This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike License. Your use of this material constitutes acceptance of that license and the conditions of use of materials on this site.

Copyright 2009, The Johns Hopkins University and John McGready. All rights reserved. Use of these materials permitted only in accordance with license rights granted. Materials provided "AS IS"; no representations or warranties provided. User assumes all responsibility for use, and all liability related thereto, and must independently review all materials for accuracy and efficacy. May contain materials owned by others. User is responsible for obtaining permissions for use from third parties as needed.

JOHNS HOPKINS
BLOOMBERG
SCHOOL of PUBLIC HEALTH

Lecture 3g: Practice Problem Solutions

John McGready
Johns Hopkins University

Practice Problems

1. Suppose a study is done to estimate the proportion of patients who suffer from nausea as a side effect from taking a drug, Drug A. Suppose a random sample of 200 users of Drug A is taken, and each individual in the sample is queried about the presence/absence of nausea. In the study, 90 of the 200 subjects report some nausea since starting the Drug A regimen.
   a) Estimate a 95% confidence interval, by hand, for the true proportion of subjects with nausea amongst everyone taking Drug A.

   - Here, $\hat{p} = \frac{90}{200} = 0.45.$ Using the formula $\hat{p} \pm 2 \times \sqrt{\frac{\hat{p} \times (1 - \hat{p})}{n}}$

   - yields $0.45 \pm 2 \times \sqrt{\frac{0.45 \times .55}{200}} \rightarrow 0.45 \pm 2 \times 0.035 \rightarrow$

     $(0.38, 0.52)$ or $(38\%, 52\%)$.

Practice Problems

1. (Continued)
   - How does the interval in part a compare to the exact confidence interval computed by Stata?

```
. cii 200 90

                                                    -- Binomial Exact --
    Variable |        Obs        Mean    Std. Err.       [95% Conf. Interval]
-------------+---------------------------------------------------------------
             |        200         .45    .0351781        .3797536    .5217507
```

Practice Problems

2. Data was from a 2004 random sample of 960 high school students in Haifa, Israel to look at the association between post-traumatic stress induced by terrorist attacks/threat and substance abuse.[1] Two of the findings from this study are that 35% knew at least one person who had been killed in a terrorist attack and that 10% of the sample had used marijuana in the 30 days prior to the study.
   - Estimate a 95% confidence intervals, by hand, for the proportion of all HS students in Haifa in 2004 who:
     - Knew at least one person killed in a terrorist attack
     - Had used marijuana in the prior 30 day period

Notes: [1] Schiff, M., et al. (2007). Exposure to terrorism and Israeli youths' cigarette, alcohol, and cannabis use. *American Journal of Public Health 97, 10.*

Practice Problems

2. (Continued)
   a) Estimate a 95% confidence intervals, by hand, for the proportion of all HS students in Haifa in 2004 who:
      - Knew at least one person killed in a terrorist attack
      - Here $\hat{p} = .35$, and since there were 960 students surveyed, .35*960 = 336 student respondents said they knew at least one person killed in a terrorist attack.
      - Using the formula $\hat{p} \pm 2 \times \sqrt{\frac{\hat{p} \times (1 - \hat{p})}{n}}$ yields:

$$0.35 \pm 2 \times \sqrt{\frac{0.35 \times .65}{960}} \rightarrow 0.35 \pm 2 \times 0.015 \rightarrow$$

$$(0.32, 0.38) \text{ or } (32\%, 38\%).$$

Notes: [1] Schiff, M., et al. (2007). Exposure to terrorism and Israeli youths' cigarette, alcohol, and cannabis use. *American Journal of Public Health 97, 10.*

Practice Problems

2. (Continued)
   a) Estimate a 95% confidence intervals, by hand, for the proportion of all HS students in Haifa in 2004 who:
      - Had used marijuana in the prior 30 day period
      - Here $\hat{p} = .10$, and since there were 960 students surveyed, .10*960 = 96 student respondents said they had used marijuana in the prior 30 day period
      - Using the formula $\hat{p} \pm 2 \times \sqrt{\frac{\hat{p} \times (1 - \hat{p})}{n}}$ yields:

$$0.10 \pm 2 \times \sqrt{\frac{0.10 \times .90}{960}} \rightarrow 0.10 \pm 2 \times 0.01 \rightarrow$$

$$(0.08, 0.12) \text{ or } (8\%,\ 12\%).$$

Notes: [1] Schiff, M., et al. (2007). Exposure to terrorism and Israeli youths' cigarette, alcohol, and cannabis use. *American Journal of Public Health 97, 10.*

Practice Problems

2. (Continued)
   b) How do the intervals in part A compare to the exact confidence intervals computed by Stata?

```
. cii 960 336

                                                    -- Binomial Exact --
    Variable |        Obs        Mean    Std. Err.       [95% Conf. Interval]
-------------+---------------------------------------------------------------
             |        960         .35    .0153941        .3198066     .381117

. cii 960 96

                                                    -- Binomial Exact --
    Variable |        Obs        Mean    Std. Err.       [95% Conf. Interval]
-------------+---------------------------------------------------------------
             |        960          .1    .0096825        .0817519    .1207426
```

Notes: [1] Schiff, M., et al. (2007). Exposure to terrorism and Israeli youths' cigarette, alcohol, and cannabis use. *American Journal of Public Health 97, 10.*