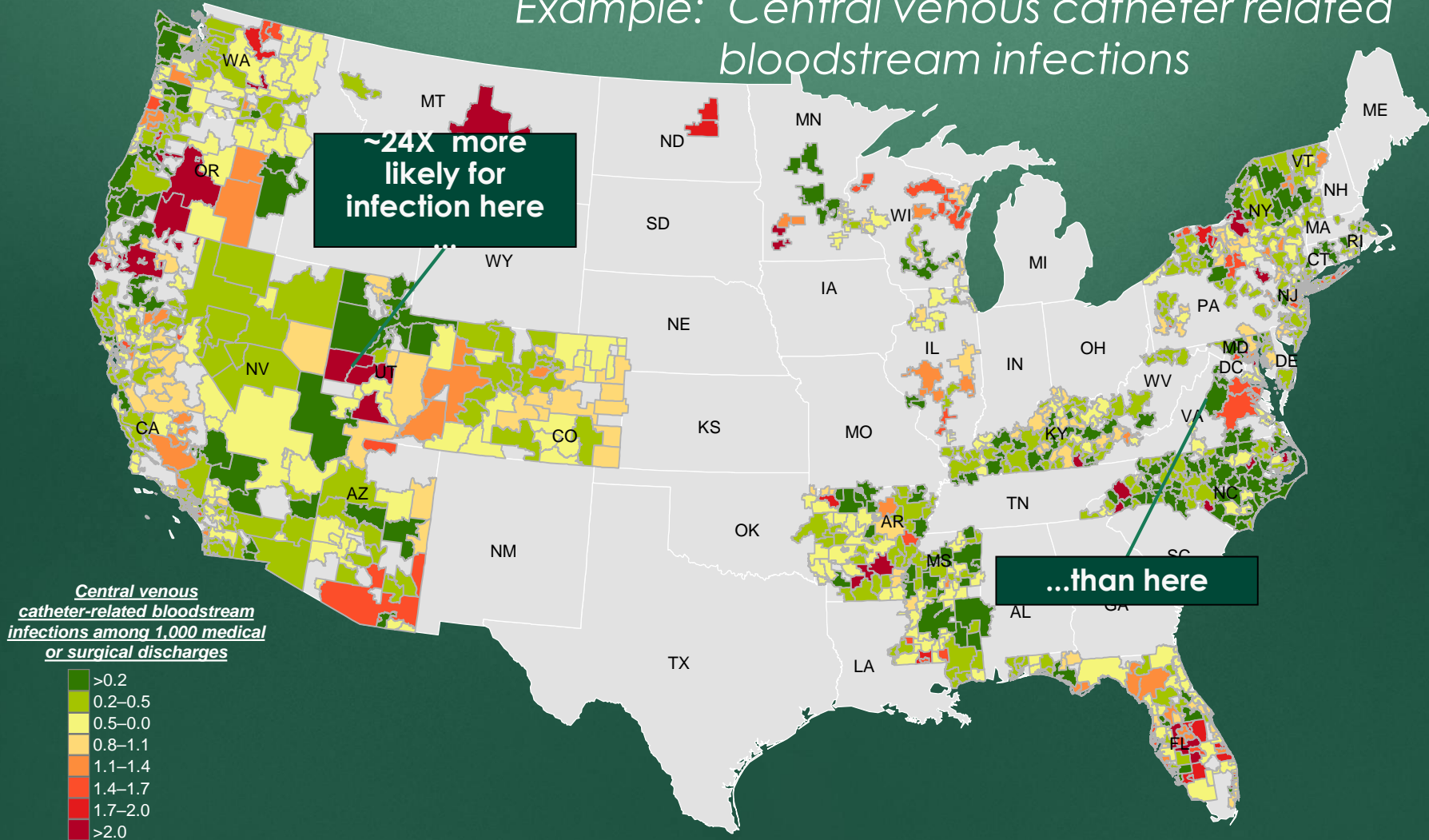
Outcome variability exceeded that of costs

Example: Acute Myocardial Infarction mortality rate



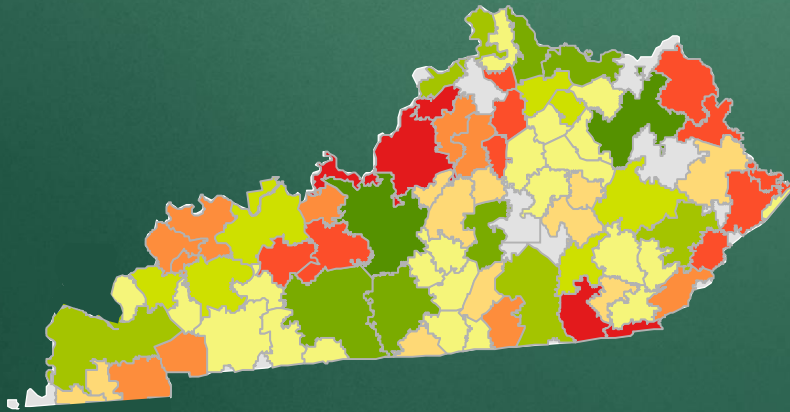
The outcome variability 2-61x across 24 metrics

Example: Central venous catheter related bloodstream infections

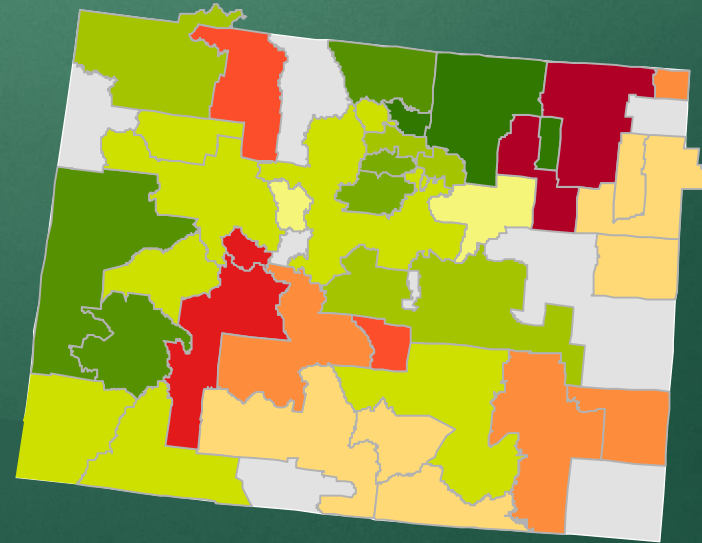


Adjusted AMI mortality rate variation

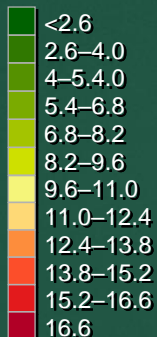
Kentucky



Colorado



Mortality per 100 discharges
with AMI diagnosis



In-hospital deaths per 100 hospital discharges with acute myocardial infarction (AMI) as a principal diagnosis for patients ages 18 years and

Outcomes variability exists between hospitals within individual metropolitan areas



New York City



Los Angeles



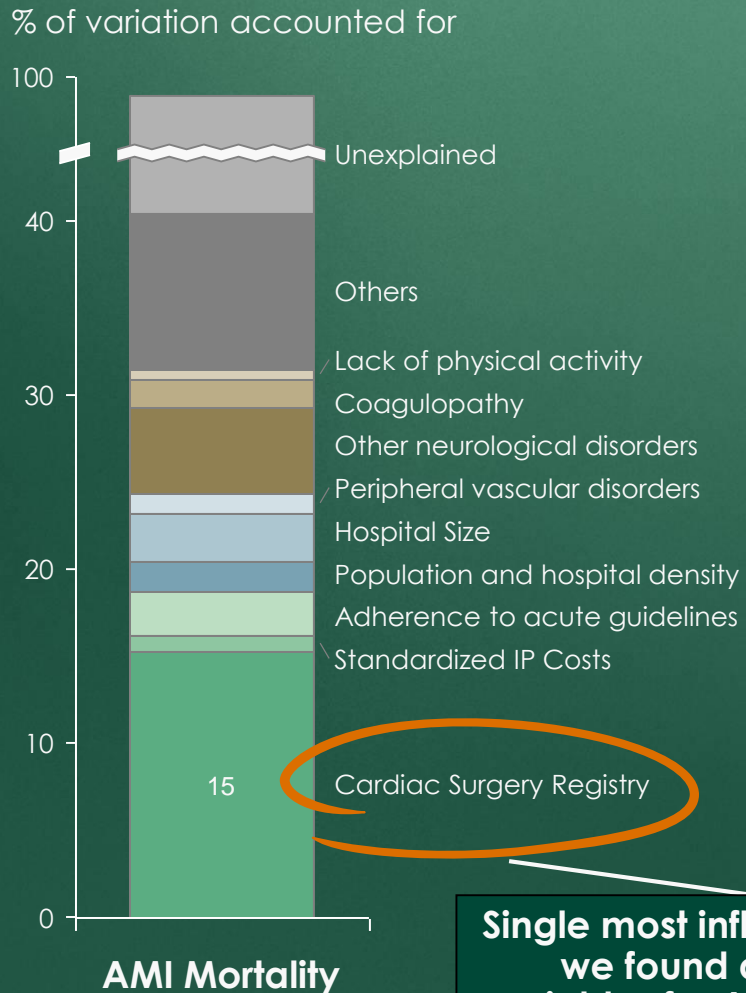
Denver



Hospitals	56	19	11
AMI Mortality Range	2 – 16%	1 – 16%	4 – 9%
CHF Mortality Range	1 – 7%	1 – 8%	1 – 6%
Pneumonia Mortality Range	2 – 8%	1 – 8%	2 – 6%

Choosing between hospitals in a city may result in substantially different health outcomes

Data transparency and quality improvement efforts can influence health outcomes



Society of Thoracic Surgeons (STS) registry has developed quality performance measures for cardiothoracic surgeons

STS National Database contains more than 5.8M surgical records; including more than 90% of all adult cardiac surgery centers in the US

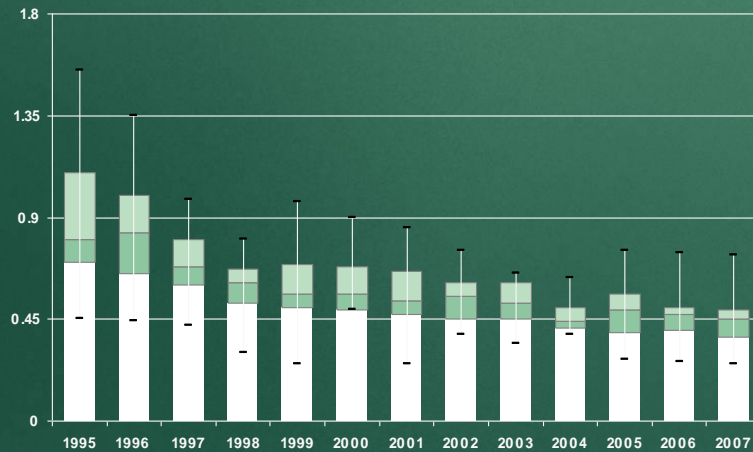
Fosters culture of quality and accountability, focus on evidence-based medicine

Single most influential variable we found across 200+ variables for AMI $p < 1.0 \times 10^{-32}$

Outcomes measurement reduces variation

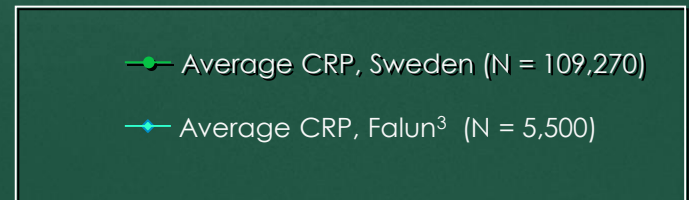
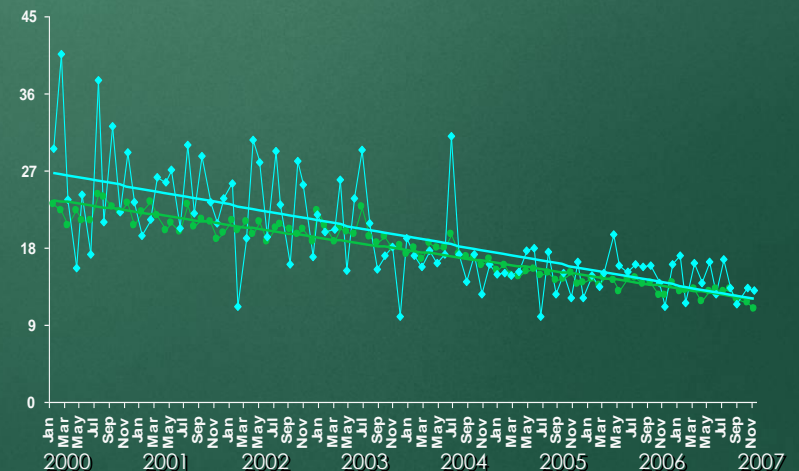
Less side-effects (astigmatism) in laser eye surgery over time and lower variance

Induced astigmatism through laser eye surgery, average and variance (# of dioptres¹)



Significantly lower inflammation levels for rheumatoid arthritis patients and lower variance in outcomes

Average RA CRP value (%)

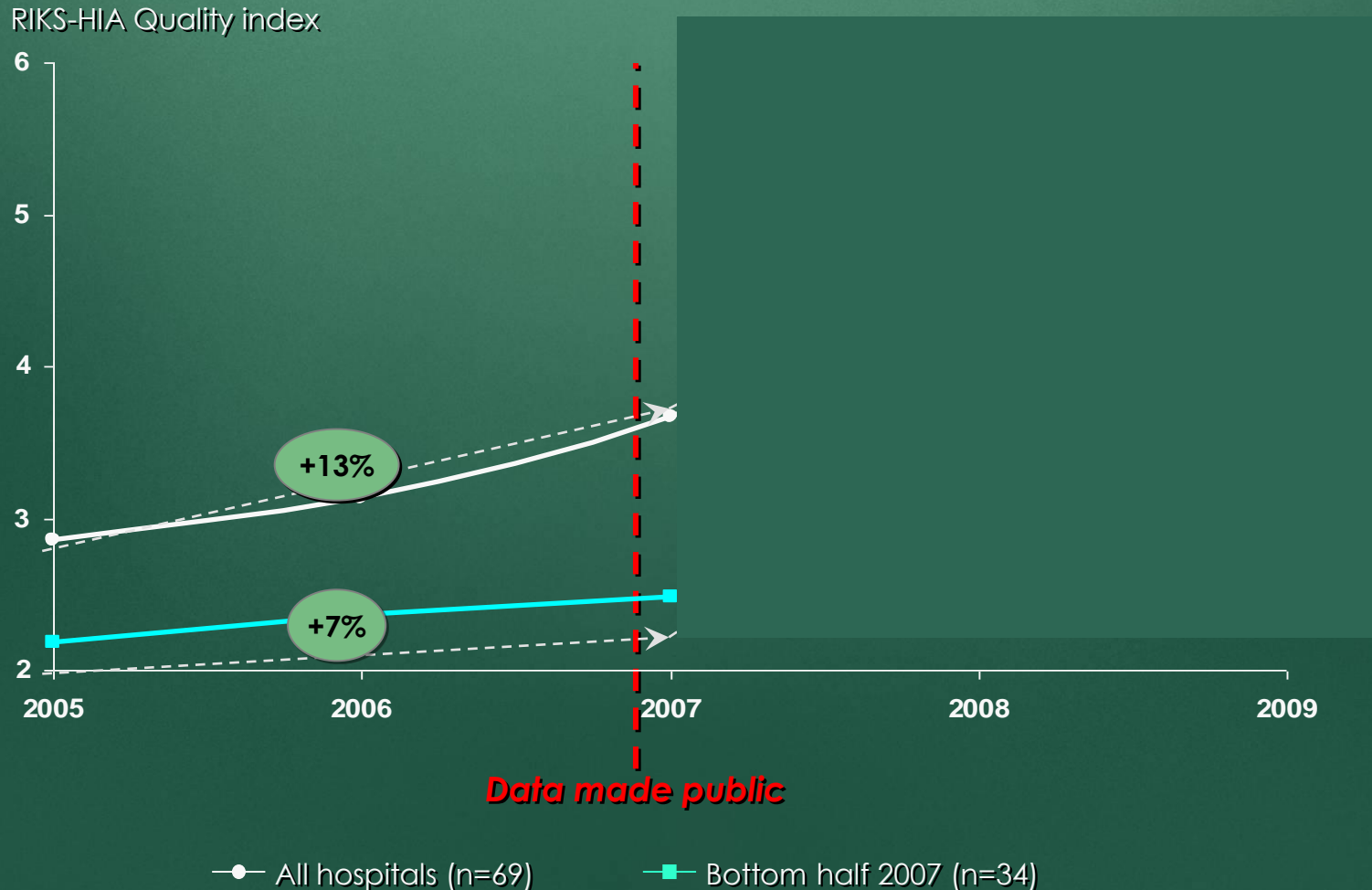


1. Dipotre = measured as average change of dioptre per clinic based on individual patient data 2. CRP-C = reactive protein level in blood indicating level of inflammation. Lower level of CRP indicate lower level of inflammation short-term as well as lower risk for inflammation long-term 3. National coverage 56% while Falun coverage is 100% for all types of RA-patients. Since 1997 Falun has measured and followed-up all its RA-patients on a monthly basis. Data has been used for regional quality work.

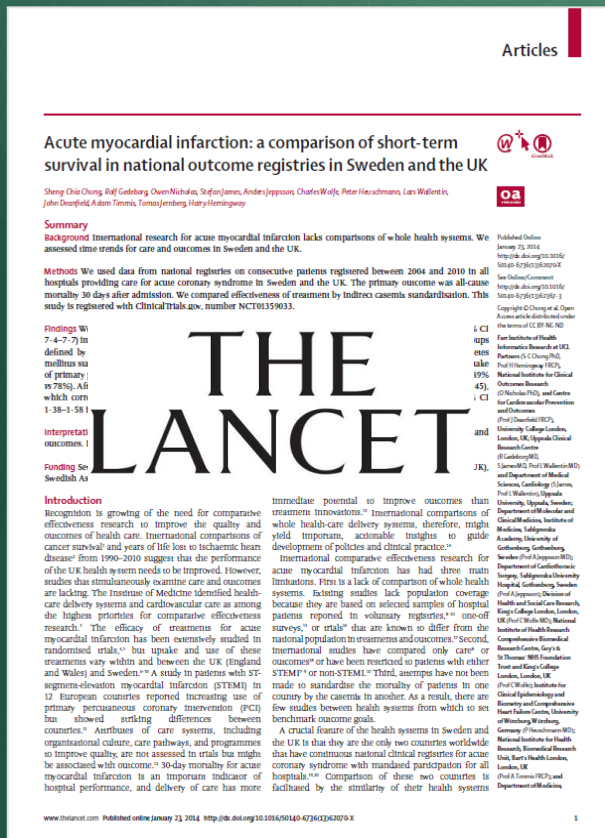
Source: Cataract Annual Report 2007; RA Annual Report 2008-09



Outcomes transparency improves compliance

Example: Swedish myocardial infarction registry



Lower variation and higher survival in Sweden



Treatment		
Primary PCI ³	59%	22%
β blocker at discharge ⁴	89%	78%
Outcomes ¹		
30-day mortality	7.6%	10.5%
Standardize d mortality rate ²	1.0	1.37

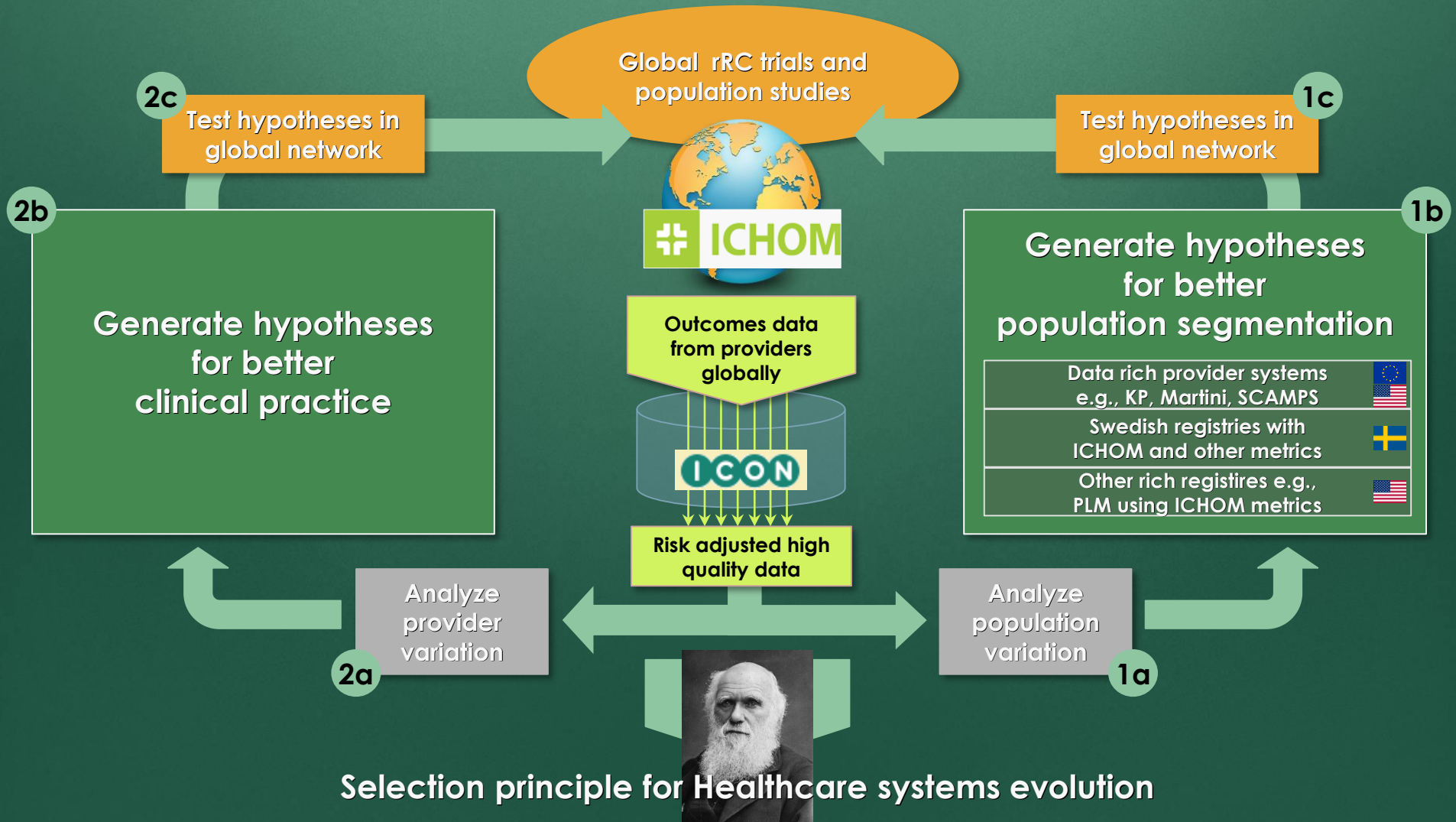
1. Acute Myocardial Infarction 2. Mortality rate adjusted for 17 casemix characteristics, 3. Primary PCI (Percutaneous Coronary Intervention) is recommended in guidelines in the USA since 2004 and in Europe since 2005 but did not become UK national policy until October 2008, β blocker at discharge has been recommended in guidelines in the USA and Europe since 1996 and in the UK since 2001, but statin therapy and ACE inhibitors or ARBs are still more commonly prescribed in the UK.
Note: The study period was 2004-2010. Source: Chung et al, The Lancet, Jan 23, 2014

ICHOM standards asset for improvement work

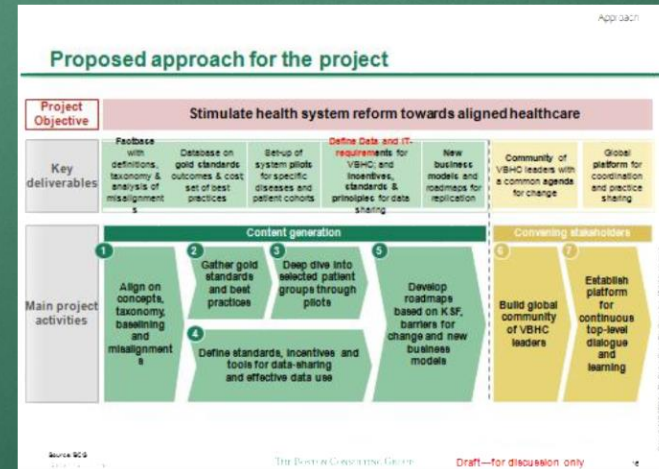
Standard Sets Complete (2013)	Standard Sets Complete (2014)	Conditions in Year Three (2015/16)	Under Consideration for 2016/17
<ol style="list-style-type: none"> 1. Localized Prostate Cancer 2. Lower Back Pain 3. Coronary Artery Disease 4. Cataracts 	<ol style="list-style-type: none"> 5. Parkinson's Disease¹ 6. Cleft Lip and Palate 7. Stroke 8. Hip and Knee Osteoarthritis¹ 9. Macular Degeneration¹ 10. Lung Cancer¹ 11. Depression and Anxiety¹ 12. Advanced Prostate Cancer 	<ol style="list-style-type: none"> 13. Breast Cancer 14. Dementia 15. Older Persons² 16. Heart Failure 17. Pregnancy and Childbirth 18. Colorectal Cancer 19. Overactive Bladder 20. Craniofacial Microsomia 21. Inflammatory Bowel Disease 	<ol style="list-style-type: none"> 22. End Stage Renal Failure 23. Oral Health 24. Brain Tumors 25. Drug and Alcohol Addiction 26. Bipolar Disorder 27. Burns 28. Melanoma 29. Head and Neck Cancer 30. Pediatric Oncology (Condition(s) TBD) 31. Rheumatoid Arthritis 32. Liver Transplantation 33. Congenital Hand Malformations 34. Chronic Rhinosinusitis 35. Congenital Hemolytic Anemia 36. Rotator Cuff Disease 37. Malaria
<p>Burden of Disease Covered</p> <p>18%</p>	<p>35%</p>	<p>45%</p>	

1. Accepted for publication 2. In the U.S. referred to as Frail Elderly

Ecosystem for Healthcare system evolution



Value in healthcare – new two year program



Global team and expert support

... and the senior BCG expert team we will mobilize

Deep expertise in VBHC, healthcare systems and all key stakeholders

Relevant experience	Relevant experience
<p>Partner and Managing Director Brett Spencer</p> <ul style="list-style-type: none"> Partner responsible for ICD Providers in USA 	<p>Partner and Managing Director Benjamin Groch</p> <ul style="list-style-type: none"> Expert on Payers and technology-enabled sales models Expert on healthcare systems
<p>Senior Partner and Managing Director Jon Kaplan</p> <ul style="list-style-type: none"> US Payer landscape and healthcare systems development in USA 	<p>Senior Partner and Managing Director John Wong</p> <ul style="list-style-type: none"> Responsible for Healthcare in China
<p>Venture Architect Principal Gunnar Trommer</p> <ul style="list-style-type: none"> BCG Digital Ventures, Health care expert 	<p>Senior Partner and Managing Director Takuya Uekusa</p> <ul style="list-style-type: none"> Responsible Healthcare Asia Pacific
<p>Partner and Managing Director Karaloe Close</p> <ul style="list-style-type: none"> Global topic leader for healthcare technology, analytics, and big data Biopharmaceutical sector and the field of digital health 	<p>Partner and Managing Director Paulo Gongalves</p> <ul style="list-style-type: none"> Account responsible for EPPIA Expert on healthcare system advancement and applications of VBHC in Pharma industry
<p>Partner and Managing Director James Kent</p> <ul style="list-style-type: none"> Leading NHS advisor, VBHC expert led the assessment of health systems and readiness to apply VBHC across Europe for an international operation 	<p>Partner and Managing Director Götz Geracke</p> <ul style="list-style-type: none"> Global lead for MedTech commercial Account responsible for MedTech Europe industry association, driving joint collaboration VBHC in MedTech and start-ups
<p>Partner and Managing Director Agnès Audier</p> <ul style="list-style-type: none"> Two decades of work with French HC policy makers. Expert on providers' transformation and operational efficiency, extensive experience with multiple providers across Europe 	<p>Senior Partner and Managing Director Jan W. Kuunen</p> <ul style="list-style-type: none"> Former provider expert Responsible Health Insurance EU Over a decade as advisor on health care system reform in Netherlands

Source: BCG, The Boston Consulting Group. Draft—for discussion only.





Thank you

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