Intervention for BAV Aortopathy: How Do the Guidelines Help Us?

(*or hurt?*)

Thoralf M. Sundt, MD
Visiting Surgeon
Edward D. Churchill Professor of Surgery

MASSACHUSETTS GENERAL HOSPITAL

HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

Disclosures

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None relevant to this presentation

We are inundated with *Guidelines*

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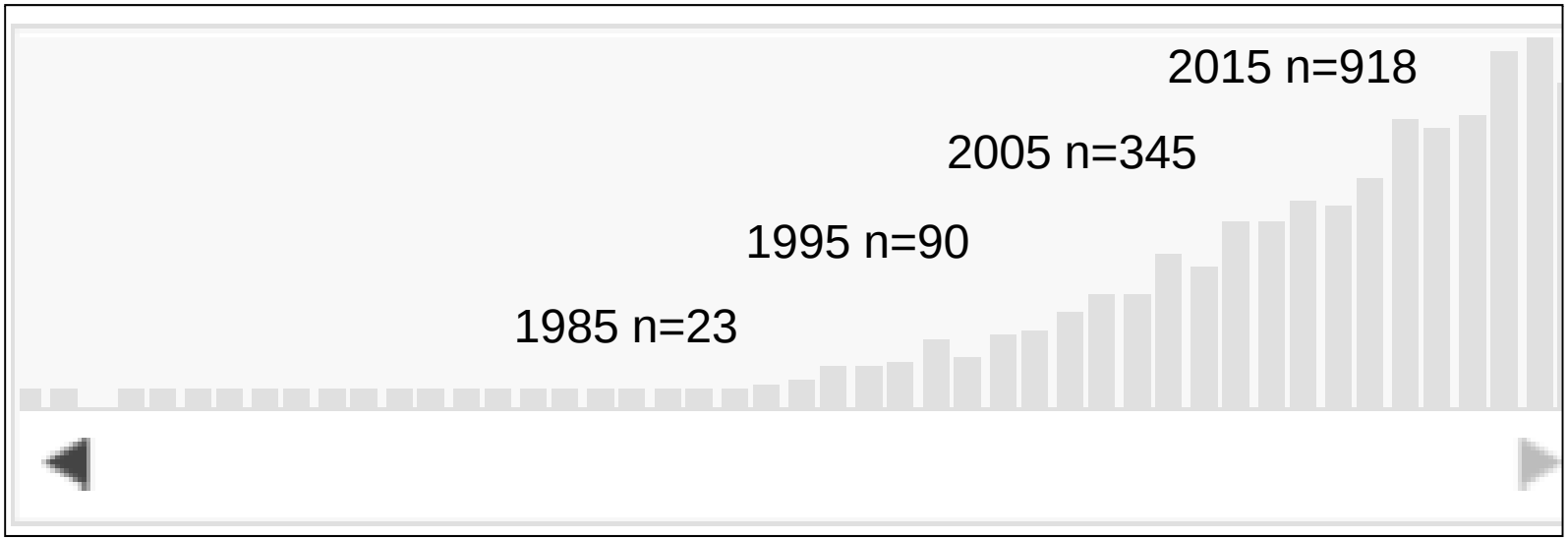
PubMed search “Guideline [ti]” 8/30/2016



Guidelines have not answered the question

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STS 2017 meeting

MONDAY, JANUARY 23

3:00 PM

Debate: Should a Moderately Dilated Ascending Aorta (4.6-5.4 cm) Be Replaced in a Patient With a Normally Functioning Bicuspid Aortic Valve?

Pro: *Lars G. Svensson, Cleveland, OH*

Con: *Thomas G. Gleason, Pittsburgh, PA*

COMMERCIAL RELATIONSHIPS L. G. Svensson: Nonremunerative Position of Influence, Serve as an unpaid Member of the PARTNER Trial Executive Committee; T. G. Gleason: Research Grant, Medtronic

My Introduction

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§§Task Force member during the writing effort.

Objective

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To share what I have learned about

- how guidelines are made
- and how they are used.

How Guidelines are made

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High quality data are sparse

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ACC /AHA Guidelines

Heart Failure
STEMI
Unstable angina

Valvular
Heart Disease

So we rely on Expert Opinion (experience)

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But there are problems with “Clinical Experience”

1) The Numerator denominator problem

2) Asymmetric Information

3) Cognitive biases

#1 We live in the numerator

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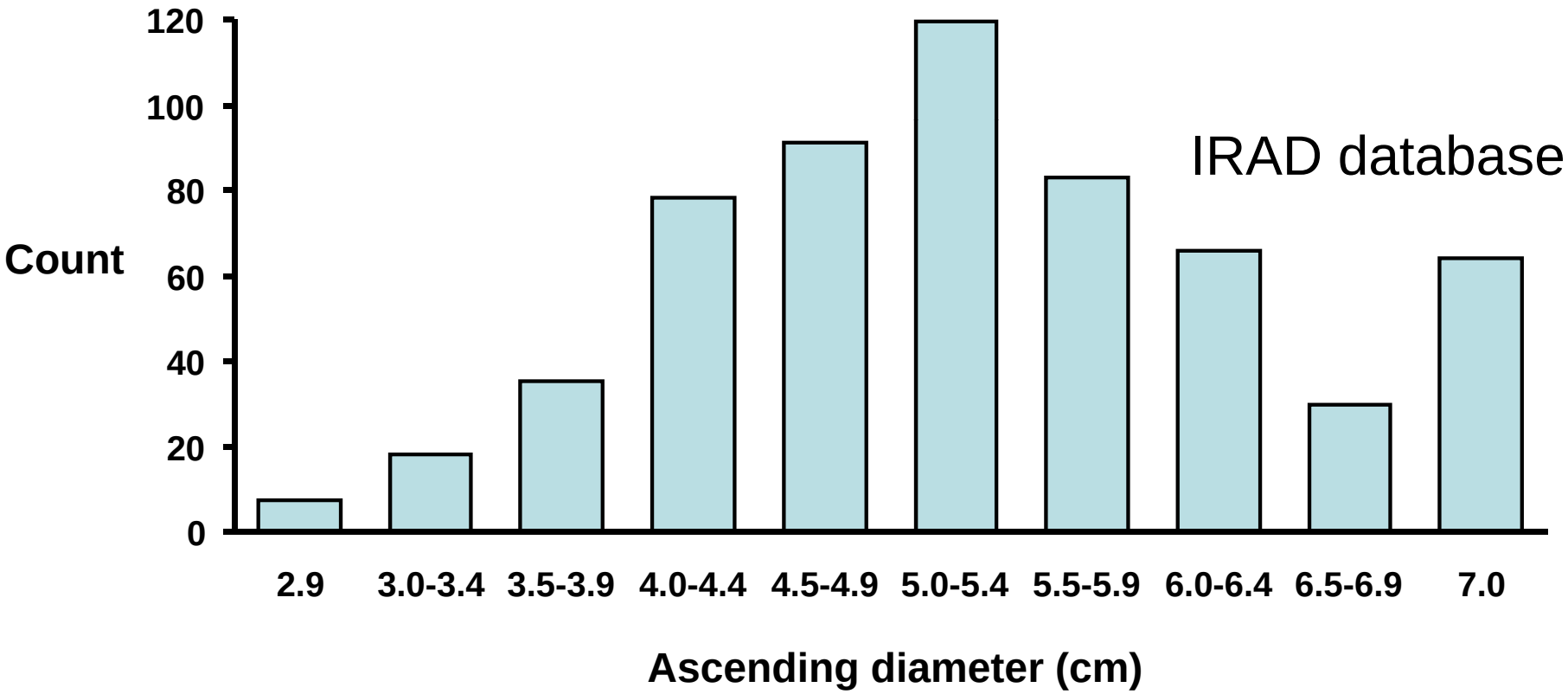
Should we be more aggressive replacing the moderately dilated aorta?



Pape et.al. Circulation. 2007

But most people have small aortas

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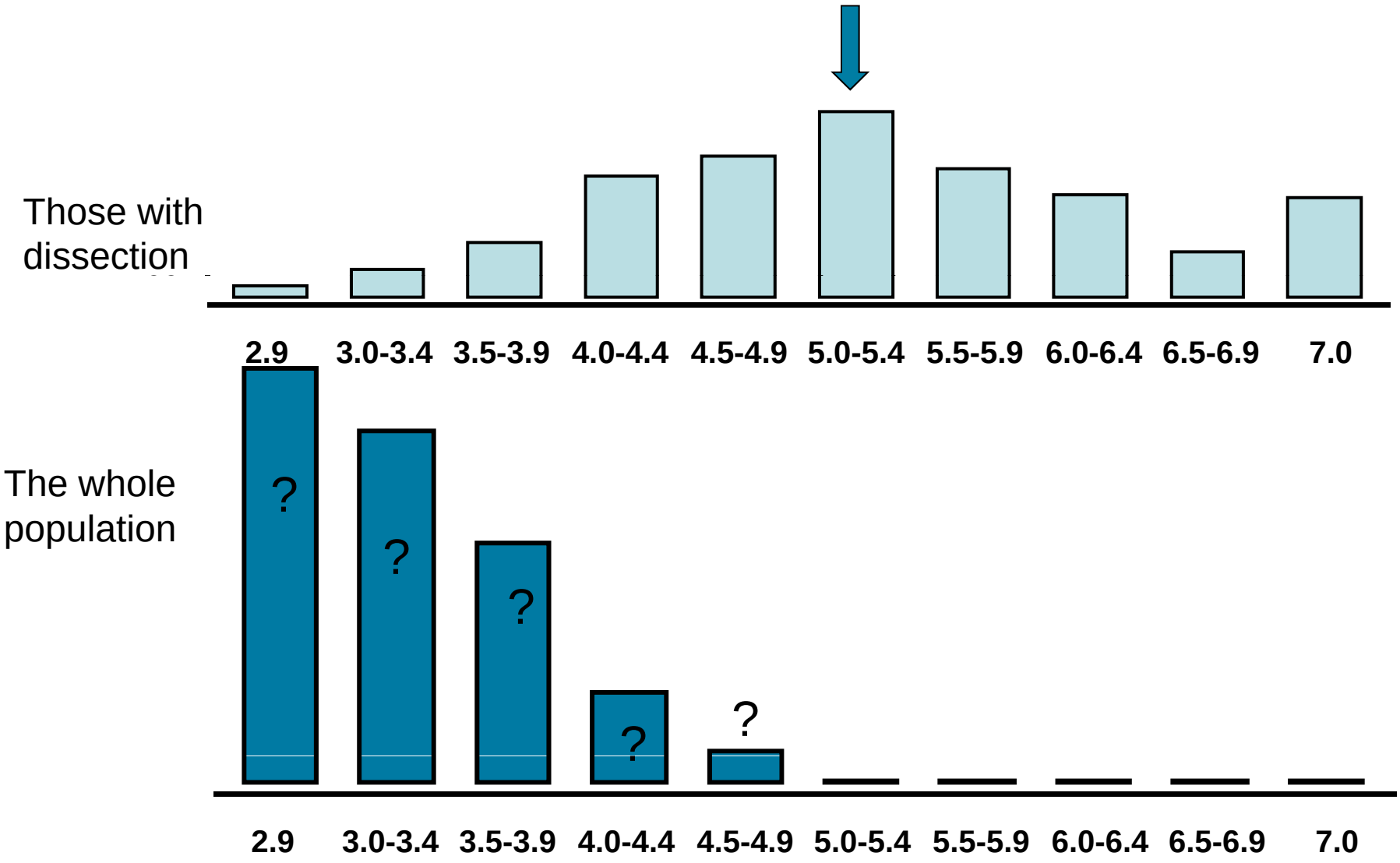

To calculate *risk* you need the denominator

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Where do Traffic Accidents Occur?

< 5 miles from home	54%
6-20 miles from home	28%
> 20 miles from home	18%

But it is not safer to drive on the freeway!

#2 Asymmetric Information

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	Aortic Surgery	No Aortic Surgery
Dissection		
No Dissection		

#2 Asymmetric Information

MASSACHUSETTS GENERAL HOSPITAL

	Aortic Surgery	No Aortic Surgery
Dissection		**Dissection occurred**
No Dissection		**Dissections did not occur**

#2 Asymmetric Information

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	Aortic Surgery	No Aortic Surgery
Dissection	**Dissections prevented**	**Dissection occurred**
No Dissection	**Dissections would not have occurred**	**Dissections did not occur**

#2 Asymmetric Information

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	Aortic Surgery	No Aortic Surgery
Dissection	**Dissections prevented**	**Dissection occurred** Known
No Dissection	**Dissections would not have occurred**	**Dissections did not occur** Partially Known*

*numerator/denominator problem

#2 Asymmetric Information

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	Aortic Surgery	No Aortic Surgery
Dissection	**Dissections prevented** Unknowable	**Dissection occurred** Known
No Dissection	**Dissections would not have occurred** Unknowable	**Dissections did not occur** Partially Known*

*numerator/denominator problem

Does airport screening prevent events?

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Heuristics and Cognitive Biases

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- We evolved to play the odds
- Look for patterns
- Overestimate high correlations and underestimate low
- Subject to "Tunnel Vision" and "fixation"
- Find the unexpected "unpleasant"
  - tend to explain away disconfirmatory evidence….
  - especially when overloaded or under pressure

“Experts” can be wrong!

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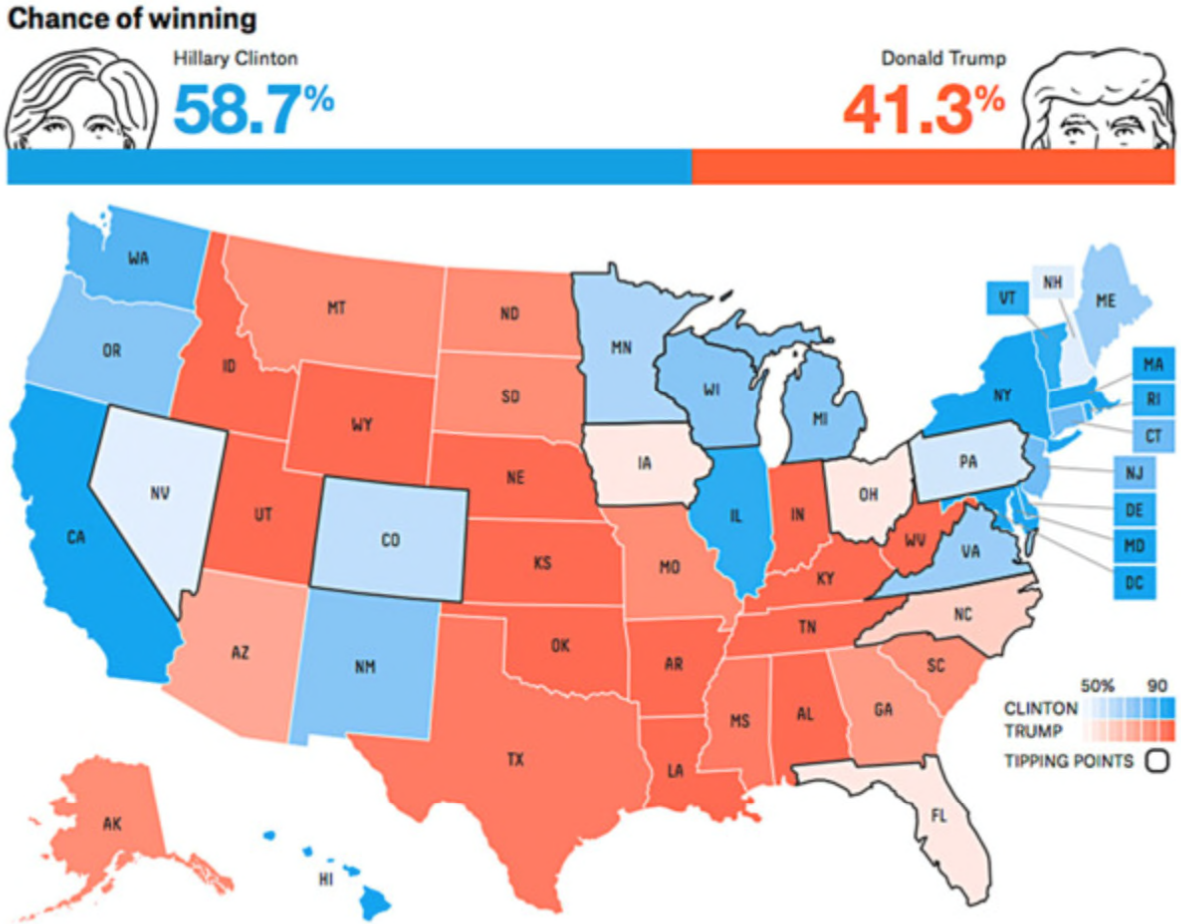

And sometimes the experts do not agree!

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PRACTICE GUIDELINE: FULL TEXT

2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM Guidelines for the Diagnosis and Management of Patients With Thoracic Aortic Disease

A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine

Endorsed by the North American Society for Cardiovascular Imaging

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I C … Marfan syndrome … vascular E-D syndrome, Turner syndrome, BAV, or FAAD … at smaller diameters (4.0 to 5.0 cm depending on the condition) ….

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I B …in patients with BAV if the diameter… is greater than 5.5cm

Iia C… if diameter greater than 5.0 cm and a risk factor present

A heated controversy!

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Surgery for Aortic Dilatation in Patients With Bicuspid Aortic Valves

A Statement of Clarification From the American College of Cardiology/ American Heart Association Task Force on Clinical Practice Guidelines

Endorsed by the American College of Radiology, American Association for Thoracic Surgery, American Society of Echocardiography, American Stroke Association, Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine, Society of Cardiovascular Anesthesiologists, Society of Interventional Radiology, and the Society of Thoracic Surgeons

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A heated controversy!

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Surgery for Aortic Dilatation in Patients With Bicuspid Aortic Valves

A Statement of Clarification From the American College of Cardiology/ American Heart Association Task Force on Clinical Practice Guidelines

I B-NR …if the diameter … is 5.5 cm or greater.

IIa B-NR … 5.0 cm or greater an an additional risk factor… or if the patient is at low surgical risk and the surgery is performed by an experienced surgical team….

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How are they used?

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"If you follow the guidelines perfectly, to the letter, without fail … you are not doing your job."

—Blase Carabello

Our data sets concern the mean…

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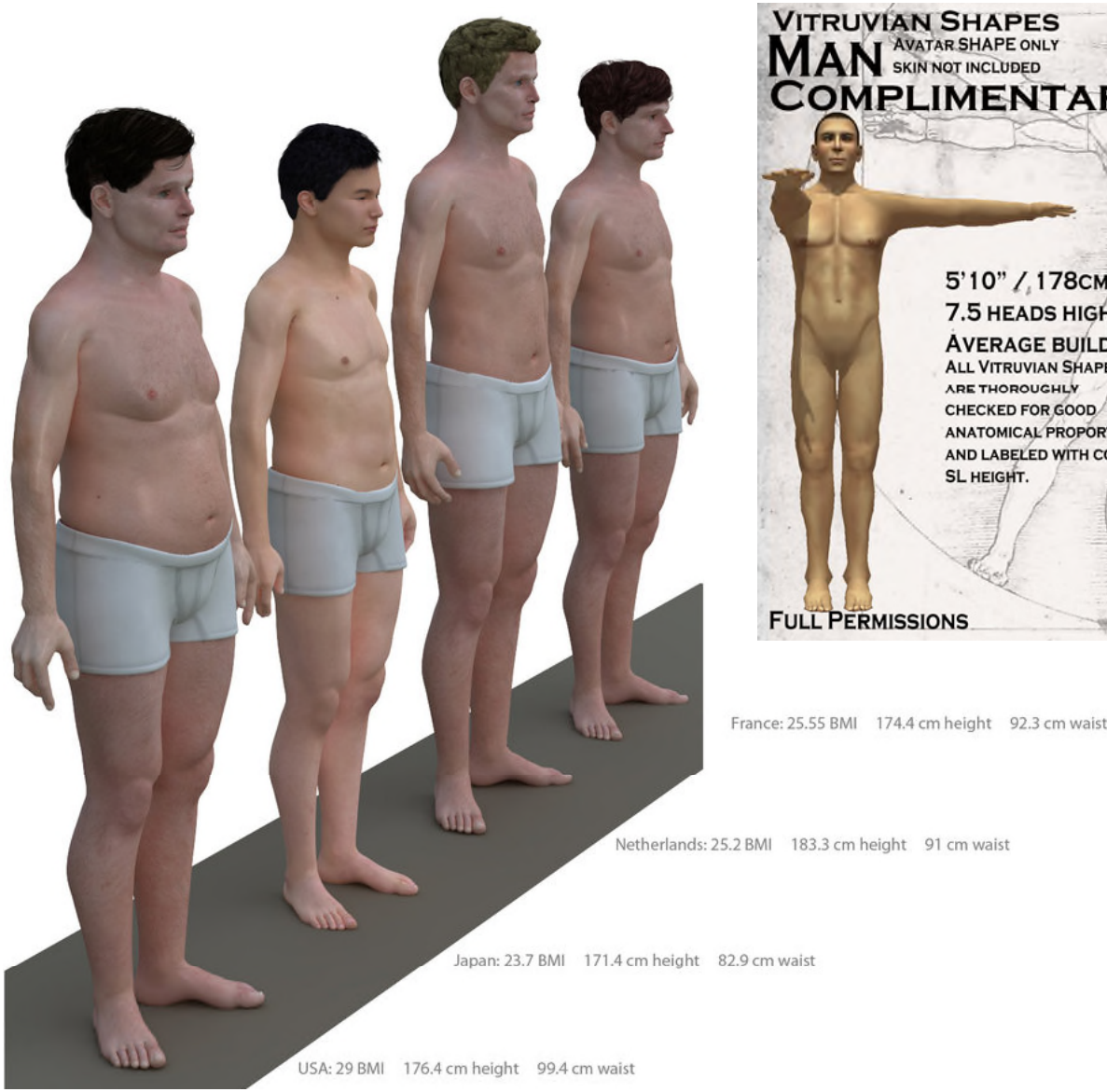

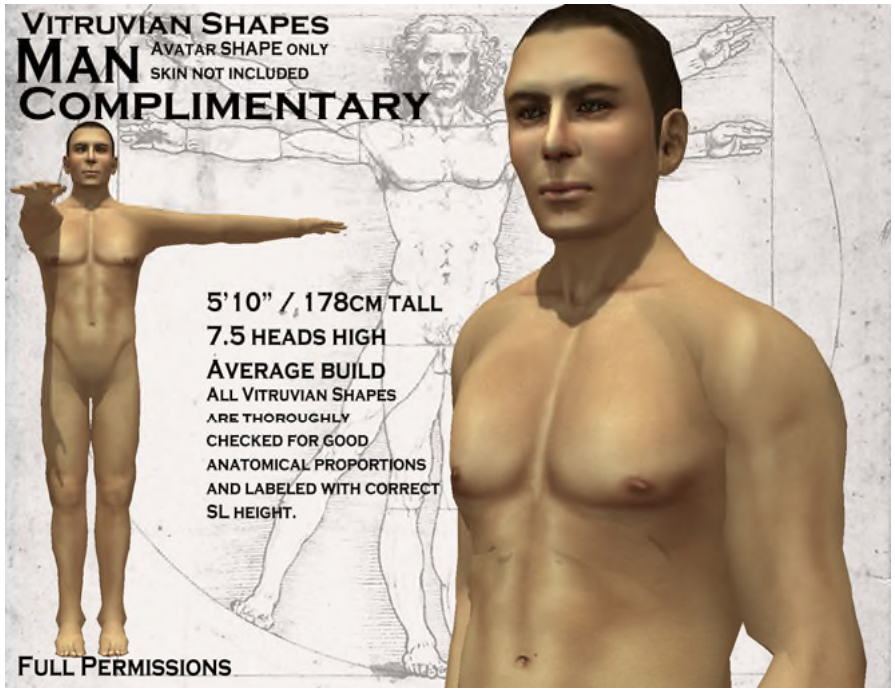

… but we treat the individual in front of us

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“Willful Ignorance”

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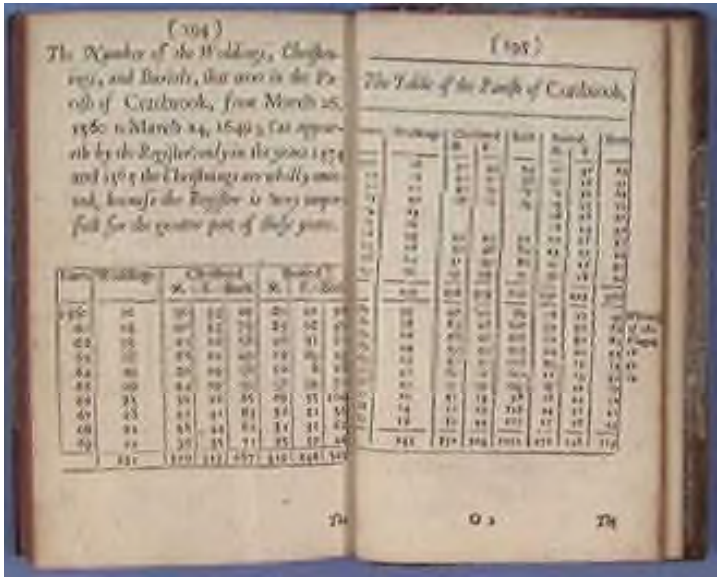
Natural and political observations made on the bills of mortality 1661

Captain John Graunt



Converting narrative into tabular data permits mathematical analysis – but requires focus on just some elements and discarding (ignoring) other details

Conditional Probability

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A) Given a dissection, what is the probability of X*? (the data we have observed)

B) Given X*, what is the probability of dissection? (what we want to know)

* X= BAV or Marfan syndrome or aorta 5.5 cm etc.

These are very different questions

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the probability of being **female** given a patient with **breast cancer** **99%**

vs

the probability of **breast cancer** given a **female** patient

» **20%**

Probability of AD given BAV

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Bayes Theorem

$$P(D/E) = \frac{P(E/D) \times P(D)}{P(E)}$$

$$\text{Prob AD given BAV} = \frac{(\text{Prob BAV given AD})\ (\text{Prob AD})}{\text{Prob BAV}}$$

$$P = \frac{(0.1)\ (0.0001)}{(0.01)} = 0.001$$

0.1%

We do this intuitively

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Imagine a patient in your office:

- Known 4.9 cm ascending aorta

We do this intuitively

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Imagine a patient in your office:

- Known 4.9 cm ascending aorta
- History of hypertension

We do this intuitively

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Imagine a patient in your office:

- Known 4.9 cm ascending aorta
- History of hypertension
- Current smoker

We do this intuitively

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Imagine a patient in your office:

- Known 4.9 cm ascending aorta
- History of hypertension
- Current smoker
- Family history negative for AD

We do this intuitively

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Imagine a patient in your office:

- Known 4.9 cm ascending aorta
- History of hypertension
- Current smoker
- Family history negative for AD

- The echo lab calls “he may have a TAV, or a BAV with a prominent raphe, but we cannot be sure. The AV functions well.”

How good is our intuition?

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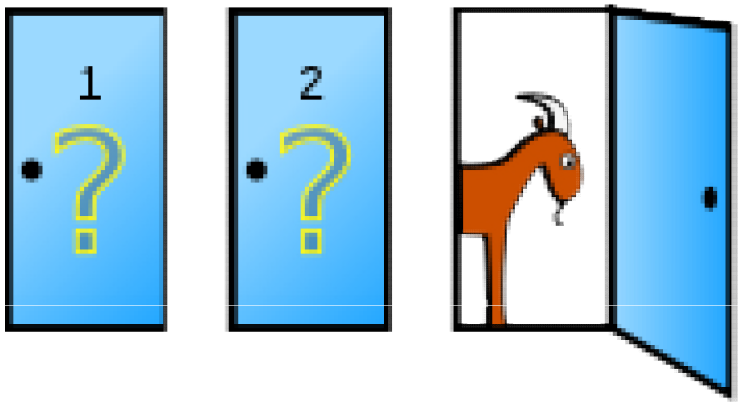
Let's Make a Deal

- Will you go home with a car or a goat?
- You picked door #1.
- Monte shows you door #3.
- Should you switch?
- *How does the new information impact probabilities?*



Using the data in decision-making

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to determine

Data that are

- -Unambiguous
- -Direct
- -“Level A” eg RCTs

Using the data in decision-making

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to determine

to support

Data that are
- -Unambiguous
- -Direct
- -“Level A” eg RCTs

Data that are
- -Incomplete
- -Uncertain
- -“Level C” EO

Using the data in decision-making

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to determine | to inform | to support

Data that are
- -Unambiguous
- -Direct
- -“Level A” eg RCTs

Data that are
- -Incomplete
- -Uncertain
- -“Level C” EO

Thank You

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Francis Bacon

The human understanding, once it has adopted an opinion, collects any instances that confirm it, and though the contrary instances may be more numerous and more weighty, it either does not notice them or else rejects them.

(Book Recommendations)

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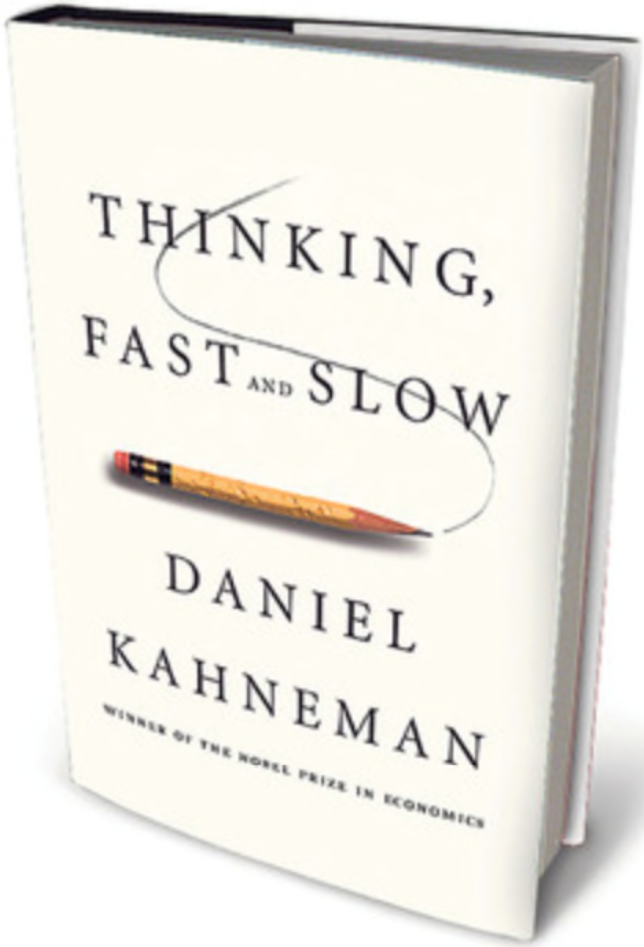

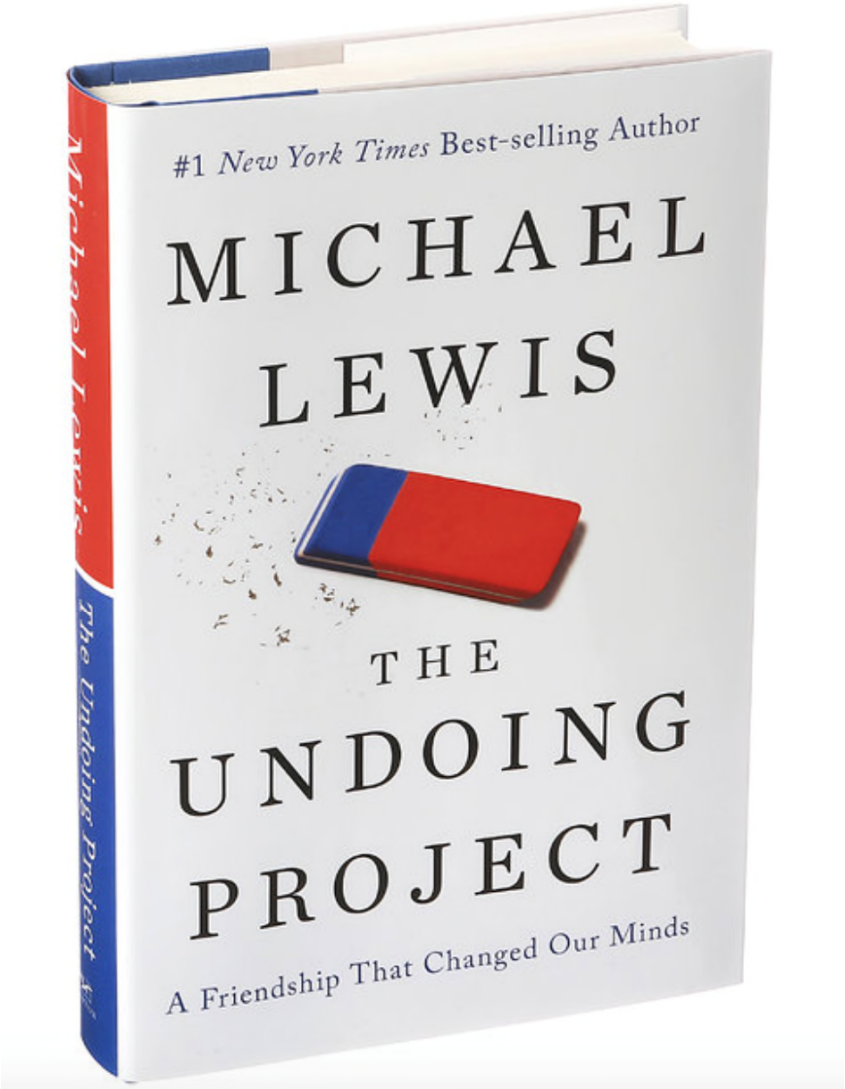

How we decide: Biases and Heuristics

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