

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: $(14/18)/(15/7) = \underline{\hspace{2cm}}$ [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 soccer players as it is for others!
- **Question:** Should Italians avoid playing pro soccer?
- **Response:** It depends on the _____: Is it 13/100 (worrisome) or 13/1,000,000 (not so bad)? In fact the risk is 1 or 2 per 100,000, 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	12	499,988	500,000
Not IS	1	499,999	500,000
T	13	999,987	1,000,000

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:**

Definitions

- **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
CPI	29.6	38.8	82.4	130.7	172.2	215.3

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

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?

Example: Calculation with CPI

- **Background:** CPI was 172.2 in 2000, 215.3 in 2008.
- **Question:** Pitt’s in-state CAS tuition was \$12,106 in 2007. What should it have been in 2008?
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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. When the U.S. Consumer Product Safety Commission conducted its first survey in 1991, only 18 percent of the estimated 66.9 million bicyclists wore helmets. Last year, 50 percent of the more than 80 million riders wore helmets. Forty-three percent said they never wore helmets; 7 percent said they wear helmets less than half the time.

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.