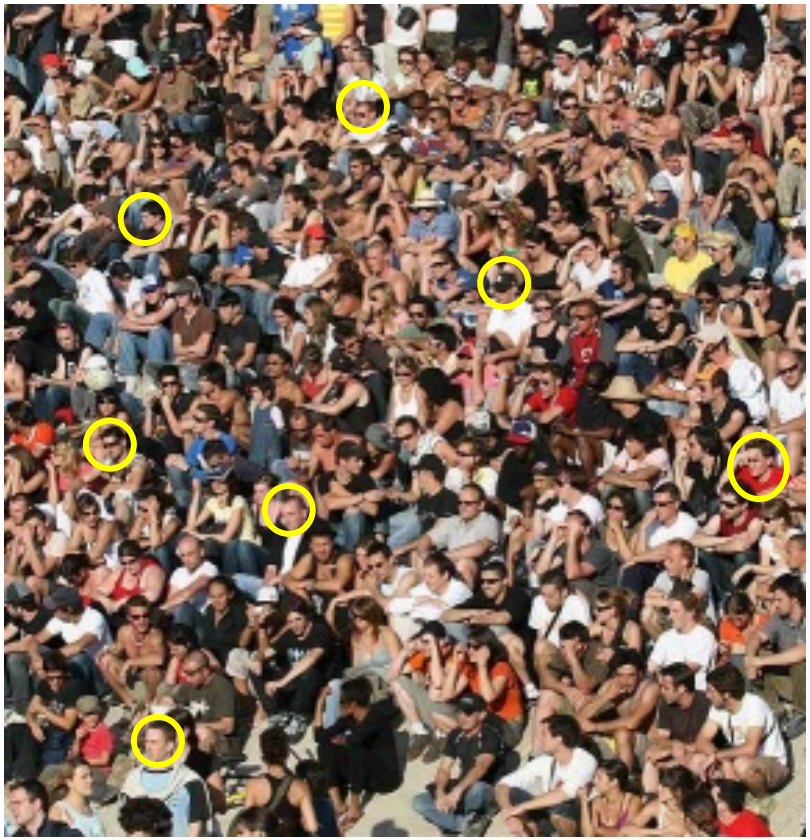
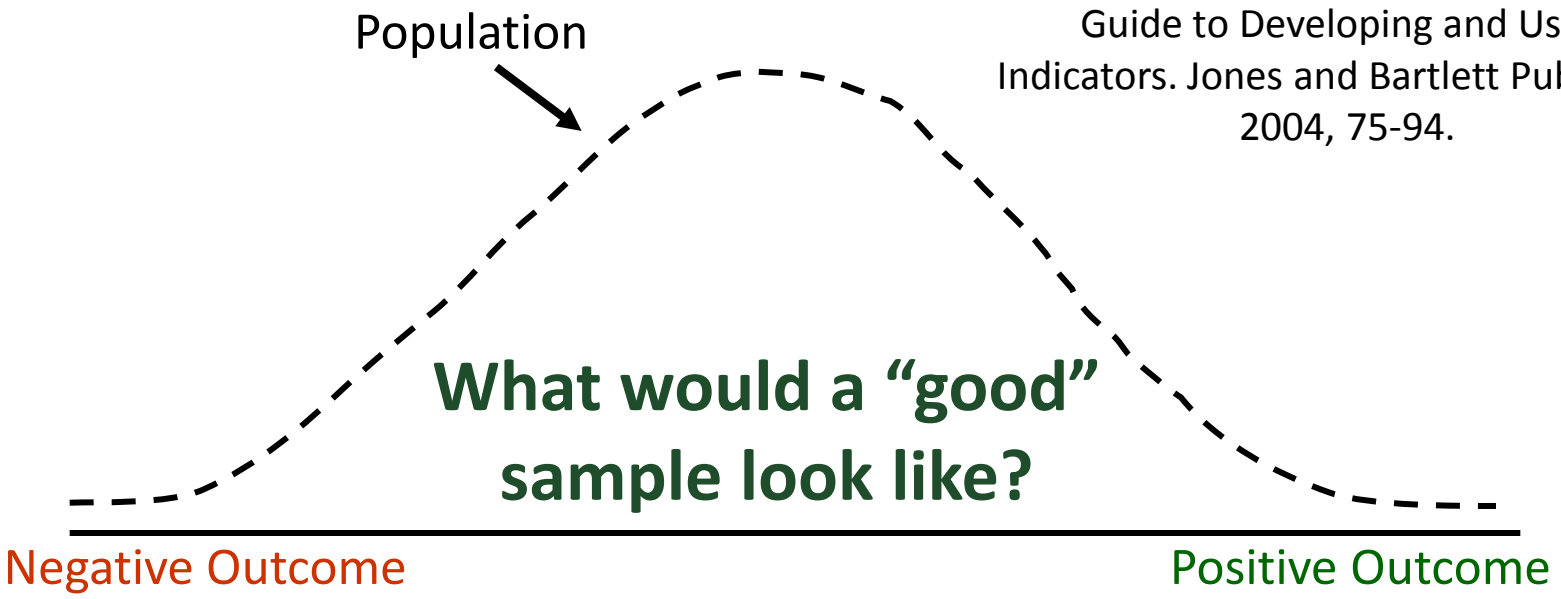
Sampling



When you can't capture data on the entire population (an enumeration), you can estimate its characteristics by sampling.

The Relationships Between a Sample and the Population

Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, 2004, 75-94.



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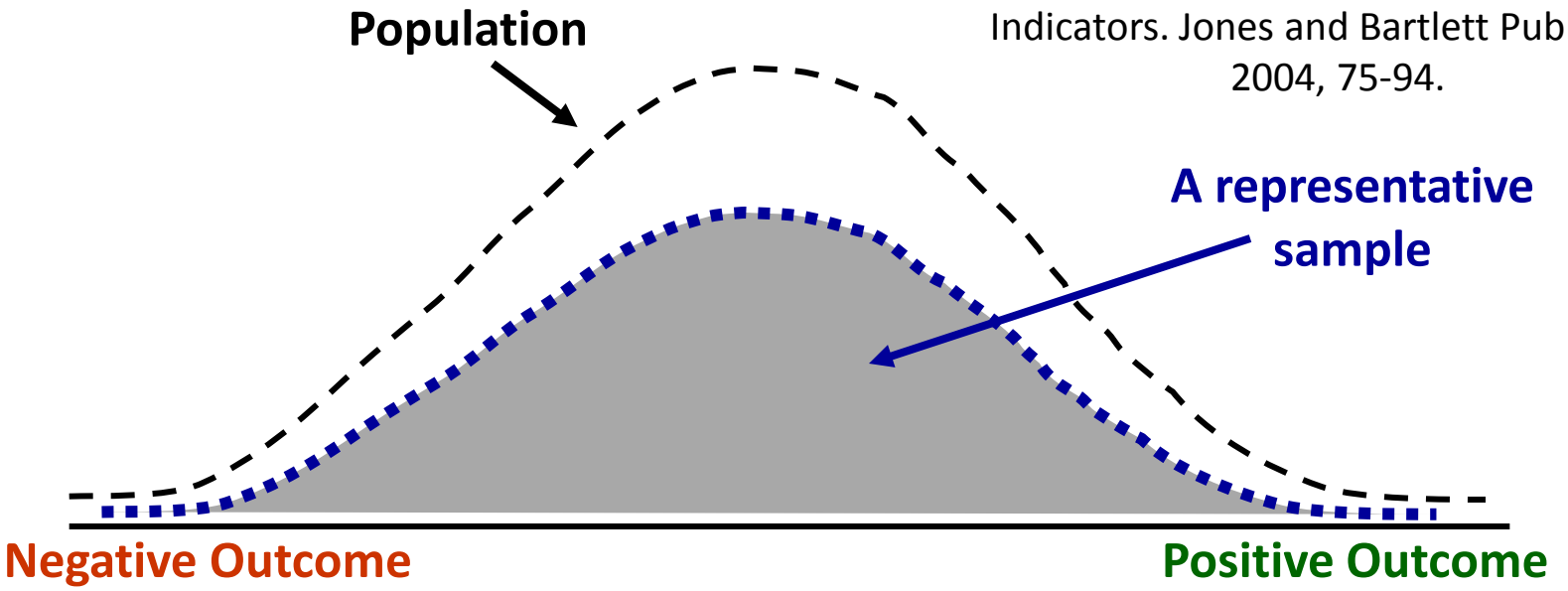
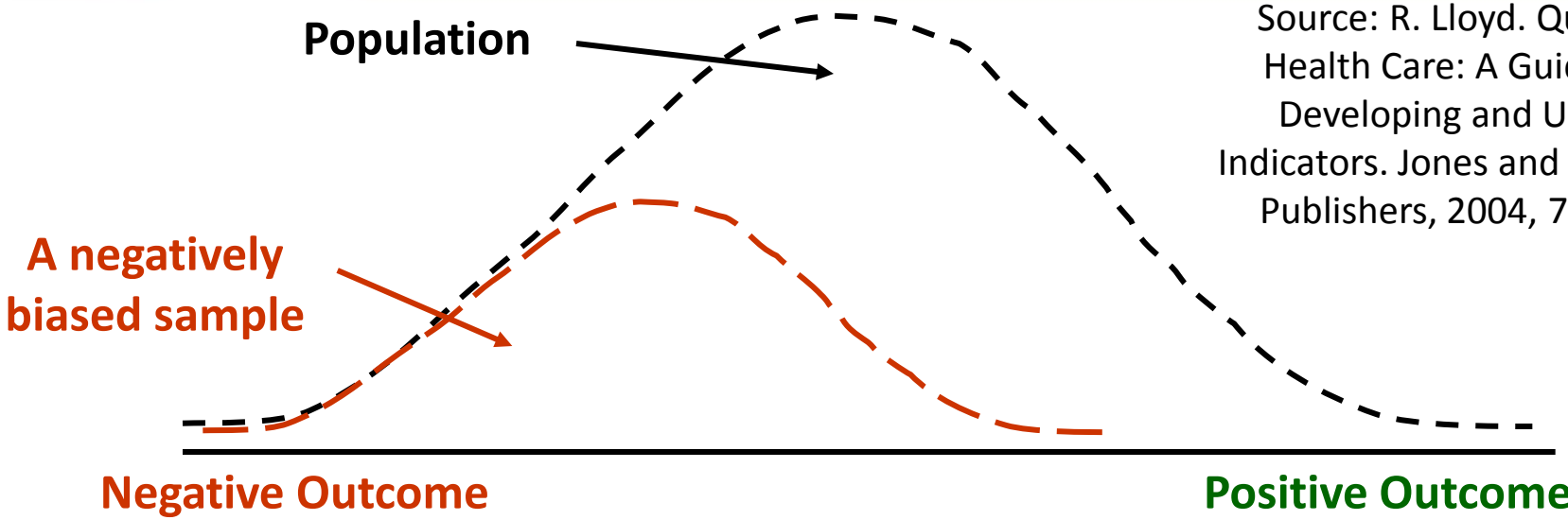


Ideally a "good" sample will have the same shape and center as the total population but have fewer observations.

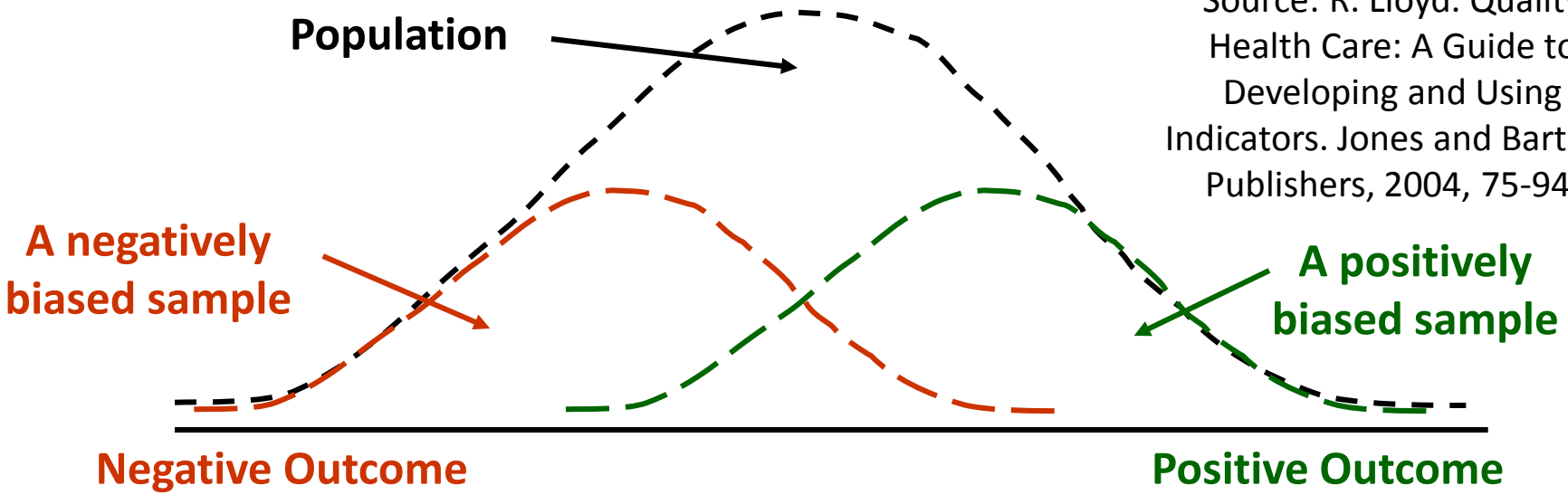
Sampling Bias



Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, 2004, 75-94.

A sample improperly pulled could result in a negative sampling bias (red curve)…

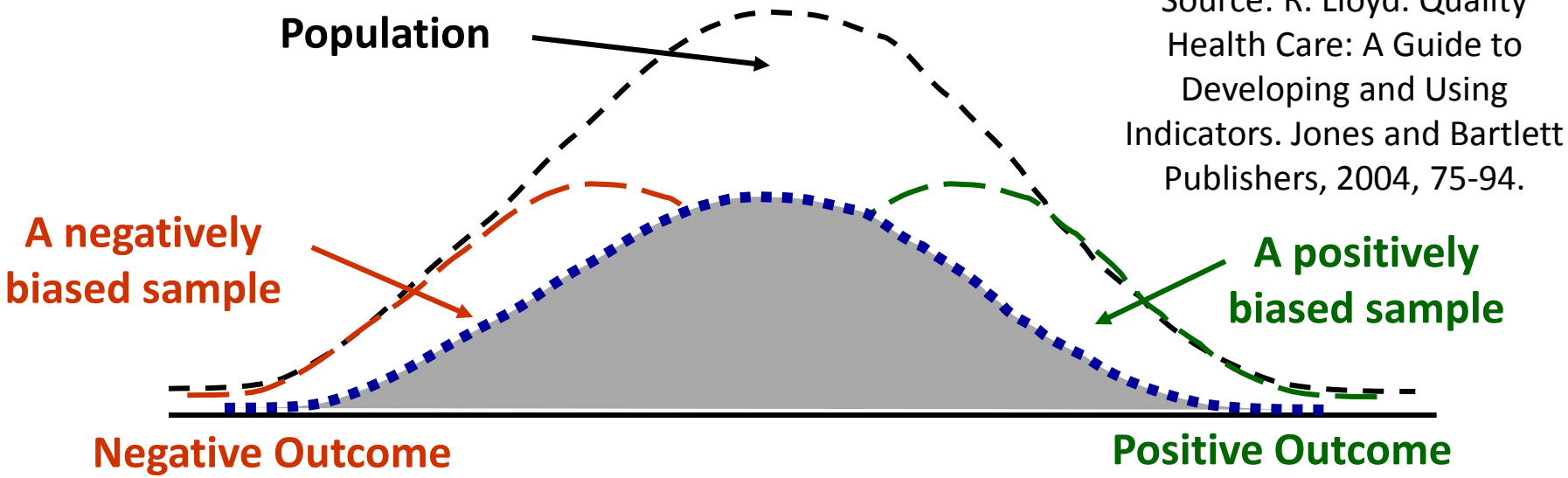
Sampling Bias



Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, 2004, 75-94.

…or a positively biased sample (green curve).

Sampling Bias



Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, 2004, 75-94.

But, a properly pulled sample will be representative of the total population.

How do you draw your samples?

Sampling Methods

Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, 2004, 75-94.

Probability Sampling Methods

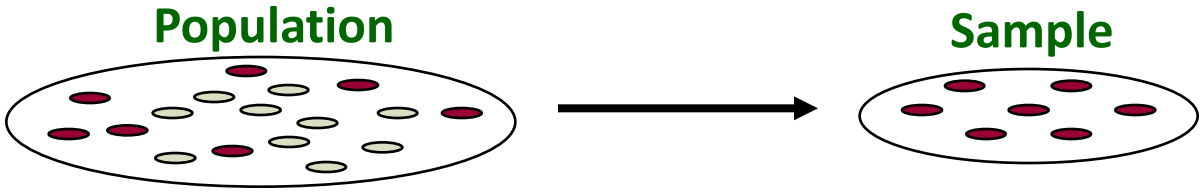
- Simple random sampling
- Stratified random sampling
- Stratified proportional random sampling
- Systematic sampling
- Cluster sampling

Non-probability Sampling Methods

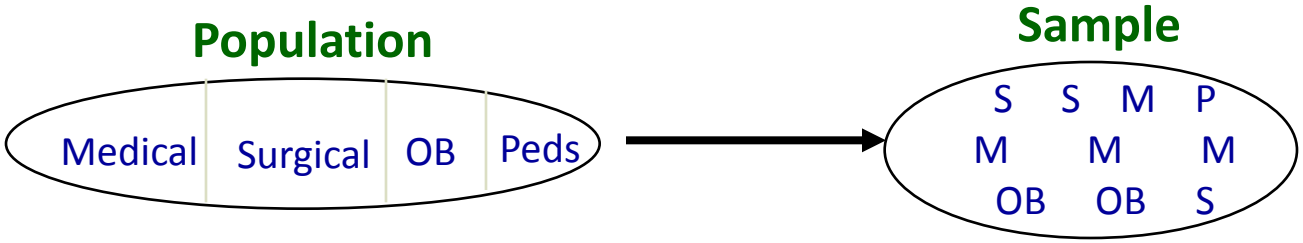
- Convenience sampling
- Quota sampling
- Judgment sampling

Sampling Options

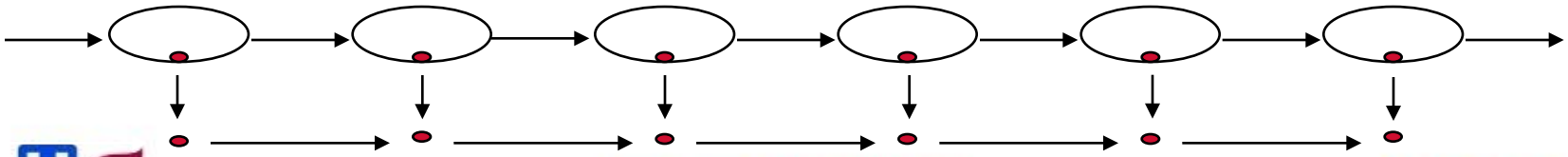
Simple Random Sampling



Proportional Stratified Random Sampling



Judgment Sampling



American Hospital Association

Institute for Healthcare Improvement

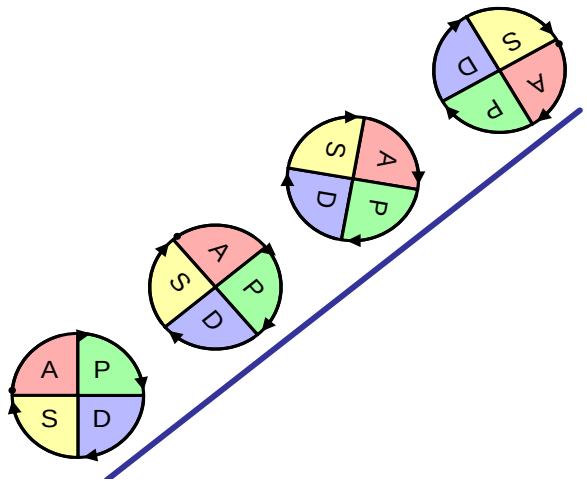
HRET Health Research & Educational Trust In Partnership with AHA

Judgment Sampling

Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, 2004, 75-94.

Especially useful for PDSA testing. Someone with process knowledge selects items to be sampled.

Characteristics of a Judgment Sample:



- Include a wide range of conditions
- Selection criteria may change as understanding increases
- Successive small samples instead of one large sample

Judgment Sampling in Action!

Well the night shift is totally different from the day shift!

It always seems pretty calm to me here in the afternoon.

It is absolutely nuts here between 8 and 10 AM!

American Hospital Association

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How often and for how long do you need to collect data?

- **Frequency – the period of time in which you collect data (i.e., how often will you dip into the process to see the variation that exists?)**
  - **Moment by moment (continuous monitoring)?**
  - **Every hour?**
  - **Every day? Once a week? Once a month?**

- **Duration – how long you need to continue collecting data**
  - **Do you collect data on an on-going basis and not end until the measure is always at the specified target or goal?**
  - **Do you conduct periodic audits?**
  - **Do you just collect data at a single point in time to "check the pulse of the process"**

- **Do you need to pull a sample or do you take every occurrence of the data (i.e., collect data for the total population)**

The Frequency of Data Collection: The Story of Flight #1549, January 15, 2009

Flight #1549, January 15, 2009

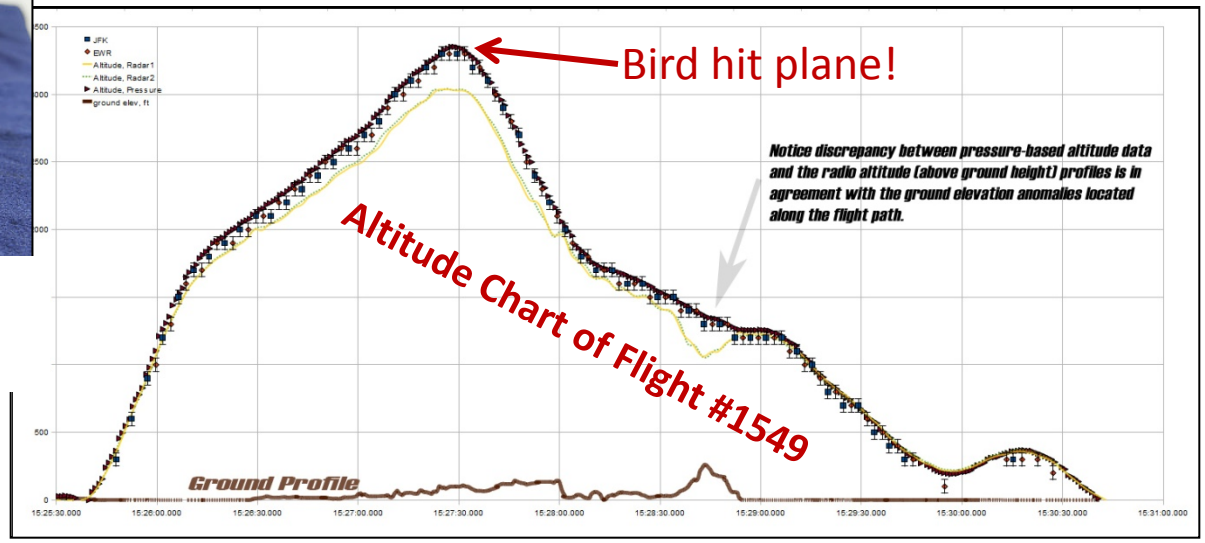
The Question:
Does the airline need data at a fixed point in time or data over time?

Static View
(Where are we right now?)

The Question:
Does the airline need data at a fixed point in time or data over time?

Static View
(Where are we right now?)

Dynamic View
(What happened over time?)

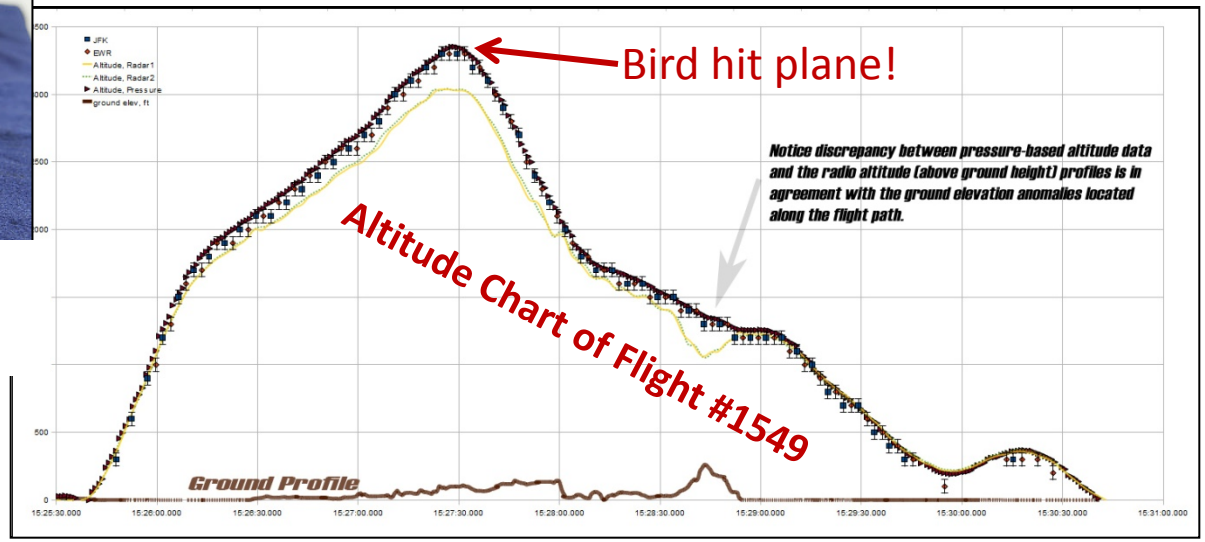


The Question:
Does the airline need data at a fixed point in time or data over time?

Static View
(Where are we right now?)

it depends on the question you are trying to answer!

Dynamic View
(What happened over time?)



The idea for this example was proposed by Alastair Philip, Quality improvement Scotland, 2010

Exercise: Data Collection Strategies
(frequency, duration and sampling)

- This exercise has been designed to test your knowledge of and skill with developing a data collection plan.
- **In the table on the next page is a list of eight measures.**
- For each measure identify:
  - The frequency and duration of data collection.
  - Whether you would pull a sample or collect all the data on each measure.
  - If you would pull a sample of data, indicate what specific type of sample you would pull.
- **Spend a few minutes working on your own then compare your ideas with others at your table.**

Exercise: Data Collection Strategies (frequency, duration and sampling)

The need to know, the criticality of the measure and the amount of data required to make a conclusion should drive the frequency, duration and whether you need to sample decisions.

Measure	Frequency and Duration	Pull a sampling or take every occurrence?
Vital signs for a patient connected to full telemetry in the ICU		
Blood pressure (systolic and diastolic) to determine if the newly prescribed medication and dosage are having the desired impact		
Percent compliance with a hand hygiene protocol		
Cholesterol levels (LDL, HDL, triglycerides) in a patient recently placed on new statin medication		

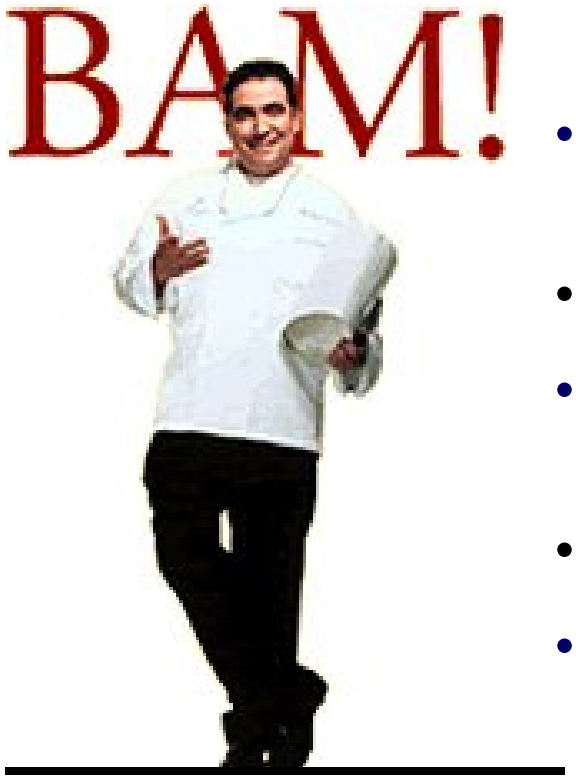
Exercise: Data Collection Strategies (frequency, duration and sampling)

Measure	Frequency and Duration	Pull a sampling or take every occurrence?
Patient satisfaction scores on the inpatient units		
Central line blood stream infection rate		
Percent of inpatients readmitted within 30 days for the same diagnosis		
Percent of surgical patients given prophylactic antibiotics within 1 hour prior to surgical incision		

Data Collection Challenges we face in a Collaborative

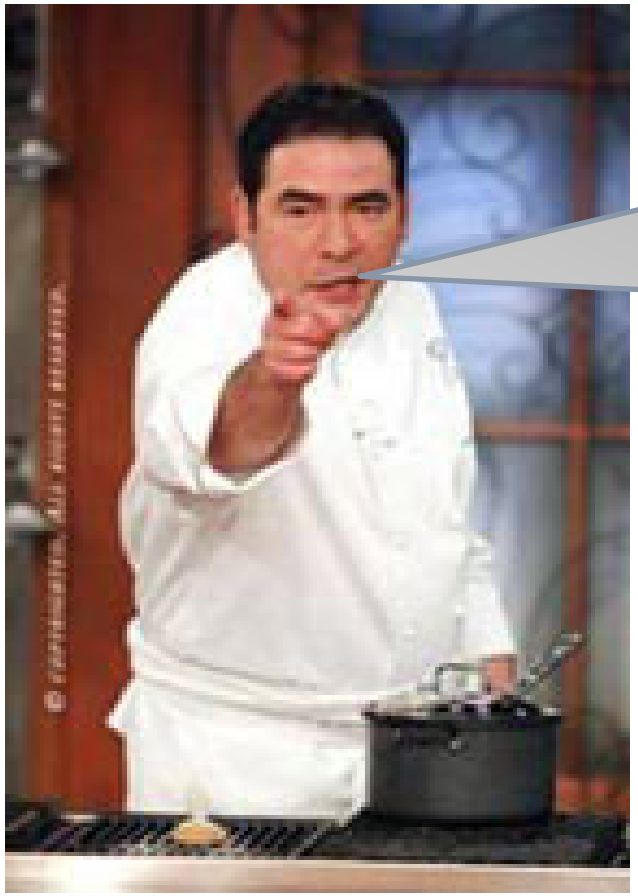
1. **Participants are often used to making before-after comparisons.**
2. We frequently do not have much historical data for some of our collaborative measures.
3. **A collaborative often runs for only 9 -13 months.**
4. It is most common to obtain a measurement once per month (the tyranny of monthly data!).
5. **This means we often have only 9-13 data points during life of collaborative (if relying on monthly data with no historical baseline), which limits our ability to determine if the collaborative reached its aims.**

But, if we are serious about our involvement in the HEN collaborative, then we need to …



Kick it up a notch!

- Enter complete data into the HRET Comprehensive Data System (CDS)
- Establish baselines (a minimum of 6 data points)
- Evaluate your data collection systems and identify roadblocks to submitting data
- Plot data over time not in the aggregate
- Annotate the charts to show where interventions (PDSAs) were tested
- Interpret the chart appropriately and don't overreact to single data points or limited data



I depend on you to kick you data submission up a notch. Your patients expect and deserve excellent and safe care! Let me know how we can help.

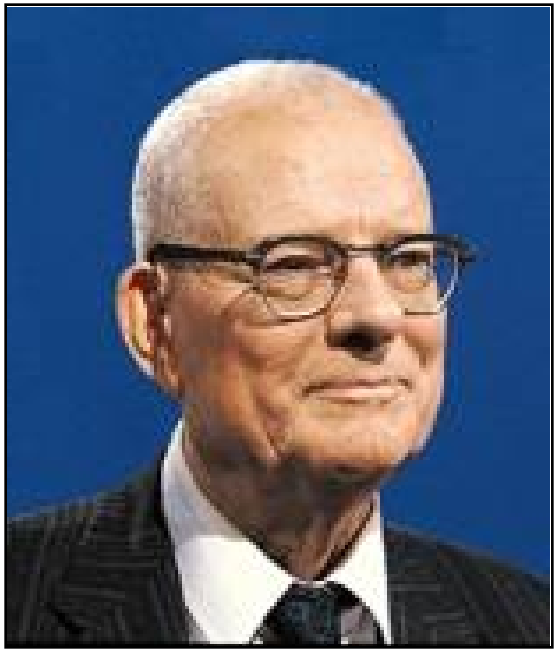
The Quality Measurement Journey

Source: R. Lloyd. Quality Health Care: A Guide to Developing and Using Indicators. Jones and Bartlett Publishers, 2004.

AIM (How good? By when?)

- Concept
- Measure
- Operational Definitions
- Data Collection Plan
- Data Collection
- **Analysis** → ACTION

What do you do with data once you have it?



"If I had to reduce my message for management to just a few words, I'd say it all had to do with reducing variation."

W. Edwards Deming

How will we know that a change is an improvement?

1. By ***understanding*** the variation that lives within your data

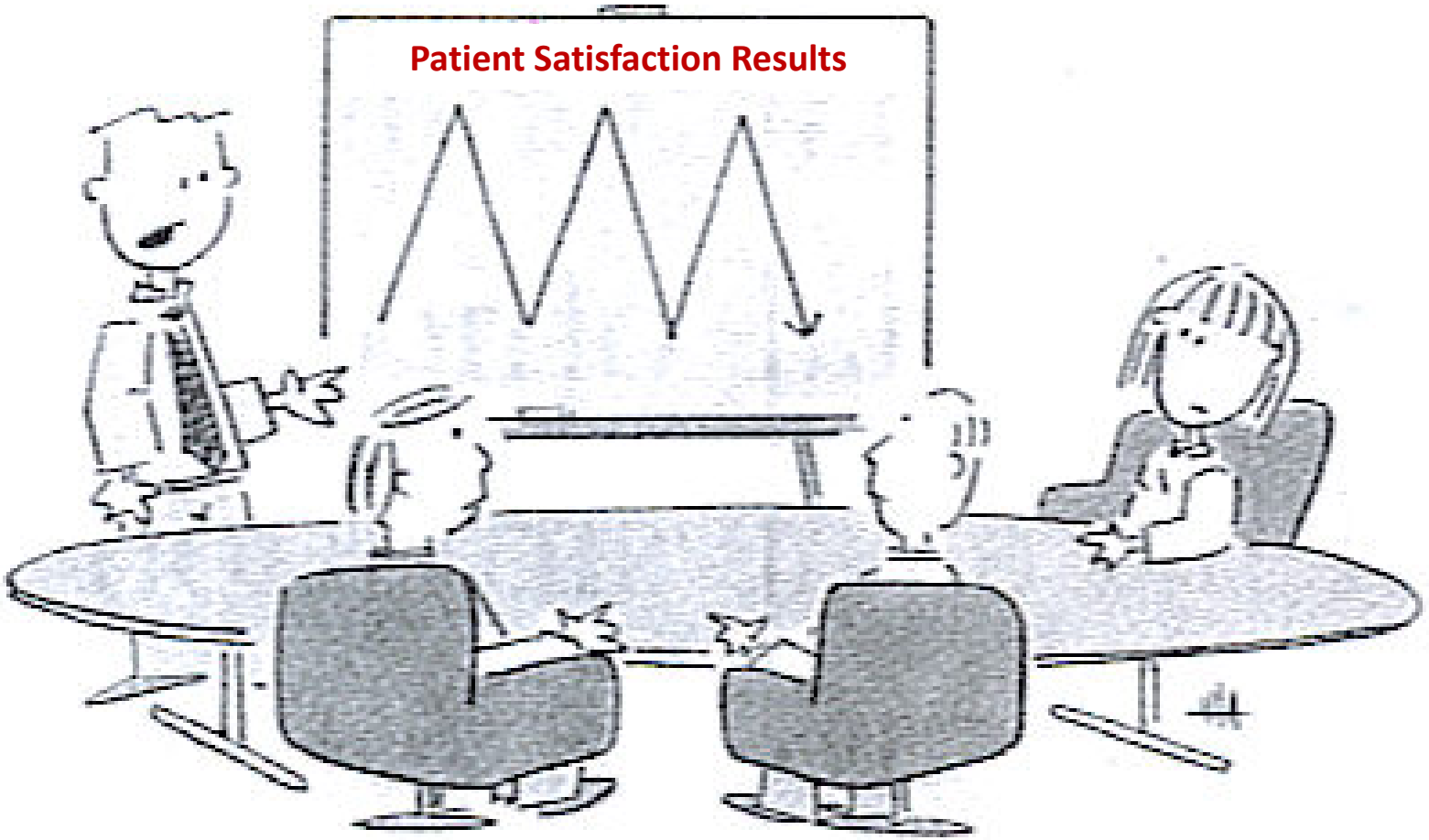
2. By making good management ***decisions*** on this variation (i.e., don't overreact to a special cause and don't think that random movement of your data up and down is a signal of improvement).

The Problem!

Aggregated data presented in tabular formats or with summary statistics will not help you measure the impact of process improvement efforts. Aggregated data can only lead to judgment, not to improvement.

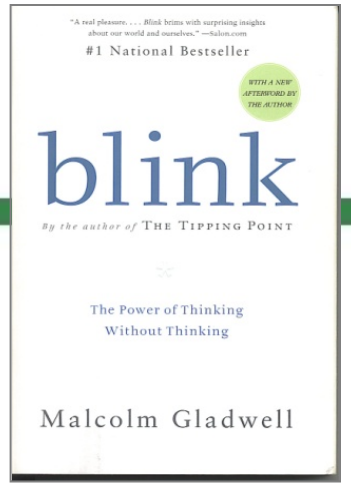
Numerical Illiteracy at its best!

(Or is it the worst?)



"…and then another drop in our patient satisfaction results this month. But I have a <u>really good</u> feeling about next month!

Thin-Slicing



"Thin-slicing refers to the ability of our unconscious to find patterns in situations and behavior based on very narrow slices of experience." ***Malcolm Gladwell, blink, page 23***

When most people look at data they thin-slice it. That is, they basically use their unconscious to find patterns and trends in the data. They look for extremely high or low data points and then make conclusions about performance based on limited data. ***R. Lloyd***

Reactions to data!

Adapted from the works of Jarman, Berwick and Lloyd, 2005

- The data are wrong!
- The data are right, but it is not a real problem!
- The data are right, it's a real problem but it's not my problem!
- The data are right, it's a real problem AND it's my problem!
- The data are right, it's a real problem AND it's my problem BUT… I'm not sure what to do about it!

Dr. Deming's 14 Points of Management

Source: W. E. Deming. *Out of the Crisis*, MIT Press, 1992

1. Create constancy of purpose for improvement of product and service.
2. Adopt the new philosophy.
3. Cease dependence on mass inspection to achieve quality.
4. End the practice of awarding business on the basis of price tag.
5. Improve constantly and forever the system of production and service.
6. Institute training on the job.
7. Institute leadership.
8. **Drive out fear.**
9. Break down barriers between departments.
10. Eliminate slogans, exhortations and targets for the work force.
11. (a) Eliminate work standards (quotas); substitute leadership.

11. (b) Eliminate management by objectives.

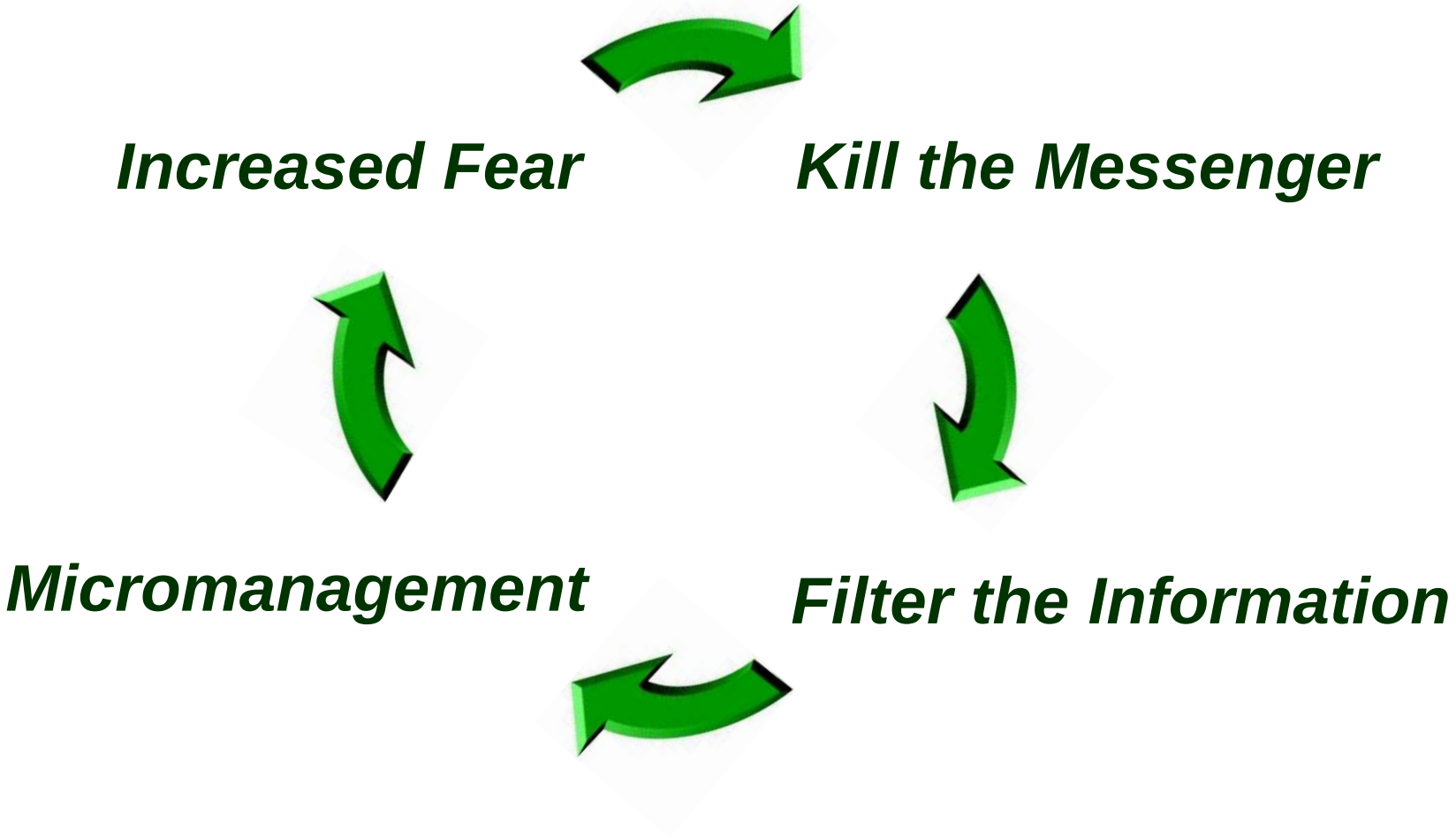
12. **(a) Remove barriers that rob the hourly worker of his right to pride In workmanship.**

12. **(b) Remove barriers that rob people in management and in engineering of the right to pride of workmanship.**

13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work to accomplish the transformation.

The Cycle of Fear

Source: William Scherkenbach. The Deming Route to Quality and Productivity. Ceep Press, Washington, DC, 1990, page 71.



Dr. Walter A Shewhart

Shewhart - Economic Control of Quality of Manufactured Product, 1931

"A phenomenon will be said to be controlled when, through the use of past experience, we can predict, at least within limits, how the phenomenon may be expected to vary in the future"