Lecture 16
Chapters 12&14 Risk and Odds; Reading the Economic News

- Two-Way Tables: Summaries, Comparisons
- Consumer Price Index

Definitions

- **Risk:** rate (proportion) when response is undesirable, such as illness or death
- **Relative risk:** ratio of rates
- **Increased risk:** relative change (up)
- **Decreased risk:** relative change (down)
- **Odds:** ratio of occurrence to non-occurrence
- **Odds ratio:** ratio of odds for two explanatory groups (put higher odds on top); is it much greater than 1?

Example: *Risks and Odds*

- **Background**: Valproate or placebo, heavy drinking or not…

Obs	D	ND	T
V	14	18	32
P	15	7	22
T	29	25	54

- **Question:** What are the various risks and odds?
- **Response:**

Risk of drinking: for V, for P

Relative risk: [risk is about as high for V]

Decreased risk: [risk decreases by]

Odds of drinking: 14 to 18 for V (less than to 1),
15 to 7 for P (more than to 1)

Odds ratio: (14/18)/(15/7)= [less than 1]

Example: *Risks and Odds*

- **Background**: Smoker or not, alcoholic or not…

Obs	A	NA	Total
S	30	200	230
NS	10	760	770
Total	40	960	1000

- **Question:** What are the various risks and odds?
- **Response:**

Risk of alcoholism: _____ for S, _____ for NS

Relative risk: _____ [risk is _____ times as high for S]

Increased risk: _____ [risk increases by _____ %]

Odds of being alcoholic: _____ for S, _____ for NS

Odds ratio: _____ [much greater than 1]

Example: *Risks & Odds for No Relation*

- **Background**: Counts *expected* if no relationship…

Obs	A	NA	Total
S	30	200	230
NS	10	760	770
Total	40	960	1000

Exp	A	NA	Total
S	9.2	220.8	230
NS	30.8	739.2	770
Total	40	960	1000

- **Question:** What would risks and odds be if no relationship?
- **Response:**

Risk of alcoholism: _____ for S, _____ for NS

Relative risk: _____ [risk is ____ times as high for S]

Increased risk: _____ [risk increases by ____ %]

Odds of alcoholic: _____ for S, _____ for NS

Odds ratio: (9.2/220.8)/(30.8/739.2)=1 [same odds]

Cautions in Interpreting Risks

- A relative risk without a baseline risk given does not provide enough info to judge the impact of the explanatory variable on the response.
- Risks quoted for samples don't necessarily apply to larger populations. (Chi-square test needed.)

Example: *Missing Baseline Risk*

- **Background**: The risk of contracting amyotrophic lateral sclerosis (ALS) is 12 times as high for Italian pro & semi-pro soccer players as it is for others!
- **Question:** Should Italians avoid playing pro soccer?
- **Response:** It depends on the
  Is it 2/100 (worrisome) or 2/76,000 (not so bad)?

  In fact baseline risk is 2 per 76,000, like the table on the

Obs	ALS	No ALS	T
IS	24	76	100
Not IS	2	98	100
T	26	174	200

Obs	ALS	No ALS	T
IS	8	23,992	24,000
Not IS	2	75,998	76,000
T	10	99,990	100,000

Example: *Risk in Sample vs. Population*

- **Background**: Experiment on bipolar alcoholics yielded

  Risk of drinking: 14/32=0.44 for V, 15/22=0.68 for P

  Relative risk: 0.44/0.68=0.65 [risk is about 2/3 as high for V]

Obs	D	ND	T
V	14	18	32
P	15	7	22
T	29	25	54

- **Question:** Would the risk of heavy drinking decrease for all bipolar alcoholics who take Valproate?
- **Response:**

Example: *Economics and Consumption*

- **Background**: For statistical analysis of consumer habits, economists consider a typical "market basket" of goods.
- **Question:** Besides food, shelter, and clothing, what do we spend money on?
- **Response:** food/beverages, housing, apparel,

Definitions in Economic News (Chapter 14)

- **Price index number:** measures relative cost of a single item compared to cost in base year.
- **"market basket" categories:** food/beverages, housing, apparel, transportation, medical care, recreation, education, other
- **Consumer Price Index (CPI):** relative change in cost of typical market basket

Year	1960	1970	1980	1990	2000	2008	2009
CPI	29.6	38.8	82.4	130.7	172.2	215.3	214.5

$$\text{Price at time 2} = \text{price at time 1} \times \frac{\text{CPI at time 2}}{\text{CPI at time 1}}$$

Example: *Calculation with CPI*

- **Background**: CPI was 172.2 in 2000, 215.3 in 2008. South Park's Cartman received $2 in 2000.
- **Questions:** If this was average for the time, how much should the going rate be in 2008?
- **Response:** Compute

Note: CNN claimed the average was $2.64 in 2008. Was Cartman underpaid for his tooth?

Example: *More Calculation with CPI*

- **Background**: CPI was 29.6 in 1960, 215.3 in 2008.
- **Question:** How much should Dr. Pfenning have been paid for a tooth in 1960, to be consistent with the 2008 rate of $2.64?
- **Response:** Compute

Note: If Dr. Pfenning received a quarter in 1960, was she underpaid for her tooth?

Example: *More Calculation with CPI*

- **Background**: CPI was 207.3 in 2007, 215.3 in 2008.
- **Question:** Pitt's in-state CAS tuition was $12,106 in 2007. What should it have been in 2008?
- **Response:** Compute

Note: Tuition went up to $12,832 in 2008. Was this out of line?

Extra Credit (Max 5 pts.) PUSHING THE HELMET HABIT The percentage of bicyclists wearing helmets has jumped dramatically in eight years, but still half of all riders never or rarely wear helmets when they ride, a new national survey shows. Last year, 50 percent of the more than 80 million riders wore helmets. Bike-related crashes kill 900 people across the United States each year and send another 567,000 people to hospital emergency rooms, according to the CPSC. Wearing a helmet can reduce risk of injury by 85 percent.

Construct a two-way table from the information given, and determine the risks of injury for helmet-wearers and non-wearers.