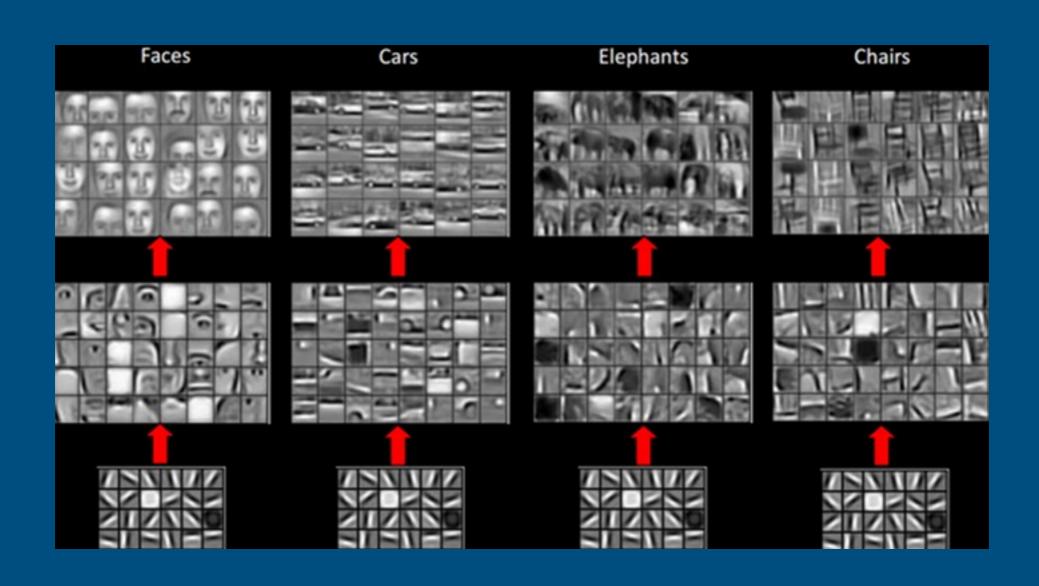
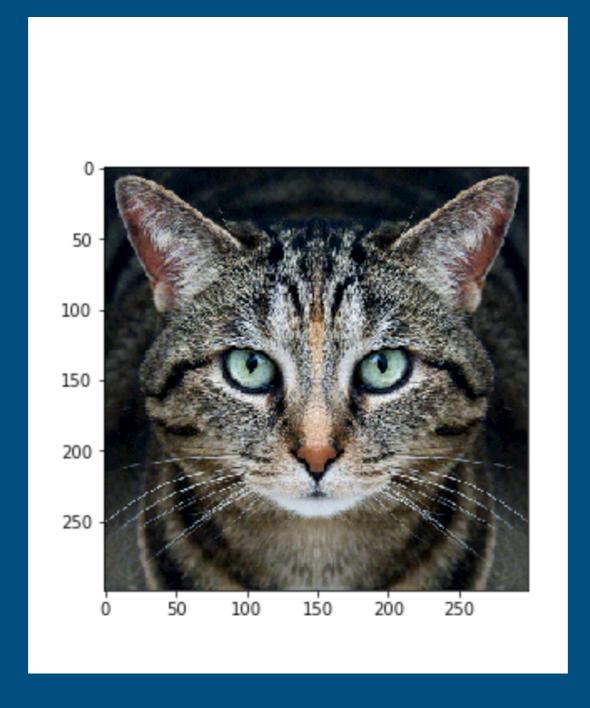
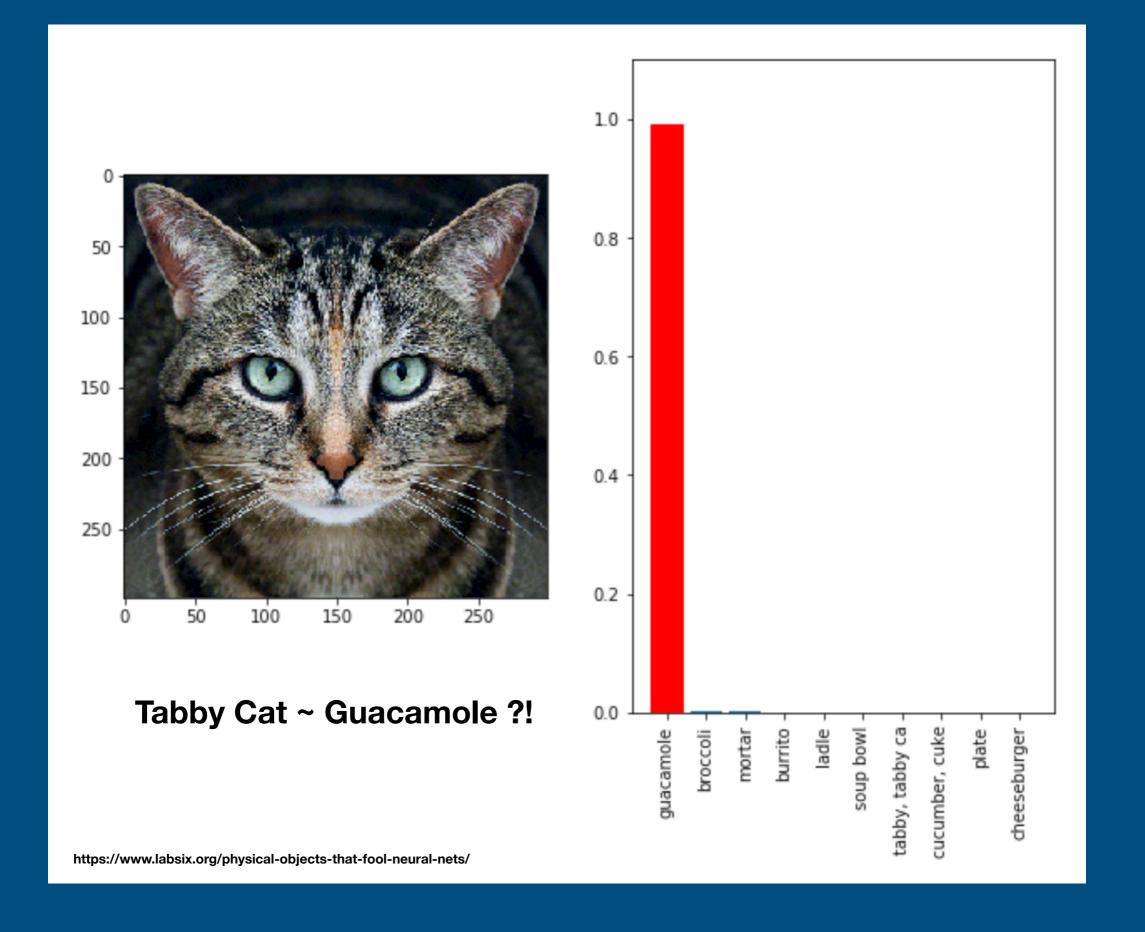
WHAT A DEEP CONVOLUTIONAL NEURAL NET LEARNS



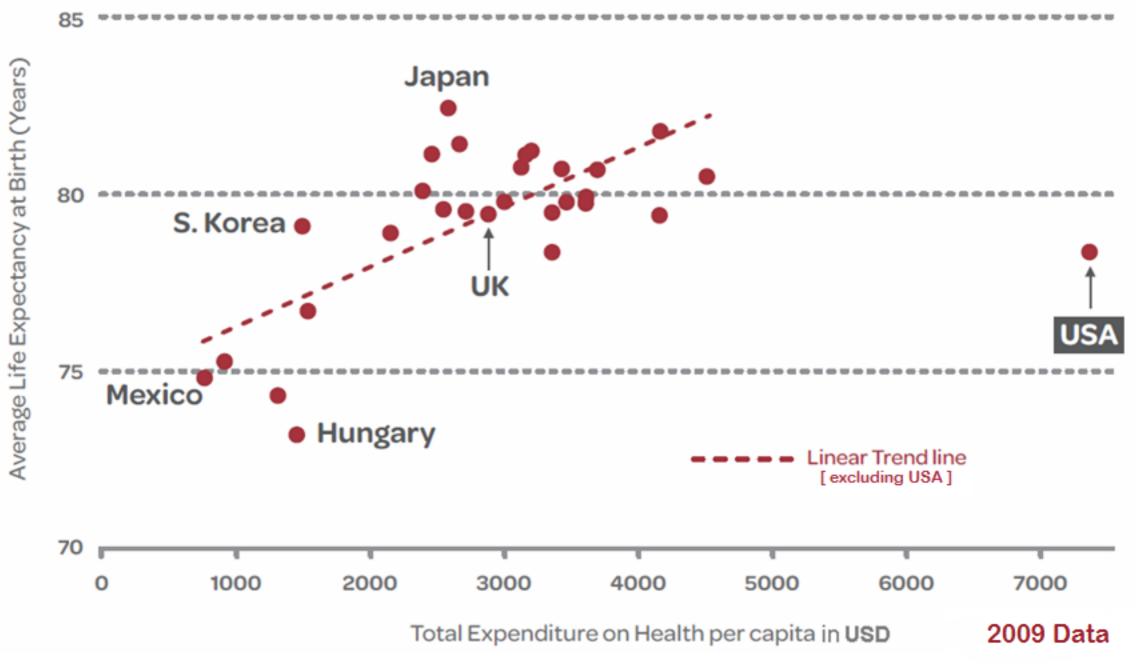




MMCi Practical Data Science lecture 09

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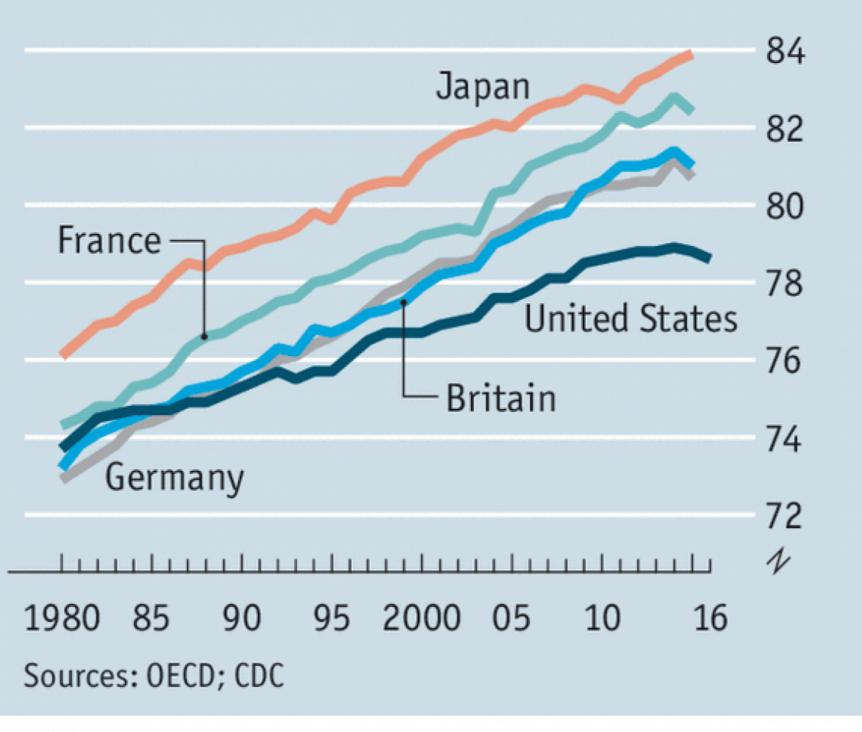
Healthcare Spending per capita vs. Average Life Expectancy Among OECD Countries





Wrong turn

Average life expectancy at birth, years





The NEW ENGLAND JOURNAL of MEDICINE



What Is Value in Health Care?

Michael E. Porter, Ph.D.

In any field, improving performance and account-Lability depends on having a shared goal that unites the interests and activities of all stakeholders. In health care, however, stakeholders have

myriad, often conflicting goals, including access to services, profitability, high quality, cost containment, safety, convenience, patient-centeredness, and satisfaction. Lack of clarity about goals has led to divergent approaches, gaming of the system, and slow progress in performance improvement.

Achieving high value for patients must become the overarching goal of health care de-

Value — neither an abstract ideal nor a code word for cost reduction — should define the framework for performance improvement in health care. Rigorous, disciplined measurement and improvement of value is the best way to drive system progress. Yet value in health care remains largely unmeasured and misunderstood.

Value should always be defined around the customer, and livery with value defined as the in a well-functioning health care

value is a central challenge. Nor is value measured by the process of care used; process measurement and improvement are important tactics but are no substitutes for measuring outcomes and costs.

Since value is defined as outcomes relative to costs, it encompasses efficiency. Cost reduction without regard to the outcomes achieved is dangerous and selfdefeating, leading to false "savings" and potentially limiting effective care.

Outcomes, the numerator of the value equation, are inherently condition-specific and multidimensional. For any medical condition no single outcome can-

Define value?

$value = \frac{Outcomes}{Cost}$

NSION Multidim

Primary Acute Knee Osteoarthritis Breast Cancer Dimensions Requiring Replacement Survival rate (1-yr, 3-yr, 5-yr, longer) Survival Mortality rate (inpatient) Functional level achieved Remission Functional status Pain level achieved Degree of health or recovery Extent of return to physical activities Breast preservation Ability to return to work Breast-conservation-surgery outcomes Time to remission Time to treatment Time to recovery and time to return Time to achievement of functional Time to return to physical activities to normal activities and cosmetic status Time to return to work Nosocomial infection Pain Nausea or vomiting Length of hospital stay Febrile neutropenia Disutility of care or treatment process Infection Limitation of motion (e.g., diagnostic errors, ineffective care, Pulmonary embolism Breast reconstruction discomfort or treatment-related discomfort, compli-Deep-vein thrombosis complications cations, adverse effects) Myocardial infarction Depression Immediate revision Delirium Maintained functional level Cancer recurrence Sustainability of health or recovery Consequences of recurrence Ability to live independently and nature of recurrences Sustainability of functional status Need for revision or reoperation Loss of mobility due to inadequate Incidence of second primary cancers Brachial plexopathy rehabilitation Premature osteoporosis Risk of complex fracture Long-term consequences of therapy Susceptibility to infection (e.g., care-induced illnesses) Stiff knee due to unrecognized complication Regional pain syndrome

6 Use Cases

High Cost Patients

Readmissions

Triage

Decompensation

Adverse Events

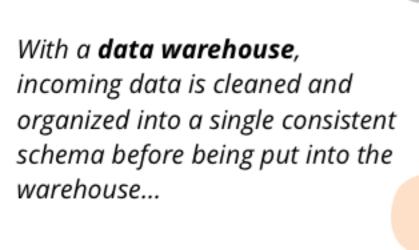
Data Analytic Approaches, By Size Of Data And Analytic Complexity

Small amounts of Large (or all) data or samples amounts of data (megabytes to (gigabytes to gigabytes) petabytes) **Advanced analytics: Big-data analytics:** Deals with smaller Can fuse different data Predictive and data sets but uses types on a massive real-time advanced techniques scale resulting in analytics predictive and real-time to analyze the capabilities impact of future analysis capabilities **Analytic complexity** scenarios **Basic analytics: Big-data computing:** Relies on historical From a systems observations to help perspective, data become avoid past mistakes more consolidated Accurate and duplicate past while analytic work flows historical are more streamlined observations successes and automated

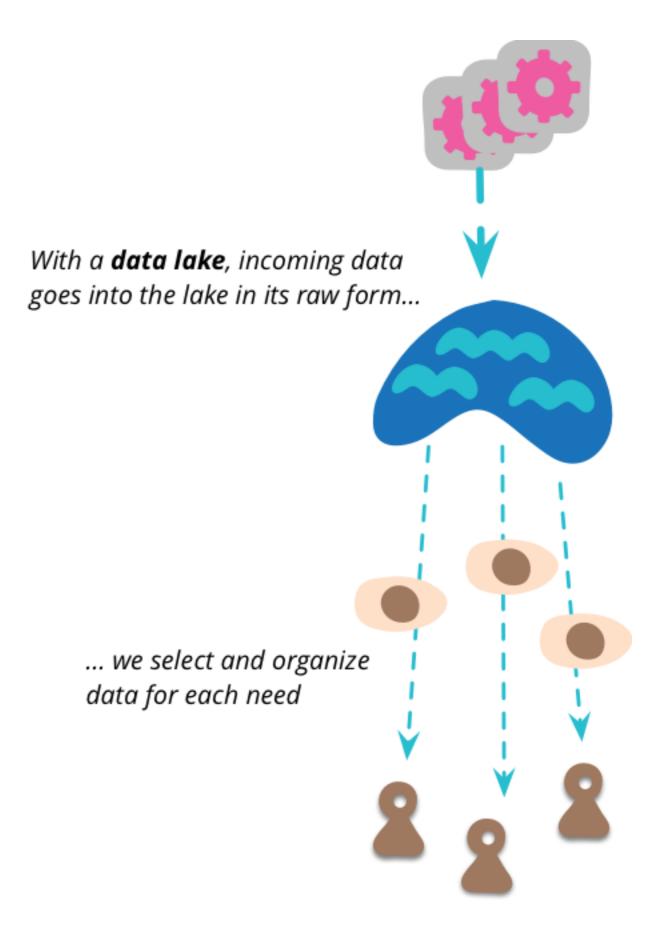
Size of data

SOURCE Booz Allen Hamilton. Cloud analytics playbook [Internet]. McLean (VA): Booz Allen Hamilton; 2012 [cited 2014 Apr 29]. Available from: http://www.boozallen.com/media/file/cloud-analytics-playbook.pdf. Adapted with permission.

Data Lake (?)



... analysis is done directly on the curated warehouse data



Swamp (?)

Operational systems communicate with each other via service connections, ignoring the data lake

