

Chapter 2 – Displaying and Describing Categorical Data

SECTION EXERCISES

SECTION 2.1

1.

a) Frequency table:

None	AA	BA	MA	PhD
164	42	225	52	29

b) Relative frequency table (divide each number by 512 and multiply by 100):

None	AA	BA	MA	PhD
32.03%	8.20%	43.95%	10.16%	5.66%

2.

a) Frequency table:

Under 6	6 to 9	10 to 14	15 to 21	Over 21
45	83	154	18	170

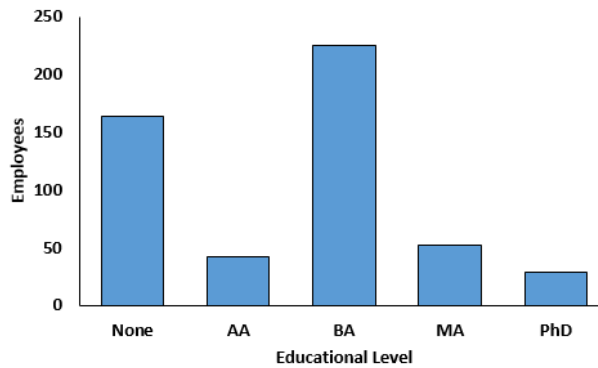
b) Relative frequency table:

Under 6	6 to 9	10 to 14	15 to 21	Over 21
9.57%	17.66%	32.77%	3.83%	36.17%

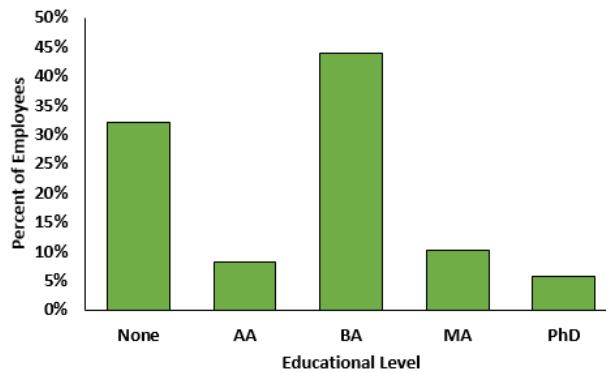
SECTION 2.2

3.

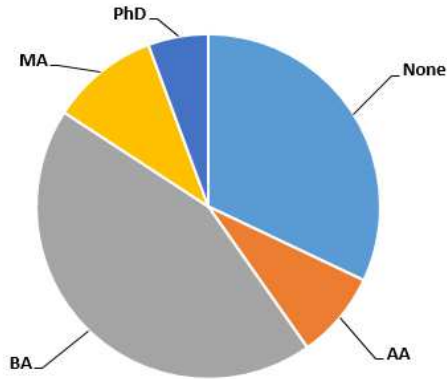
a)



b)

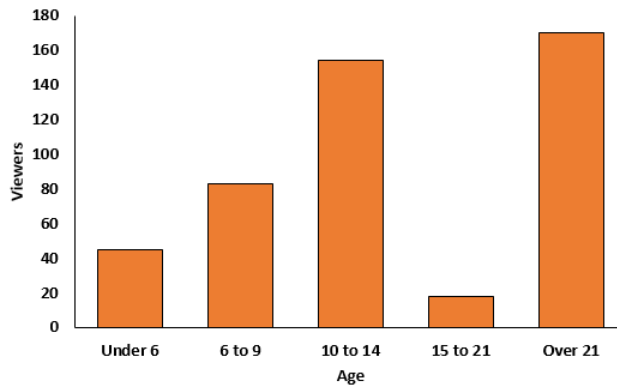


c)

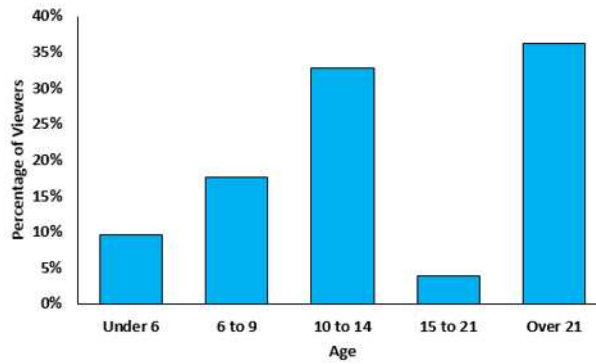


4.

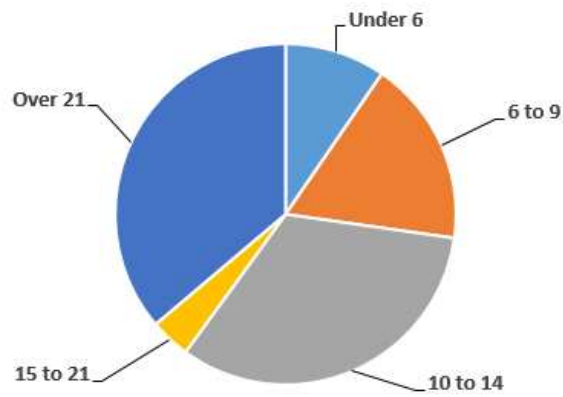
a)



b)



c)



5.

- a) Most employees have either a bachelor’s degree (44%) or no college degree (32%). About 10% have master’s degrees, 8% have associate’s degrees, and nearly 6% have PhDs.
- b) It is difficult to generalize these results to any other division of the company or to any other company. These data were collected from only one division. Other divisions and companies might have vastly different educational requirements for their employees and therefore distributions of educational levels.

6.

- a) Approximately $\frac{1}{3}$ of the viewers were 10–14 years old. Over a third (36%) of the viewers were over the age of 21, many of whom could be parents accompanying their children. Slightly over 50% of the viewers were children and younger teenagers from 6 to 14 years of age. About 10% of the viewers were younger children under 6 years of age. Only 4% were older teenagers to young adults from 15 to 21 years of age.
- b) We do not know whether these audiences are representative. No information is given about how the locations were selected, what time of day the interviews were conducted, etc. Moreover, we don’t know how many individuals did not agree to be interviewed. Are teenagers and young adults from 15 to 21 years of age underrepresented in the sample because the film was not appealing to this age group or because they declined to be interviewed?

SECTION 2.3

7.

a)

	Totals
< 1 year	95
1-5 years	205
more than 5 years	212

b) Yes.

None	AA	BA	MA	PhD
164	42	225	52	29

8.

a)

	Totals
Never	350
Once	78
More than Once	42

b) Yes.

Under 6	6 to 9	10 to 14	15 to 21	Over 21
45	83	154	18	170

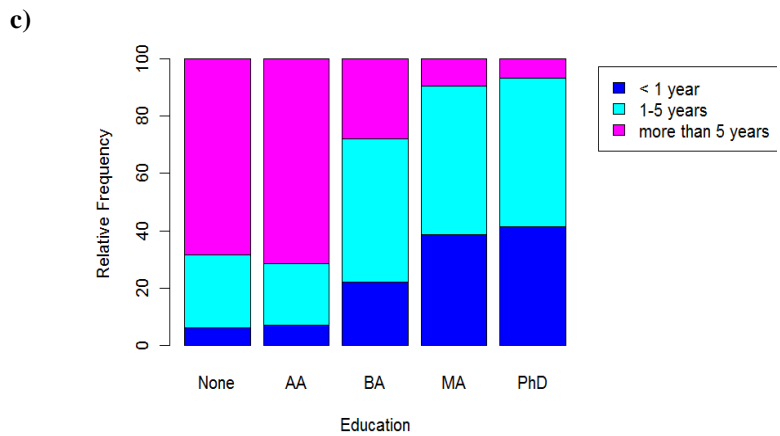
SECTION 2.4

9.

a)

(%)	None	AA	BA	MA	PhD
< 1 year	6.1	7.1	22.2	38.5	41.4
1-5 years	25.6	21.4	49.8	51.9	51.7
more than 5 years	68.3	71.4	28.0	9.6	6.9

b) No. The distributions look quite different. More than 2/3 of those with no college degree have been with the company longer than 5 years, but almost none of the PhDs (less than 7%) have been there that long. It appears that within the last few years the company has hired better educated employees.



- d) It is easier to see the differences in the distributions in the stacked bar chart.
 e) A mosaic plot would display the different counts for each degree type. Areas of the plot representing each cell would then reflect the cell counts accurately.

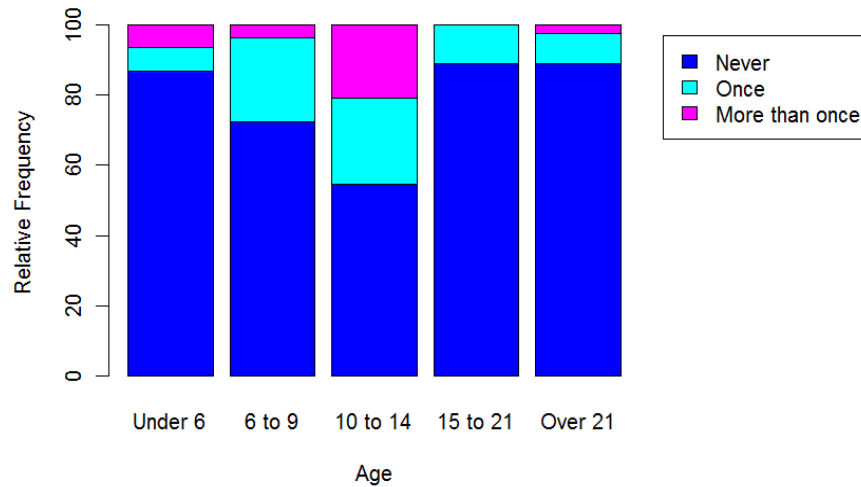
10.

a)

(%)	Under 6	6 to 9	10 to 14	15 to 21	Over 21
Never	86.7	72.3	54.5	88.9	88.8
Once	6.7	24.1	24.7	11.1	8.8
More than once	6.7	3.6	20.8	0	2.4

b) The vast majority of viewers hadn't seen the movie before except for the 10- to 14-year-old group, where nearly half (45.5%) had seen the movie at least once.

c)



- d) It is easier to see the differences in the distribution in the stacked bar chart. The stacked bar chart makes the 10 to 14 year old age group (and to a lesser extent the 6 to 9 year old age group) stand out as having a larger percentage of viewers who have seen the movie at least once before compared to the other age groups.
- e) A mosaic plot would display the different counts in each age group accurately as well, providing a better representation of the counts in the table.

CHAPTER EXERCISES

11. **Graphs in the news.** Answers will vary.
12. **Graphs in the news, part 2.** Answers will vary.
13. **Tables in the news.** Answers will vary.
14. **Tables in the news, part 2.** Answers will vary.
15. **U.S. market share.**
- Yes, this is an appropriate display for these data because all categories of one variable (sellers of carbonated drinks) are displayed. The categories divide the whole and the category Other combines the smaller shares.
 - The company with the largest share is Coca-Cola.
16. **Brand value.**
- Yes, this is an appropriate display for these data. The variable which is categorical (distributors of carbonated beverages) are displayed and dollar value easily readable.
 - The company with the smallest share is Dr. Pepper.
 - Red Bull slightly edges out Pepsi.

17. Market share again.

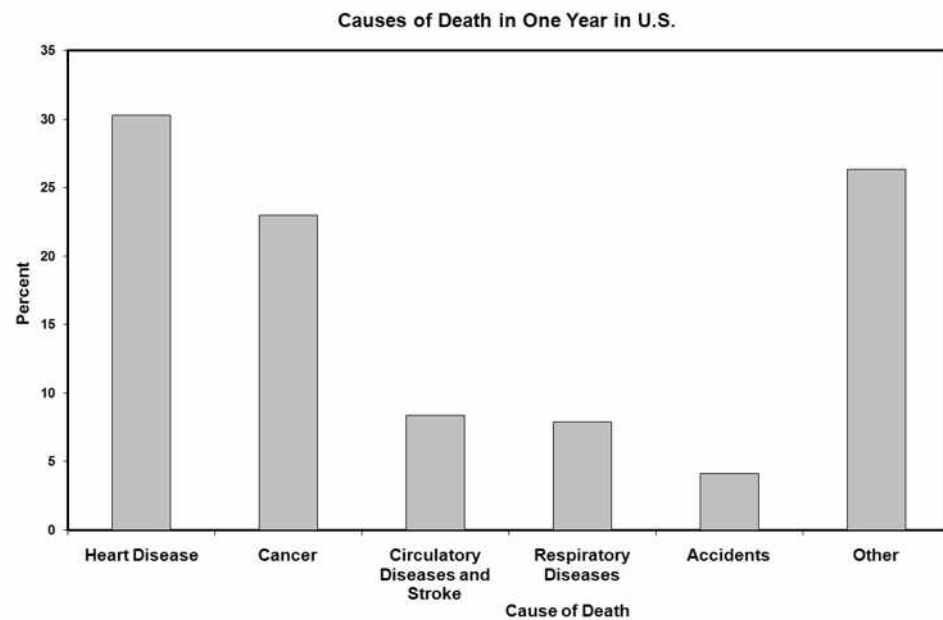
- a) The pie chart does a better job of comparing portions of the whole.
- b) The “Other” category is missing and without it, the results could be misleading.

18. Brand value again.

- a) The bar chart does a better job. The close categories are hard to compare directly in a pie chart because they are almost the same size pie segments.
- b) Too close to tell from the pie chart. Much easier to see from the bar chart.

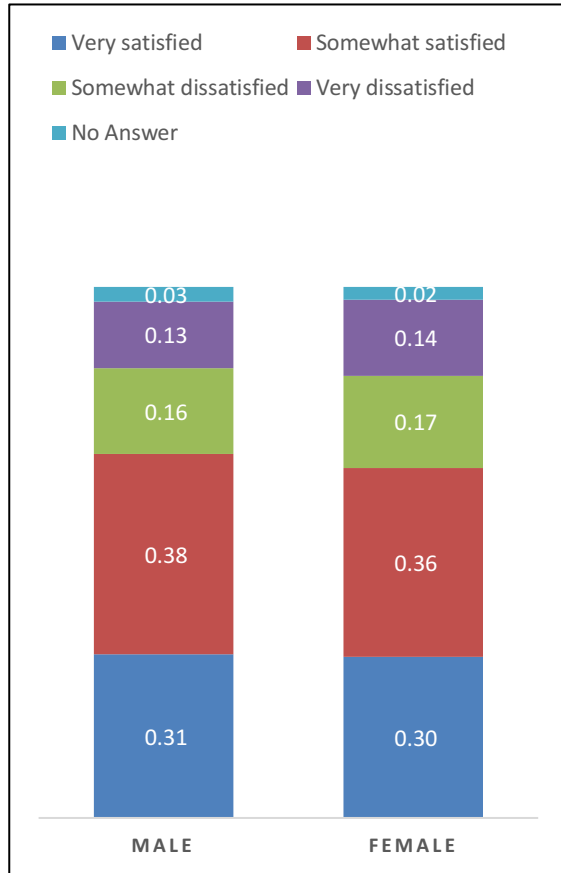
19. Insurance company.

- a) Yes, it is reasonable to conclude that deaths due to heart OR respiratory diseases is equal to 30.3% plus 7.9%, which equals 38.2%. The percentages can be added because the categories do not overlap. There can only be one primary cause of death.
- b) The percentages listed in the table only add up to 73.7%. Therefore, other causes must account for 26.3% of U.S. deaths.
- c) An appropriate display could either be a bar graph or a pie graph, using an “Other” category for the remaining 26.3% causes of death.

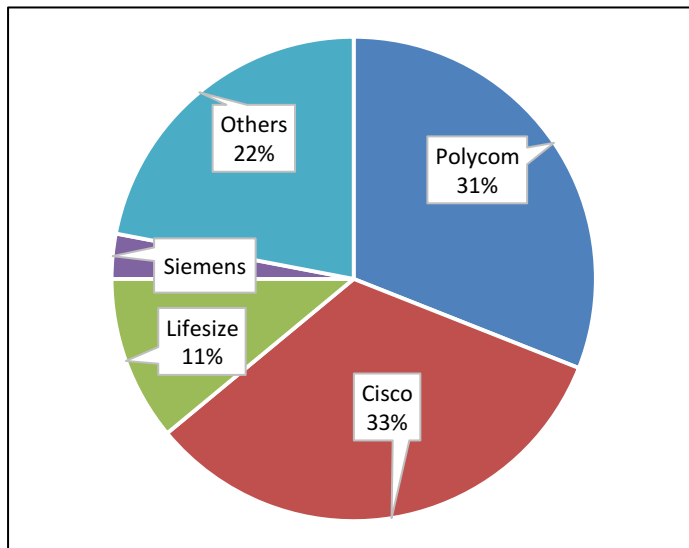


20. Financial satisfaction

- a) Answers may vary. Side-by-side bar charts, stacked bar charts, or mosaic plots would all be good visualizations. A comparison of percentages by level of satisfaction is shown in the following segmented bar chart. It is appropriate to compare percentages rather than individual numbers. Based on the given data, the comparison between females and males show that both genders have very comparable percentages for levels of satisfaction. It would not be reasonable to conclude that females are less satisfied than males with their financial situation.
- b) It would not be reasonable to conclude that there are more than 50% males in the United States from the data provided because the data represent a sample, not the whole.

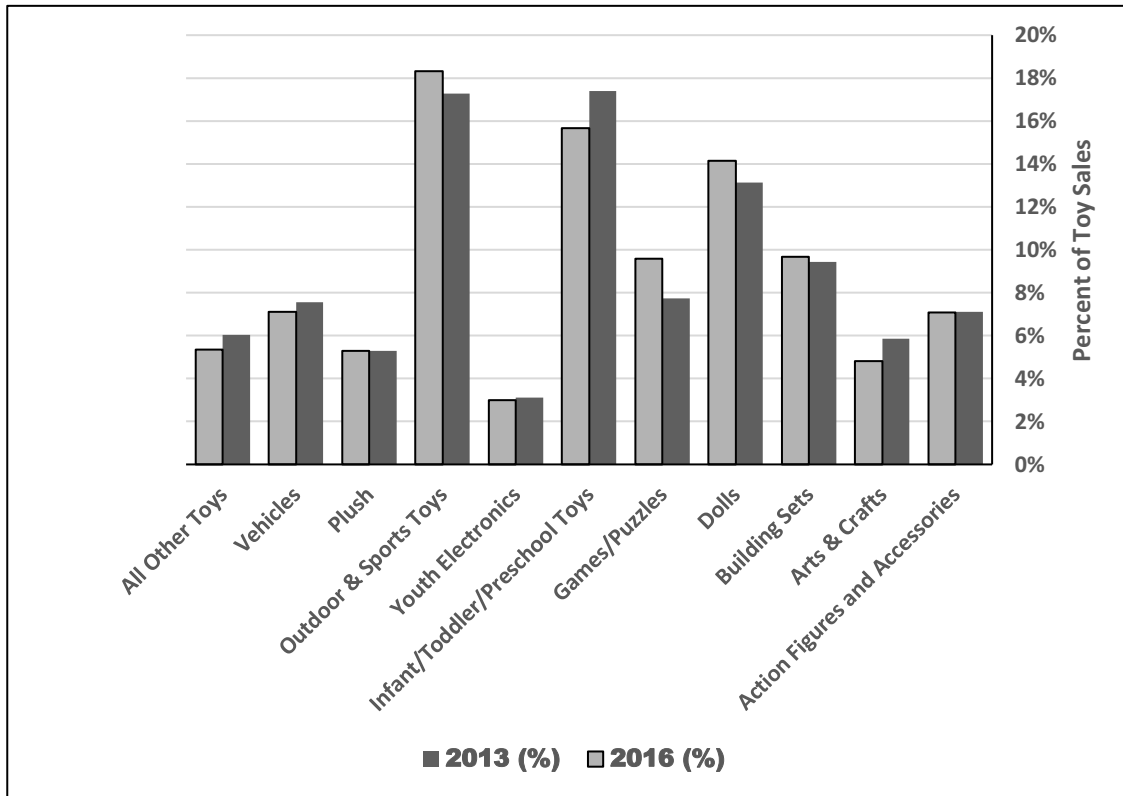


21. **B2B.** Cisco and Polycom are close to each other, battling for first place in the Netherlands, and the remainder of the market is fragmented. A pie chart or bar chart would be appropriate.



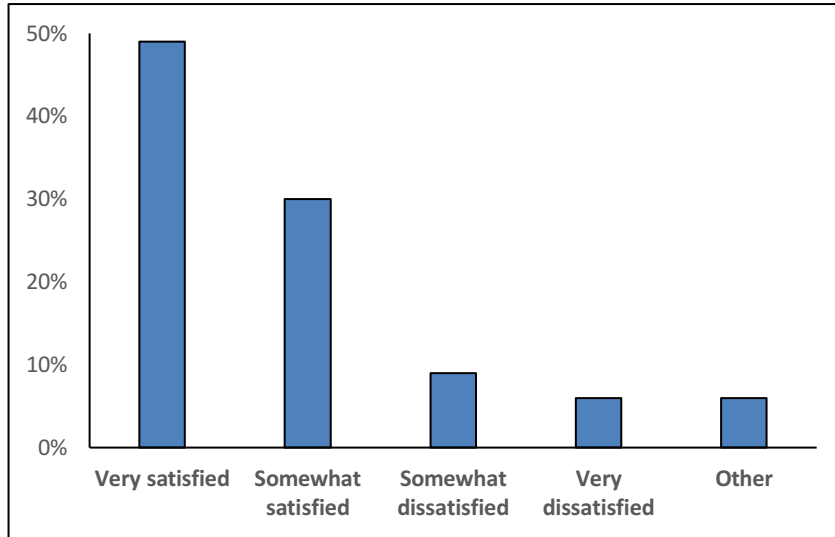
22. Toy makers.

- a) Answers may vary. Sales of toys grew nearly 15.9% from 2013 to 2016. The only category that did not show growth was Arts & Crafts. Outdoor & Sports Toys and Infant/Toddler/Preschool Toys were the largest two categories across the years, followed by Dolls closely behind in third place. In terms of percentages, between 2013 and 2016, Outdoor & Sports Toys (23% increase), Games/Puzzles (43% increase), and Dolls (25% increase) grew the most.
- b) Answers may vary. Plotted as raw values (\$) or as a stacked bar graph, it is difficult to see the differences. Computing the percent of total by year and using that value in a bar graph comparing percent by years, reveals changes from 2013 to 2016 for each category. Specifically, Outdoor & Sports Toys, Infant/Toddler/Preschool Toys, and Dolls have the highest percentages for 2016.



23. Job satisfaction.

- a) The percentages don't total 100%. Others either refused to answer or didn't know.
- b) Bar chart:

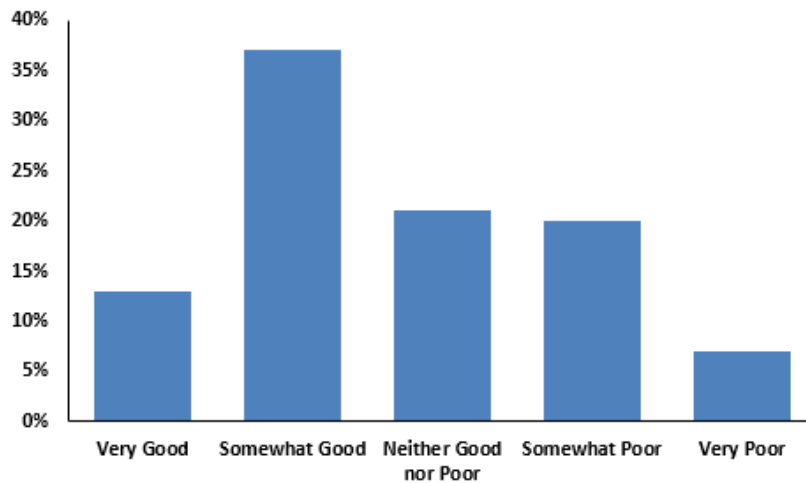


c) A pie chart would not be appropriate with the data as is because the percentages do not represent parts of a whole and do not total 100%. A pie chart would work if “Other” category is added.

24. Small business hiring.

a) The percentages total 98%. The other 2% either didn’t answer or didn’t know.

b) Bar chart:



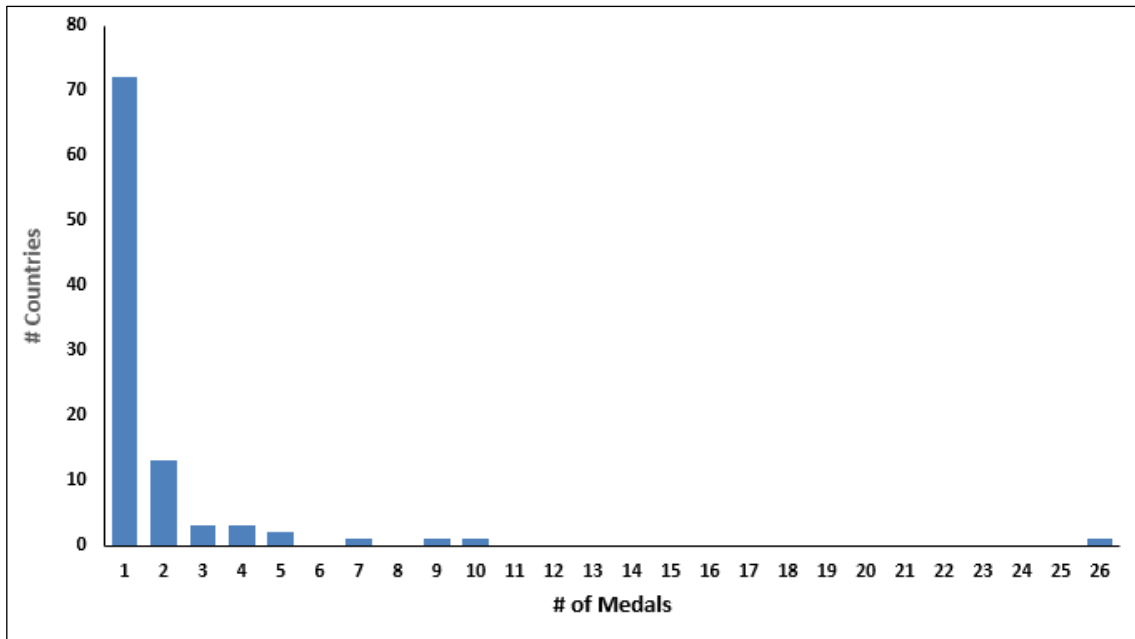
c) A pie chart would not be appropriate because the percentages do not represent parts of a whole and do not total 100%. An “Other” category would have to be added.

d) (Answers will vary) Half (50%) of the respondents said that their cash flow was very or somewhat good (37% said somewhat). Only 27% said somewhat or very poor.

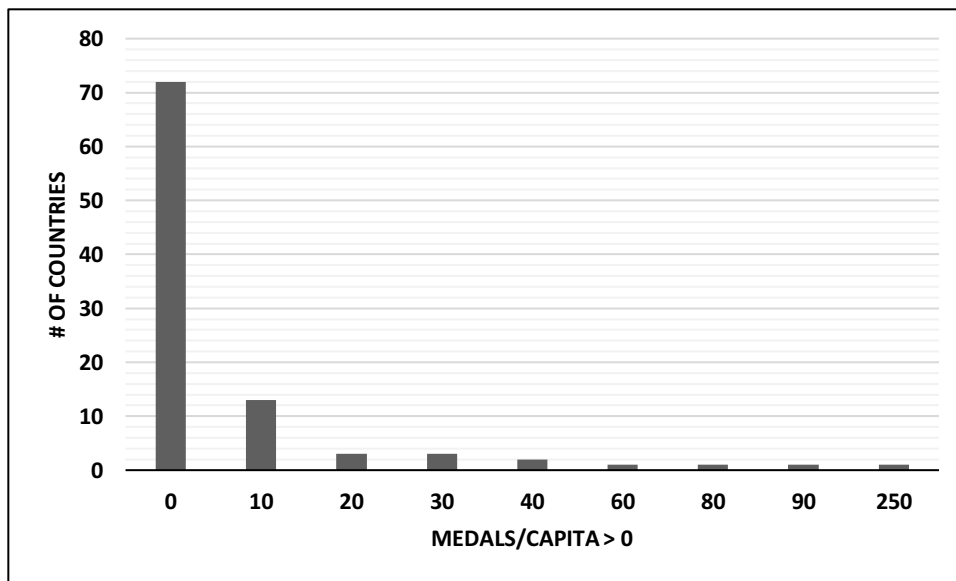
25. Environmental hazard 2016. The bar chart shows that Grounding and Collisions are the most frequent causes of oil spillage for these 460 spills and allows the reader to rank the other types as well. If being able to differentiate between close counts is required, use the bar chart. The pie chart is also acceptable as a display and makes it easier to see that Grounding and Collisions make up around 60% of the total causes of spillage but it is

harder to determine the causes that are close to each other, such as Grounding and Collisions or Hull Failure vs. Fire/Explosion. To showcase the causes of oil spills as a fraction of all 460 spills, use the pie chart.

26. Olympic medals.



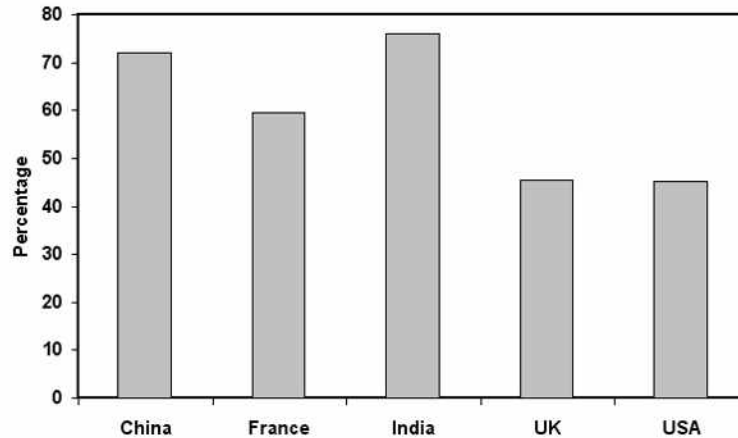
- a) If we treat the number of medals as the category, there are too many categories--most of them empty.
- b) One alternative is to show only the bars for medal counts that have occurred. The risk here is that a reader might not notice the missing counts.



27. Importance of wealth.

- a) India 76.1%-USA 45.3% = 30.8%, almost 31%
- b) The vertical axis on the display starts at 40% which makes the comparison between countries difficult and the areas disproportionate. For example, the India bar looks about 5-6 times as big as the USA bar when in fact the actual values are not even twice as big.
- c) The display would be improved by starting the vertical axis at 0%, not 40%.

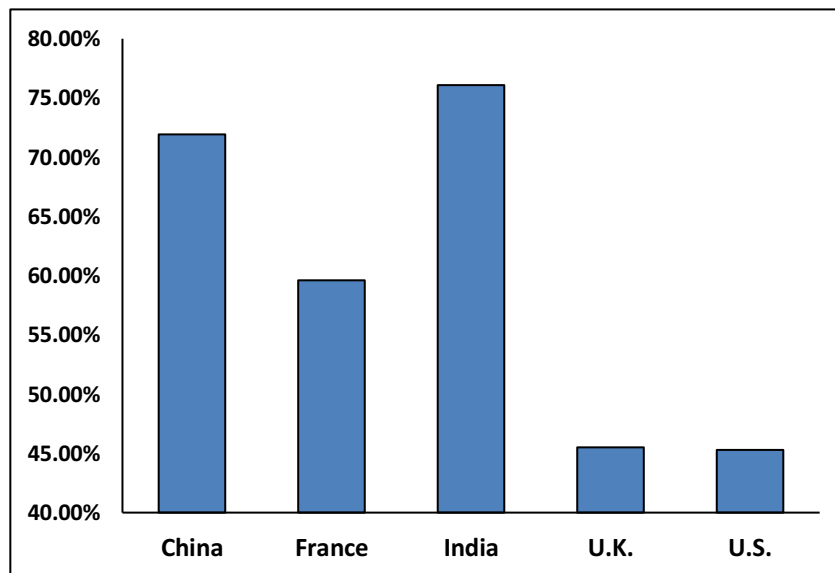
d)



- e) The percentage of people who say that wealth is important to them is highest in China and India (over 70%), followed by France (close to 60%) and then the USA and U.K. where the percentages were close to 45%.

28. Importance of power.

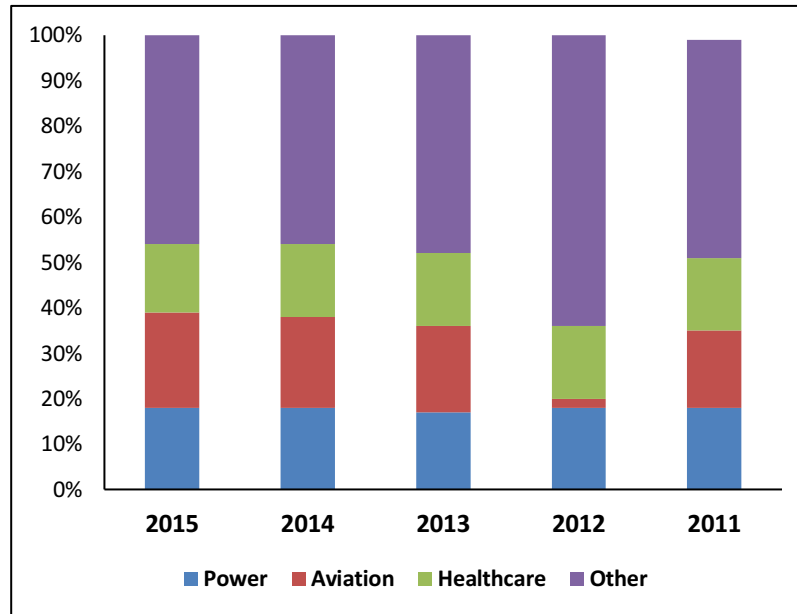
- a) The percentages don't add up to 100% so a pie chart is not appropriate. Showing the pie chart three dimensionally on a slant violates the area principle and makes it much more difficult to compare fractions of the whole.
- b) A bar chart is more appropriate.



- c) The percentage of people who say that power is important to them is highest in India (over 75%), followed by China (close to 72%) and then France (almost 60%). The lowest percentages occur in USA and the UK (both close to 45%).

29. GE financials.

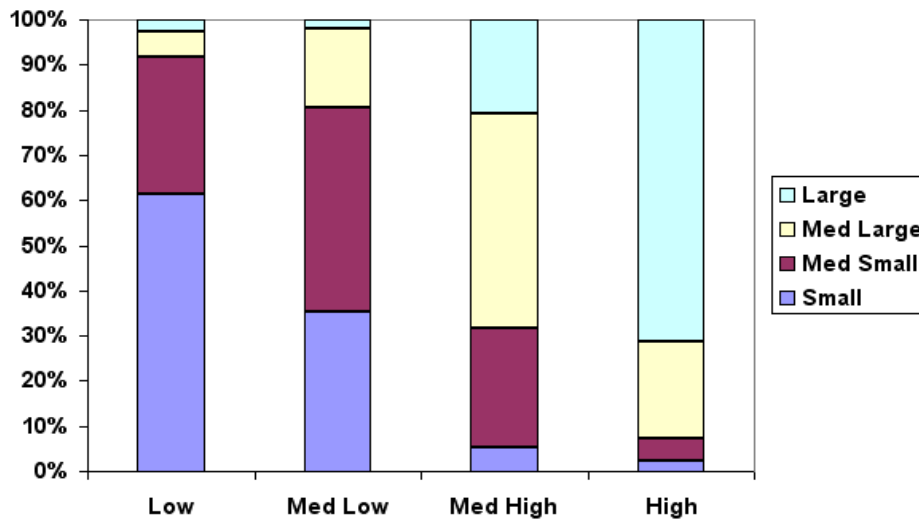
- a) These are column percentages because the column sums add up to 100% and the row percentages add up to more than 100%.
- b) A stacked bar chart is appropriate.



- c) Over 50% of GE's revenue comes Power, Aviation, and Healthcare, except in 2012, which had a major drop in Aviation revenue and a major increase in Other. In a typical year, 45% of revenue is accounted by Other sources.

30. Real estate pricing.

- a) These are column percentages because the column sums add up to 100% and the row percentages add up to more than 100%.
- b) 2.4%
- c) This cannot be determined. We are only given the percentages of size within each Price category.
- d) Small 61.5% + Med Small 30.4% = 91.9%.
- e) Larger houses appear to cost more. A stacked bar chart is shown below illustrating the changing conditional distributions.



31. Stock performance.

- a) 45.1% $(164+48)/470$
- b) 34.9% $(164)/470$
- c) 5.3% $(25)/470$
- d) 59.8% $(48+233)/470$
- e) 41.3% $(164)/397$
- f) 65.8% $48/(48+25)$
- g) Companies that reported a positive change on a single day were more likely to report a negative change for the year than companies who reported a negative change on a single day.

32. New product.

- a) 4.0% $(56/1415)$
- b) 34% $(481/1415)$
- c) 3.7% $(18/481)$
- d) 32.1% $(18/56)$
- e) Marginal Distributions – total % of the categories: Students 64.0%; Faculty/Staff 23.9%; Alumni 4.0%; Town Residents 8.2%.
- f) Conditional Distributions – percentages for *Very Likely* column: Students 66.5%; Faculty/Staff 20.4%; Alumni 3.7%; Town Residents 9.4%.
- g) The likelihood to buy seems independent of campus group (compare percentages for *Very Likely* in each category). However, there are more students, so focusing advertising in that group may have a greater impact on revenue.

33. Foreclosures 2016.

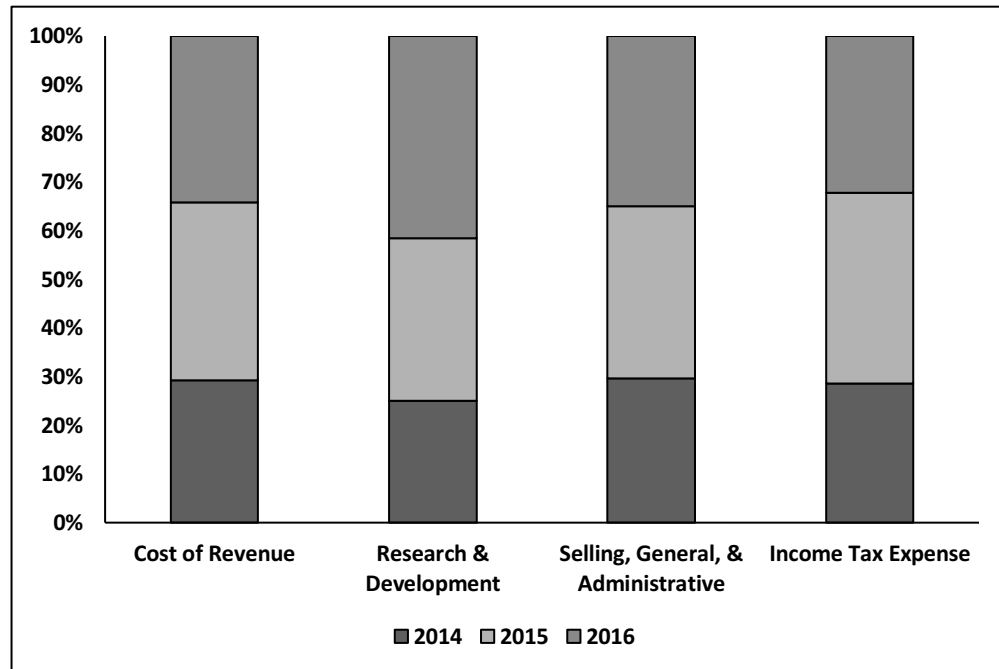
- a) 10.1% $(203,108/2,020,354)$
- b) 33.4% $(2,300,000/6,891,060)$
- c) 12.5% $(575,378/4,599,817)$
- d) Overall, the change was -71.0% . On a compound annual growth rate basis, this is -26.6% per year.
- e) Answers may vary. Two things stand out: the numbers seem rounded for 2012 and not for the other years. Two numbers in 2014 and 2015 are identical.

34. Appl financials.

- a) R&D % 2014: 4.2% (6,041,000/144,265,000); 2016: 5.9% (10,045,000/ 171,300,000)
- b) Tax % 2015: 10.5% (19,121,000/181,606,000); 2016: 9.2% (15,685,000/ 171,300,000)
- c) In absolute dollars, SG&A has increased, but because total expenses have increased, as a percentage of total expenses, SG&A has fallen slightly.
- d)

	2014	2015	2016
Cost of Revenue	77.8%	77.1%	76.7%
Research & Development	4.2%	4.4%	5.9%
Selling, General, & Administrative	8.3%	7.9%	8.3%
Income Tax Expense	9.7%	10.5%	9.2%

e)



35. Movie ratings.

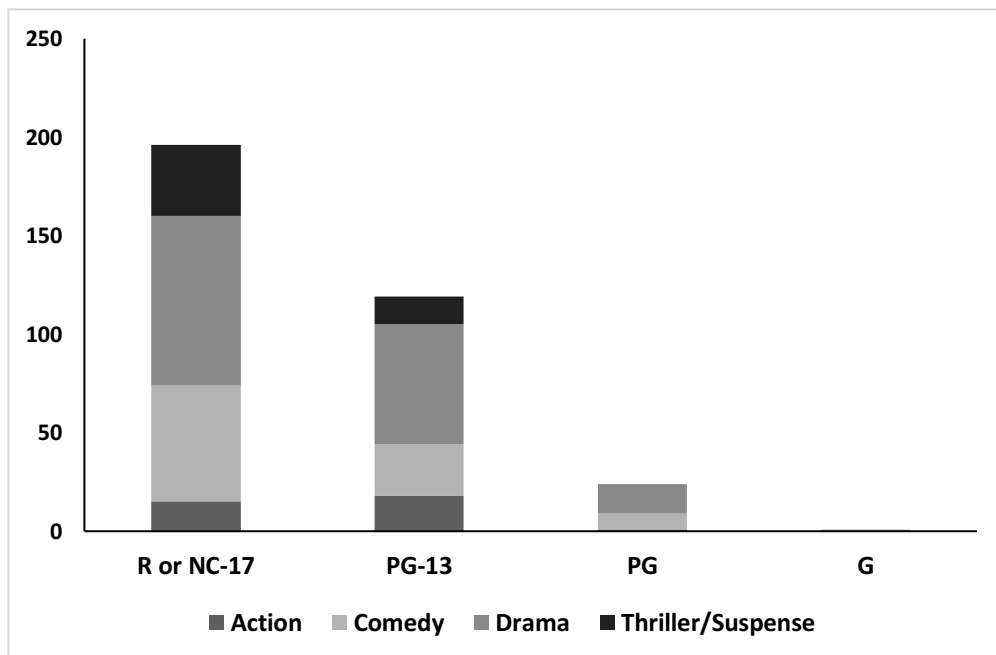
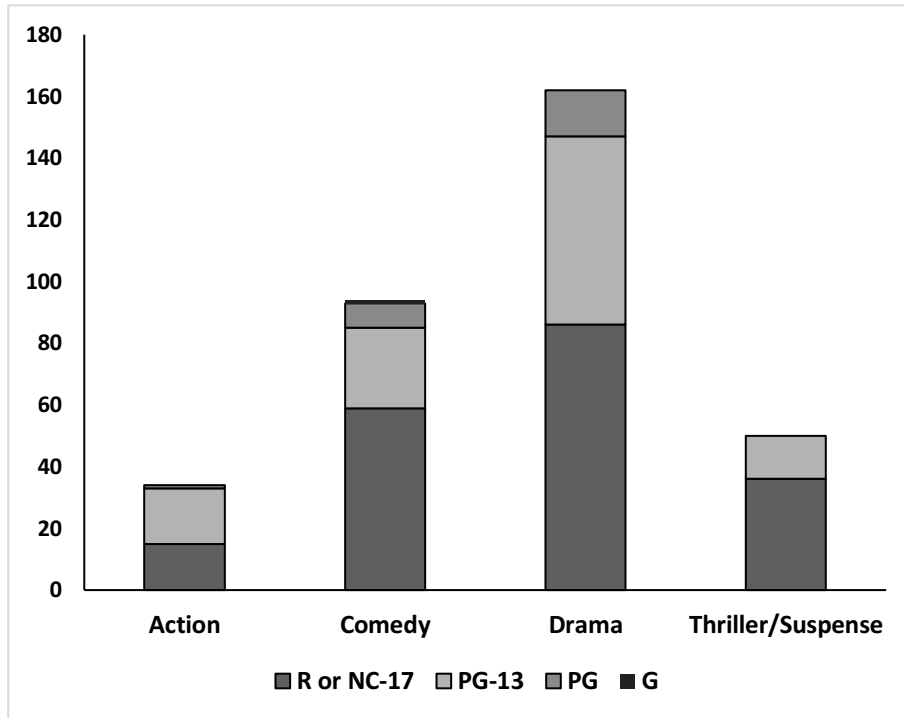
- a) Conditional distribution (in percentages) of movie ratings for action films:

	R or NC-17	PG-13	PG	G	Total
Action	44.1%	52.9%	2.9%	0.0%	100.0%

- b) Conditional distribution (in percentages) of movie ratings for PG-13 films:

	PG-13
Action	15.1%
Comedy	21.8%
Drama	51.3%
Thriller/Suspense	11.8%

- c) Depending on what you want to emphasize, either segmented bar chart shown below is appropriate. Placing Genre on the x -axis emphasizes that Dramas are the most commonly made film type. Placing MPAA Rating on the x -axis show that R (or NC-17) movies are the most commonly made.



- d) *Genre* and *Rating* do not appear to be independent. It appears that it is more likely for a Drama or a Comedy to be rated PG than Action or Thriller. Similarly, Thriller/Suspense movies are more likely to be rate R.

36. CyberShopping.

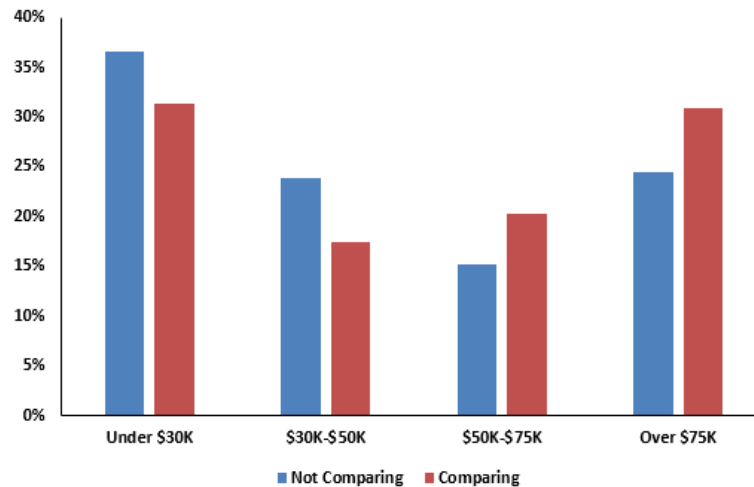
- a) Conditional distribution (in percentages) of income distribution for those who do NOT compare prices on the Internet:

Under \$30K	36.6% (625/1708)
\$30K-\$50K	23.8% (406/1708)
\$50K-\$75K	15.2% (260/1708)
Over \$75K	24.4% (417/1708)

- b) Conditional distribution (in percentages) of income distribution for those who DO compare prices on the Internet:

Under \$30K	31.4% (207/660)
\$30K-\$50K	17.4% (115/660)
\$50K-\$75K	20.3% (134/660)
Over \$75K	30.9% (204/660)

- c) Bar chart:



- d) Answers may vary. Comparison shopping is more common among those with higher incomes.

37. MBAs.

- a) 62.7% (168/268)
 b) 62.8% (103/164)
 c) 62.5% (65/104)
 d) The marginal distribution of origin: 23.9% from Asia; 1.9% from Europe; 7.8% from Latin America; 3.7% from the Middle East; 62.7% from North America.

- e) The column percentages:

	Two-Yr	Evening	Total
Asia/Pacific Rim	18.90	31.73	23.88
Europe	3.05	0.00	1.87
Latin America	12.20	0.96	7.84
Middle East/Africa	3.05	4.81	3.73
North America	62.80	62.50	62.69
Total	100.00	100.00	100.00

- f) They are not independent. For example, there is less than a 19% chance (31/164) that a randomly selected Two-Year MBA student is an Asian/Pacific Rim student. However, there is more than a 31% chance (33/104) that a randomly selected Evening MBA student is an Asian/Pacific Rim student. This is over a 50% increase in the likelihood that a student is an Asian/Pacific Rim student. In addition, the percentage from Latin America in Two-Year programs is 12.2% while for those in the Evening programs is less than 1%. Thus knowing the kind of MBA program does affect the likelihood of the origin of the MBA student.

38. MBAs, part 2.

- a) 32.1% (86/268)
 b) 29.3% (48/164)
 c) 36.5% (38/104)
 d) There seems to be a slightly higher percentage of Evening MBAs who are women. This may be because women have other commitments during the day (such as work, family, etc.) that limit their choices.

39. Top producing movies.

- a) 2.0% (135/6897)
 b) 2.5% (18/716)
 c) 2.0% (140/6897)
 d) 20.0% (943/4,718)
 e) 54.5.0% ((592+879+3)/2,703)
 f)

	NC-17	R	PG-13	PG	G	Not Rated
2006-2010	0.15%	33.11%	20.80%	9.87%	2.13%	33.94%
2011-2015	0.16%	30.36%	19.64%	8.40%	1.81%	39.63%

More movies were unrated in the 2011-2015 time period than the 2006-2010 period. However, of the movies that were rated, the distributions are similar. There are slightly more R rated movies in the 2006-2010 time period but this could be because makers of R rated movies chose instead to release them unrated in the later time period (2011-2015).

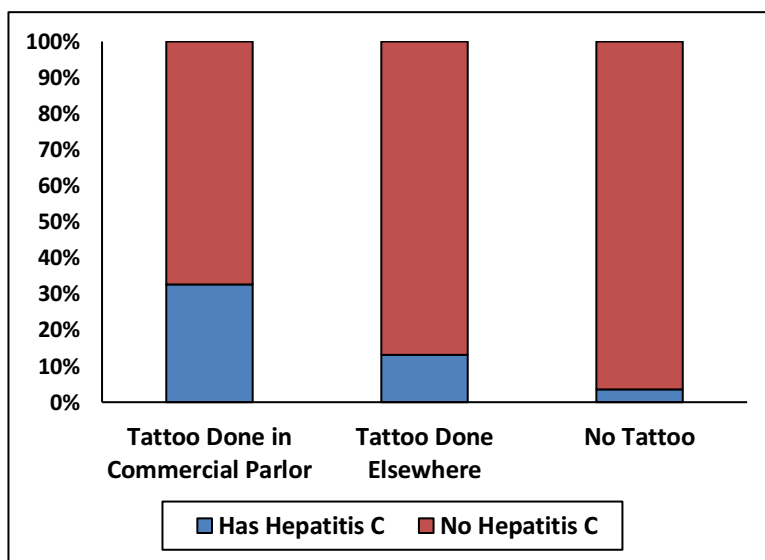
40. Movie admissions 2016.

- a) 33.4% ((16.2+19.9)/108.1)
 b) 56.7% ((5.4+7.2+8)/36.3)
 c) 6.5% (7/108.1)
 d) 14.9% (5.1/34.3)
 e) 4.7% (5.1/108.1)
 f) The conditional age distribution- each value is divided by the total for that year:

	2-11	12-17	18-24	25-39	40-49	50-59	60+
2016	8.5%	14.9%	19.8%	22.0%	9.1%	11.6%	14.0%
2015	8.5%	15.5%	16.6%	21.6%	13.1%	9.9%	14.9%
2014	7.2%	14.7%	18.7%	18.9%	15.2%	11.2%	14.1%

The age distribution stayed fairly constant between the three years. The largest percentage of movie goers are in the age groups 18-24 and 25-39 consistently. There seems to be a substantial decline in the 40-49 age group and older. Other changes seem to more like random fluctuations and not extreme.

- 41. Tattoos.** The study by the University of Texas Southwestern Medical Center provides evidence of an association between having a tattoo and contracting hepatitis C. Approximately 33% of the subjects who were tattooed in a commercial parlor had hepatitis C, compared with 13% of those tattooed elsewhere, and only 3.5% of those with no tattoo. If having a tattoo and having hepatitis C were independent, we would have expected these percentages to be roughly the same.



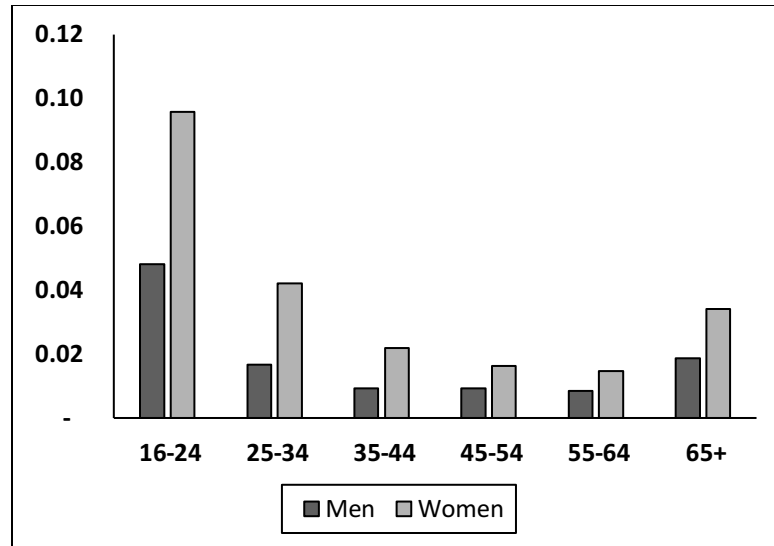
- 42. Poverty and region 2015.** The percentage of people living below poverty level in the four regions are: 12.4, 11.7, 15.3 and 13.3, respectively. Although the rates are similar, there do seem to be higher rates in the South and West than in the Northeast and Midwest.

43. Being successful.

- a) 51.4% $((139+273)/802)$
- b) Men are slightly higher. Young men: 54.3% $((163+346)/937)$
- c) The distributions are similar, but slightly more men say that a high-paying job is “very” important, and slightly more women say that a high-paying job is “somewhat” important.

44. Minimum wage workers.

- a) 20.3% (Count for 16-24 divided by Total Female: 7701/37,972)
- b) It can be seen from the side-by-side bar graph below that the proportion of female workers who work at minimum wage or less is nearly twice that of men at every age group.



45. Moviegoers and ethnicity.

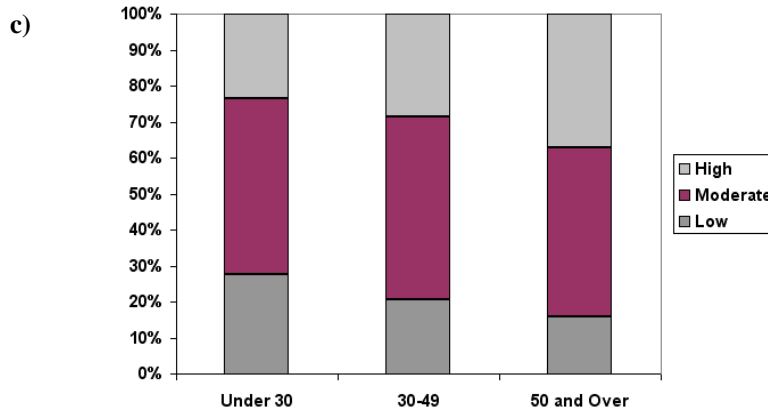
a)

	Caucasian	Hispanic	African-American	Other
Population	66.0% (204.6/310)	16.0% (49.6/310)	12.0% (37.2/310)	6.0% (18.6/310)
Moviegoers	63.0% (88.8/141)	19.0% (26.8/141)	12.0% (16.9/141)	6.0% (8.5/141)
Tickets	56.0% (728/1300)	26.0% (338/1300)	11.0% (143/1300)	7.0% (91/1300)

b) The distributions of moviegoers are quite similar to the population as a whole, but Hispanics appear to buy proportionally more tickets and Caucasians fewer. Hispanics appear to go to the movies more often, on average, than Caucasians.

46. Department store.

- a) Low 20.0%; Moderate 48.9%; High 31.0%.
- b) Under 30: Low 27.6%; Moderate 49.0%; High 23.5%
 30-49: Low 20.7%; Moderate 50.8%; High 28.5%
 Over 50: Low 15.7%; Moderate 47.2%; High 37.1%



- d) As age increases, the percentage of customers reporting a high frequency of shopping increases, and the percentage who report a low frequency of shopping decreases.
- e) No. An association between two variables does not imply a cause-and-effect relationship.

47. Success II. Needs changes

- a) 53.0%
- b) Number of 18-34 yr olds who think being successful is one of the most important things =44.7%

48. Income and pets.

- a) No, the income distributions of households by pet ownership wouldn't be expected to be the same. Caring for a horse is much more expensive, generally, than caring for a dog, cat, or bird. Households with horses as pets would be expected to be more common in the higher income categories.
- b) Column percentages (add up to 100%).
- c) No. Among horse owners, there are relatively fewer households in the lowest income bracket and relatively more households in the highest income bracket. In the middle income ranges, the percentages are about the same for each of the different types of pets.

49. Insurance company, part 2.

- a) The marginal totals were added. 160 of 1300 or 12.3% had a delayed discharge.

	Large Hospital	Small Hospital	Total
Major surgery	120 of 800	10 of 50	130 of 850
Minor surgery	10 of 200	20 of 250	30 of 450
Total	130 of 1000	30 of 300	160 of 1300

- b) Major surgery patients were delayed 15.3% of the time. Minor surgery patients were delayed 6.7% of the time.
- c) Large Hospital had a delay rate of 13%. Small Hospital had a delay rate of 10%. The small hospital has the lower overall rate of delayed discharge.
- d) Large Hospital: Major Surgery 15% and Minor Surgery 5%.
Small Hospital: Major Surgery 20% and Minor Surgery 8%.
- e) Yes, while the overall rate of delayed discharge is lower for the small hospital, the large hospital did better with *both* major and minor surgery.
- f) The small hospital performs a higher percentage of minor surgeries than major surgeries. 250 of 300 surgeries at the small hospital were minor (83%). Only 200 of the large hospital's 1000 surgeries were minor (20%). Minor surgery had a lower delay rate than major surgery (6.7% to 15.3%), so the small hospital's overall rate was artificially inflated. The larger hospital is the better hospital when comparing discharge delay rates.

50. Delivery service.

- a) Pack Rats has delivered a total of 28 late packages (12 Regular + 16 Overnight), out of a total of 500 deliveries (400 Regular + 100 Overnight). $28/500 = 5.6\%$ of the packages are late. Boxes R Us has delivered a total of 30 late packages (2 Regular + 28 Overnight) out of a total of 500 deliveries (100 Regular + 400 Overnight). $30/500 = 6\%$ of the packages are late.
- b) The company should have hired Boxes R Us instead of Pack Rats. Boxes R Us only delivers 2% (2 out of 100) of its Regular packages late, compared to Pack Rats, who deliver 3% (12 out of 400) of its Regular packages late. Additionally, Boxes R Us only delivers 7% (28 out of 400) of its Overnight packages late, compared to Pack Rats, who delivers 16% of its Overnight packages late. Boxes R Us is better at delivering Regular and Overnight packages.
- c) This is an instance of Simpson's Paradox, because the overall late delivery rates are unfair averages. Boxes R Us delivers a greater percentage of its packages Overnight, where it is comparatively harder to deliver on time. Pack Rats delivers many Regular packages, where it is easier to make an on-time delivery.

51. Graduate admissions.

- a) 1284 applicants were admitted out of a total of 3014 applicants. $1284/3014 = 42.6\%$
- b) 1022 of 2165 (47.2%) of males were admitted. 262 of 849 (30.9%) of females were admitted.
- c) Since there are four comparisons to make, the table below organizes the percentages of males and females accepted in each program. Females are accepted at a higher rate in every program.

Program	Males Accepted (of applicants)	Females Accepted (of applicants)	Total
1	511 of 825	89 of 108	600 of 933
2	352 of 560	17 of 25	369 of 585
3	137 of 407	132 of 375	269 of 782
4	22 of 373	24 of 341	46 of 714
Total	1022 of 2165	262 of 849	1284 of 3014

Program	Males	Females
1	61.9%	82.4%
2	62.9%	68.0%
3	33.7%	35.2%
4	5.9%	7%

- d) The comparison of acceptance rate within each program is most valid. The overall percentage is an unfair average. It fails to take the different numbers of applicants and different acceptance rates of each program. Women tended to apply to the programs in which gaining acceptance was difficult for everyone. This is an example of Simpson's Paradox.

52. Simpson's Paradox. Answers will vary. The three-way table below shows one possibility. The number of local hires out of new hires is shown in each cell.

	Company A	Company B
Full-time New Employees	40 of 100 = 40%	90 of 200 = 45%
Part-time New Employees	170 of 200 = 85%	90 of 100 = 90%
Total	210 of 300 = 70%	180 of 300 = 60%

Ethics in Action

Nina's Ethical Issue: Nina is trying to benefit from an incorrect combination of percentages in her established groupings. Comparing percentages and averaging percentages isn't accurate unless the groupings are similar sizes.

Undesirable consequences: the OTF will find out how many participants are selling undesirable products and boycott the trade fair. In attention, even if the trade fair is not initially boycotted, it could receive bad press afterwards because of their incorrect analysis of percentages (Simpon's paradox).

Ethical Solution: Nina should not combine the percentages as the results are misleading. If he decides to disseminate the information to the participants, she must do so without combining. Group 3 is the largest group with the largest percentage

For further information on the official American Statistical Association's Ethical Guidelines, visit:

<http://www.amstat.org/about/ethicalguidelines.cfm>

The Ethical Guidelines address important ethical considerations regarding professionalism and responsibilities.

Brief Case – Credit Card Bank

Report:

A bank wants to summarize bank card spending and how their customers earn and use promotional points. There are a number of types of graphs and charts that could be constructed to communicate information about the bank's customers. Pie charts and simple bar charts are useful for general information. More detailed clustered bar charts give more detailed data about the differences in spending by types of industry segments along with the use of promotions by customers. The most useful charts were the spending bar charts grouped by categorical variables.

The bank might be interested in knowing the spending habits of their customers by month and by type of segment. They might also be interested in customers use of promotional points

About half of the credit card customers have enrolled in either a travel or retail promotional program, with travel being slightly higher at 50.2%. Opportunity segment analysis showed equal percentages for all spending groups with med-low and low spending being the smallest segments at 16.7%. Industry segments were fairly uniform at 28% for all categories except for a 16.7% retail segment.

Spending was fairly uniform across the months for both retail and travel charges. Median charges were close to \$600 per month with a peak in December for holiday spending at \$800 with an unexplained drop to less than \$400 in April 2017.

The spendlift variable had the largest negative value for the low and med-low spenders.

