Using Data to Guide Quality Improvement – Pareto Charts and Histograms

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County of Los Angeles Public Health

Seven Basic Tools of Quality

- Cause-and-effect diagram (aka "fishbone" or Ishikawa diagram)
- Check sheet
- Control chart
- Histogram
- Pareto chart
- Scatter diagram
- Stratification (aka flow chart or run chart)

Tague, NR The Quality Toolbox, Second Edition, ASQ Quality Press, 2005, pg 15

Today's Goals & Objectives

GOALS

- Brief Overview of Histogram (p52) & Pareto Chart (p80)
- Group exercise: Example scenario utilizing each tool
- Review Storyboard

OBJECTIVES

- General understanding of Historgrams and Pareto Charts
- How to create and interpret each

HISTOGRAM

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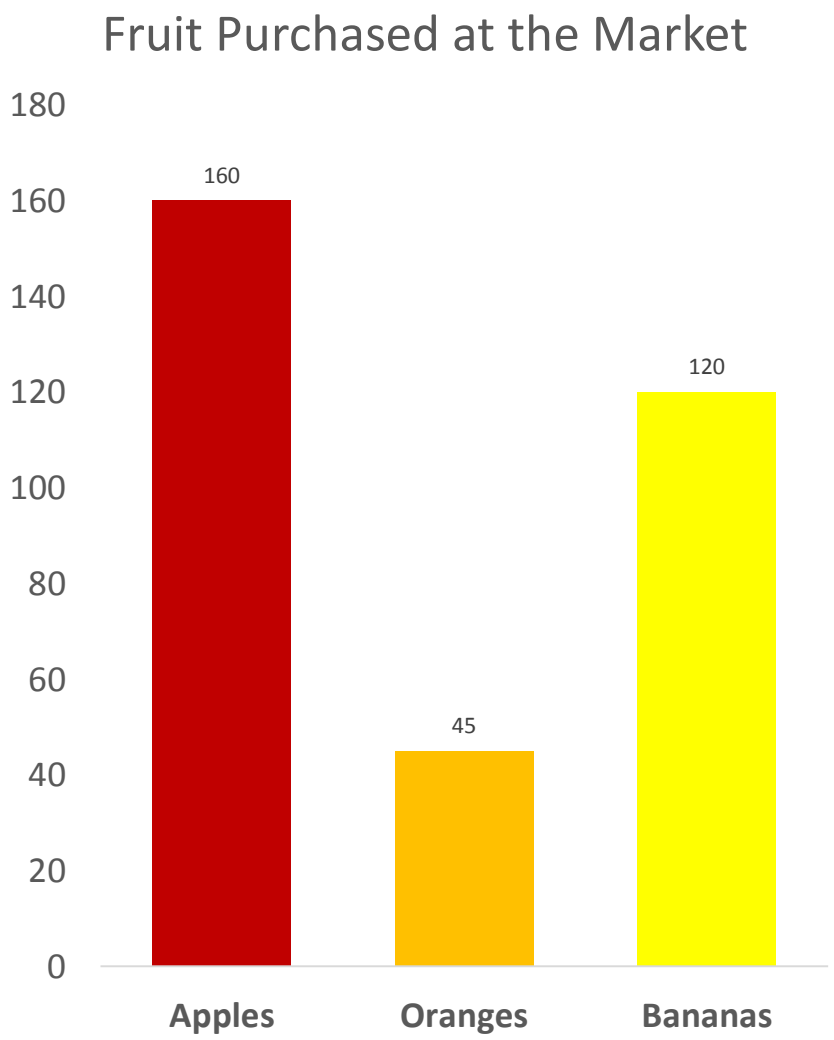
What is a Histogram?

- Graph used to show the frequency of occurrence of different values:
  - X-axis or horizontal axis represents the values present in the data
  - Y-axis (and thus the height of each bar) represents the frequency of occurrence of that value or range of values

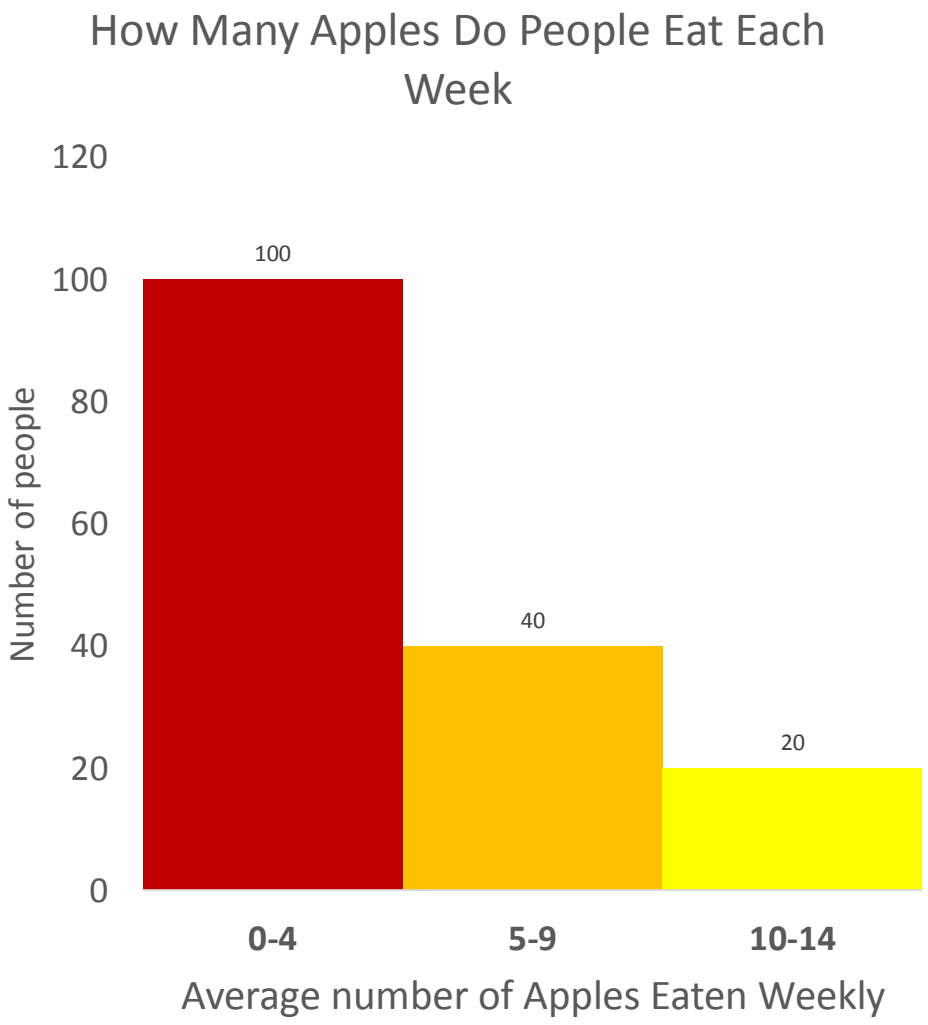
- Histograms allow a team to:
  - Display large amounts of data in visual format
  - Show relative frequency of various data values
  - Illustrate underlying distribution of the data
  - Reveal the shape and variation of the data
  - Provide information for predicting future performance

HISTOGRAM – WHY IT IS USED

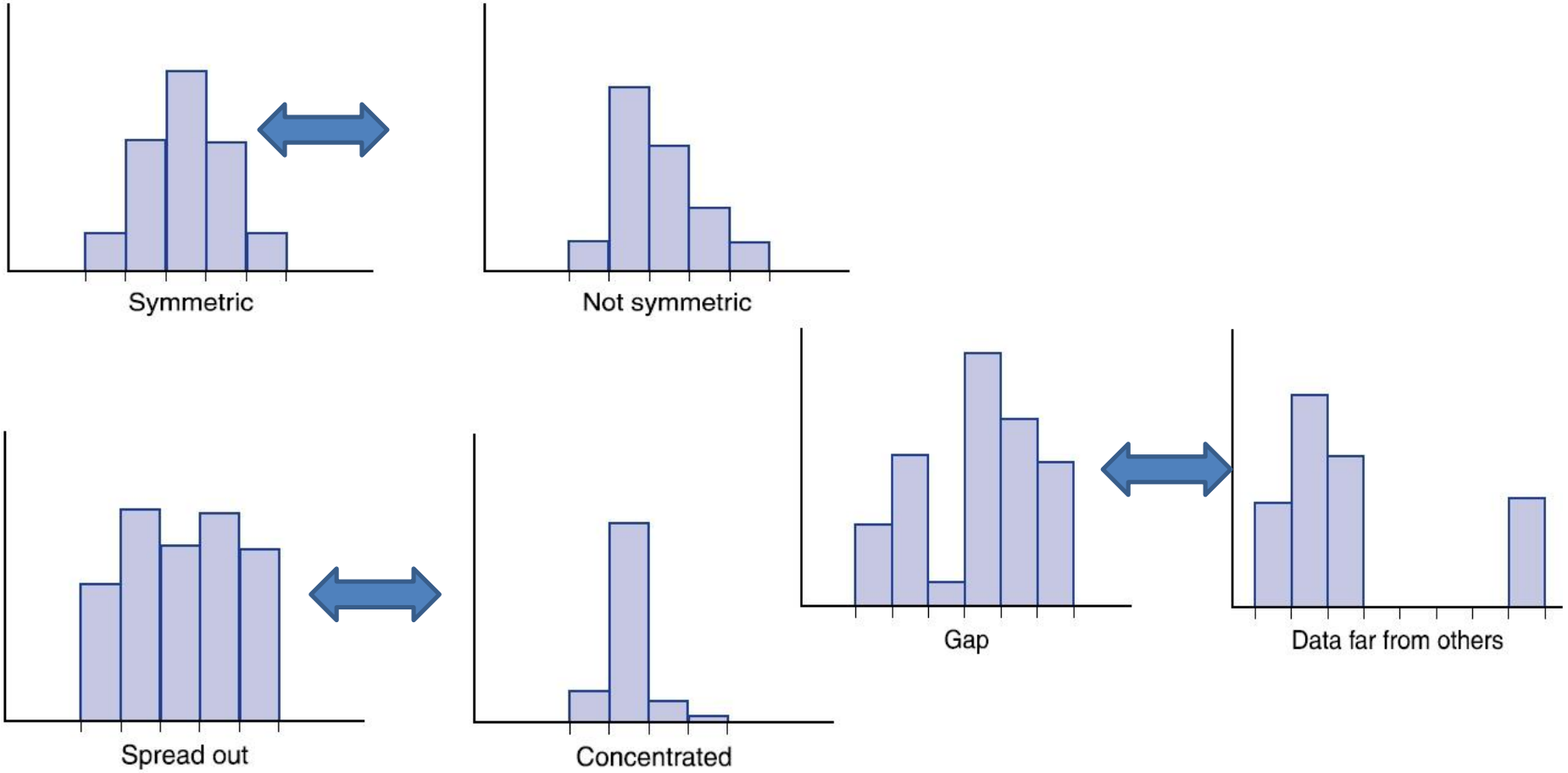
BAR GRAPH – categories



HISTOGRAM - intervals



Characteristics of data detected by histograms

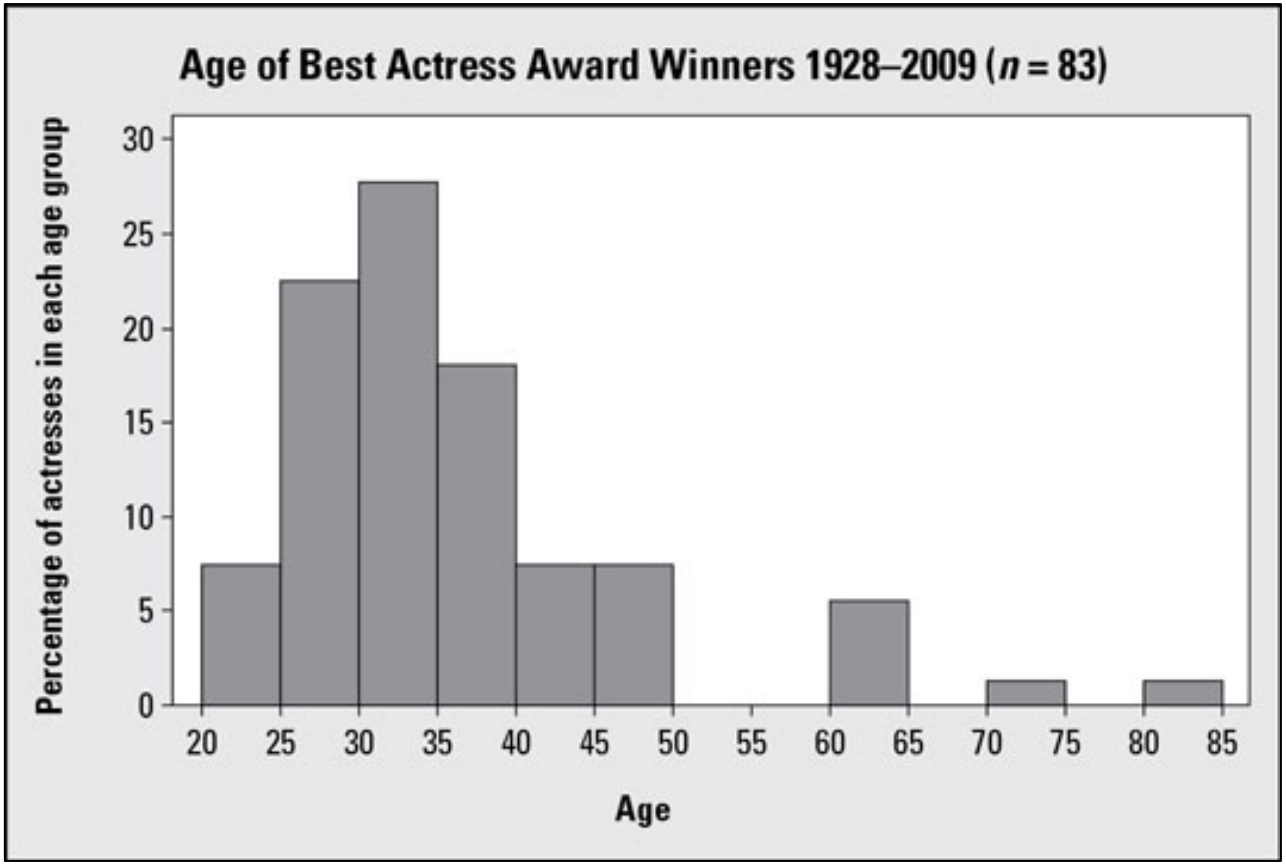


How to Construct a Histogram

1. Decide on the indicator to be measured
2. Collect a large number of data points
3. Prepare a frequency table from the data
4. Group the data into intervals
5. Plot/Create the histogram

Creating a Histogram - Example

Age Range	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85
Percentages of actresses	7	23	27	18	9	9			5		1		1



http://www.dummies.com/how-to/content/how-to-spot-statistical-variability-in-a-histogram.html

HISTOGRAM VIDEO

- https://www.youtube.com/watch?v=jFqRECGWAcM

Pareto Charts

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What is a Pareto Chart?

- A Pareto chart helps a team focus on problems that offer the greatest potential for improvement, by showing different problems' relative frequency or size in a descending bar graph, which highlights the problems' cumulative impact.
- Teams can then focus on problem causes that could have the greatest impact if solved or improved.

- The Pareto principle: **20% of sources cause 80% of problems**.

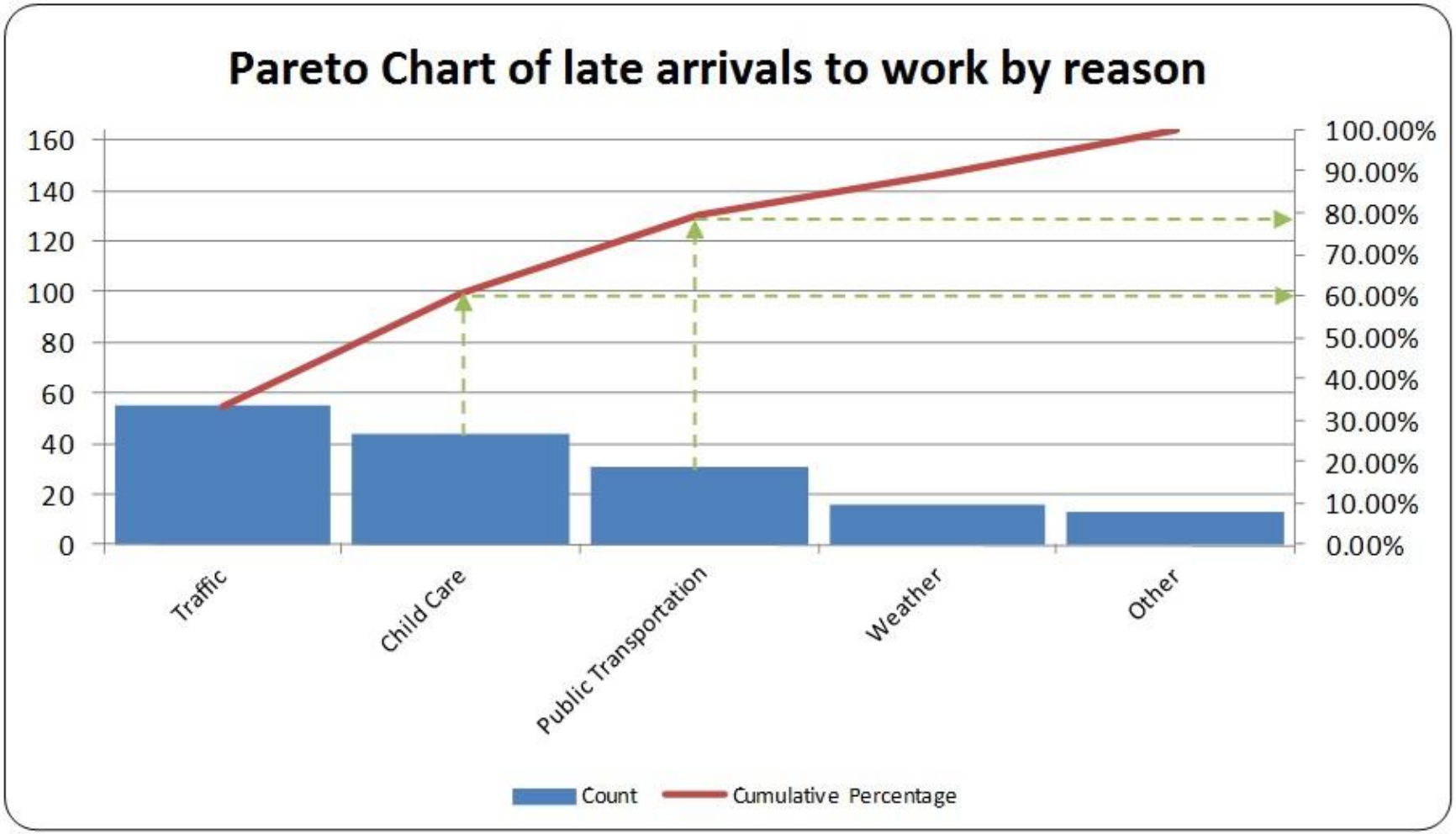
Why is a Pareto Chart Used?

- Contains both bars and a line graph - individual values are represented in descending order by bars, and the cumulative total is represented by the line
  - The left vertical axis (y-axis) is the frequency of occurrence
  - The (y-axis) right vertical axis is the cumulative percentage of the total number of occurrences, total cost, or total of the particular unit of measure
  - The x-axis (horizontal) is the list of units, potential causes, etc. that you are measuring
- The purpose of the Pareto chart is to highlight the most important among a (typically large) set of factors

How to Construct a Pareto Chart

1. Choose Problem, Potential Causes
2. Choose Measurement Units
3. Gather Data
4. Construct Pareto Chart

How we can use a Pareto Chart - Example



http://1000lives.net/2014/11/10/prioritising-changes/

Pareto Chart Video

- https://youtu.be/HwTSnkBWaHM

Self Assessment Questions

Most common purpose(s) for using a histogram is/are:

A. Show distribution
B. how often each different value in a set of data occurs
C. which factors are more significant
D. look for a relationship
E. A & B
F. A & D
G. All the above

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Most common purpose(s) for using a Pareto chart is/are:

A. problems' cumulative impact
B. contains an ordered bar chart
C. contains a line graph
D. summarizes where opportunity lies
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F. A, B, &C
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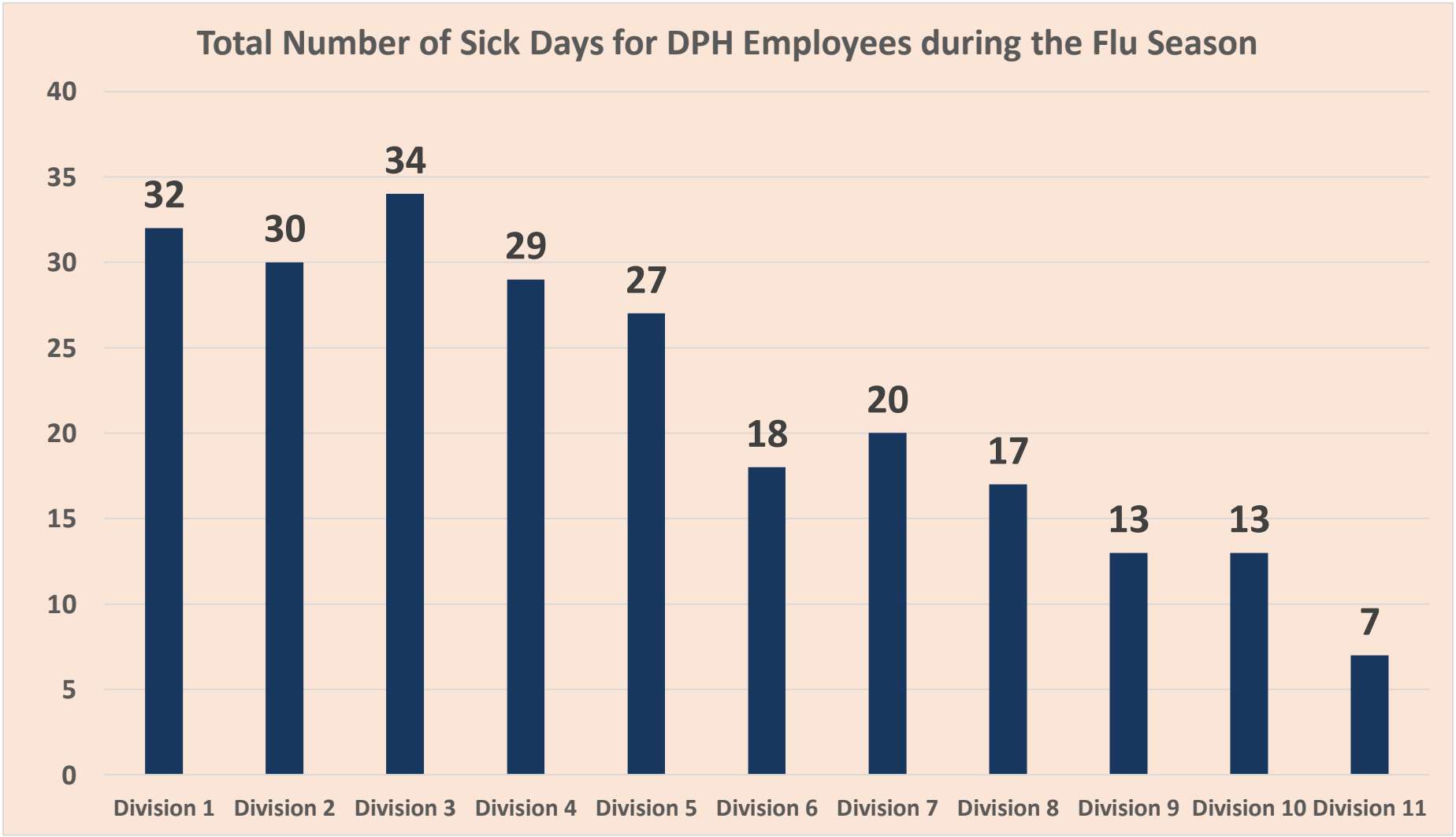
GROUP EXERCISES

GROUP ACTIVITY – Histogram – Exercise 1

DPH - Employees Absenteeism During Flu Season (Dec - March 2015)

DPH Div	Dec	Jan	Feb	March	Total	% Days Sick
Division 1	10	10	9	3	32	13.3%
Division 2	10	10	8	2	30	12.5%
Division 3	9	10	8	7	34	14.2%
Division 4	9	10	9	1	29	12.1%
Division 5	8	10	8	1	27	11.3%
Division 6	7	9	1	1	18	7.5%
Division 7	8	7	3	2	20	8.3%
Division 8	7	6	2	2	17	7.1%
Division 9	6	5	1	1	13	5.4%
Division 10	5	5	2	1	13	5.4%
Division 11	2	3	1	1	7	2.9%
Total	81	85	52	22	240	100.0%

Histogram 1: Create a Histogram for Total N Sick Days



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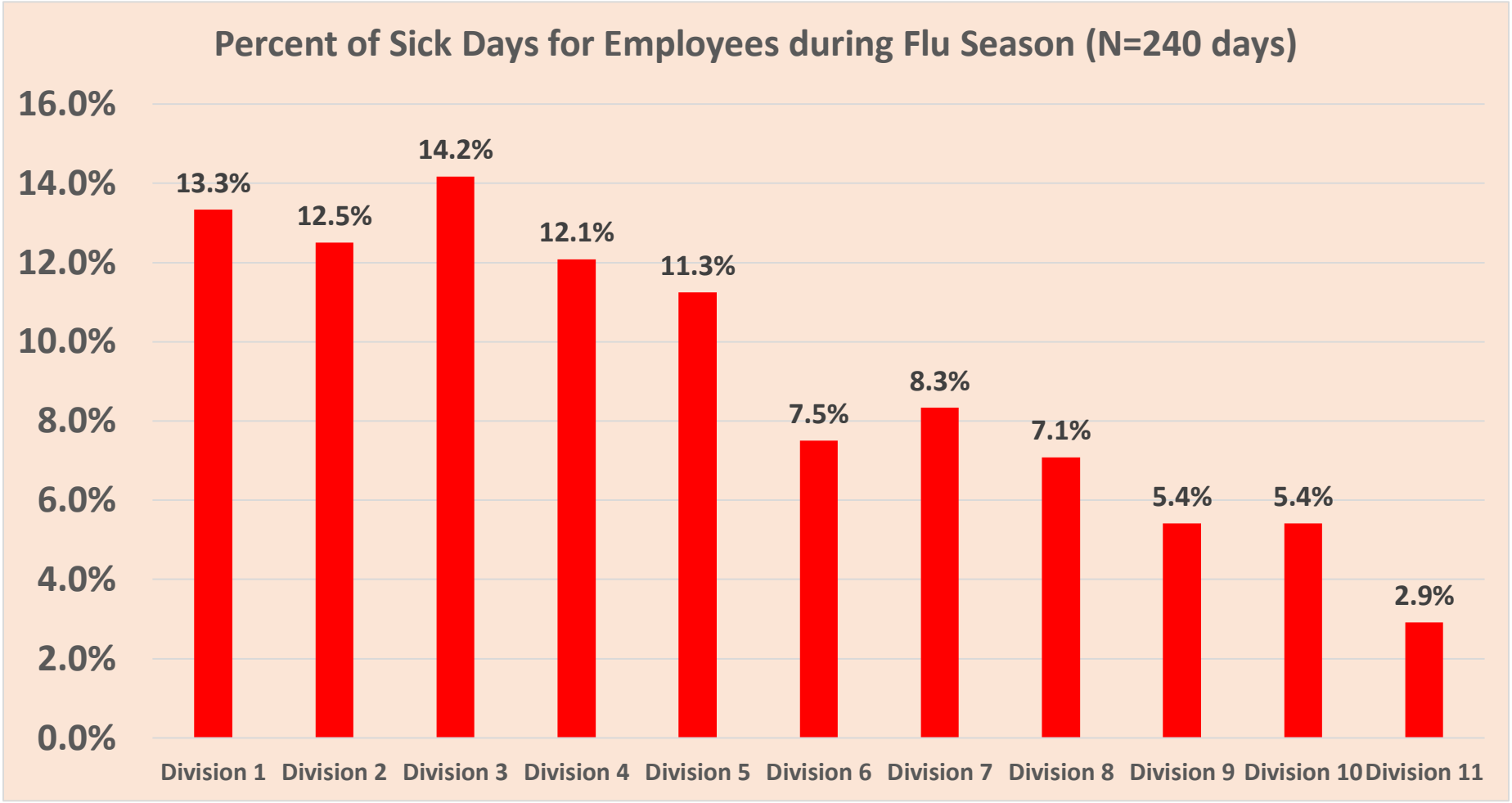


2: Pareto Chart – Hypothetical Problem Description

Scenario: (Hypothetical)

Problem: Based on the recent internal departmental time sheet data analysis, DPH Employee absenteeism during the Flu Season has significantly increased during the period from December 2014 to March 2015. Most of the time employees were out sick due to a widespread flu. As a requirement, all DPH employees are mandated to have their Flu Vaccinations by Dec 1, 2014 and report statistics of employees who received and declined flu vaccinations to the Nurse Administration.

Task:

Based on information provided to you, please review some basic (hypothetical) stats of DPH Employee Flu Vaccination Status as of Dec 1, 2014 for DPH 11 Divisions and create Pareto Charts in order to identify the where the problem is.

Exercise 2: Pareto Chart

Group Exercise 1:
Task: Create a Pareto Chart for the Percent of Employees who Declined Flu Vaccine. Where is the problem?

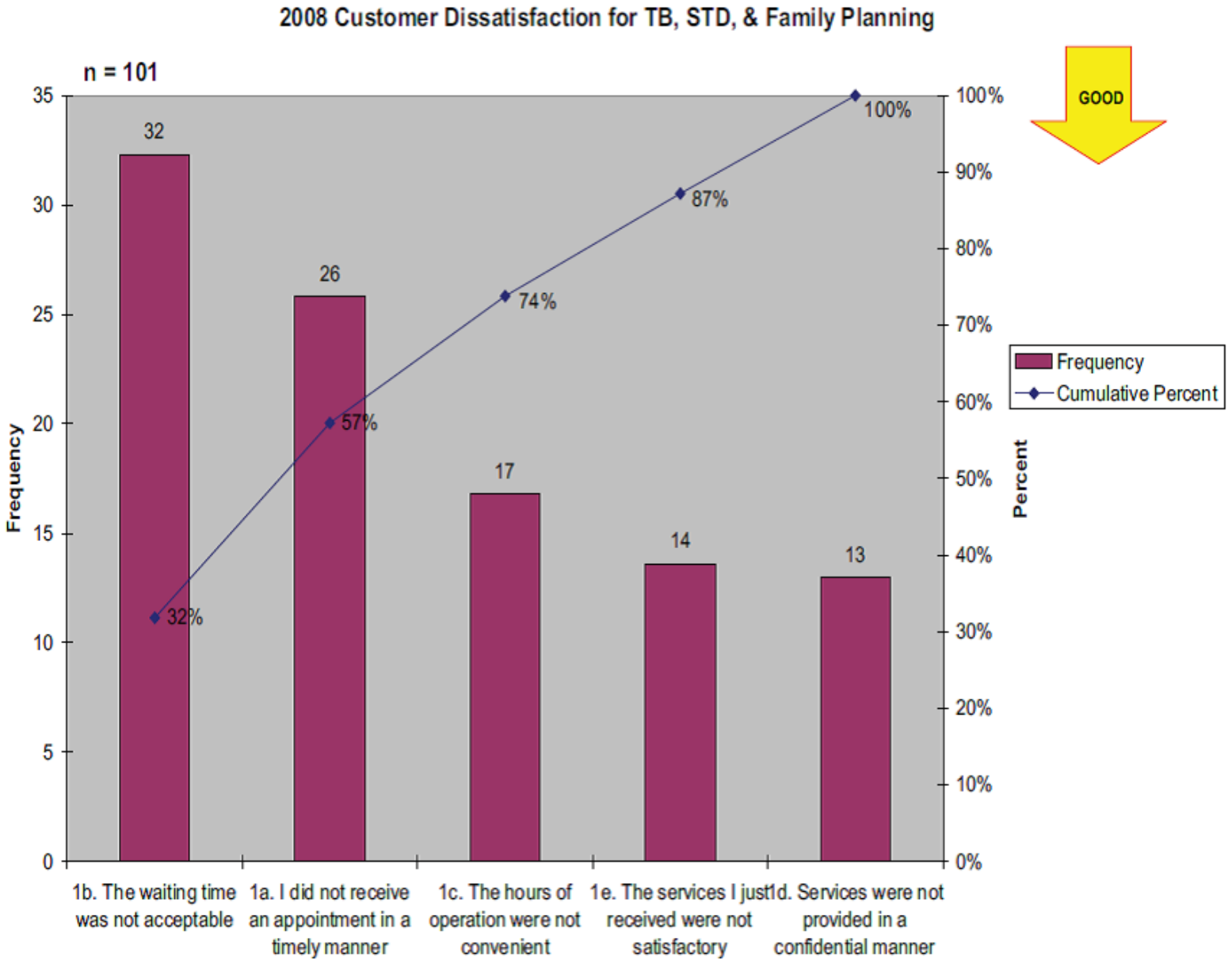
Group Exercise 2:
Task: Create a Pareto Chart for the Percent of Employees who Received Flu Vaccine. Where is the problem?

Group Exercise 3:
Task: Create a Pareto Chart for the reasons for declining flu vaccination. Where is the Problem? How can you affect it?

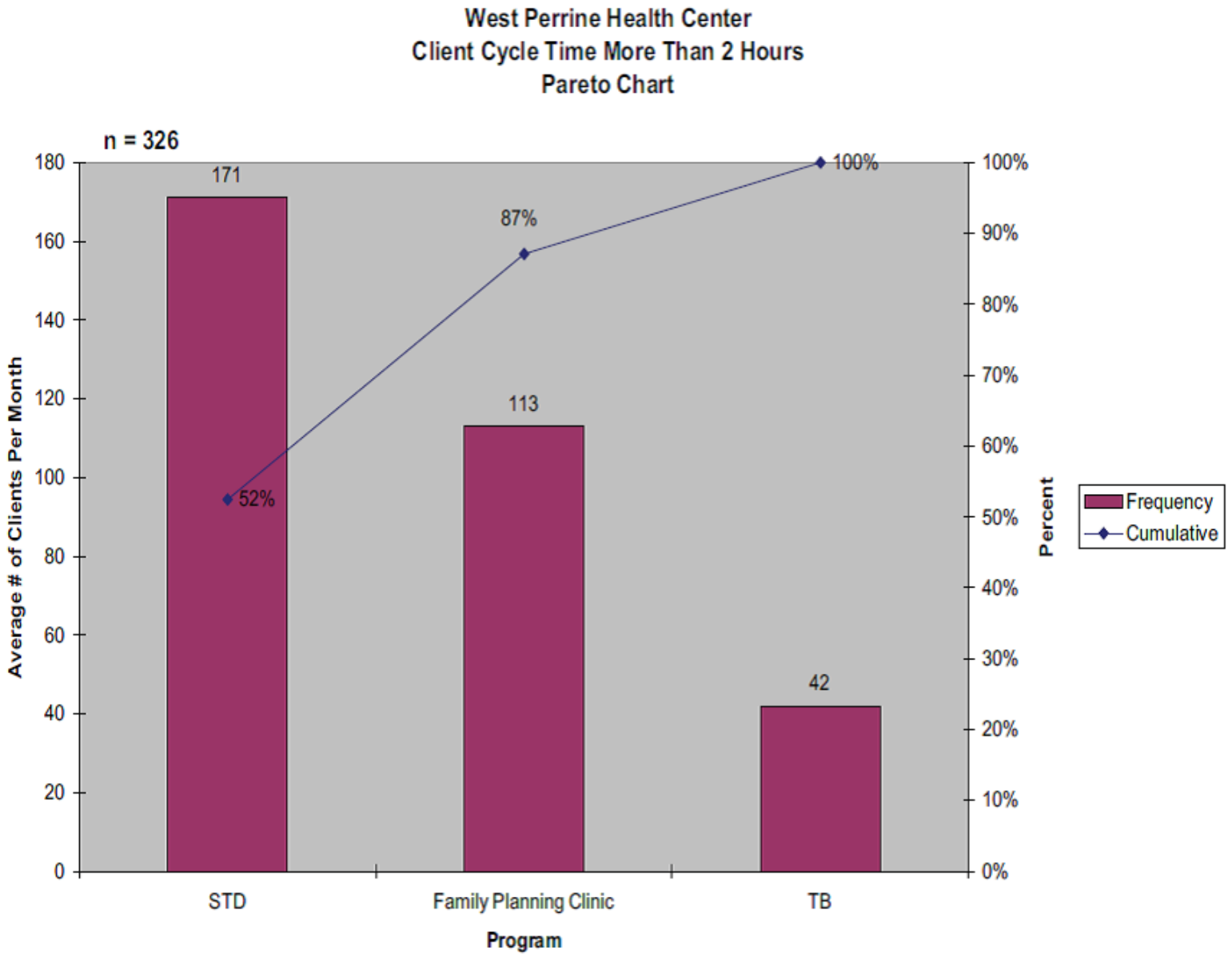
STORY BOARD

Reduction in Percentage of Clients with Cycle Times Greater than 2 Hours in a Family Planning Clinic

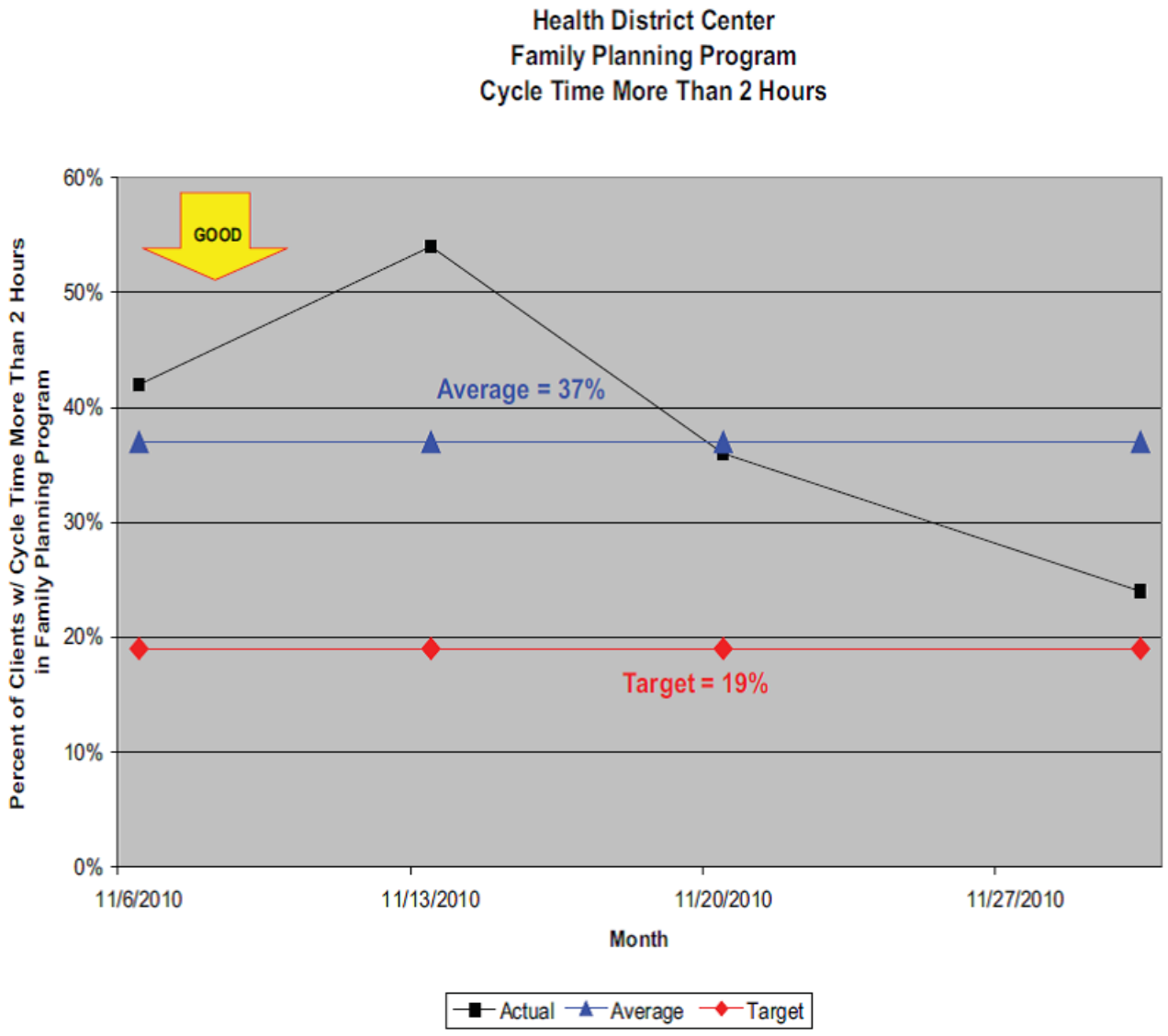
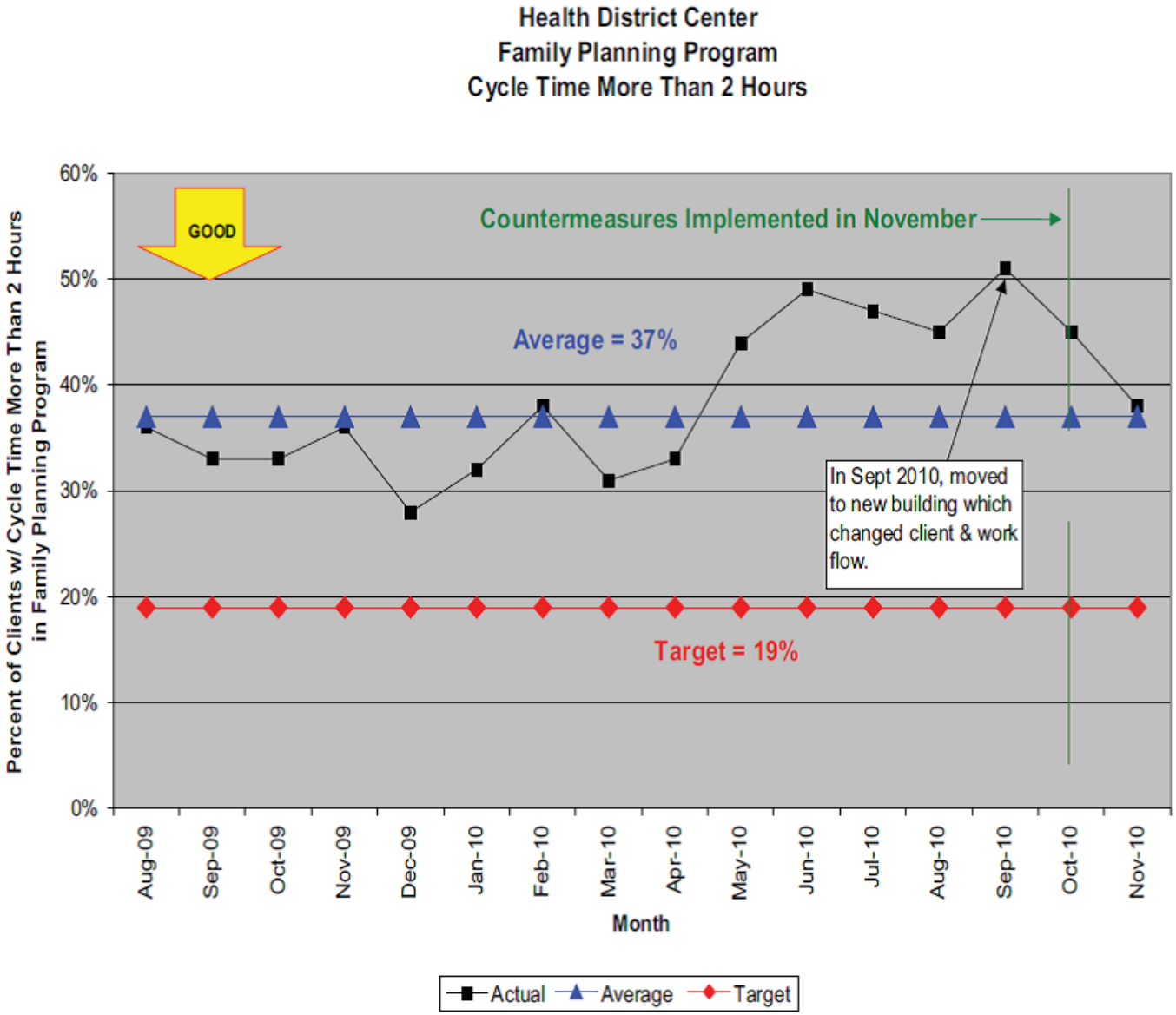
Story Board – Figure 1



Story Board – Figure 2



Story Board – Figure 3



Story Board – Figure 4