Agenda

- Warm Up   10 min
- Checkup
    - *Check, copies*
- Types of variables   5 min
- Make-a-list   10 min
- Lecture   20 min
    - Bar graph (incl. side-by-side)
    - Dot plot
- How tall can you go?   15 min
    - *Maybe skip?*
- Survey, observational study, experiment   25 min
    - Which would you do? (whiteboards)   10 min
- "Pick a question" (original)   20 min
- SOCS?   20 min
- Exit Pass   5 min

Warm Up

What is the probability of:

1. rolling a "5" on a standard die?

2. rolling a "5" or a "6" on a standard die?

3. rolling a "5" and a "6" on two standard dice?

4. selecting a "spade" from a standard deck?

5. selecting an Ace or a "spade" from a standard deck?

AP Classroom

- Sign up for our AP classroom. Go to myap.collegeboard.org. Use the code:

Period 1 → 2VGWGJ

Period 3 → A9NVWZ

Collect HW

- Student questionnaire (**GREEN**)

Checkup time

Yesterday's Warm Up

1) Write down 1 example of a "categorical" variable.

2) Write down 1 example of a "quantitative" variable.

3) Is a phone number <u>categorical</u> or <u>quantitative</u>?

Quantitative: Uses numerical values for which arithmetic operations (adding, averaging, etc.) make sense. *Example: Hair length.*

Categorical (also "Qualitative"): Places an individual into one of several groups or categories. *Example: Hair color.*

"Make-a-List"

- Desk partners, share 1 whiteboard.
- Take turns writing down answers
- Winner = longest list

Example:

Prime numbers

"Make-a-List"

- Desk partners, share 1 whiteboard.
- Take turns writing down answers
- Winner = longest list

Your topic is……

Quantitative variables

"Make-a-List"

- Desk partners, share 1 whiteboard.
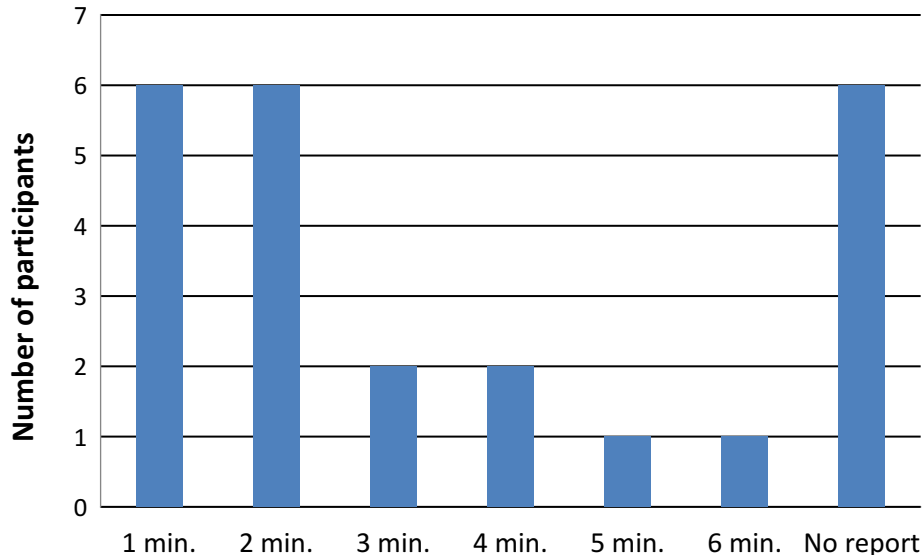- Take turns writing down answers
- Winner = longest list

Your topic is……

Categorical variables

2pts each for categorical variables consisting of <u>numbers</u>
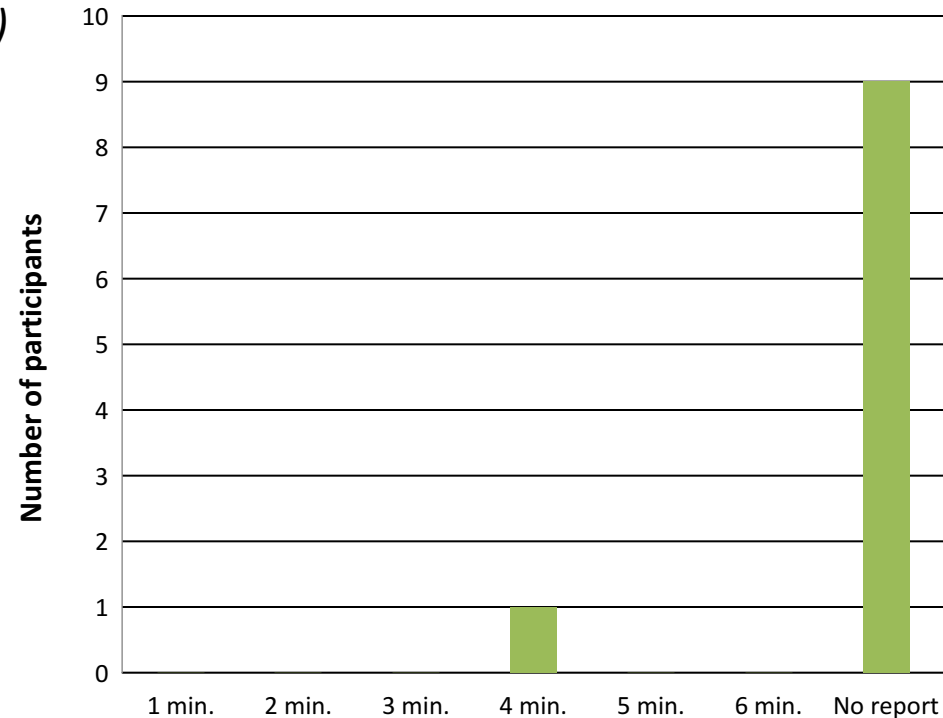
Bar graph

- A chart with rectangular bars, with lengths proportional to the values they represent.
    - Can be plotted vertically or horizontally.

- *Example,* Latane & Darley (1968)

Alone

2 confederates

We try

Let's say you were eligible to vote in the last presidential election. Who would you have voted for?

Choose the following:

1. Donald Trump   (Republican Party)
2. Hillary Clinton   (Democratic Party)
3. Darrell Castle   (Constitution Party)
4. Dr. Jill Stein   (Green Party)
5. Gary Johnson   (Libertarian Party)

You try

- In August 2005, researchers for the American Society for Microbiology & the Soap and Detergent Association monitored the behavior of more than 6000 users of public restrooms. They observed people in public venues such as Turner Field in Atlanta and Grand Central Station in New York City.

- 2393 men washed their hands, and 813 men did not wash their hands.

- 2802 women washed their hands, and 328 women did not wash their hands.

1. *Make a bar graph that displays this information.*
2. *Based on this data, would you rather shake hands with a man or a woman?*
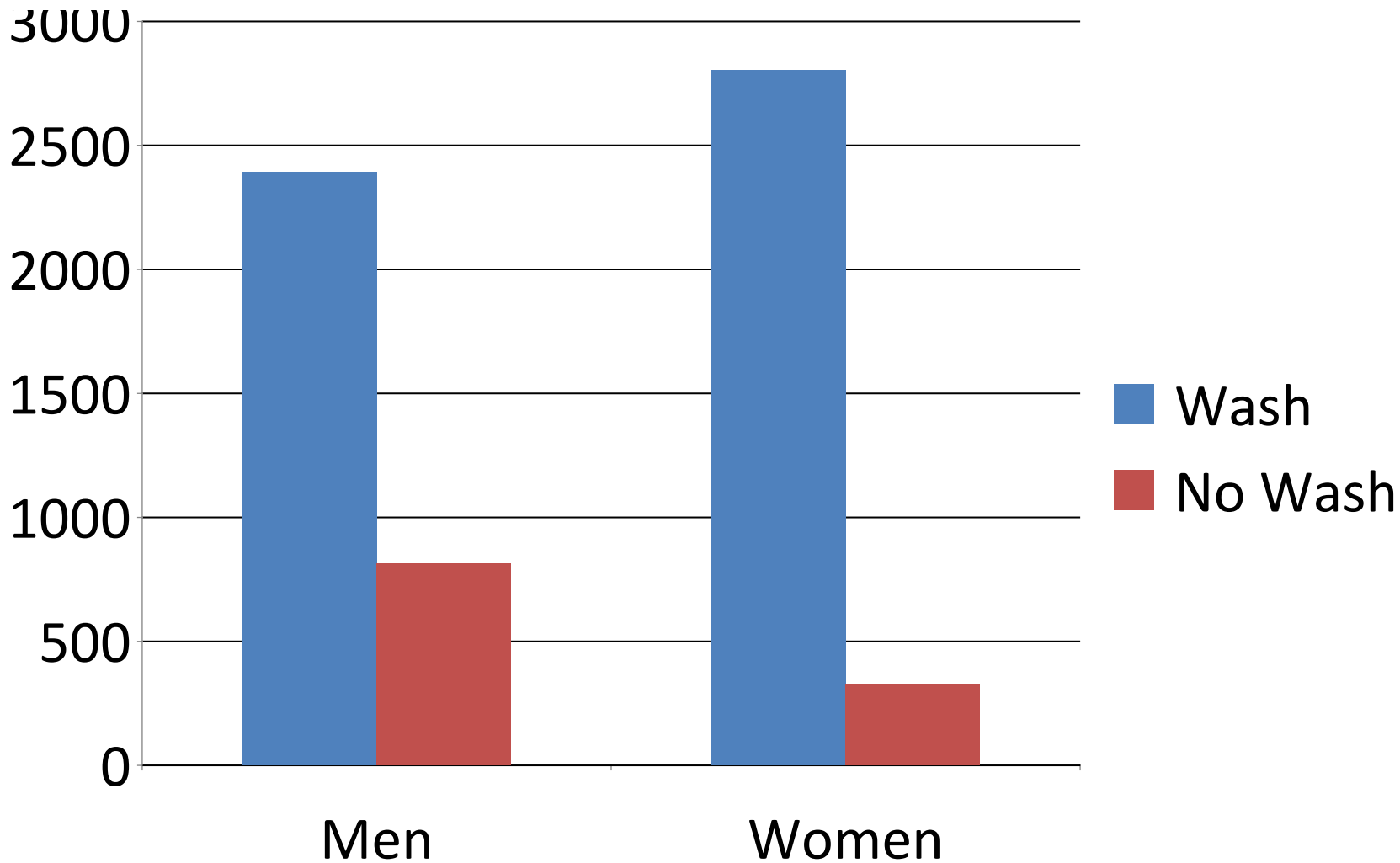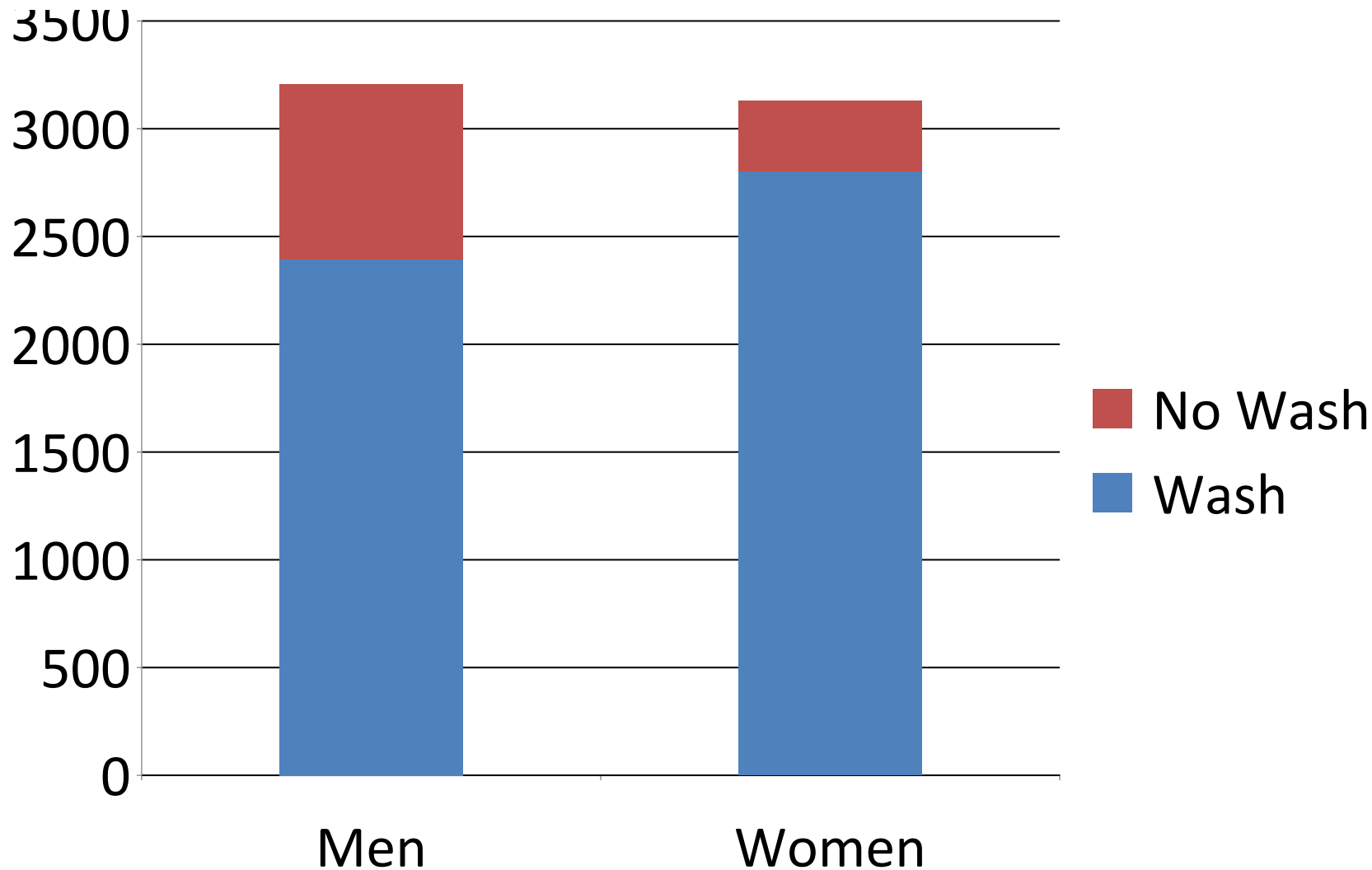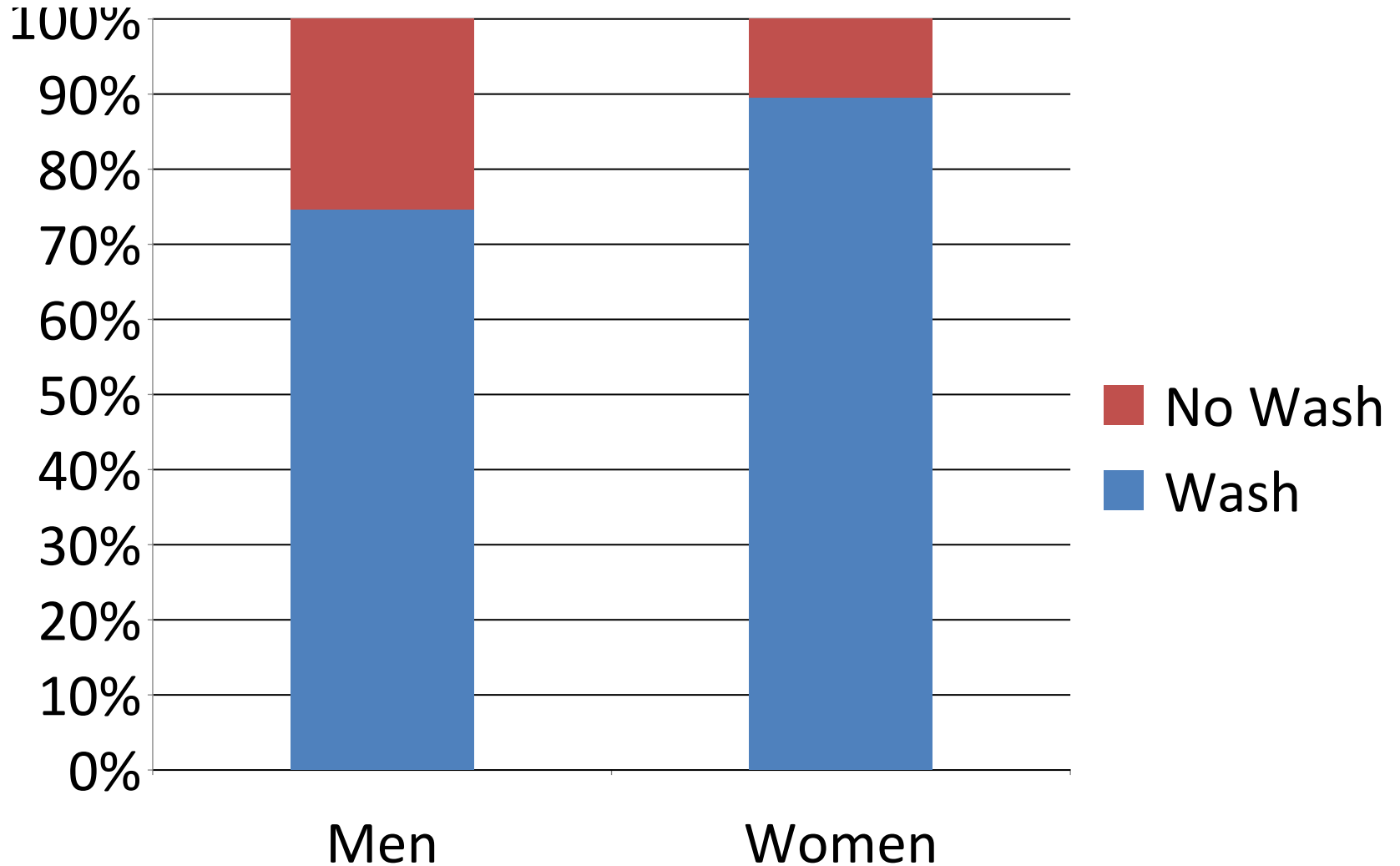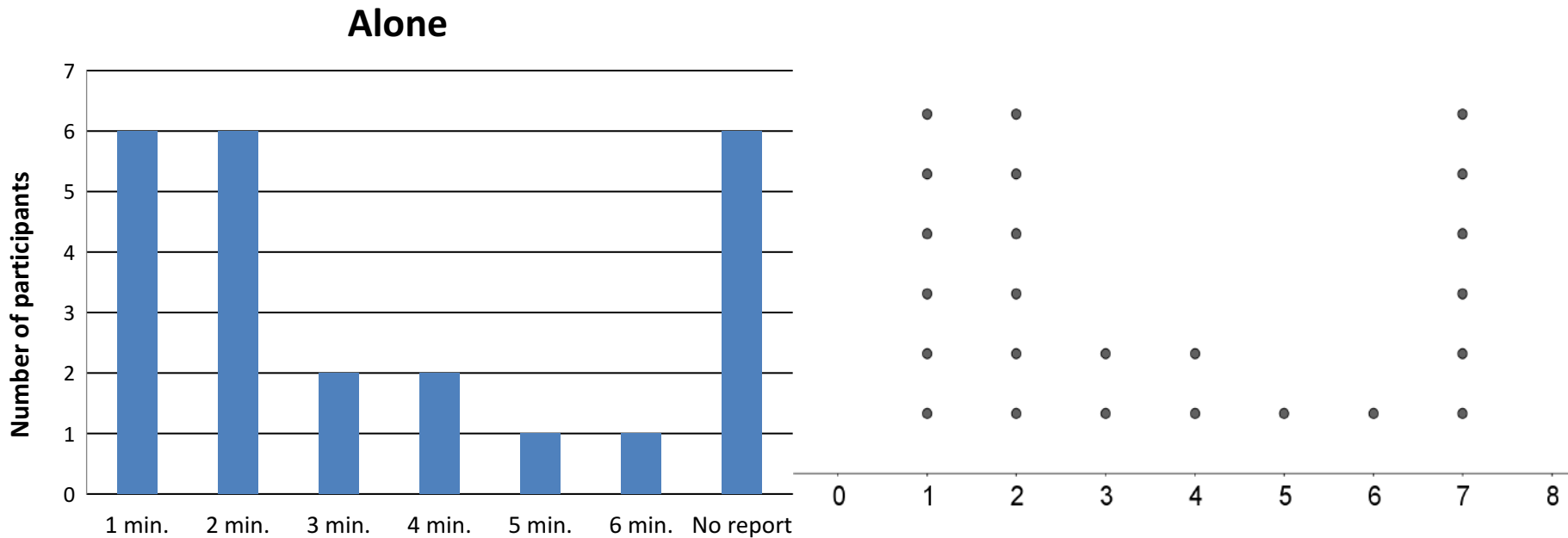
Chart 1 of 3

Chart 3 of 3

Men   Women

No Wash

Wash

Dot Plot

- A chart of data points plotted on a simple scale, typically using dots.

- *Example: Latane & Darley (GeoGebra)*

You try

How many states have you visited for at least 24 hours?

How tall can you go?

How tall can it go?

- Groups of 3-4 (I will assign)
- 7 minutes
- Winners earn +5 extra-credit in "Assignments/Checkups" category.

- Build the structure with the highest elevation using the following supplies:
  - EXACTLY (no more, no less) 2 sheets of paper.
  - 10 paper clips

Firefox/Chrome vs. Safari/Explorer

- "Cornerstone OnDemand" analyzed ~50,000 people who took 45-min. online job assessment and then were hired.

- Found that people who used non-default browser (e.g. Firefox, Chrome) stayed at jobs ~15% longer.

- Michael Housman (chief analytics officer), "The fact that you took the time to install Firefox or Chrome on your computer shows us something about you.... you've made an active choice to do something that wasn't default."
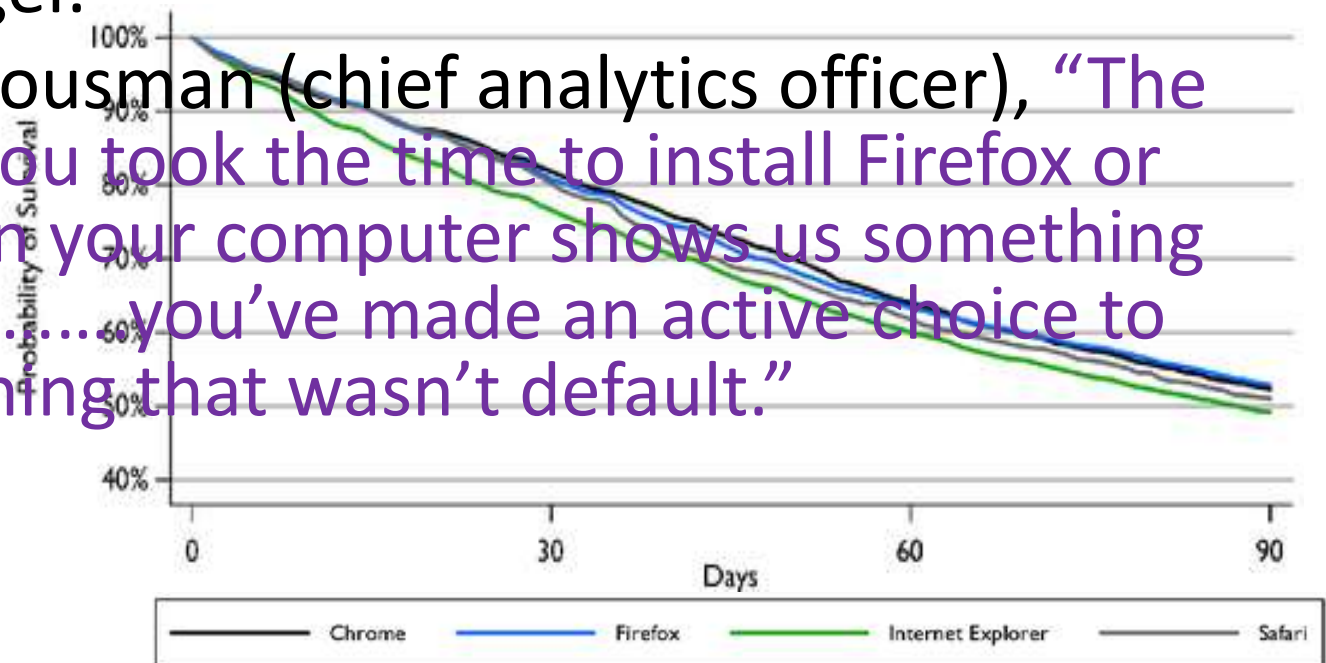
- Scissors
- Holding it up
- Glue, stapler, more paper clips
- Hanging (ceiling, ladder, etc.)
- Peeking at other groups
- Sabotaging other groups

Types of Studies

Surveys, Observational Studies, and Experiments

Method #1: Survey

- Select representative sample of population
- Ask questions, record responses. Do not influence!

- *The Literary Digest*
  - In 1936, huge survey (2.4 million!) predicted *Alf London*, Republican governor of Kansas, as winner of presidential election
    - Won Vermont and Maine. Lowest electoral vote ever.
    - Magazine bankrupt. Statistics discredited ☹.

Method #2: Observational study

- Observe representative sample of population
- Do not influence!

- *Estrogen after Menopause*
  - 1992-2002, most women took estrogen after menopause.
    - Seemed to reduce risk of heart attack by 35-50%.
  - 2002, National Institute of Health (NIH) concluded that earlier observational studies were wrong. Estrogen didn't reduce risk of heart attack, and in fact some types seemed to increase risk of strokes and breast cancer. Whoops.

Method #3: Experiment

- Do something to representative sample of population. Don't change anything else.

- Record variables of interest.

Milgram, 1961-1963

- Volunteer was "teacher", and the fake volunteer was "learner".
- "Teacher" and "learner" separated into different rooms, talk but not see each other.
- "Teacher" uses shock machine. First shocked themselves, low dose. "Teacher" given list of word pairs to teach the "learner".
- If "learner" answers incorrectly, "teacher" administers shock (fake)
  - Increased by 15 volts for each wrong answer
  - All the way to 450-volt with skull-crossbones symbol
- "Learner" fakes noises, distress, bangs on wall that separated him from "teacher"
  - After several times banging on wall and complaining about heart condition, "learner" goes quiet
- If "teacher" wants to stop experiment, given a succession of verbal statements:
  - Please *continue*.
  - The experiment requires that you *continue*.
  - It is absolutely essential that you *continue*.
  - You have no other choice, you *must* go on.
- If the "teacher" still wanted to stop after all 4 verbal prods, the experiment was halted.
  - Or, it was halted after subject had given the maximum 450-volt shock 3 times.
- *Results? What % of participants do you think went all the way?*
- *61-66% administered final lethal shock*

Do you understand?

How would you answer this question?

Survey

Observational study

Experiment

EXAMPLE. Do men have better navigational abilities than women?

1. *What percentage of high school students know the name of our current vice president?*
2. *Is global warming really happening?*
3. *Do people think global warming is really happening?*
4. *Is smoking bad for you?*

"Pick a Question"

- Choose a question from the list (next slide), and brainstorm the following:

1. **Which** would you do?

- Survey, observational study, or experiment

2. **How?** Give details (briefly)

- Survey → Who will you ask? What will you say?

- Observational → How will you observe but not influence?

- Experiment → What/who will you manipulate? How will you keep everything else the same?

"Pick a Question"

1. Make up your own question. (or choose from below)
2. Who will win the 2016 presidential election?
3. Do high school students prefer Coke or Pepsi?
4. Does students with Macs have higher grades?
5. How many hours a week do students spend on a computer?
6. Does more Facebook friends mean more real friends?
7. Does alcohol make you worse at driving?
8. What is the most popular restaurant in West Sacramento?
9. Are teenagers worse at driving than everyone else?
10. Does people commit more crimes when it's hotter outside?
11. Does perfume/cologne make people more attractive?
12. Does Vitamin C help cure a cold?
13. Are blondes less intelligent?

> **How?** Give details (briefly)
> *Survey*→Who will you ask? What will you say?
> *Observ.*→How will you observe but not influence?
> *Experiment*→What/who will you manipulate?
> How will you keep everything else the same?

"Pick a Question"

- Survey → Who will you ask? What will you say

- Observational → How will you observe without influencing?

- Experiment → What will you manipulate? How will everything else stay the same?

1. Share with your partner.

2. Two strengths in your partner's design.

3. Two flaws in your partner's design.

Exit Pass

1. ~~Write down your email address.~~

I want to know if cigarettes cause cancer. Classify each as a survey, observational study, or experiment:
2. I ask 20 people with cancer if they smoke cigarettes.
3. I lock 20 people in a cigarette-smoked room for 5 years to see if they get cancer.

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4. Write down an example of an observational study.