

## 2016 Defense Health Information Technology Symposium

# The Tao of Knowledge: Analytics & Business Intelligence



*“Medically Ready Force...Ready Medical Force”*

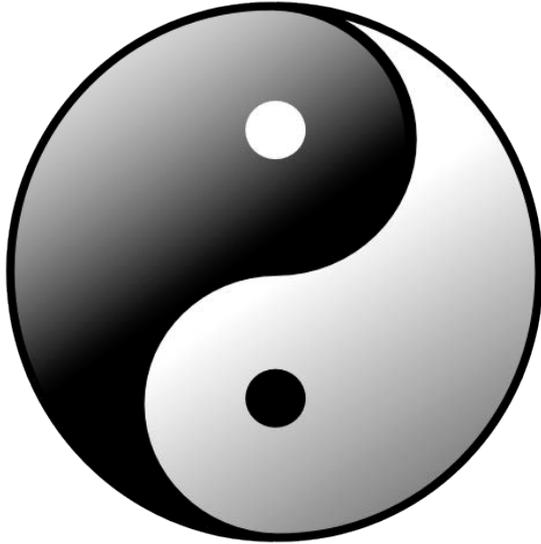
**“A joint, integrated, premier system of health, supporting those who serve in the defense of our country.”**



***“Medically Ready Force...Ready Medical Force”***

# Learning Objectives

- Discuss a possible business model for centralized and decentralized analytic interactions and collaboration
- Describe the different functions of an information portal, analytic workbench, and data science laboratory
- Discuss how complementary uses of analytics and visualization will enhance data discovery and decision making at point of care



- Analytics & Business Intelligence Structure and Strategy
- The Interdependence of Analytics and Business Intelligence

# Act I: Strategy & Structure



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# The Tao [path] of Knowledge



*The Warrior Within*

*Tao operates in Yin and Yang, a pair of mutually complementary forces that are at work in and behind all phenomena ... **One can see that the two forces, although they appear to conflict, in reality are mutually interdependent; instead of opposition, there is cooperation and alternation.** -- Bruce Lee*

# Strengths & Limitations



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## Centralized

- Enterprise
- Scalability
- Lagging Indicators
- Standardization
- Disconnected

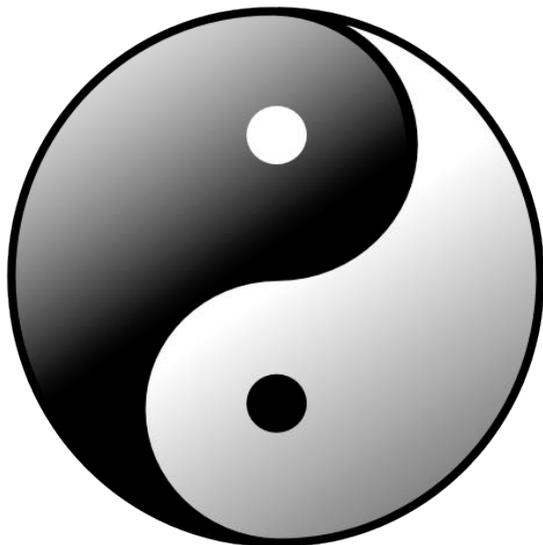
## Decentralized

- Local Factors
- Applicability
- Leading Indicators
- Change Agents

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# Federated Relationship

*Centralized*



*Decentralized*

- Scalable
- Extendible
- Flexible



Information Portal



Analytic Workbench



Data Science Lab

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# Four Disciplines of Execution

## *Discipline 1*

*Focus On Wildly  
Important Goals  
(WIGs)*

## *Discipline 2*

*Act on Lead  
Measures*

## *Discipline 3*

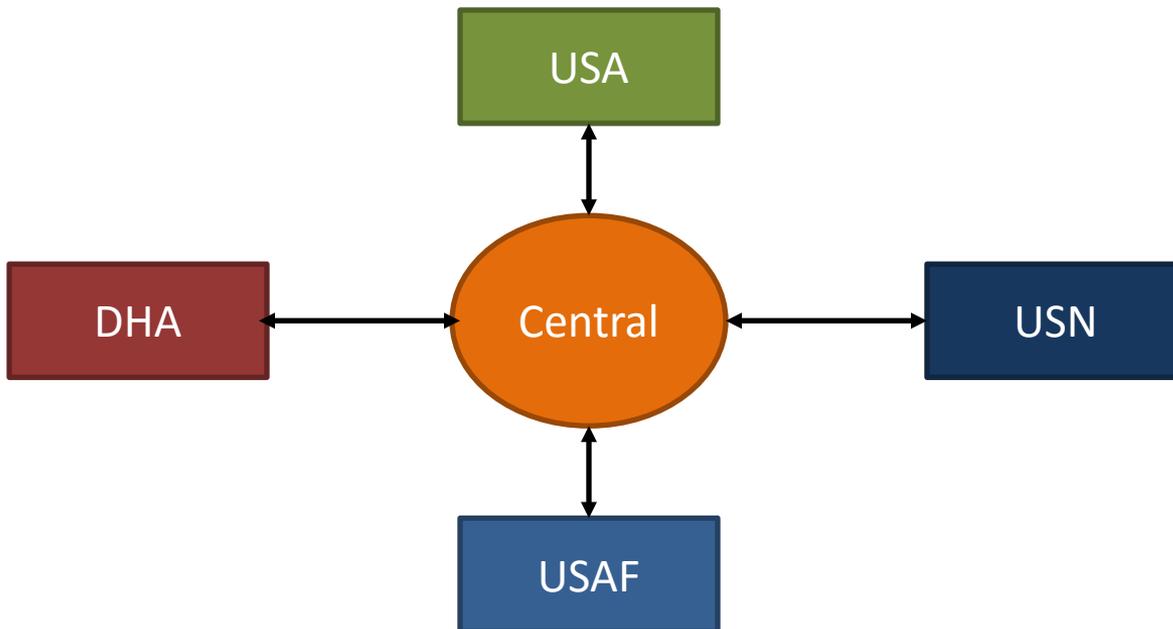
*Keep a  
Compelling  
Dashboard*

## *Discipline 4*

*Create a  
Cadence of  
Accountability*

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# The Federated Approach



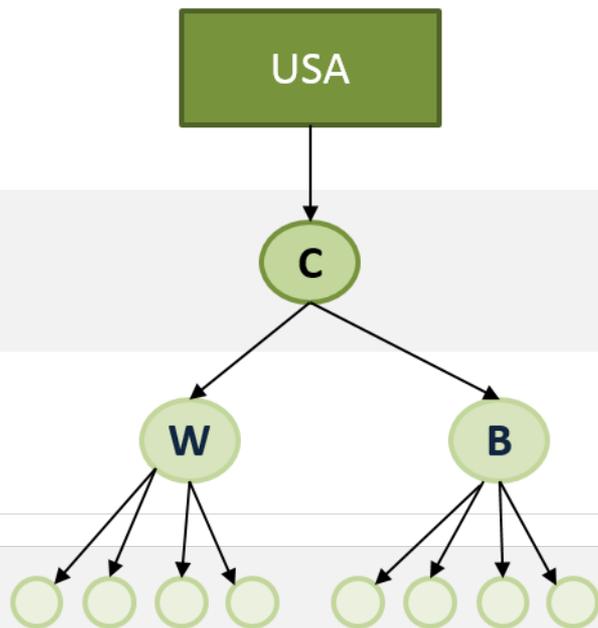
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# Central (Core) Defined



- Enterprise Measures
- Platforms
  - Data and Information Management
  - Analytic Workbench
  - Business Intelligence [self-service]
  - Data Science Lab
- Core Data Science & Analytics Team

# Going from Information to Knowledge

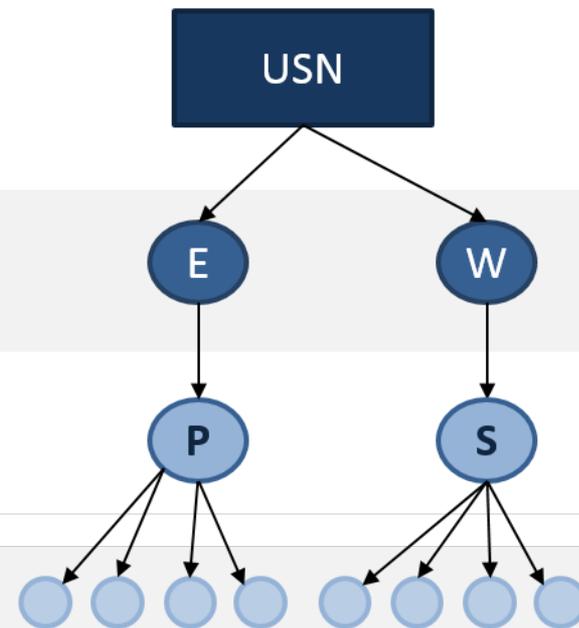


Component

Command

Parent

Child



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# Extendibility & Flexibility Example

*Let's say a Service/Component wanted to answer the question: Do diabetics enrolled to a specific MTF Diabetes Center of Excellence have better outcomes?*

Standardized Measure + Core Team



DCOE Roster



Self Service BI Report

Development



Platforms

Information Platform



Analytic Workbench



Self-Service BI Production Site



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# Data Science Example

*Let's say a Service/Component wanted to answer the question: What conditions cause healthy people to suddenly increase their healthcare needs in the MHS?*

*Standardized Terms + Core Team*



*Platforms*

*Information Platform*



*Data Science Lab*



*Analytic Workbench*



*Information Platform*



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# Act I: Conclusion

- There is interdependence of all components in the MHS
  - Centralized activities should enable decentralized execution
  - Decentralized activities should align with strategic initiatives
  - These ‘forces’ should be complementary
- Platforms should allow for extension and flexibility of application of centralized functions (such as measures, etc)
- Process improvement (hallmark of HRO) cannot occur without a strong federated relationship (centralized/decentralized)

# Act II: Relationship of Analytics & BI

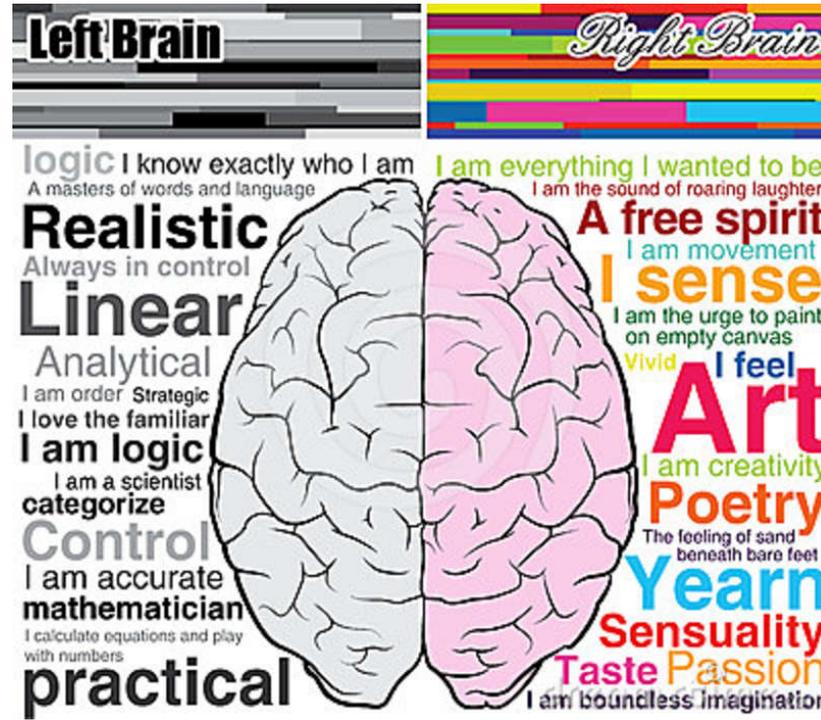


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# The Communication Gap

## Yin

Have you ever tried to explain a random forest analysis to a non-statistical person?



## Yang

Have you ever had a statistician explain post-regression diagnostic plots to you?

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# Challenges for Visualization (BI)

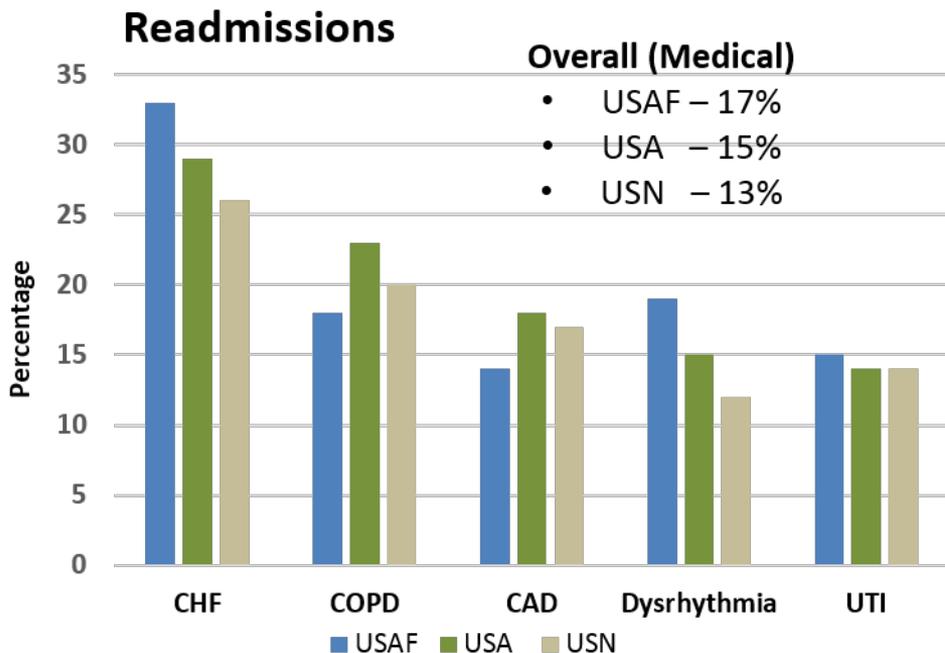
- Statistical Significance
- Univariate versus multivariate
- Risk Adjustment
- Correlation and magnitude of association
- Biases

# Statistical Significance & Multivariables



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Covariate	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
<b>Service</b>		
Army	Referent	Referent
Air Force	1.19 (0.86-1.65)	1.08 (0.90-1.29)
Navy	1.04 (0.77-1.41)	1.07 (0.91-1.27)
<b>Peer Group</b>		
Medium	Referent	Referent
Large	1.56 (1.22-1.98)	1.26 (1.08-1.47)
Small	0.73 (0.55-0.95)	0.89 (0.72-1.11)
<b>Age group</b>		
20-29	Referent	Referent
1-19	0.81 (0.73-0.89)	0.84 (0.75-0.95)
40-59	1.13 (1.05-1.20)	1.05 (0.97-1.14)
60-79	2.03 (1.90-2.17)	1.34 (1.22-1.47)
>=80	2.93 (2.70-3.18)	1.44 (1.29-1.61)

# Risk Adjustment



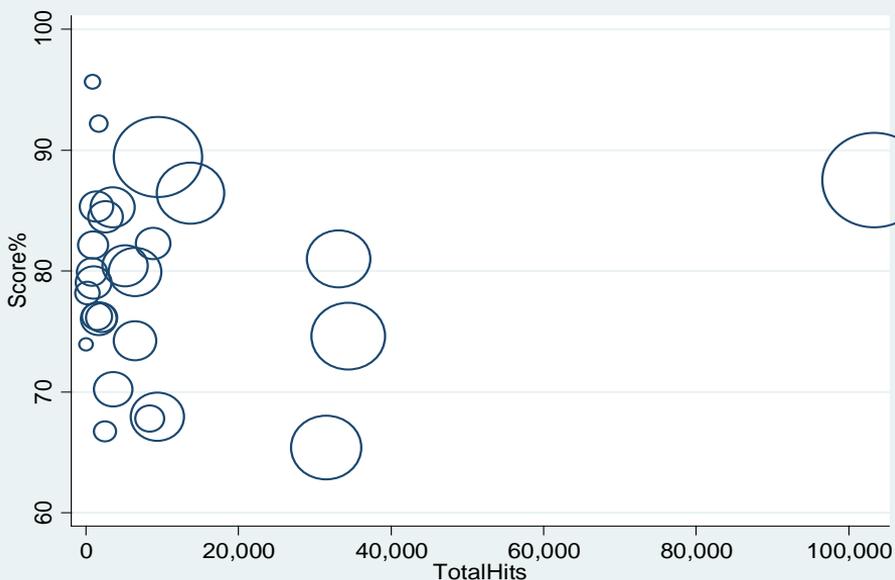
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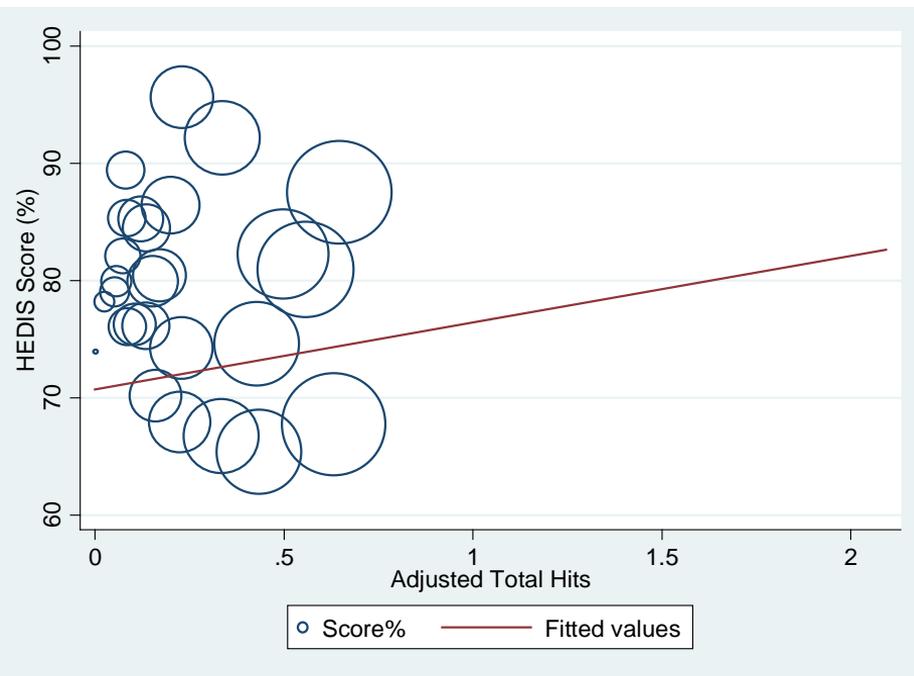
MTF	FY09 Case-mix (IBI)	FY10 IP Rate (Unadj)		FY10 IP Rate (Adj)	
Little Rock	0.76	①	3.4	①	4.0
Elmendorf	0.85	②	3.8	③	4.3
Robins	1.11	③	4.3	②	4.1
MacDill	1.29	④	6.2	⑤	5.6
Wright-Patterson	1.49	⑤	6.6	④	5.3

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# Correlation: MHSPHP Usage & Performance?



Size of Bubbles = Enrollment Size



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# Biases

- Selection Bias
- Confirmation Bias
- Availability Bias

# Act II: Conclusion

- Statistical analysis is key to understanding how factors correlate with each other and the magnitude of the correlation
- Visualization helps communicate the interactions of terms in a more simplistic and effective way
- Using one without the other will open the door to misunderstanding and in some cases biased conclusions

# Act III: Bringing It All Together



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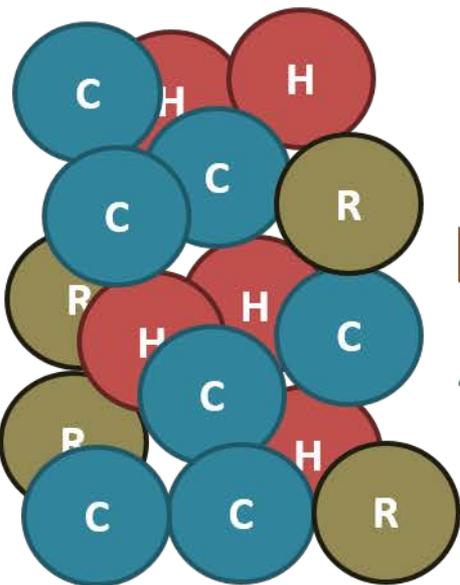
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# Creation of ACGs

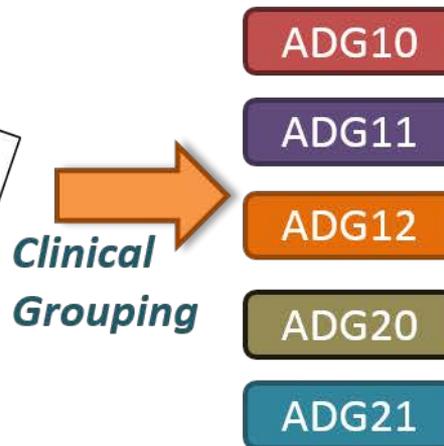
## Healthcare Encounters



## Diagnostic Codes



## Morbidity Groups



## ACGs



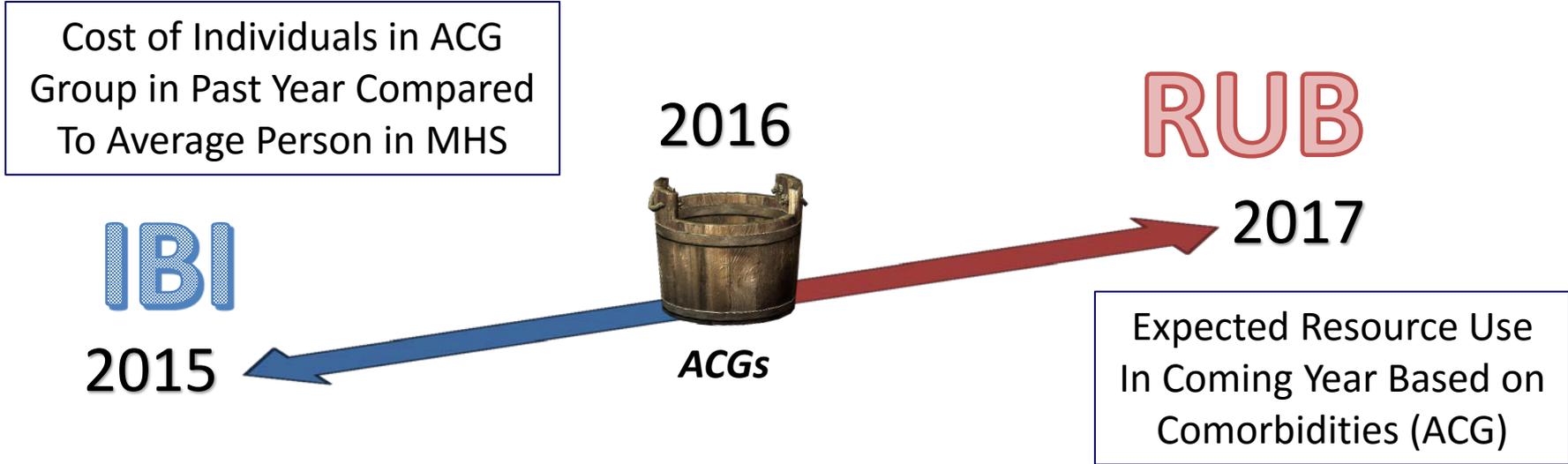
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# Resource Utilization Bands

## Versus Illness Burden Index



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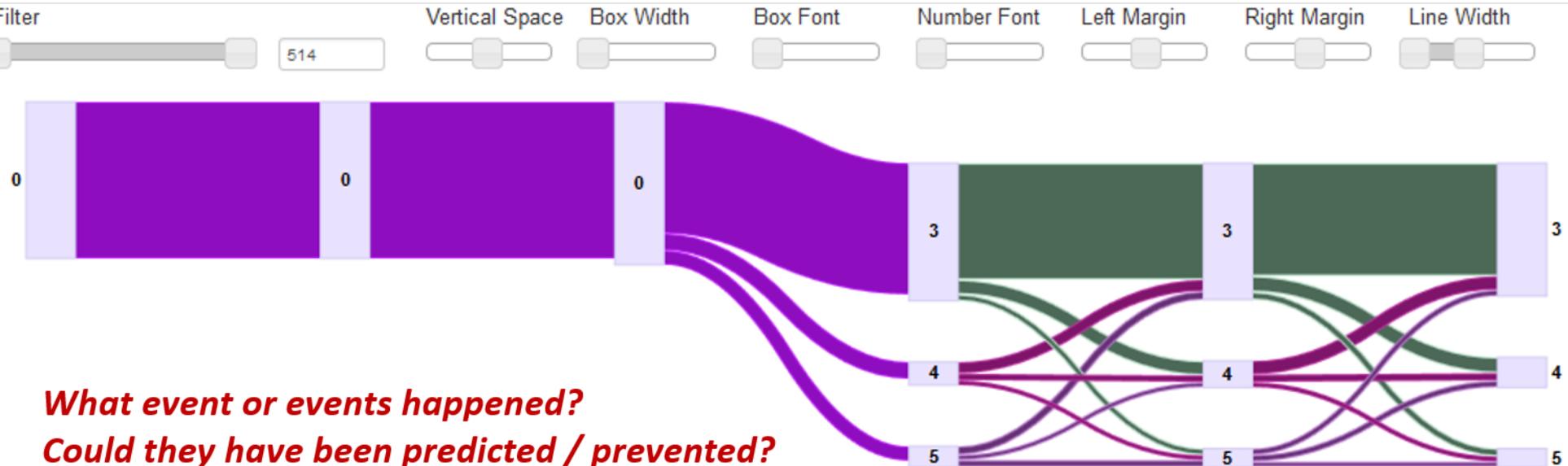


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# Data Science Visualization (1)

*RUB = 0 for three years*

*RUB  $\geq$  3 for three years*

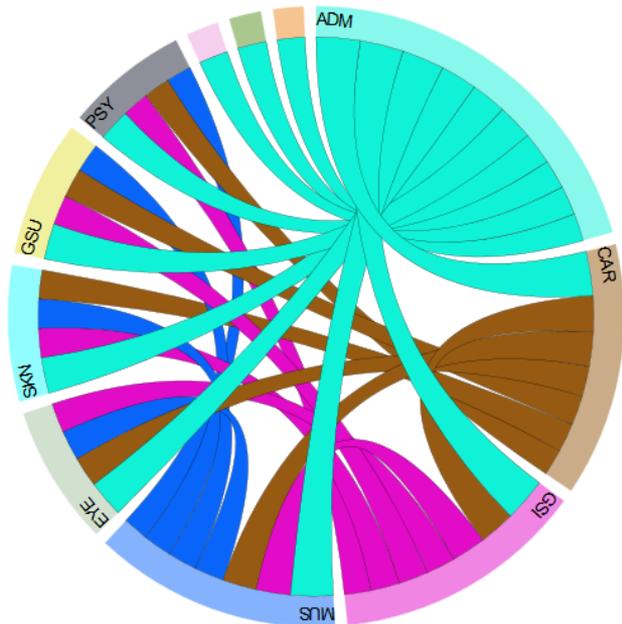


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# Data Science Visualization (2)

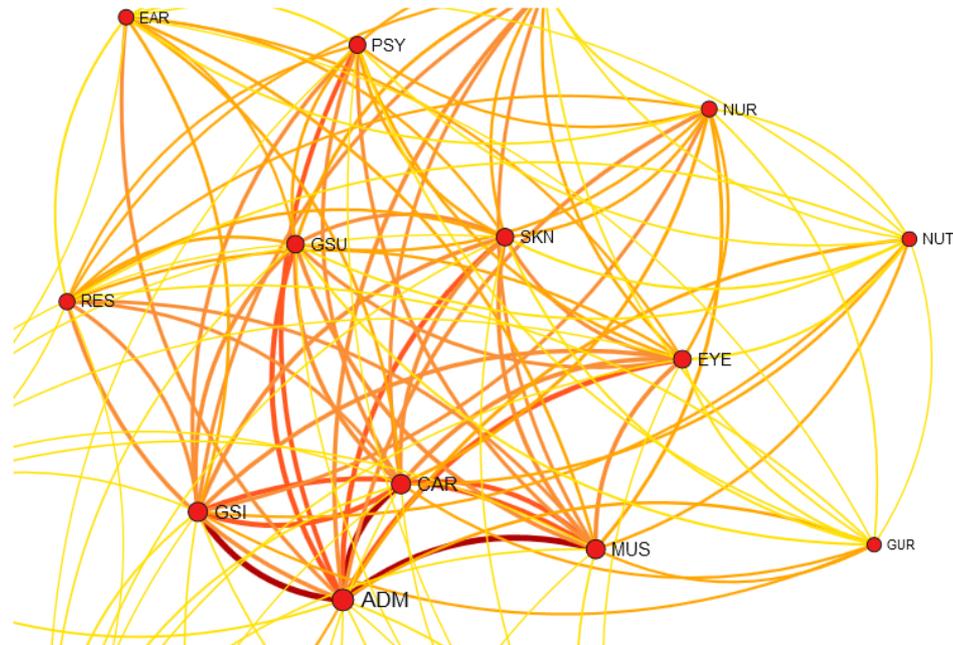
Top MEDC code affinity - RUB group 3 or more

Move your mouse over the diagram to show values



Top MEDC code affinity - RUB group 3 or more

Click and drag to zoom in \* CLICK NODE FOR DETAILS \* USE MOUSE WHEEL TO ZOOM \* CLICK AND DRAG TO PAN



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# Data Science Handoff

**Data Science Methods:** generate hypotheses that can / should be tested by traditional analytics approaches to prove association is real, not spurious.

Standardized Terms + Core Team



Platforms

Information Platform



Data Science Lab



Analytic Workbench



Information Platform



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# Act III: Conclusion

- Data discovery using big data methods & visualization can shed light on the ‘unknown unknowns’

# Key Takeaways

- There is interdependence of all components in the MHS
  - Platforms should allow for extension and flexibility of application of centralized functions (such as measures, etc)
  - Process improvement (hallmark of HRO) cannot occur without a strong federated relationship (centralized/decentralized)
- There is an interdependence between analytics and BI
  - Statistics determines correlation, significance, and variable interactions
  - Visualization makes interpretation of statistical findings easy to understand
  - Using one without the other will open the door to misunderstanding and in some cases biased conclusions

# Questions?



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# Evaluations



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Please complete your evaluations

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