



The Relationship Between Smoking Cigarettes and Sleep Apnea

Shippen, J., Klemm, M.

Fall 2017, Statistics 315, Section 1



Introduction and Background

Recently California State University, Chico enacted a campus-wide tobacco ban, causing many students, staff, and faculty to have to refrain from smoking until they have left campus.

This study aims to see if this ban has the potential to help students maintain healthier sleeping habits. A previously conducted study by Krishnan et al. (1989) found that smokers exhibited higher rates of sleep apnea compared to non-smokers.

The results of another study, this one conducted in 2008 on smokers who experience sleep apnea, found that the disruption to getting a full night sleep was reported to be caused by an “inner drive” where the patients had no control over their urges to smoke in the middle of the night (Provini F., Vetrugno R., Montagna P., 2008).

Objectives

The goals of the analysis will include:

- 1) establishing a relationship between smoking and sleep apnea.
- 2) determining whether or not the relationship between smoking and sleep apnea is dependent on the participants overall general health.

Methods

- After assumptions were met, the variables of interest were examined and summarized.
- Graphical tools such as bar charts were used for initial exploratory data analysis.

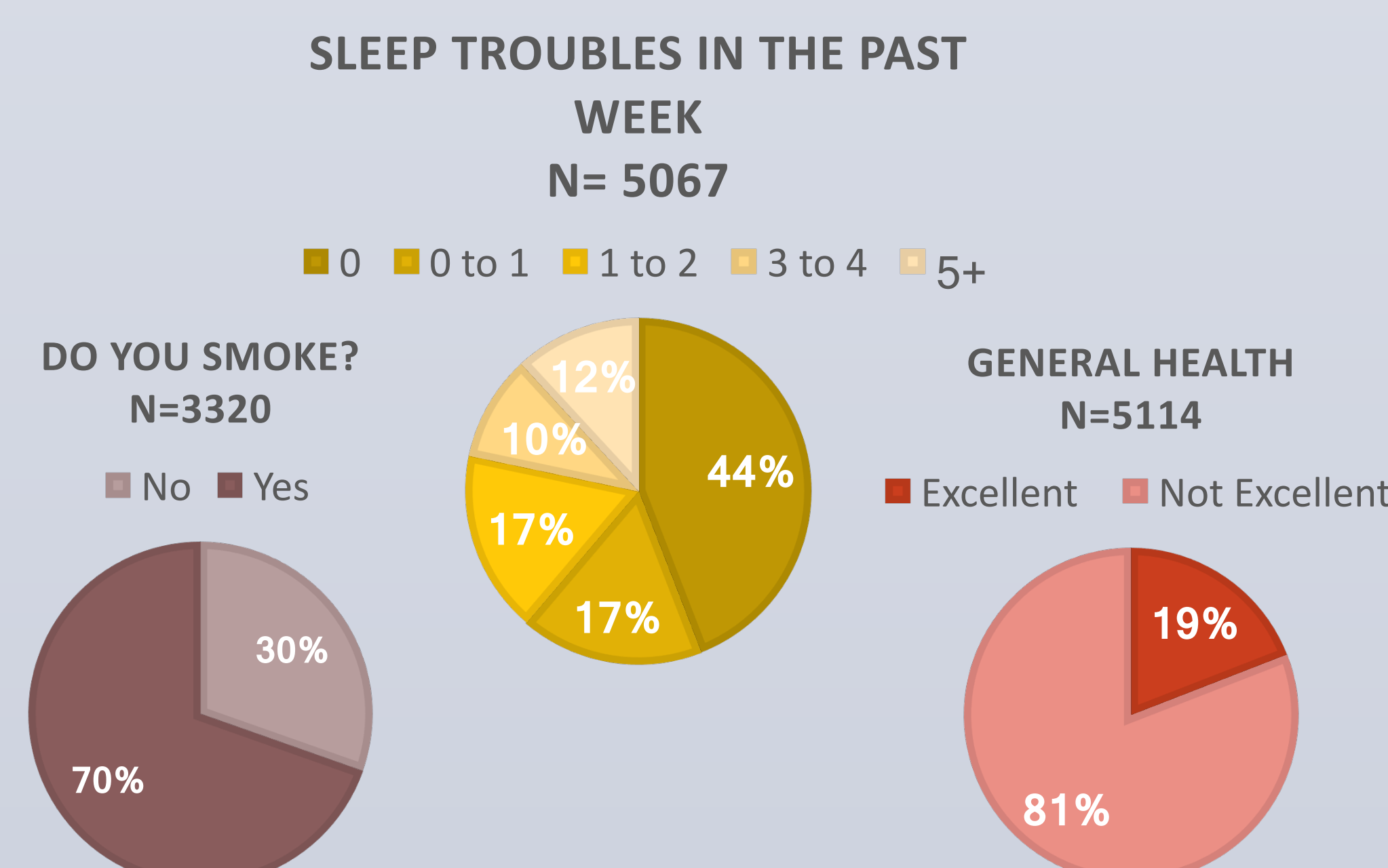
Methods (continued)

- General health, which was rated from: Excellent > Very Good > Good > Fair > Poor. These categories were combined into a binary variable: “excellent” and “not excellent”.
- A chi-square test of association was used to determine if there was an association between smoking and suffering from sleep apnea.
- A chi-square test of equal proportions was used to see if the participants’ general health acted as a moderator.
- A multivariable logistic model was fit to determine the effect of cigarette smoking and sleep apnea after controlling for general health.

Sample Characteristics

- Data from the Wave IV Add Health study was used in this research. This survey had given us access to 5114 male and female respondents ranging age group of 24-32.

Sleep Apnea	Cigarette Smoker	General Health
Number of times in the past week participants reported having troubles sleeping through the night.	Out of those who have ever smoked, has the participant smoked at least 1 cigarette/day in the last 30 days?	Does the participant report excellent or less than excellent general health?



Results

- The bivariate relationship between sleep and cigarette smoker proved significant results with a chi-squared test ($\chi^2=20.812$, $df=4$, p -value=0.0035).
- After stratifying by the binary version of general health, the "excellent" category of general health became non-significant with a p -value > 0.05.
- The relationship between sleep apnea and smokers within those that report “excellent health” was nullified ($p=0.278$). Therefore, general health acts as a moderator.

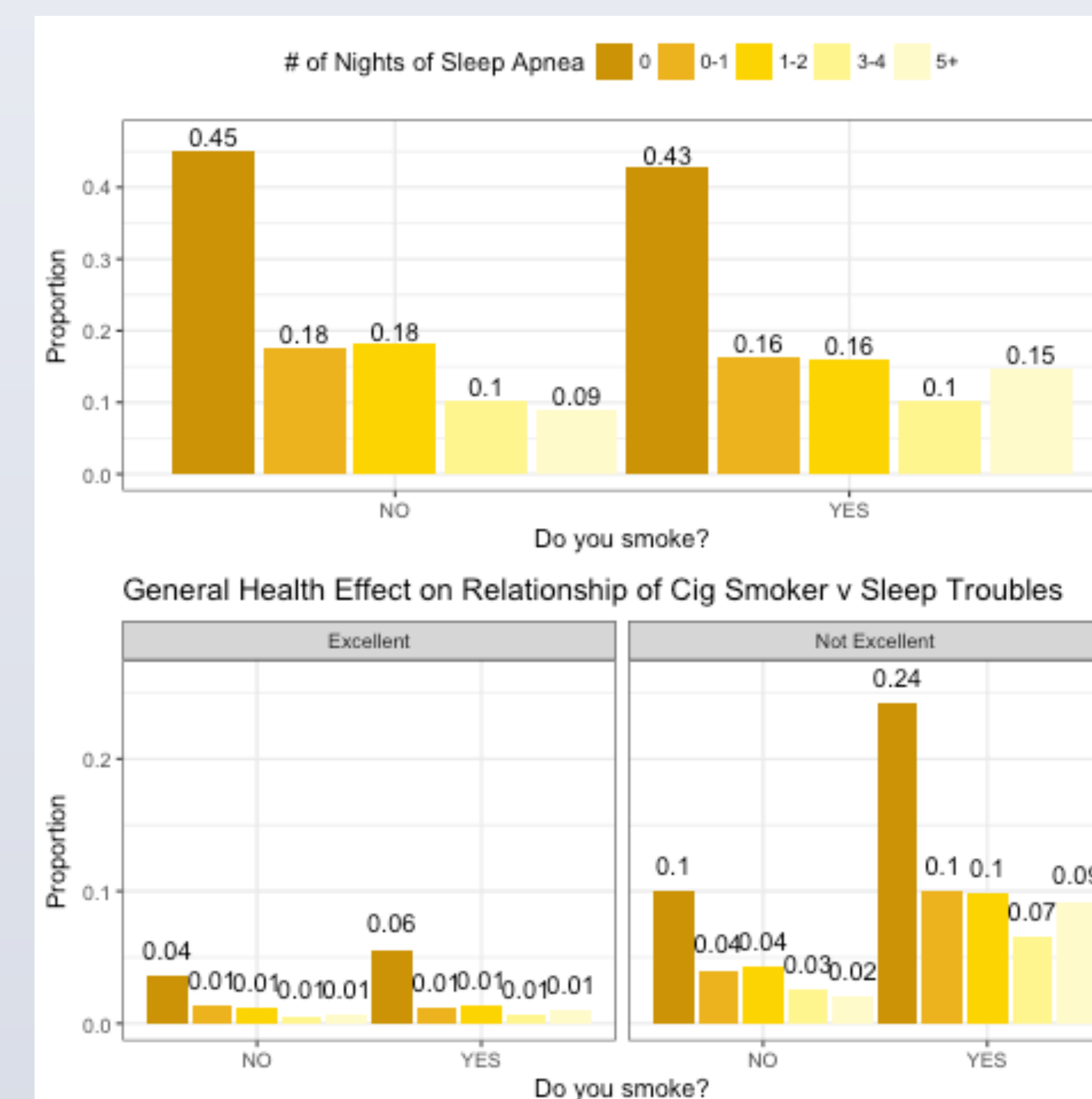


Figure 1. This graph shows that those who are in “Not Excellent” health have a much higher proportion of participants that have problems sleeping throughout the night.

Logistic Regression

Variables	OR	C.I.	P-value
Intercept	1.29	(1.08, 1.55)	<0.01
Sleep 0-1	0.933	(0.75, 1.16)	0.529
Sleep 1-2	0.889	(0.72, 1.10)	0.281
Sleep 3-4	0.993	(0.76, 1.29)	0.956
Sleep 5+	1.628	(1.26, 2.12)	<0.01
Not Excellent General Health	1.971	(1.63, 2.34)	<0.01

Table 1. This table includes odds ratio, confidence interval, and p -value of each group compared to those who had excellent health.

Logistic Regression Analysis

- After controlling for general health, participants with sleep troubles 5+ times in the last week (1.6, CI 1.26- 2.12, $p=0.0002$) was significantly associated with the likelihood of the participant currently being a smoker.
- The odds ratio tells us that those who are experiencing sleep troubles 5+ times per week are 1.6 times more likely to smoke.

Conclusion & Implications

The study is a valuable contribution to the understanding the importance of smoking habits, sleep habits and how it can be related to general health. Chico State is moving towards a healthier student community by offering free gym access and now a campus wide smoking ban. Our research indicates that these efforts could be favorable for the entire student body and faculty. Analysis of the AddHealth dataset we established that smoking habits and sleep apnea are modified by a person's general health. Previous research by Fackelmann (1989) has shown that healthy people who sleep a full night are more wakeful during the day and perform better on tests measuring comprehension and vigilance. With Chico State offering free gym access and a non-smoking campus, it could potentially raise the proficiency of the entire student body and faculty.

References

- Fackelmann K. A.. Scientists Give the Nod to More Sleep Time.1989. Science News, 136(17), 260-260. Retrieved from <http://www.jstor.org/stable/3973818>
- Krishnan, V., Dixon-Williams, S., & Thornton, J. D. (2014). Where There Is Smoke...There Is Sleep Apnea: Exploring the Relationship Between Smoking and Sleep Apnea. *Chest*, 146(6), 1673–1680. <http://doi.org/10.1378/chest.14-0772>
- Provini F., Vetrugno R., Montagna P. (2008). Sleep-related smoking syndrome. *Sleep Medicine*, 9(8), 903-905. doi.org/10.1016/j.sleep.2007.10.021
- RStudio Team (2015). RStudio: Integrated Development for R. RStudio, Inc., Boston, MA URL <http://www.rstudio.com/>.
- Harris, Kathleen Mullan. 2009. The National Longitudinal Study of Adolescent to Adult Health (Add Health), Waves I & II, 1994–1996; Wave III, 2001–2002; Wave IV, 2007–2009 [machine-readable data file and documentation]. Chapel Hill, NC: Carolina Population Center, University of North Carolina at Chapel Hill. DOI: 10.3886/ICPSR27021.v9

Contact Jessica Shippen:
jshippen1@mail.csuchico.edu