



# How Big Data is Shaping Health Care Decisions

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Optum Technologies



Cancer is second only to heart disease as the **most common** cause of death in the U.S.

**Thanks to consistent advances in prevention, screening and treatment, 68% of people diagnosed with cancer today are expected to live at least five years beyond the diagnosis.**

The United States is projected to see a **600%** increase in cancer spending over the next 30 years.

# What is Big Data?



<http://www.connexica.com/big-data-buzz-or-big-data-fuzz-2/#sthash.sETpK8J4.dpbs>

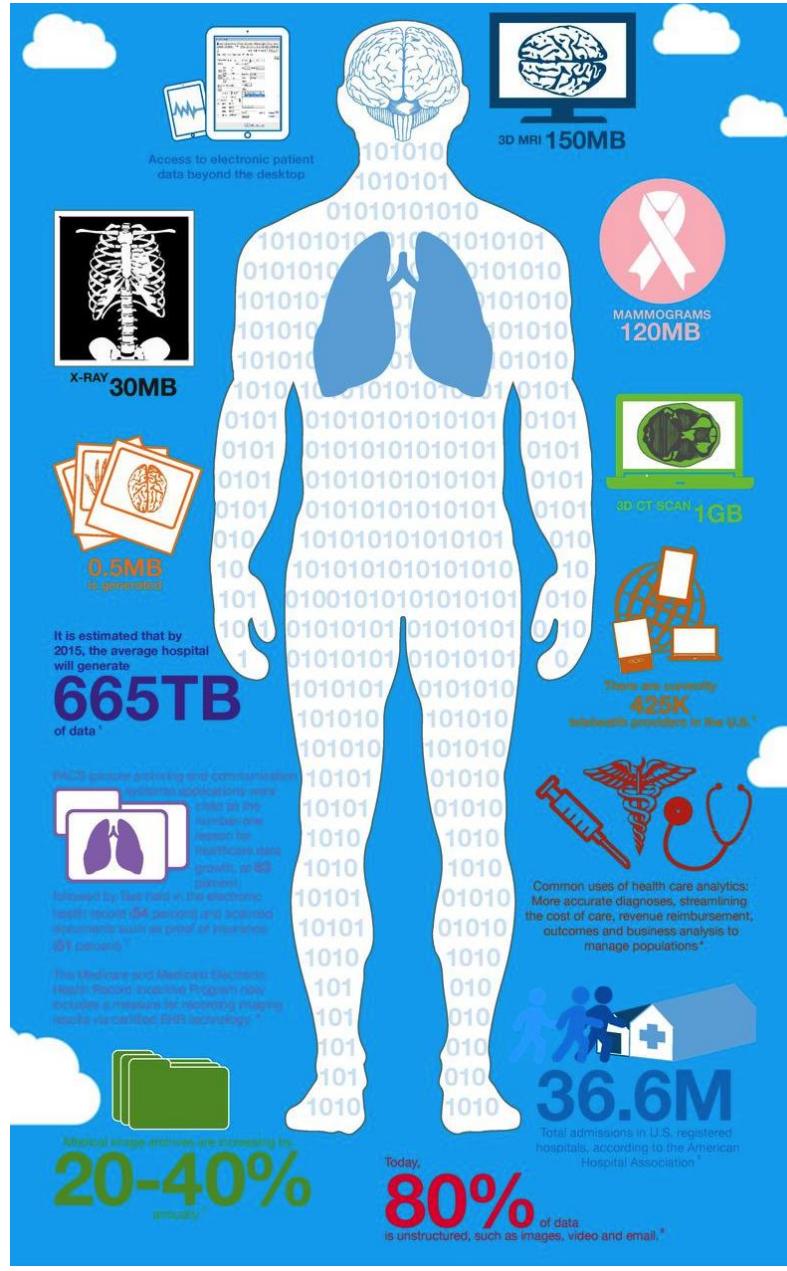
**Big data** is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.

*Source: Gartner*

# 2,500,000,000,000,000 bytes

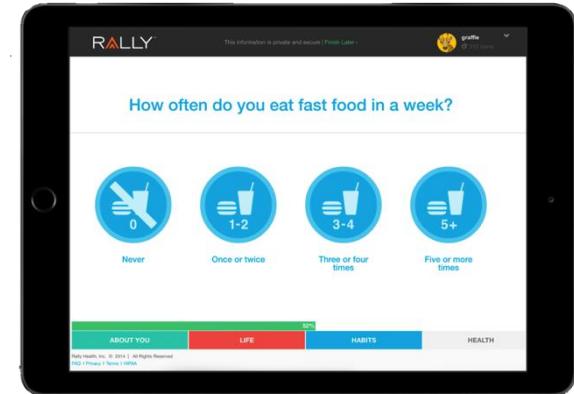
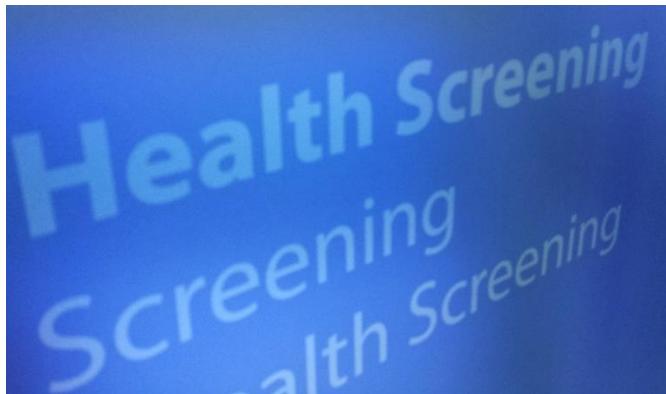


# The Body As Data



Source: NetApp

# Health Data



# Public/Private



# Provider



# Employer

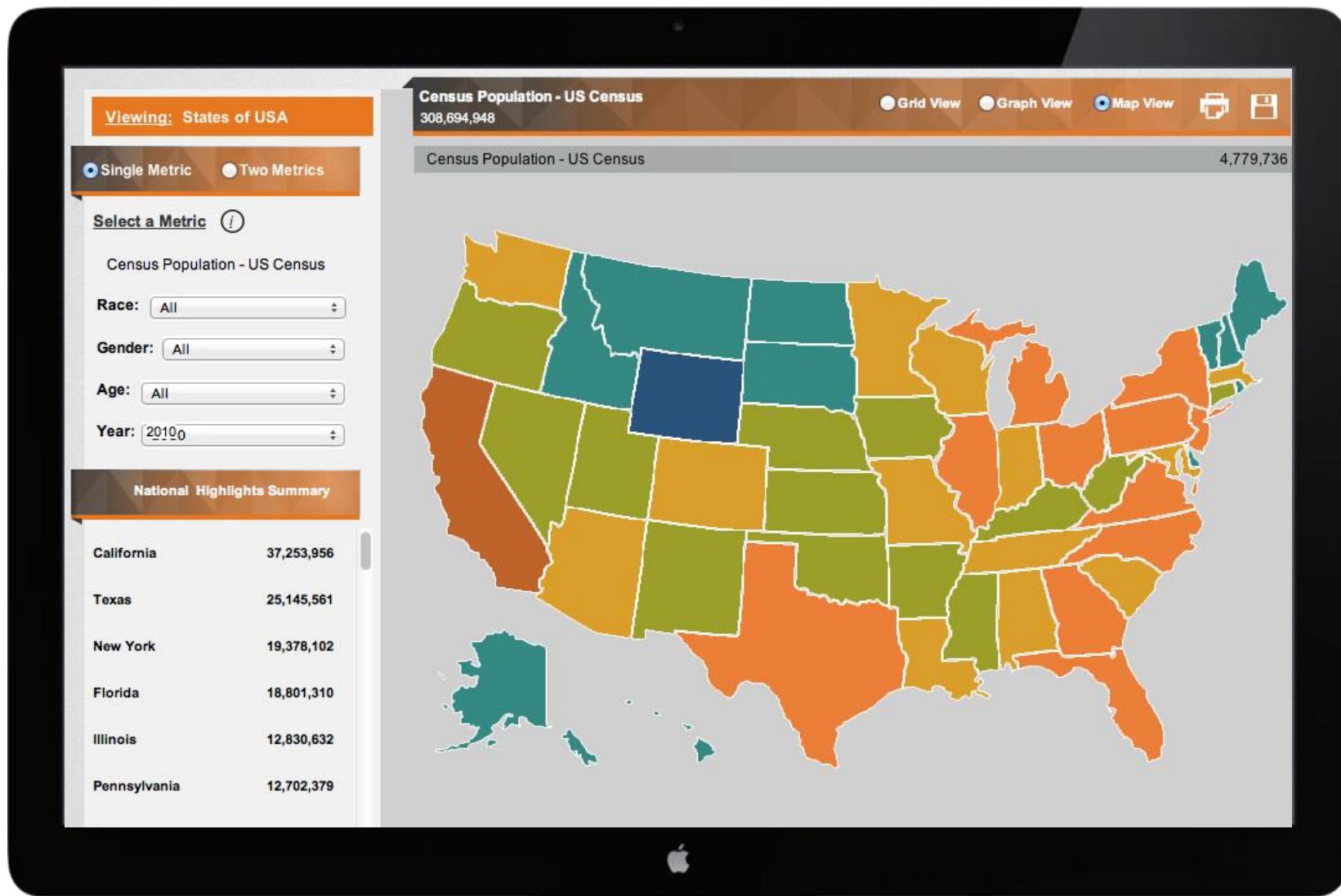


# Consumer

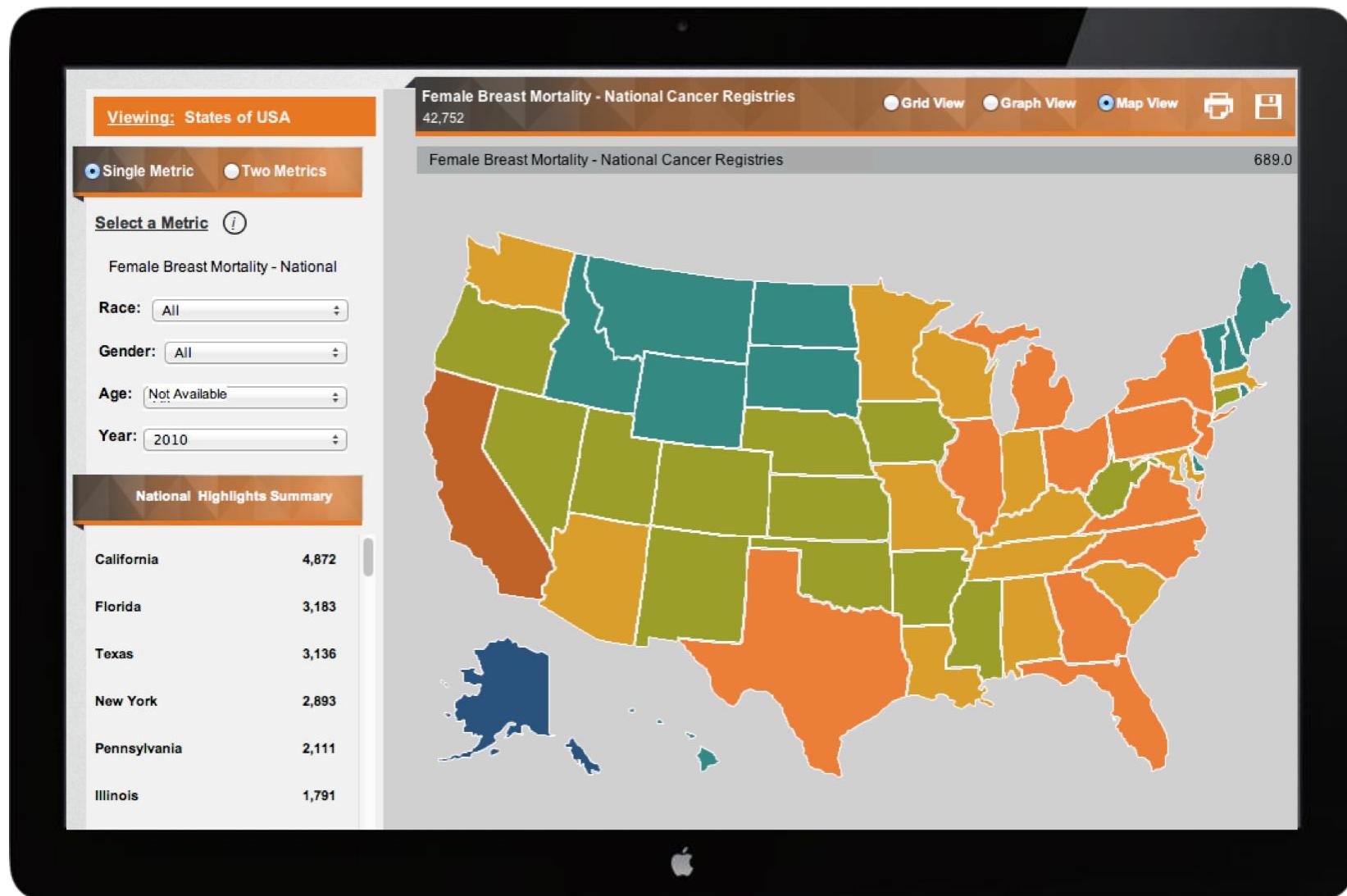


## Public/Private Data

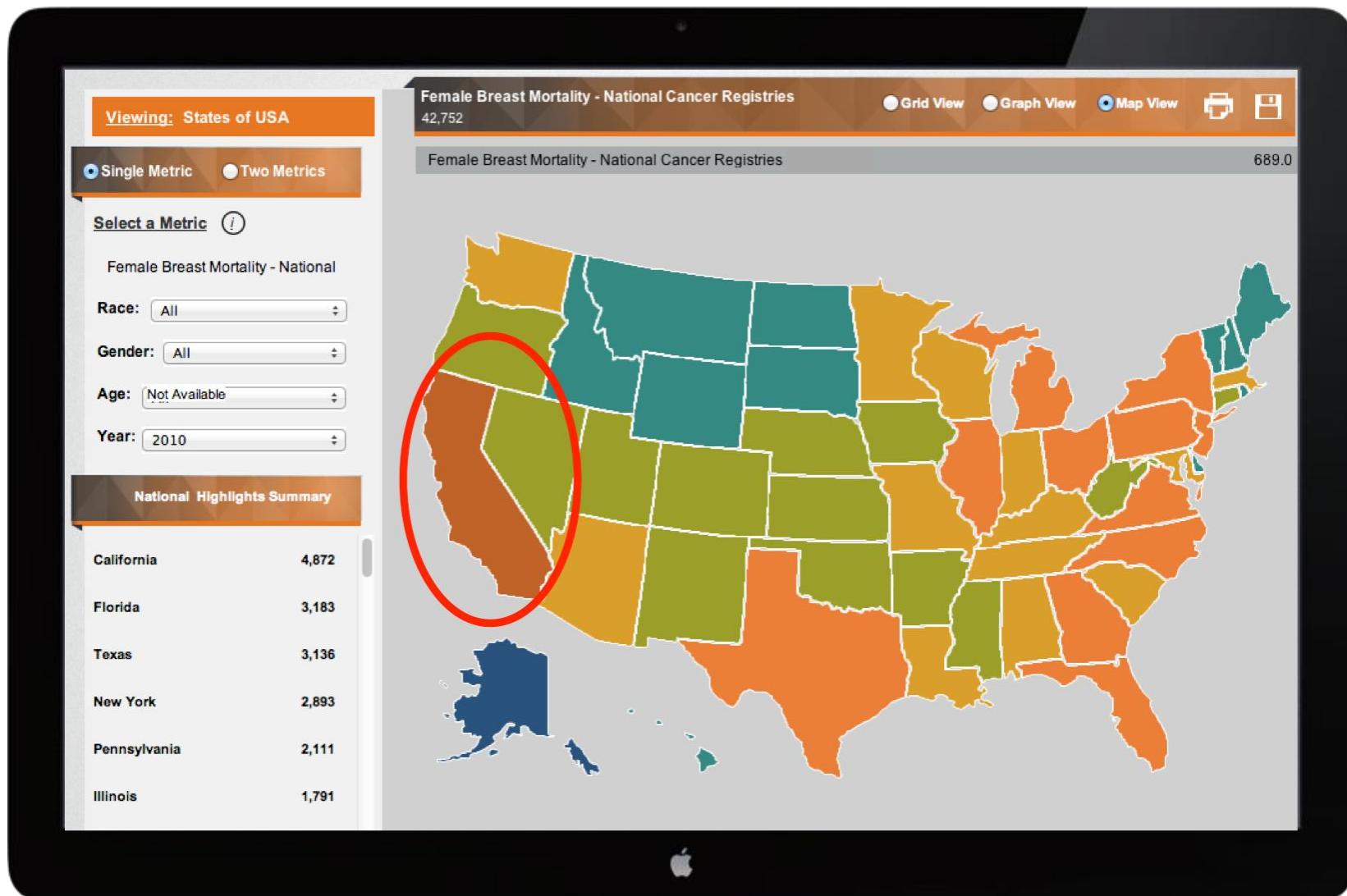
# Visualizations



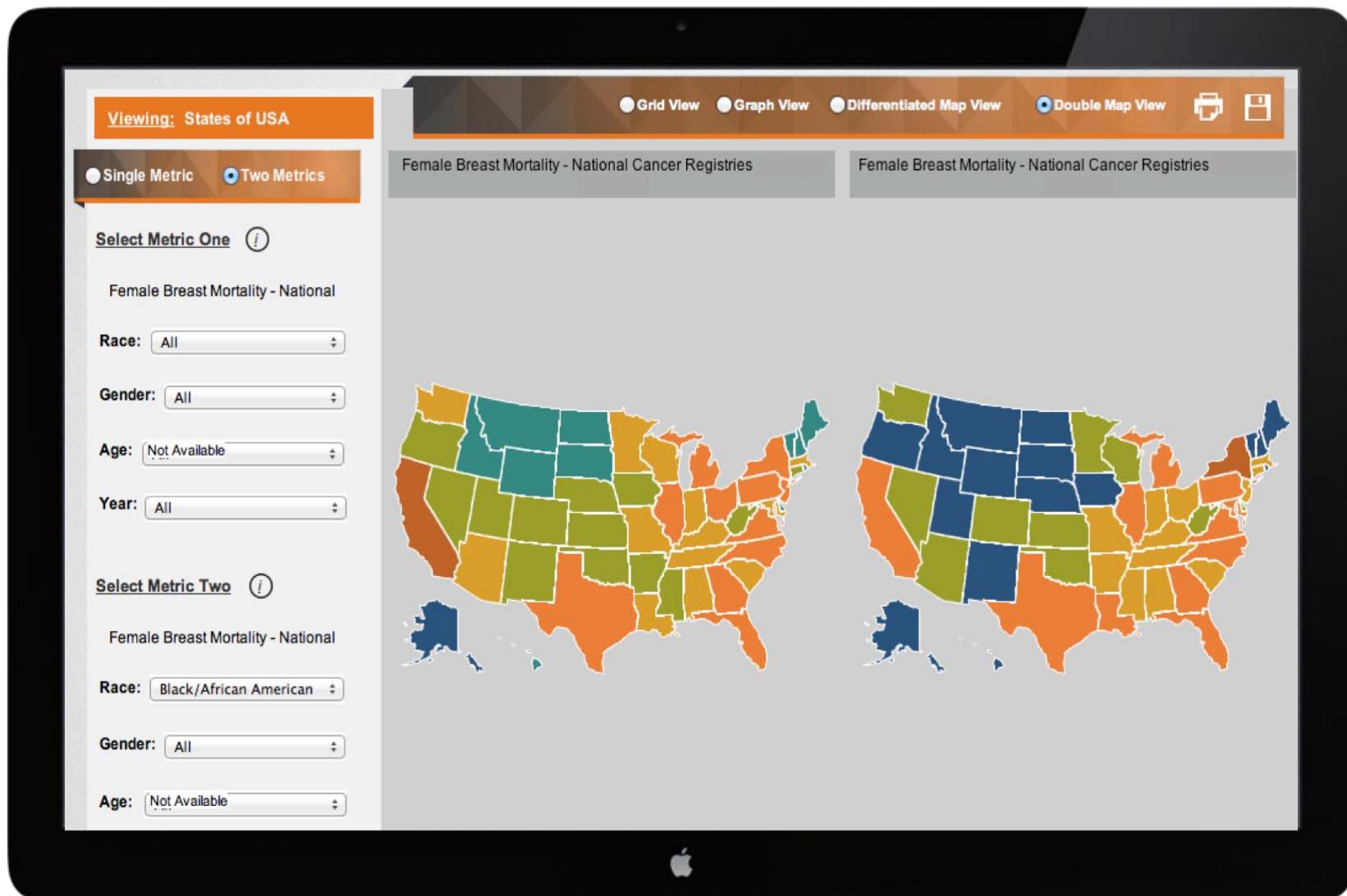
# Visualizations



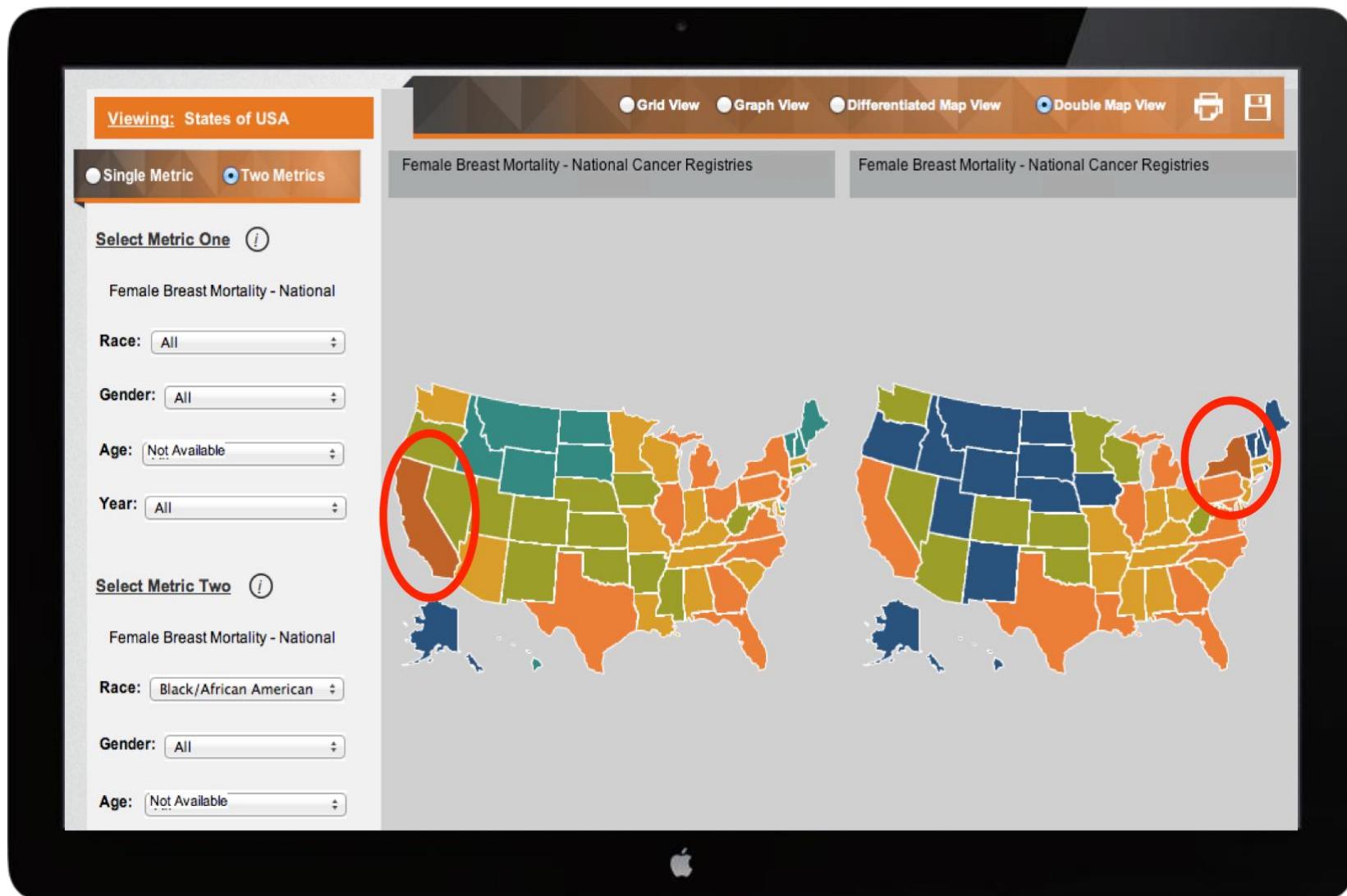
# Visualizations



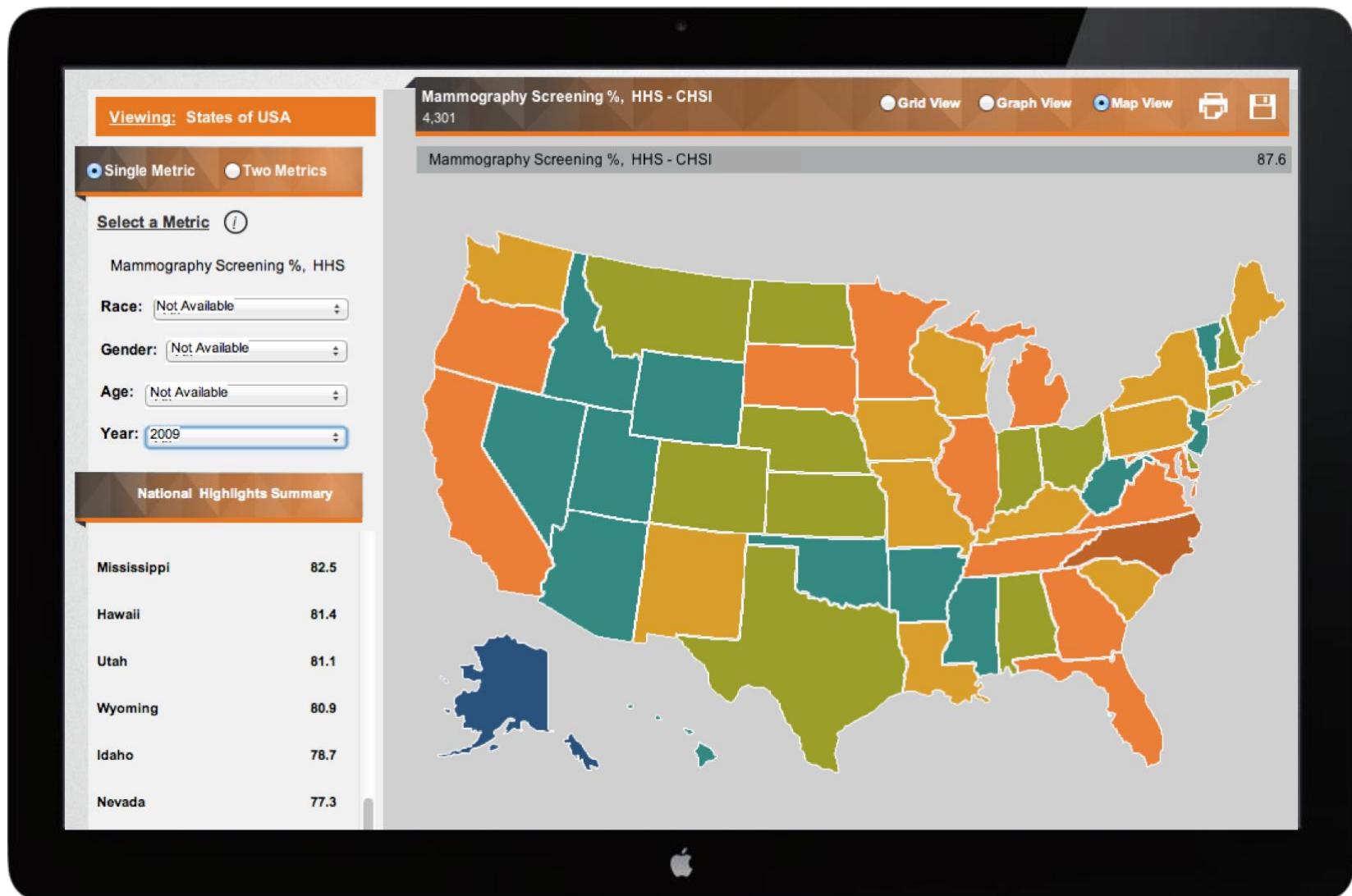
# Visualizations



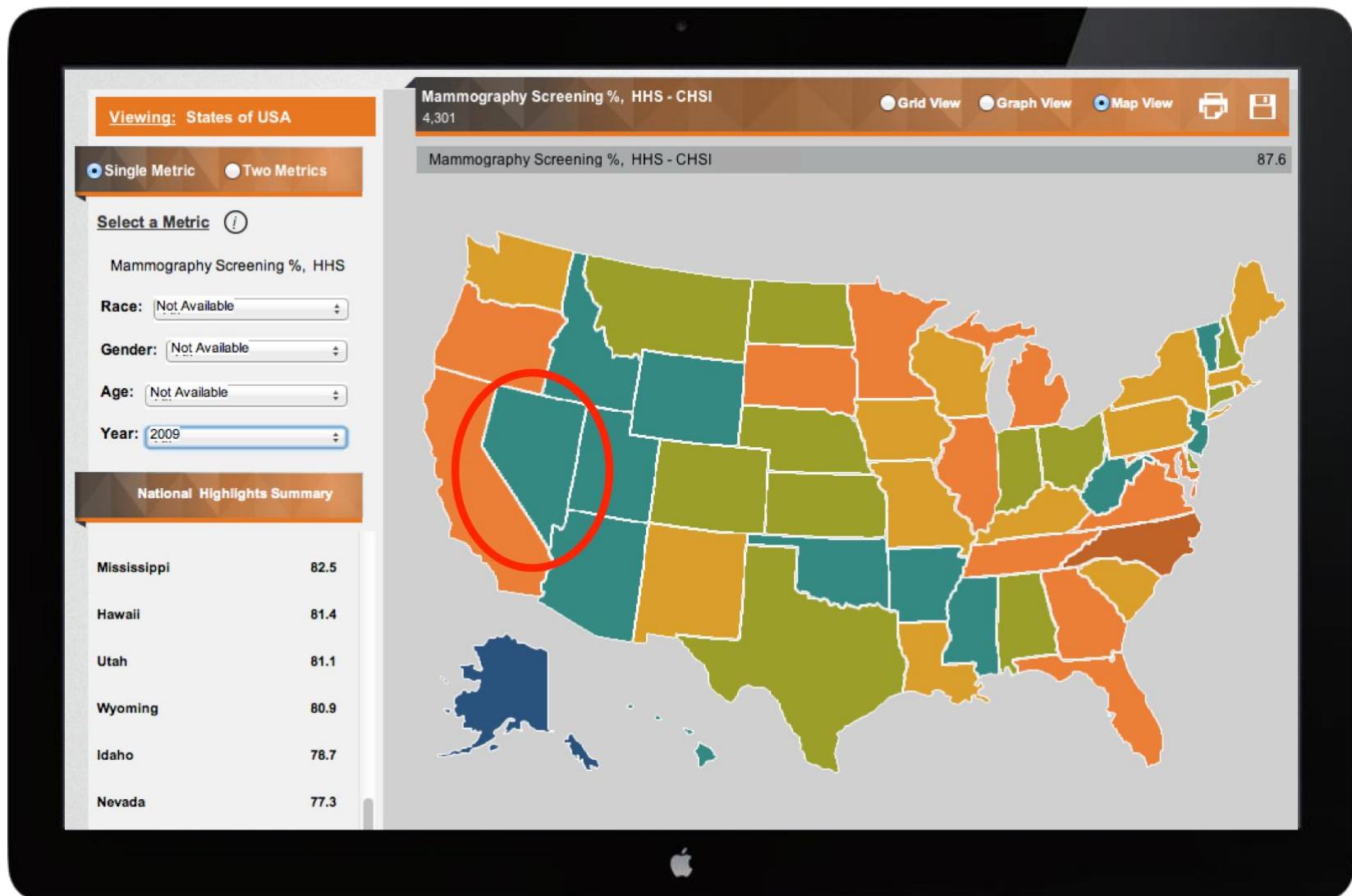
# Visualizations



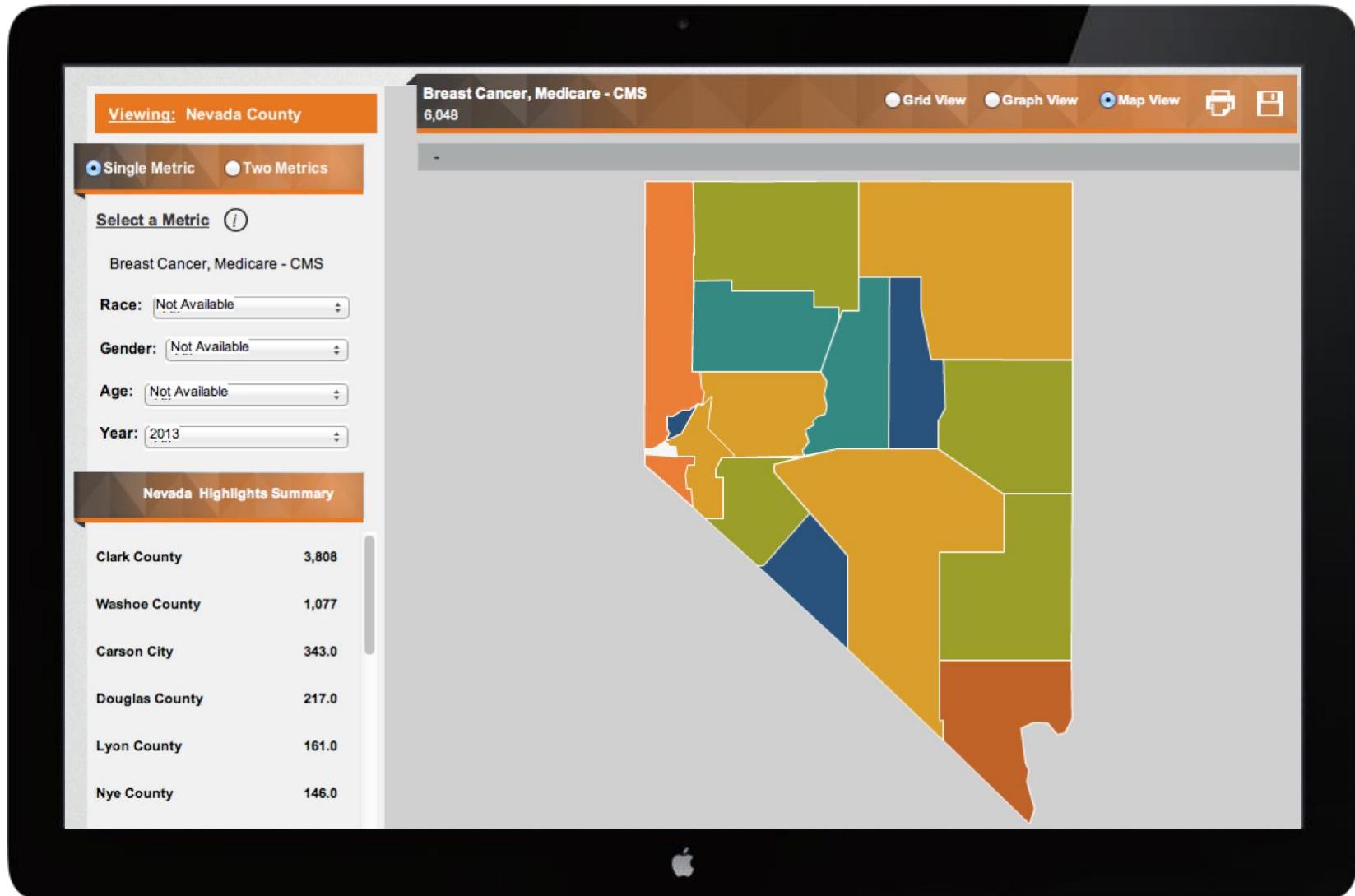
# Visualizations



# Visualizations



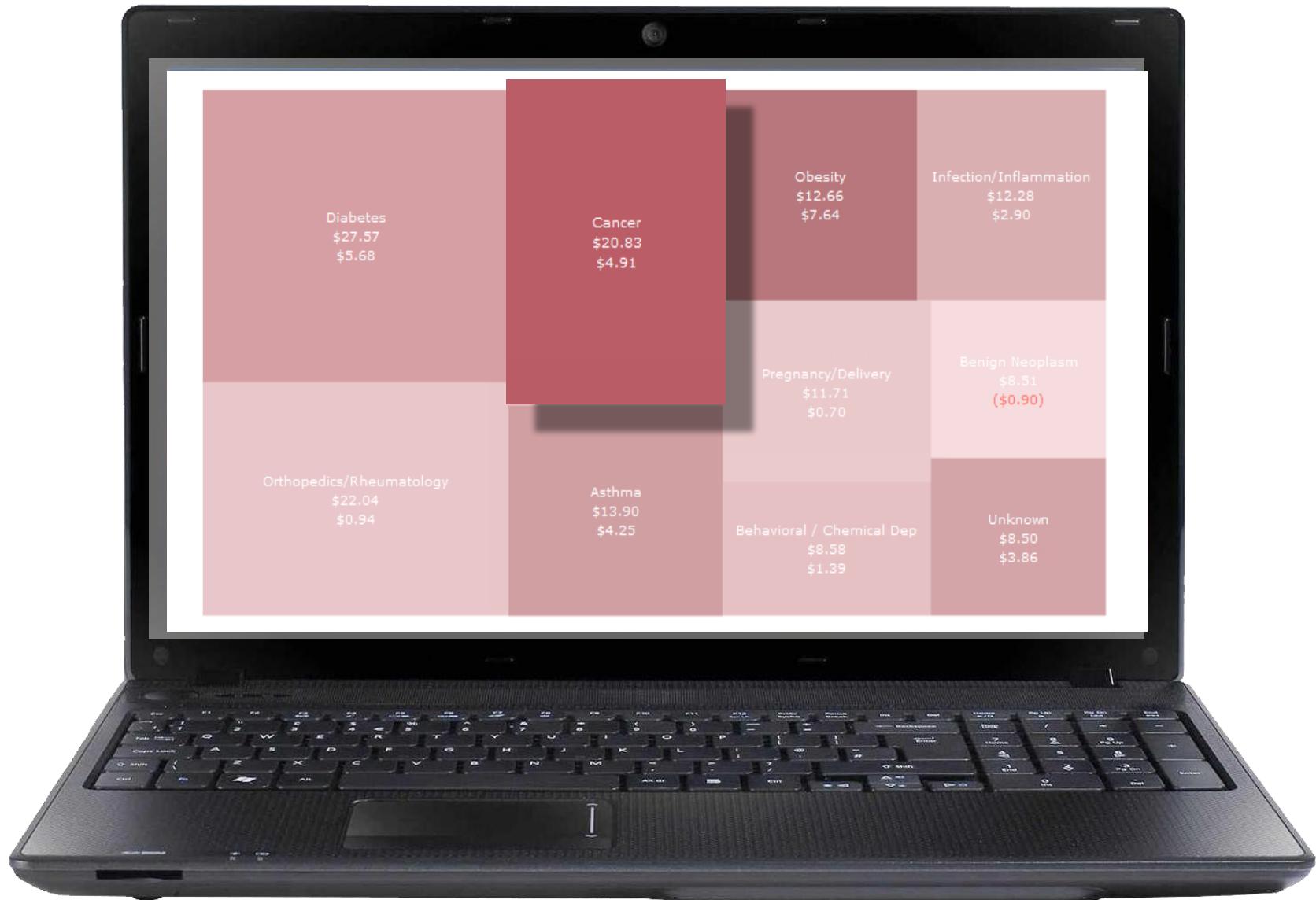
# Visualizations



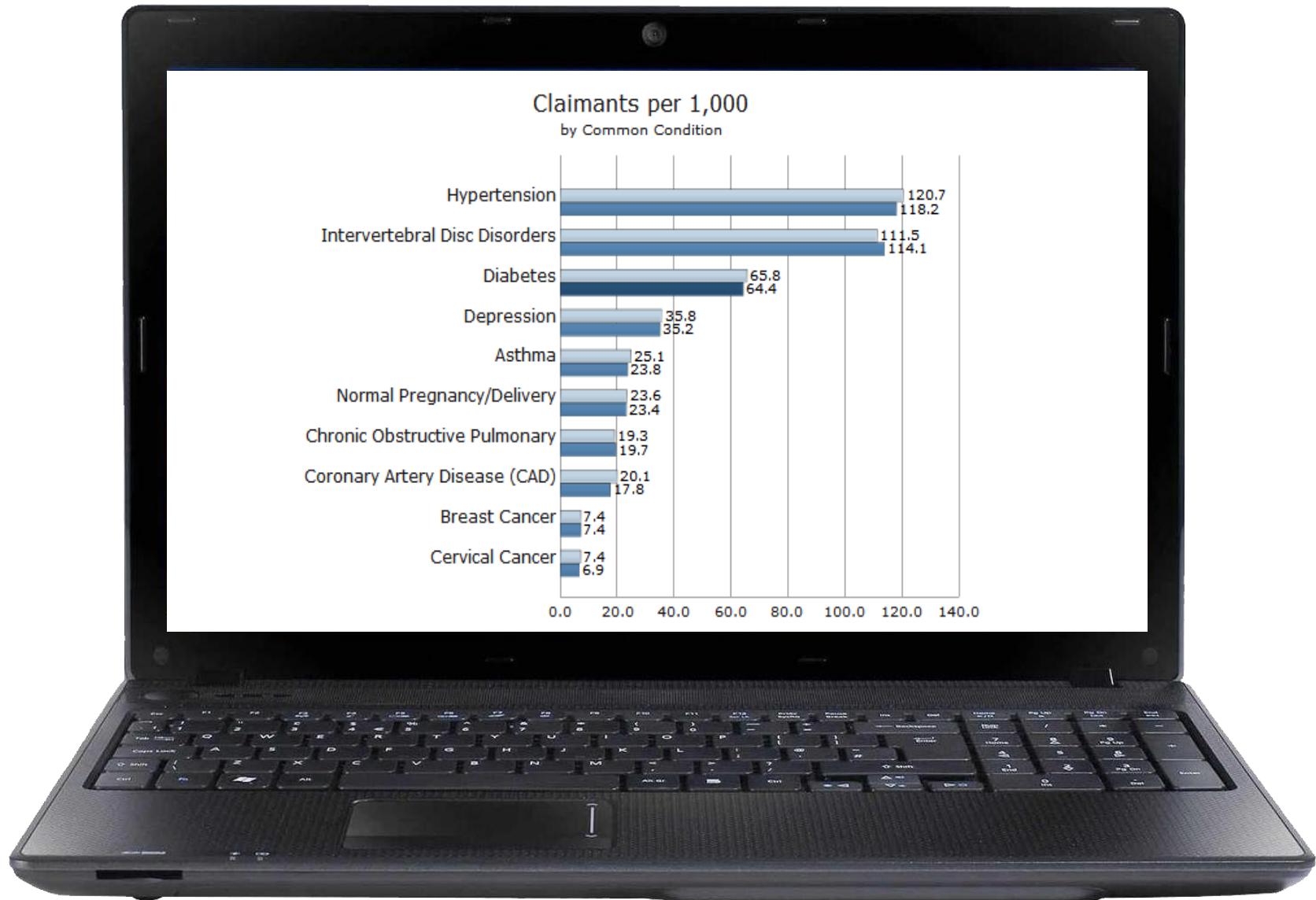


# Plan Sponsor

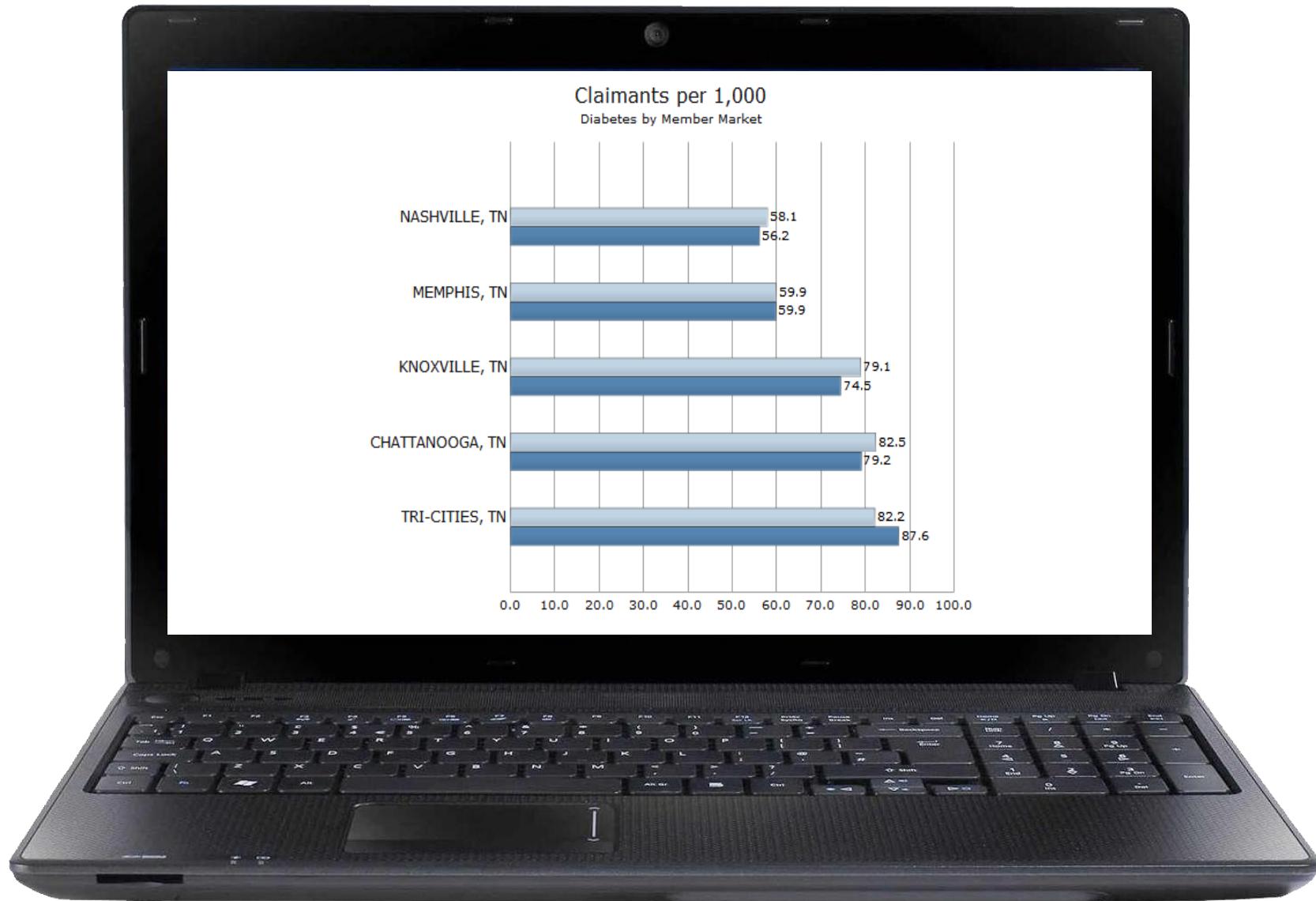
# Visualizations



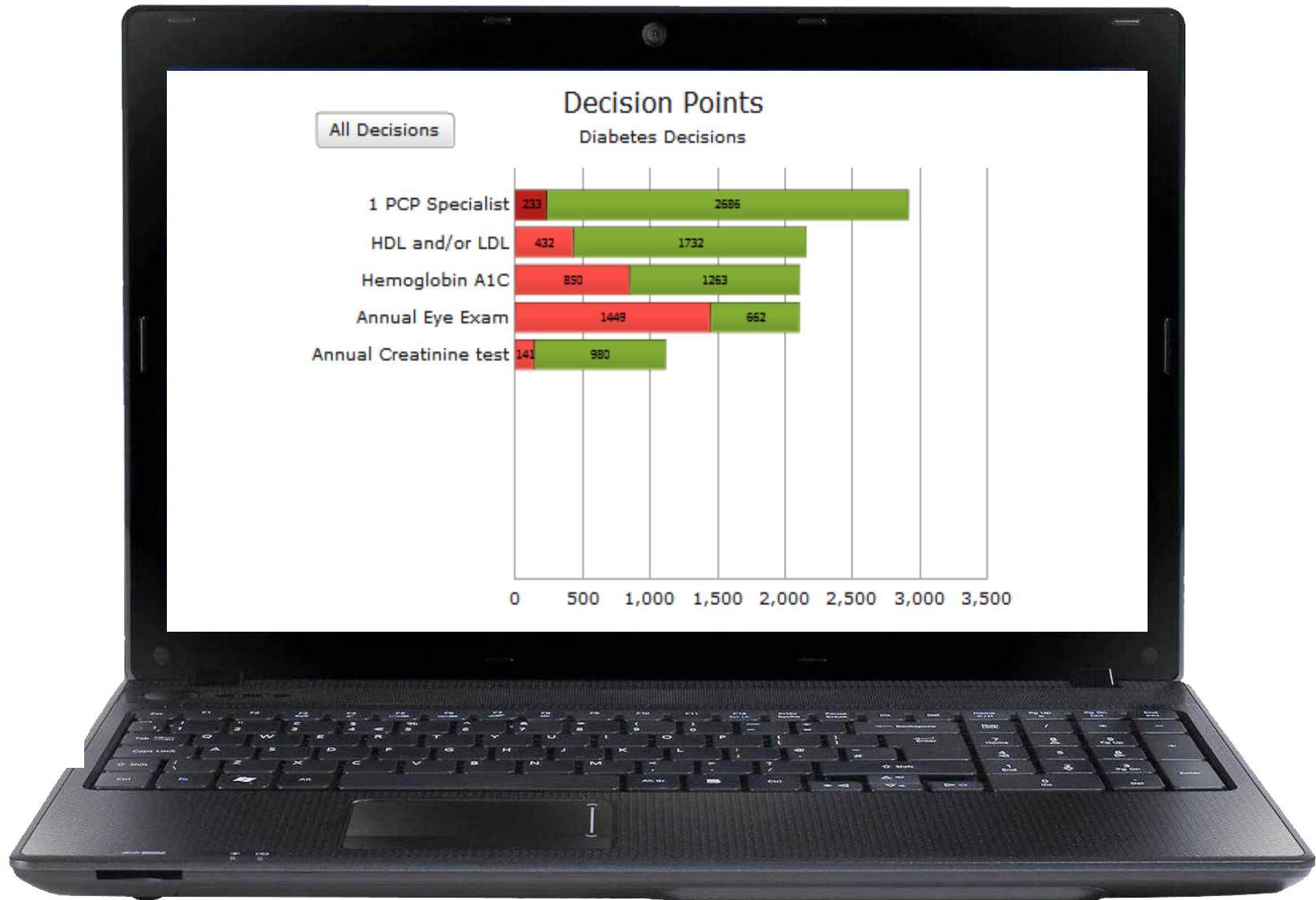
# Deeper Data



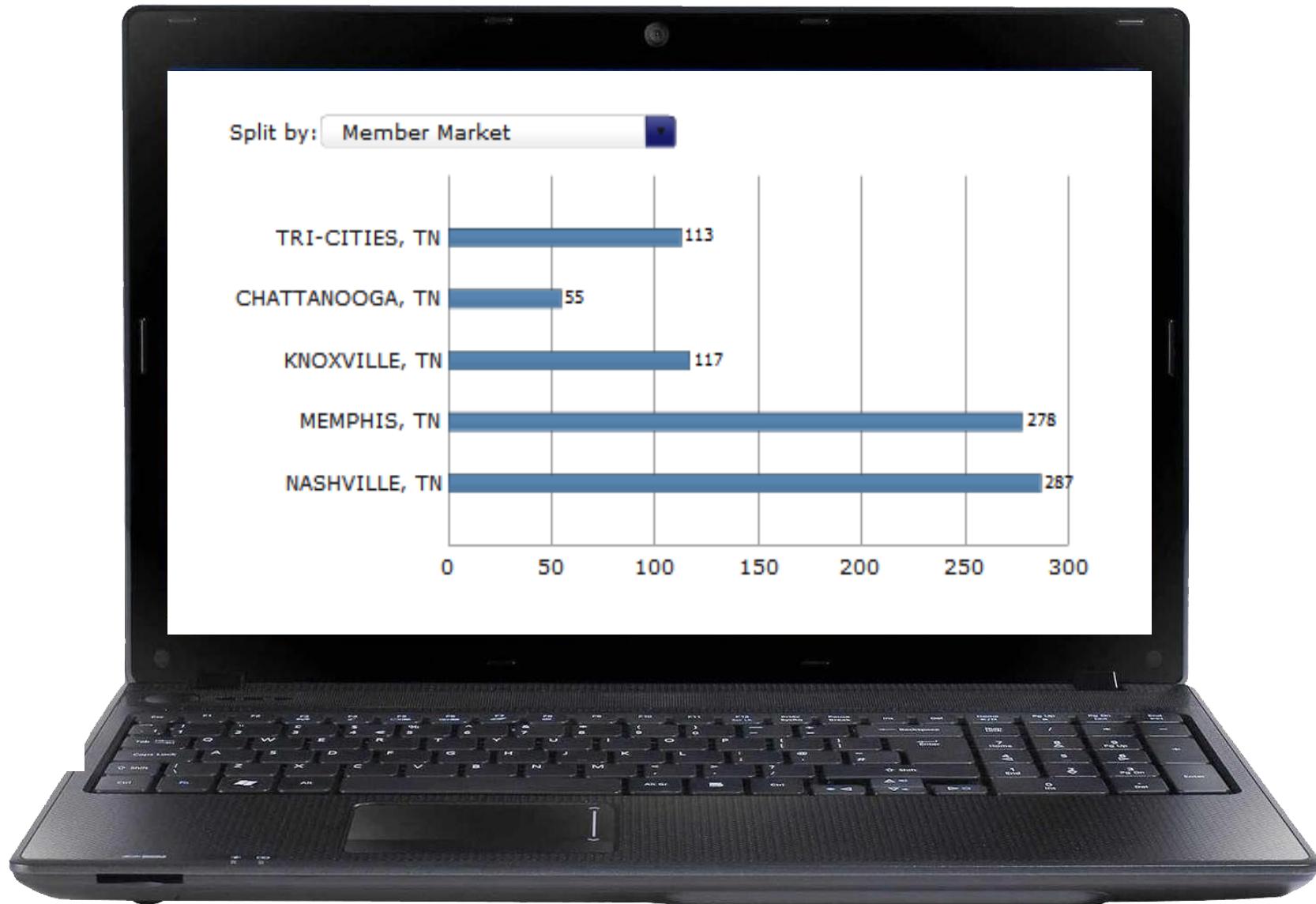
# Deeper Data



# Deeper Data



# Deeper Data

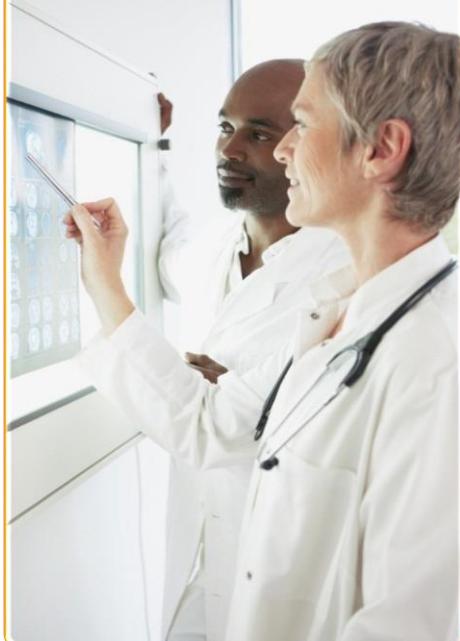




# Provider

# Analytics for the Physician

Manage Risk



Optimize the Care Continuum



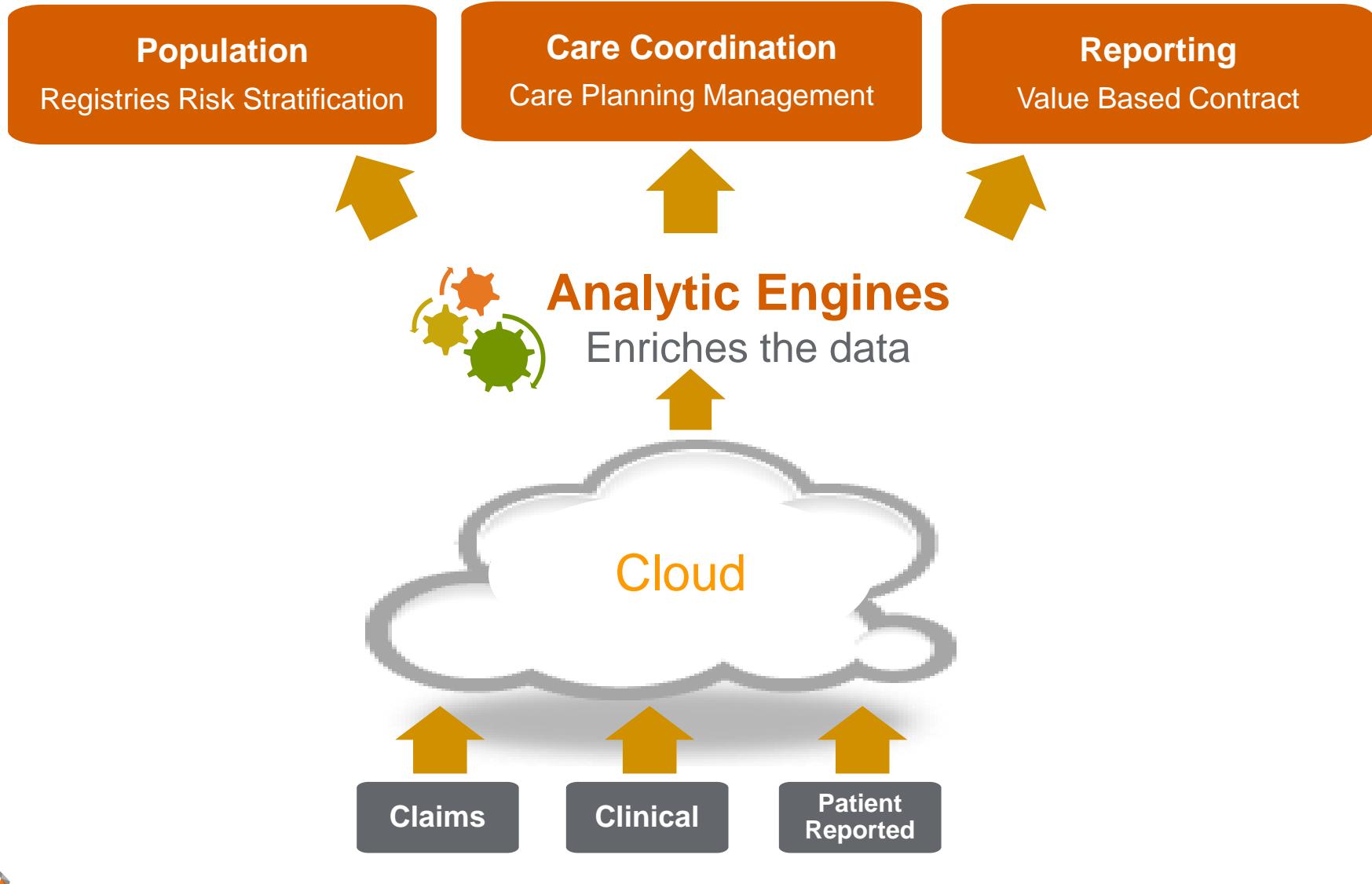
Align Incentives



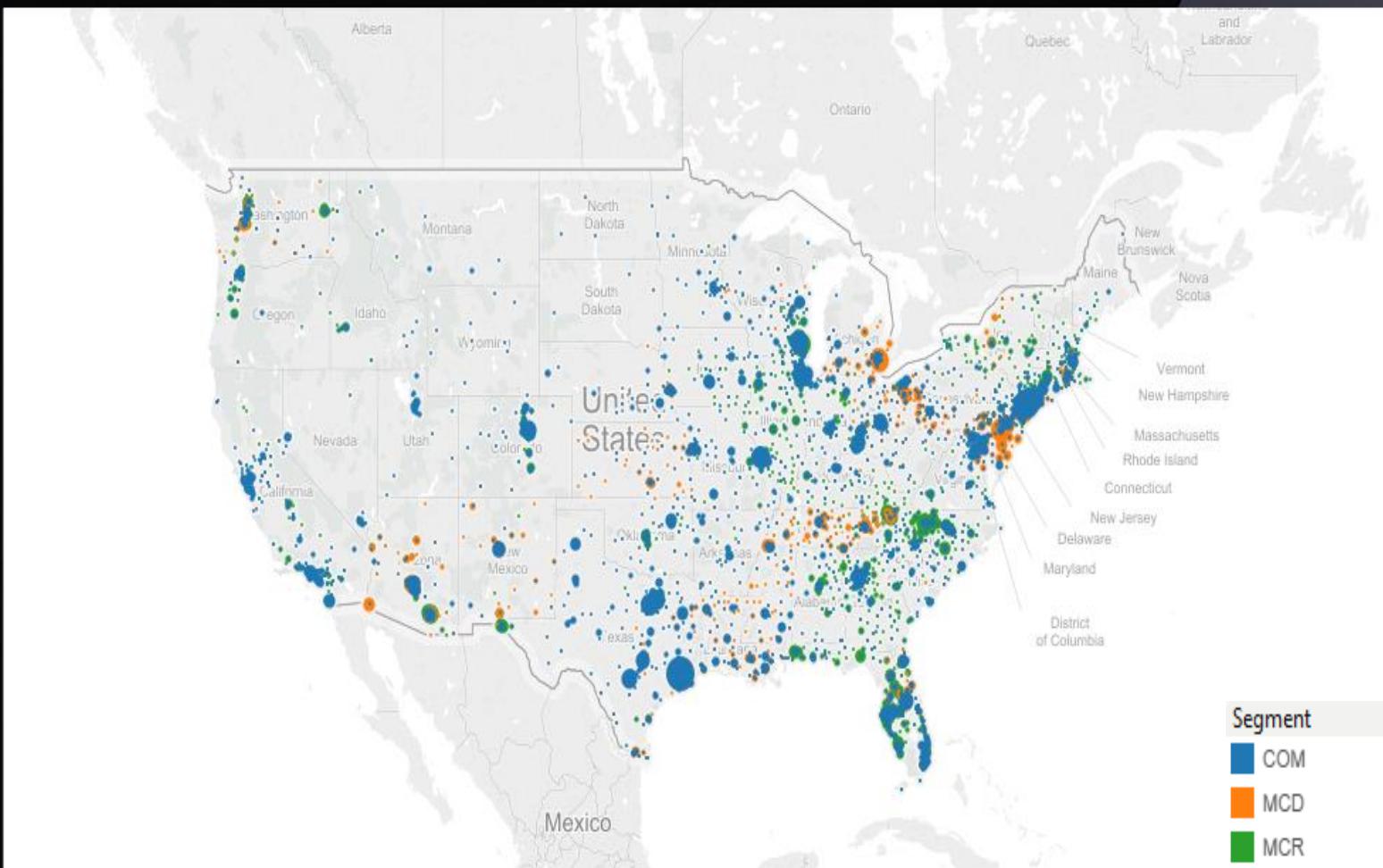
Engage Patients in Self Care



# Analytics for the Physician

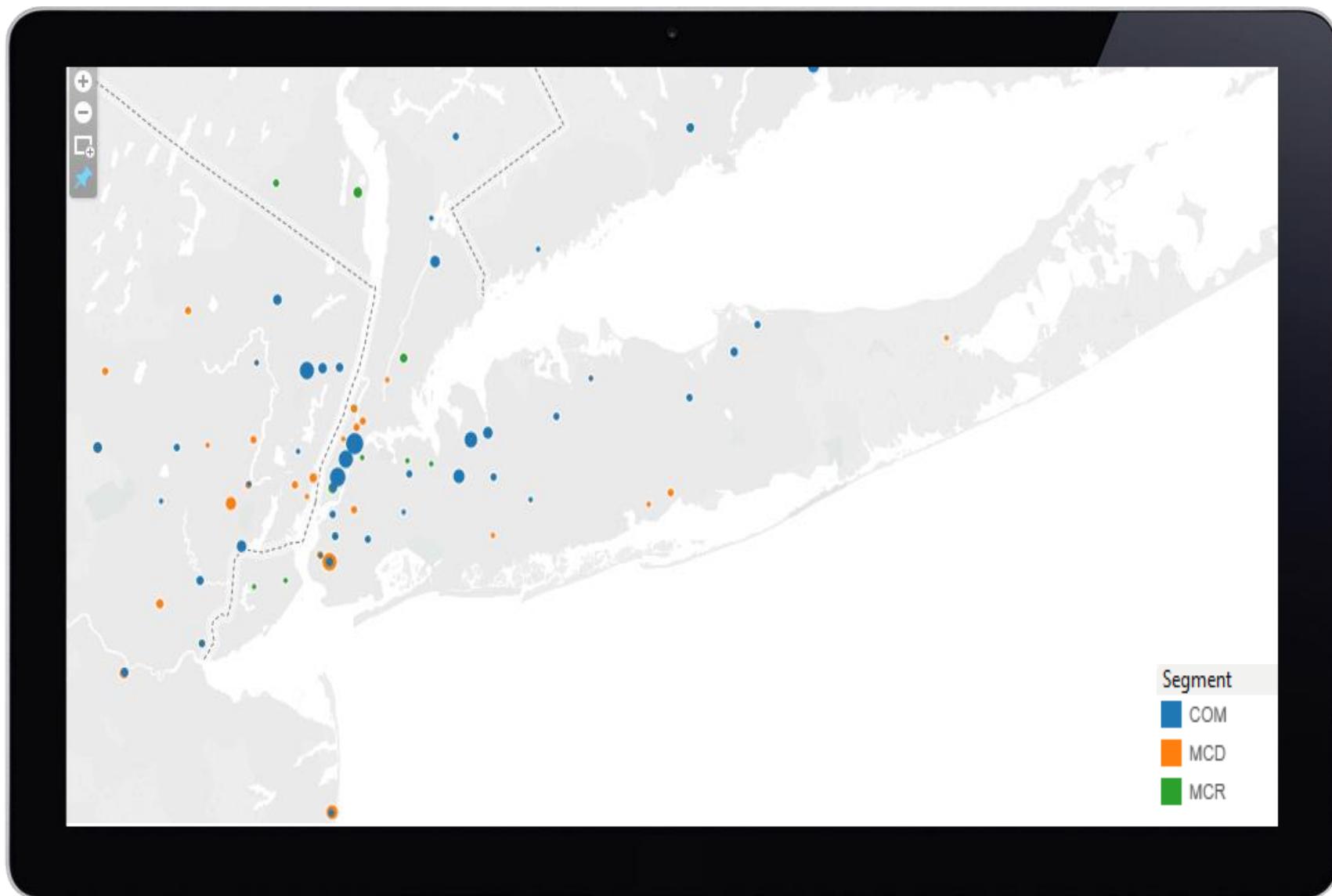


# Inpatient Admissions: Week of February 15th



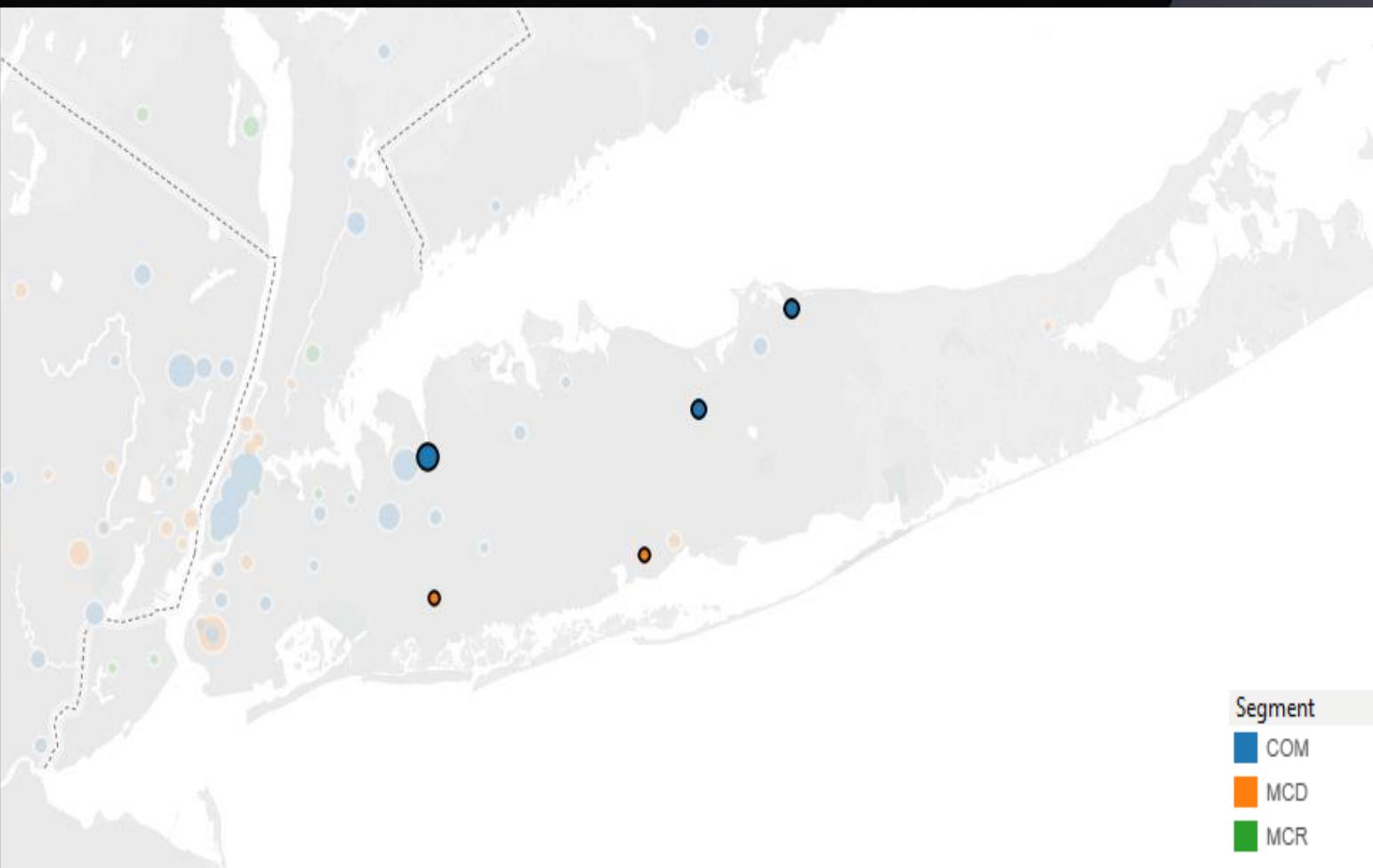
# Inpatient Admissions by Hospital System: Long Island NY

## Week of February 15th



# North Shore LIJ Health System

## Inpatient Admissions



# Population Analytics – Diabetes Registry

Diabetes Mellitus Registry											Displaying 1-15 of 88 Records   Records per page: 15   Page 1 of 6		
Admission Risk: 3 Months											Views	Settings	
<input type="button" value="Select Action"/> Risk % ▾ Patient Name ▾ Age ▾ Sex ▾ Care Program ▾ HbA1c ▾ LDL ▾ BP ▾ Attributed Provider ▾ Attributed Clinic ▾													
27	Underwood, Annette	88	F	1	View Program	11.1	200	157/93	Haraesun, Ryan, MD	WellHealth Clinic	6	East	
<input type="checkbox"/>	<b>21</b>	<b>Johnson, Arthur</b>		<b>72</b>	<b>M</b>								
<input type="checkbox"/>	16	Joshi, Rohan	84	M	1	View Program	10.5	177	147/91	Lane, Harriet, MD	Parkplace West		
<input type="checkbox"/>	11	Goldberg, David	69	M			9.7	197	133/78	Johnson, Jesse, MD	WellHealth Clinic		
<input type="checkbox"/>	10	Troisi, Michelle	72	F	3	View Programs	8.9	156	180/84	Brown, Robert, MD	WellHealth Clinic		
<input type="checkbox"/>	8	Chung, Jennifer	59	F	1	View Program	9.4	129	145/78	Martinez, Linda, MD	Grandview		
<input type="checkbox"/>	8	Lim, Spencer	61	M			8.7	145	130/74	Anderson, Pat, MD	WellHealth Clinic		
<input type="checkbox"/>	8	Sherlock, Diane	69	F	1	View Program	8.1	163	150/89	Davis, John, MD	St. Mary's		
<input type="checkbox"/>	6	Lam, Wayne	57	M	2	View Programs	8.4	104	129/80	Hart, Frank, MD	WellHealth Clinic		
<input type="checkbox"/>	6	Radova, Elena	63	F	1	View Program	7.2	138	137/72	Wilson, James, MD	WellHealth Clinic		
<input type="checkbox"/>	6	Patel, Milind	72	F			7.7	110	121/74	Patel, Vipul, MD	Grandview		
<input type="checkbox"/>	5	Taylor, Zachary	66	M	2	View Programs	8.0	131	133/76	Lorenz, Niklas, MD	Parkplace West		
<input type="checkbox"/>	4	Jones, Letitia	69	F			6.9	127	140/80	Schubert, Robert, MD	St. Mary's		
<input type="checkbox"/>	4	Gusev, Anna	71	F	1	View Program	8.7	143	127/78	Bauman, Sara, MD	Grandview		

# Patient Level Analytics

 Arthur Johnson

Sex: Male      Medical Record: 7684992  
Date of Birth: 02/12/1940 (72y)      Phone: 763-748-9981  
Language: English      Address: 1322 Central Ave NE  
Minneapolis, MN 55413

[Talk to Patient](#) [Full Patient Demographic](#) [Schedule Task](#)

[Dashboard](#) [Care Plan](#) [Assessments](#) [Progress Analytics](#)

**Clinical Indicators**

Problem/Dx	Clinical Data	Active Medications	Test/Exams	Social History
HbA1c (%)	▲ 10.7	EMR		
Blood Pressure	▲ 145/90	EMR		
LDL mg/dL	▲ 180	EMR		
Weight (lbs)	▲ 177.3	EMR		
Body Mass Index (%)	▲ 30.4	EMR		

**Encounters**

Date	Location	Provider	Reason	Source
08/29/2012	UrgentWest Care	Beckett, Paul	Hypoglycemia	Claims
04/30/2012	St. Mary's	Radovich, Samuel	DKA	EMR
02/07/2012	University ER	Patel, Mona	Hypoglycemia	Claims

**Program Management**

Suggested Programs		Historical Programs	Add a Program
Enroll	Program Name	Owner	Status
<input type="checkbox"/>	Readmission Prevention	Caldwell, Kelly	Suggested
<input type="checkbox"/>	Diabetes Mellitus	Caldwell, Kelly	Suggested

**Patient Risk Scores**

Description	Risk	Date
Admission Risk: 3 months	21%	09/17/2012
Cost: 12 months	2.0	06/22/2012



# Consumer

# Quick Estimate: for a selected treatment

Show information for: MOTYKA GRISSETT 08/10/1978 ▾ Hello MOTYKA GRISSETT | Log Out

Your remaining deductible: Individual \$250 Family \$750

## myHealthcare Cost Estimator

Childbirth - Vaginal Delivery and Newborn Care

✓ Save

**Your Quick Estimate:**  
These numbers are based on your health plan and average costs in your area. For a more accurate assessment, [get a personalized estimate.](#)

Average costs based on your area 78704 Update

Estimated duration of your treatment: 8 Months

Your estimated total cost (In-Network): **\$11,613**  
See [Out-of-Network Costs](#)

Estimate of what portion your health plan will pay: **\$10,343**

Your estimated out-of-pocket cost: **\$1,270**

Add your preferred physicians and facilities to this estimate to see even more accurate results.

Search + Physician + Facility = Estimate

By selecting which doctors, clinics and hospitals you intend to visit, you'll see quality reviews and a more accurate estimate of your costs.

[Personalize Your Estimate ▶](#)

# Personalized Estimate: select a quality physician

The screenshot shows the myHealthcare Cost Estimator interface. At the top, it displays a Care Estimate for Childbirth - Vaginal Delivery and Newborn Care. The estimated Out-of-Pocket cost based on the user's plan is \$1,270, while the In-Network Cost is \$1,161.3. The Health Plan Pays \$10,343. Below this, there are icons for Home, Select Physician, and various steps of the process: Step 2 (Vaginal Delivery and Newborn Care), Step 3 (Newborn Care (physician charges)), Step 4 (Postnatal Visit), and Final Estimate.

Prenatal Care, Routine Labs, Ultrasound, and Delivery (physician charges)  Save

Search By: 78704, Austin, TX 25 Miles Specialties (optional): 1 selected  Compare Choose up to 5 Physicians and Compare Them

Physician First Name:  Gender:  M  F Languages (optional): 1 selected

Physician Last Name:

Your search returned (100) physicians ranging from: \$1,541 - \$8,796

Sort By: Premium Designation  View: 10 per page Currently Viewing 1 - 10 of 100

Provider Name  Add to Compare

Rank	Provider Name	Address	Local Average:	This Physician:	Health Plan Pays:	Out-of-Pocket:	Cost of Affiliated Facility:	Action
1	UnitedHealth Premium Tier 1 <small>Obstetrics and Gynecology</small>	Address Phone#	\$2,368	\$1,541	\$1,233	\$308	\$8,938 - \$8,977	<input type="button" value="Select Physician"/> <input type="button" value="Move to Next Step"/>

# Personalized Estimate: select a quality physician – newborn care

The screenshot shows the myHealthcare Cost Estimator interface. At the top, it displays a care estimate for "Childbirth - Vaginal Delivery and Newborn Care" with an out-of-pocket cost of \$1,234 and an in-network cost of \$1,0710. Below this, there are icons for various services: Home (\$1,541), Prenatal Care, Routine Labs, Ultrasound, and Delivery (physician charges) Chouteau (\$8,938), Vaginal Delivery and Newborn Care (facility charges) El Davids Medical Center (\$120), Postnatal Visit Chouteau (\$111), and Final Estimate.

The main search area allows users to search by location (78704, Austin, TX), radius (25 Miles), specialty (1 selected), gender (M/F), language (1 selected), and physician first and last names. A "Compare" button is available to choose up to 5 physicians. The message "Your search returned (100) physicians ranging from: \$86 - \$418" is displayed.

The results table includes columns for Provider Name, Address, Phone #, Health Plan Pays, Out-of-Pocket, and a "Select Physician" button. One provider, "UnitedHealth Premium Tier 1 Pediatrics", is highlighted with a red box around its name. The address is listed as "4.85 Miles from 78704, Austin, TX" and the physician is marked as "In Network".

# Personalized Estimate post natal care

The screenshot shows the myHealthcare Cost Estimator interface. At the top, it displays a Care Estimate for Childbirth - Vaginal Delivery and Newborn Care, with an Out-of-Pocket amount of \$1,231 (Based on Your Plan), an In-Network Cost of \$1,067 (Below Average), and a Health Plan Pays of \$9,445.

The main content area shows five categories of medical services with their respective costs:

- Home: \$1,541
- Prenatal Care, Routine Labs, Ultrasound, and Delivery (physician charges) Chouleau: \$8,938
- Vaginal Delivery and Newborn Care (facility charges) St David's Medical Center: \$86
- Newborn Care (physician charges) Edoka: \$111
- Choblesse: \$111

A "Final Estimate" button is also present.

On the left sidebar, there are links for "See My Benefits", "Saved Searches", and "Help".

The search interface includes fields for "Search By" (78704, Austin, TX), "Specialties (optional)" (1 selected), "Gender" (M, F), "Languages (optional)" (1 selected), and a "Search" button. It also allows users to "Compare" up to 5 physicians.

The search results indicate 100 physicians ranging from \$111 to \$719. The current view is 1-10 of 100. A "Refresh" button is available.

A specific provider entry for UnitedHealth Premium Tier 1 Obstetrics and Gynecology is shown, located 4.85 miles from 78704, Austin, TX, and is In Network. The provider has an Address and Phone #, a Local Average cost of \$148, and a This Physician cost of \$111 (Below Average). The Health Plan Pays is \$91, and the Out-of-Pocket cost is \$20. Buttons for "Select Physician" and "Remove This Physician" are provided.

# Final Personalized Estimate with total out-of-pocket cost

The screenshot displays the myHealthcare Cost Estimator interface on a tablet. The top navigation bar includes links for "Start Over", "Prescription Estimates", "What Is It?", and "How it works". The main title "myHealthcare Cost Estimator" is centered above the content area. A summary section at the top right shows "Your Out-of-Pocket: Based on Your Plan \$1231" and "In-Network Cost: Below Average \$10676", with a note that "Health Plan Pays: \$9,445". Below this, a grid of icons represents different medical services and their costs: Home (\$1,541), Prenatal Care, Routine Labs, Ultrasound, and Delivery (physician charges) Chouteau (\$8,938), Vaginal Delivery and Newborn Care (facility charges) St Davids Medical Center (\$86), Newborn Care (physician charges) Edoka (\$111), and Postnatal Visit Chouteau. A large orange button labeled "Final Estimate" is prominently displayed.

**Your Final Estimate for Childbirth - Vaginal Delivery and Newborn Care**

**Great work**

This is your final estimate for the service you selected. Next you can:

- Review the detailed cost breakdown below
- Print and save this estimate

Your final cost may be different from your estimate because services such as lab work, x-rays and devices/supplies are not included. See [why costs may vary](#).

Note: If you did NOT select a clinician or facility, your estimate is based [See More....](#)

[Your final estimate](#) [Next steps](#) [Funding options](#) [Why costs may vary](#)

**\$1,231 Estimated Out-of-Pocket Cost** **Health Plan Pays \$9,445**

In-Network Total Cost: **\$10,676**  
Average Duration of Treatment and Recovery: **8 Months**

# Public/Private



# Provider



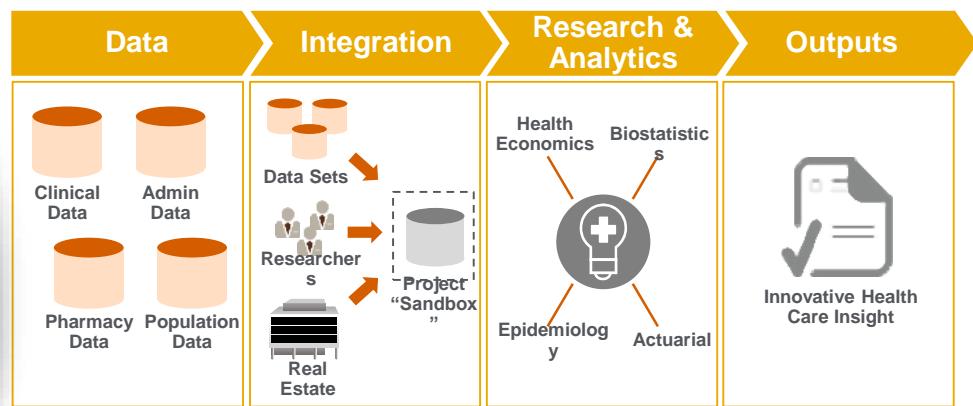
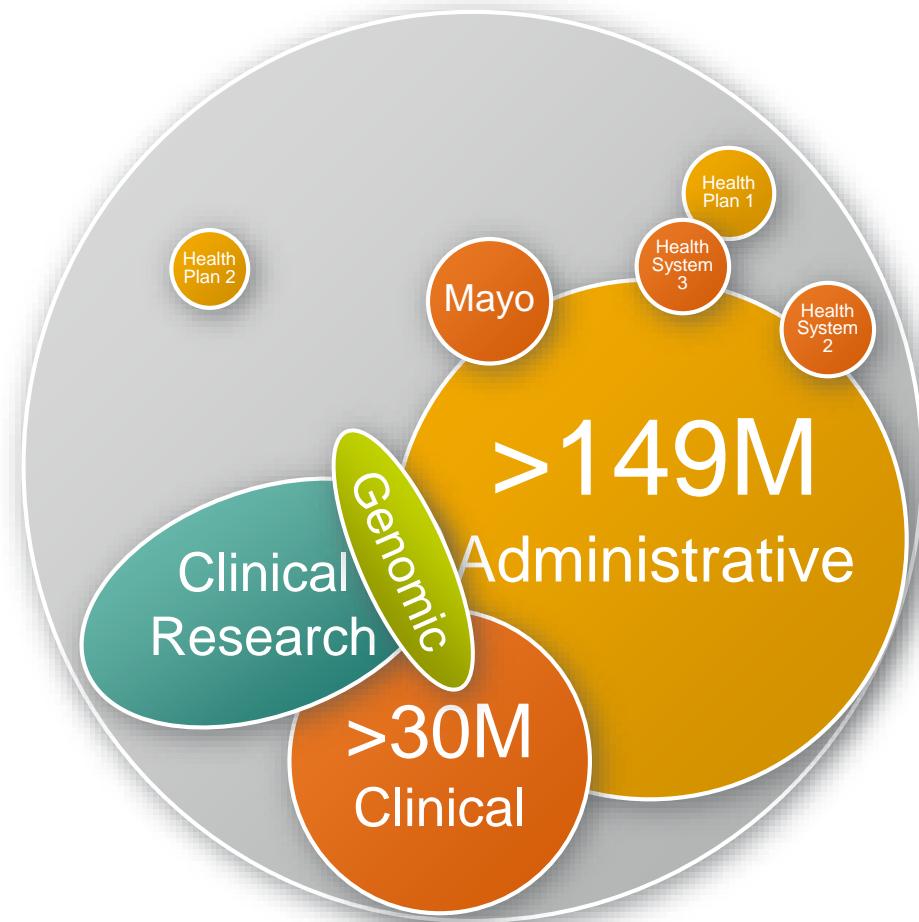
# Employer



# Consumer

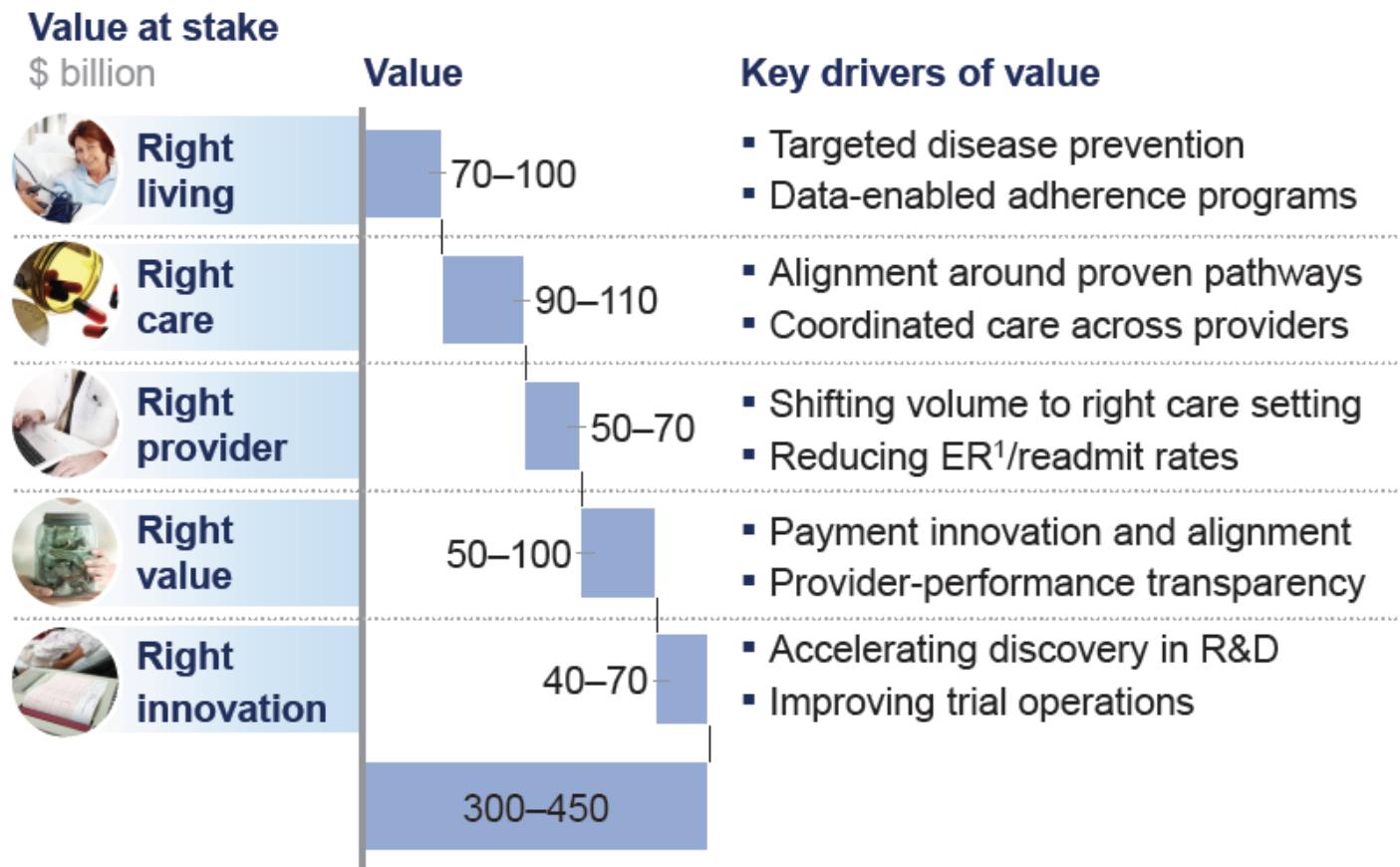
# Optum Labs

**315M** US Population



# Big Data is the Enabler

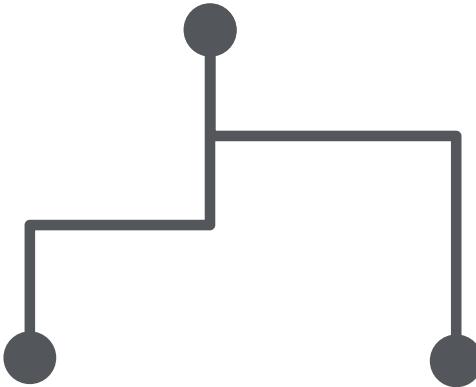
**Exhibit 4: Applying early successes at scale could reduce US healthcare costs by \$300 billion to \$450 billion.**



<sup>1</sup> Emergency room.

Source: American Diabetes Association; American Hospital Association; HealthPartners Research Foundation; McKinsey Global Institute; National Bureau of Economic Research; US Census Bureau

# The **Future** of Big Data in Health Care



Predictive Analytics



Precision Medicine

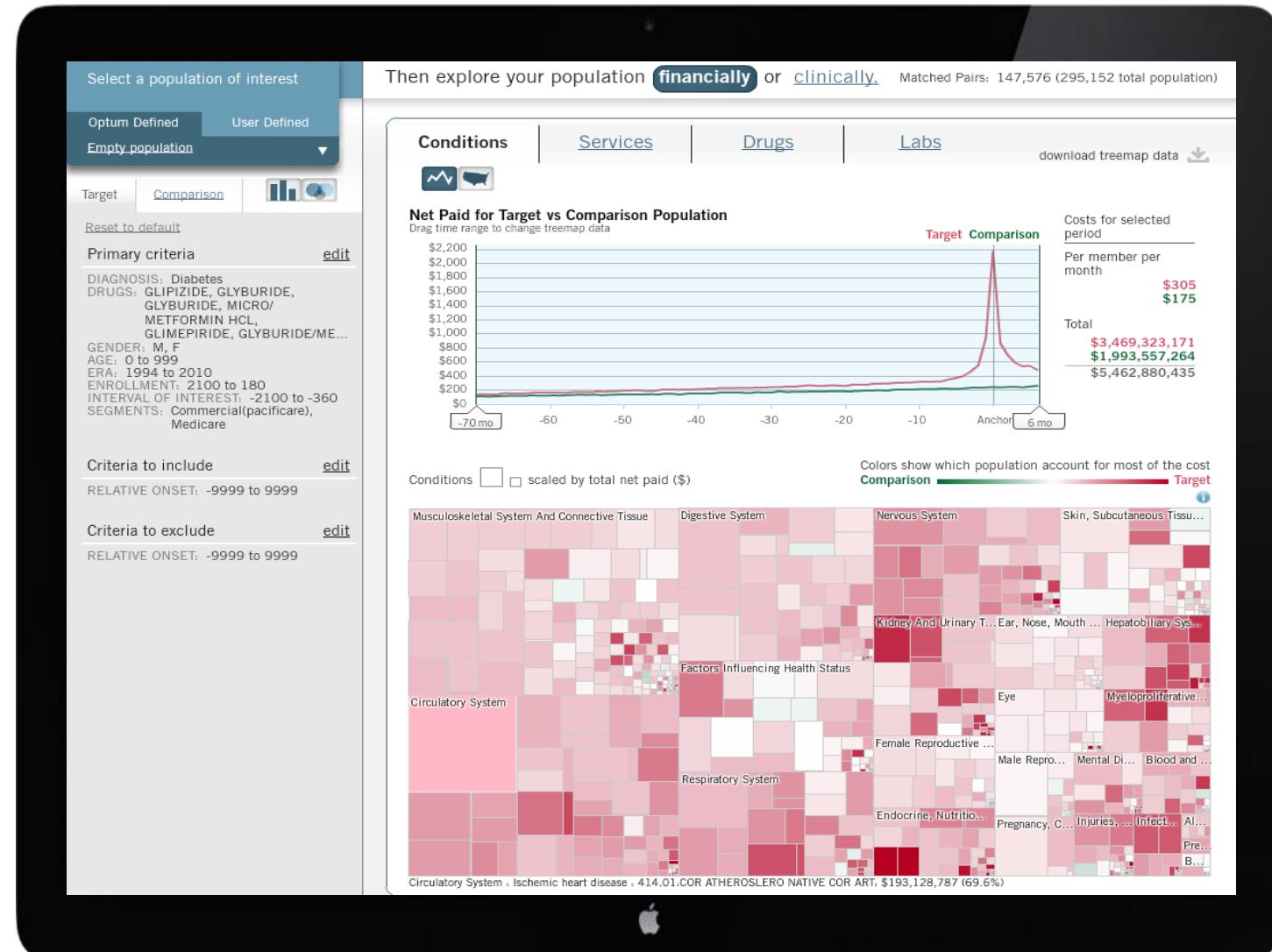


# PREDICTIVE ANALYTICS

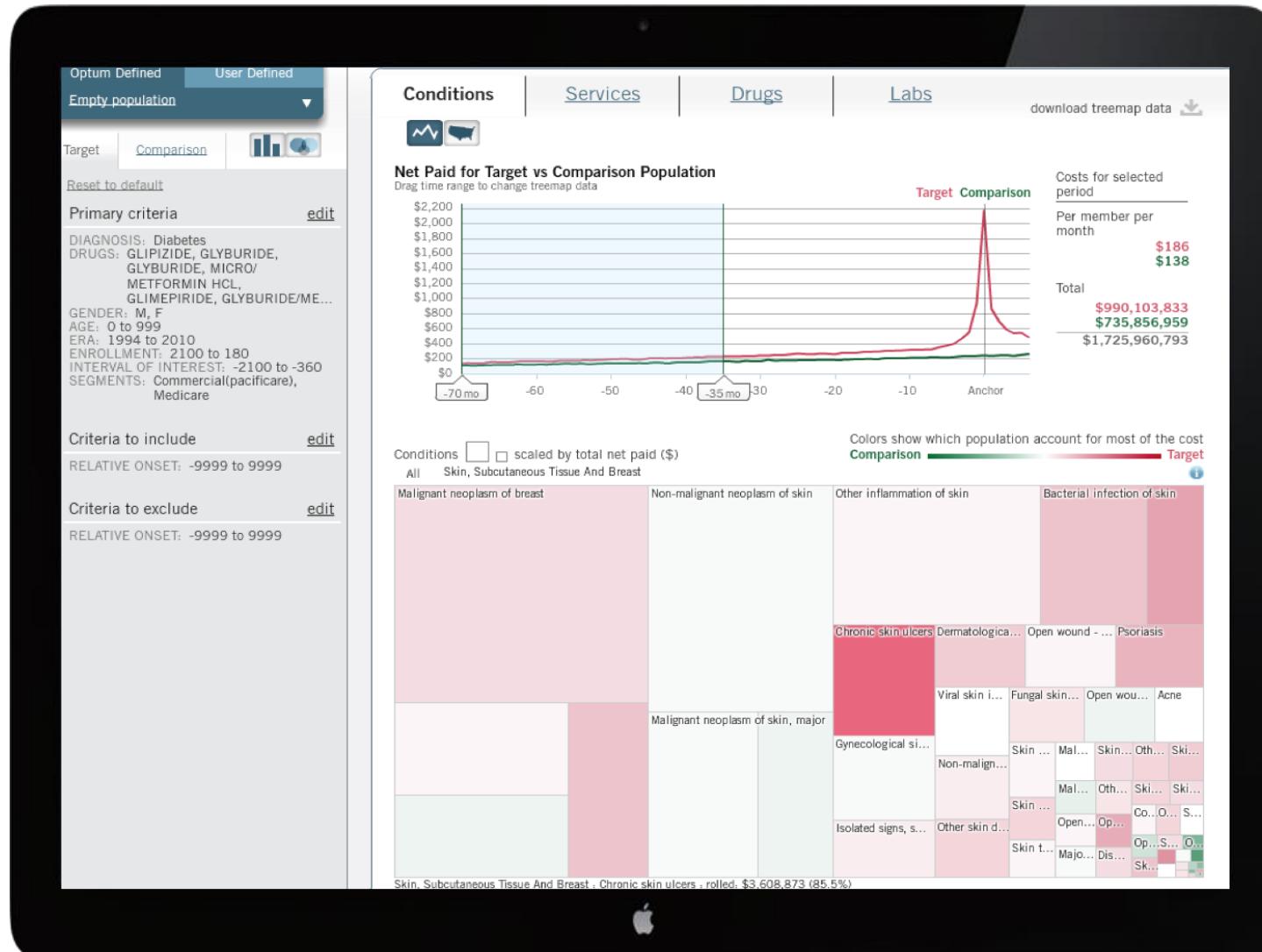
Straight Ahead

## Predictive Analytics

# Predictive Analytics



# Predictive Analytics



# Predictive Analytics

Select a population of interest

Optum Defined User Defined  
Empty population

Target Comparison

[Reset to default](#)

**Primary criteria** [edit](#)

DIAGNOSIS: Diabetes  
DRUGS: GLIPIZIDE, GLYBURIDE,  
GLYBURIDE, MICRO/  
METFORMIN HCL,  
GLIMEPIRIDE, GLYBURIDE/ME...

GENDER: M, F  
AGE: 0 to 999  
ERA: 1994 to 2010  
ENROLLMENT: 2100 to 180  
INTERVAL OF INTEREST: -2100 to -360  
SEGMENTS: Commercial(pacificare),  
Medicare

**Criteria to include** [edit](#)

RELATIVE ONSET: -9999 to 9999

**Criteria to exclude** [edit](#)

RELATIVE ONSET: -9999 to 9999

Then explore your population [financially](#) or [clinically](#). Matched Pairs: 147,576 (295,152 total population)

**Conditions Services Drugs Labs** [download treemap data](#)

Anchor relative start and end period  
-70 -70 -12 6 72 mo  
-72 mo 0 mo 72 mo  
Pre/post anchor enrollment requirement

**Codes of Interest**

Top 10	Odds Ratio	Bottom 10	Odds Ratio
1. 277.7:DYSMETABOLIC SYNDROM...	4.08	645. 650:NORMAL DELIVERY	0.75
2. 790.2:ABNORMAL GLUCOSE TOL...	3.81	644. 550.90:INGUINAL HERINA UNILA...	0.80
3. 271.3:INTEST DISACCHARIDASE ...	3.70	643. V77.91:SCREENING FOR LIPOID ...	0.81
4. 790.21:IMPAIRED FASTING GLUC...	3.39	642. V27.0:OUTCOME OF DELIVERY SI...	0.81
5. 790.29:OTHER ABNORMAL GLUC...	3.35	641. V06.1:NEED PROPH VAC W/COMB ...	0.84
6. 278.01:MORBID OBESITY	3.17	640. 692.74:OTH CHRON DERMATITIS ...	0.84
7. 571.8:OTH CHRON NONALCOHOLI...	2.74	639. 709.09:OTHER DYSCHRONIA	0.85
8. 278.00:OBESITY, UNSPECIFIED	2.73	638. V10.83:PERSONAL HX OTH MALI...	0.85
9. 790.6:OTHER ABNORMAL BLOOD ...	2.31	637. 799.0:ILL-DEF & UKN CAUS M...	0.86
10. 780.57:UNSPECIFIED SLEEP APN...	2.30	636. 216.7:BEN NEOPLASM SKIN LOW...	0.86

**780.57:UNSPECIFIED SLEEP APNEA**

Conditions  scaled by comparison to total population Colors show which population account for most of the cost  
**Comparison** **Target**

Factors Influencing Health Status Circulatory System Skin, Subcutaneous Tissue And Breast Ear, Nose, Mouth And Throat

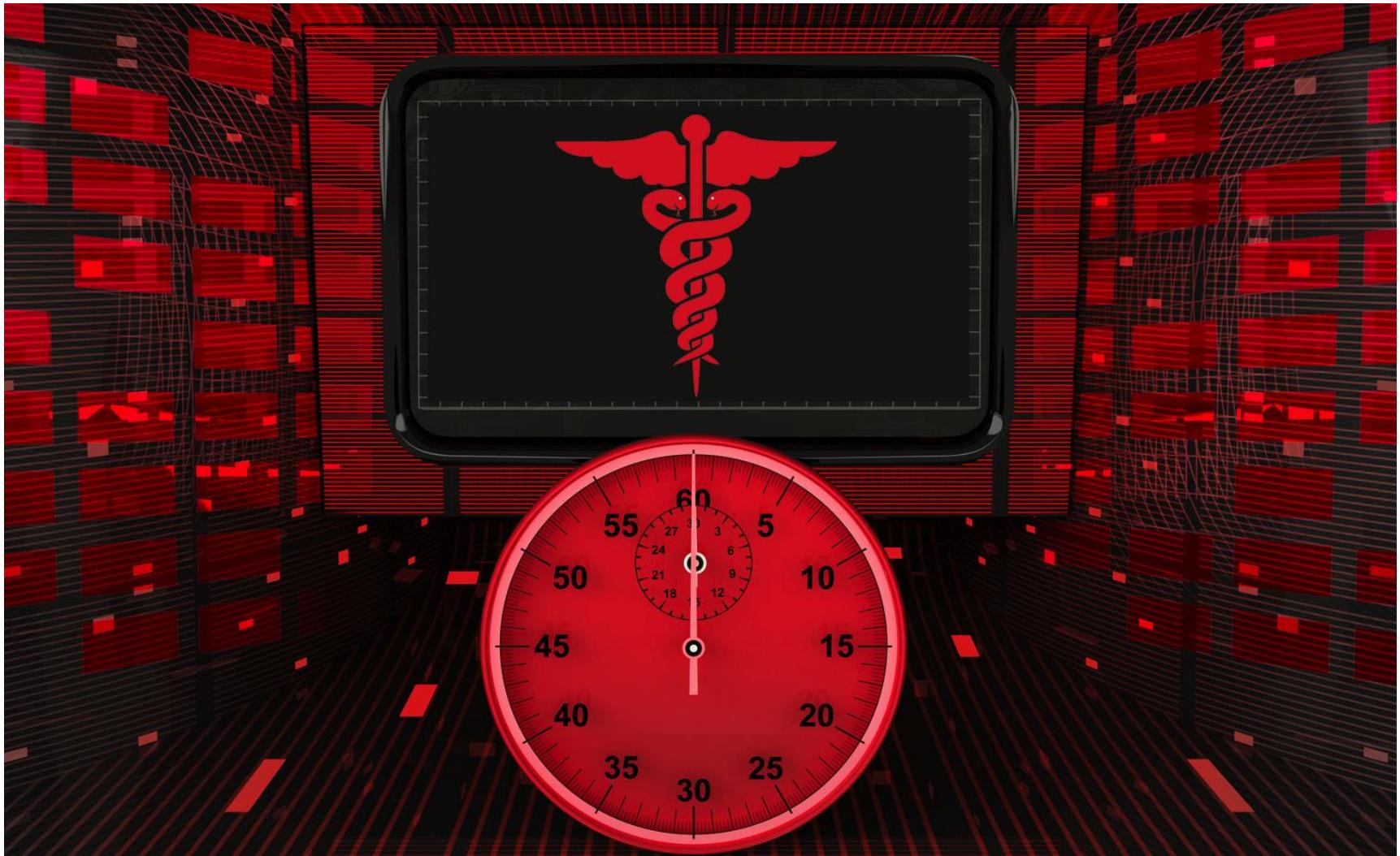
Respiratory System Eye Kidney And Urinary...

Musculoskeletal System And Connective Tissue Digestive System Nervous System Mental Diseases... Male R...

Endocrine, Nutritional ... Blood an... Hep... Inju...

Female Reproductiv... Pre-MDC In... Alco...

My...



# Precision Medicine

# Precision Medicine



Source: <http://give.brighamandwomens.org/stories/entry/2014-big-data>



# Thank you

