Cleveland Clinic

Predictive Analytics
and
Decision-Support for Improving Patient Care

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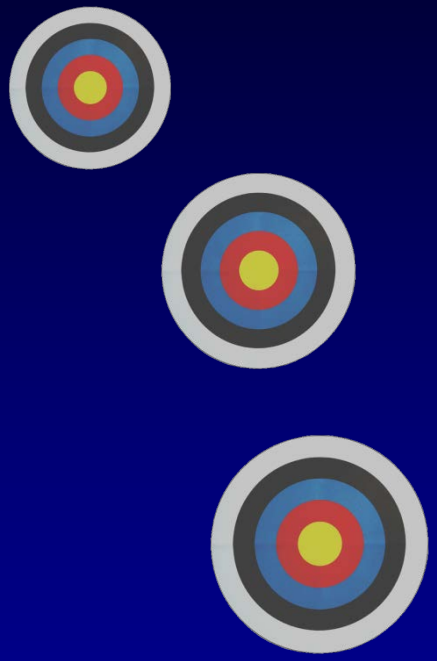
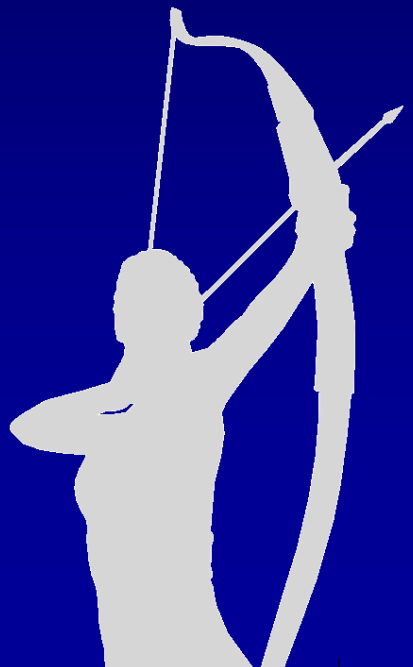
Acute Care Reimbursement History
Medicare

Timeframe	1965 - 1982	1983 - Present	2014 - Future
Reimbursement Models	Cost +	IPPS or DRG	All Inclusive Risk-based

CMS Three Part Aims for Healthcare Delivery System Improvement



- Better care for individuals through seamless coordinated health care
- Reduced costs through continuous improvement
- Better health for populations



Definitions

BIG Data / Decision Support / Predictive Analytics

Definitions

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"Big data is high-volume, -velocity and -variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making."

Svetlana Sicular
Research Director

Gartner

Definitions

BIG Data / Decision Support / Predictive Analytics

Decision Support is the rapid, algorithmic analysis of retrospective and real-time data for reducing variation in clinical decision making.

Definitions

BIG Data / Decision Support / Predictive Analytics

Predictive analytics is a forward-looking, rapid analysis approach to data mining that emphasizes prediction rather than classification to suggest the clinical challenges of the future.

Definitions

Data

BIG Data / Decision Support / Predictive Analytics

Definitions

Data

Machine-Reasoning

Machine-Learning

Decision Support / Predictive Analytics

Decision Support

Predictive Analytics

Data

Machine-Reasoning

Decision Support

Predictive Analytics

IBM WATSON

Cleveland Clinic

Watson

Medical Research Agenda

Build and demonstrate a Clinical Decision Support software system having the following progressive, step-wise capabilities:

Cleveland Clinic Use Cases

- **Healthcare System Physiology** ← **Utilization Management and other Administrative Tasks**
- **Care Management and Coordination** ← **Clinical Process Monitoring**
- **Selected Diagnostics and Treatment Skills: To map *factors* (bits of patient data) to *probable diagnoses* through justifiable *evidence* collected from background content and/or through user interaction. To map *factors* and *probable diagnoses* to appropriate *treatment options* through justifiable *evidence* collected from background content and/or through user interaction** ← **Clinical Diagnosis and Treatment Decision Support**
- **How to do Continuous Medical Education** ← **Watson goes to Medical School**

Watson

Goals / Progress Matrix

How to do Continuous Medical Education	• Specialized medical content - Internal journals, ontology, coding system, etc.			
Selected Diagnostics and Treatment Skills				
Care Management and Coordination				
Healthcare System Physiology				
	Utilization Management and other Administrative Tasks	Clinical Process Monitoring	Clinical Diagnosis and Treatment Decision Support	Watson goes to Medical School

Watson

Goals / Progress Matrix

How to do Continuous Medical Education

Selected Diagnostics and Treatment Skills

Care Management and Coordination

Healthcare System Physiology

- **Expertise:**
  - **Cleveland Clinic will provide:**
    - **Expert (human) annotators and annotations**
    - **Use case definition and development with practitioners**
- **Diagnostic and Treatment Process**
    - **Vetted Input and Output pairs, along with vetted Evidence**

Utilization Management and other Administrative Tasks	Clinical Process Monitoring	Clinical Diagnosis and Treatment Decision Support	Watson goes to Medical School

Data

Machine-Reasoning

Decision Support

Predictive Analytics

google.org Flu Trends

Google.org home

Dengue Trends

Flu Trends

Home

United States

National

Download data

How does this work?

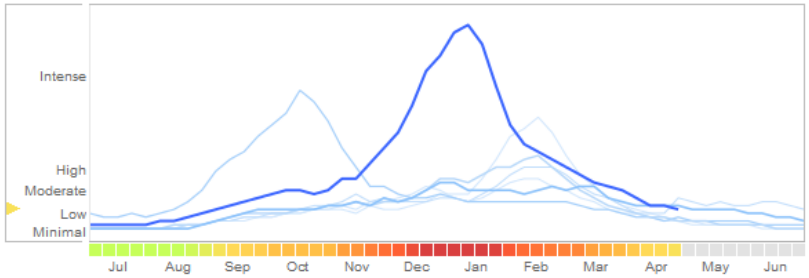
FAQ

Explore flu trends - United States

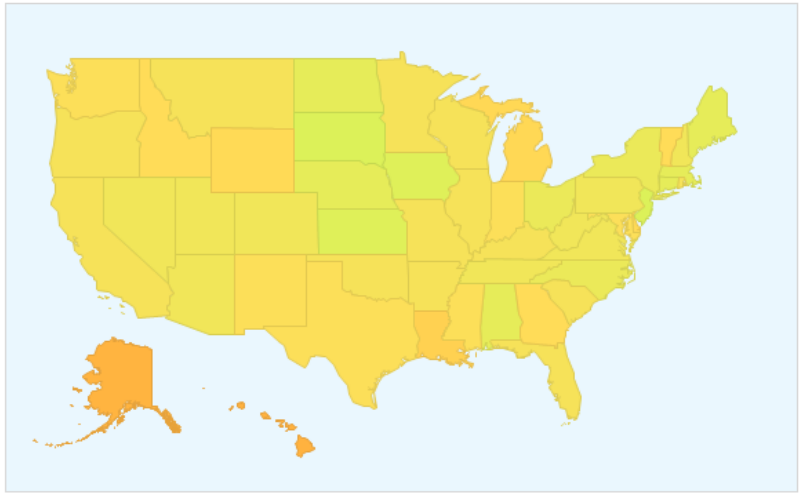
We've found that certain search terms are good indicators of flu activity. Google Flu Trends uses aggregated Google search data to estimate flu activity. Learn more »

National

2012-2013 Past years



States | Cities (Experimental)



Estimates were made using a model that proved accurate when compared to historic official flu

Each week, millions of users around the world search for health information online.

We have found a close relationship between how many people search for flu-related topics and how many people actually have flu symptoms.

We compared our query counts with traditional flu surveillance systems and found that many search queries tend to be popular exactly when flu season is happening.

By counting how often we see these search queries, we can estimate how much flu is circulating in different countries and regions around the world.

google.org / flutrends / about

The New York Times

FEBRUARY 24, 2013, 11:00 AM 4 Comments

Disruptions: Data Without Context Tells a Misleading Story

By NICK BILTON

Erik S. Lesser/European Pressphoto Agency

Google's Flu Predictor overestimated how many people had the flu this flu season

FACEBOOK
TWITTER
GOOGLE+
SAVE
E-MAIL
SHARE
PRINT

Several years ago, Google, aware of how many of us were sneezing and coughing, created a fancy equation on its Web site to figure out just how many people had influenza. The math works like this: people's location + flu-related search queries on Google + some really smart algorithms = the number of people with the flu in the United States.

So how did the algorithms fare this wretched winter? According to Google Flu Trends, at the flu season's peak in mid-January, nearly 11 percent of the United States population had influenza.

Yikes! Take vitamins. Don't leave the house. Wash your hands. Wash them again!

But wait. According to an article in the science journal Nature, Google's disease-hunting algorithms were wrong: their results were double the

According to an article in the science journal Nature, Google's disease-hunting algorithms were wrong: their results were double the actual estimates by the Centers for Disease Control and Prevention.

Scientists have a theory about what went wrong. Google's algorithm was looking only at the numbers, not at the context of the search results.

In today's digitally connected world … almost everything we touch is part of a larger data set.

But the people and companies that interpret the data may fail to apply background and outside conditions to the numbers they capture.

Now, as we enter a world of big data, we have to learn how to apply context to these numbers.

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Data

Machine-Reasoning

Policy Implications

Decision Support

Predictive Analytics

Implication 1

Implication 2

Judgement:

When presented with multiple options, who or "what" makes the choice?

Responsibility

When a decision is made based on a computer-performed analysis, who ultimately, is accountable for the outcome?

Data

Machine-Reasoning

Policy Implications

Data

In an era of ever-increasing data availibity, analytic capability, and machine-based reasoning and action, policy leadership becomes ever-more important to achieve intended outcomes.

Machine-Reasoning

Machine-Guided Action

Judgement:

Analytic Tools

Data

Machine-Reasoning

Machine-Guided Action

Analytic Tools

Policy

In an era of ever-increasing data availibity, analytic capability, and machine-based reasoning and action, policy leadership becomes ever-more important to achieve intended outcomes.

Cleveland Clinic

Every life deserves world class care.