**Chapter 4 Practice Worksheet for 4.2**

**STAT 218-150 Spring 2020**

For each problem, answer the following questions:

1. Is this study an experiment or observational study?
2. Did the researchers use random sampling?
3. Can they generalize their conclusions to the whole population or to their sample only?
4. Did the researchers use random assignment?
5. Can they make cause-and-effect conclusions?

**Problems**

Robert Matthews, from Ashton University at Birmingham England, (“*Storks Deliver Babies (p = 0.008)”*) studied if there is a significant association between the number of white stork pairs and the human birth rates for all European countries. In other words, will the number of white storks affect the human birth rate? I quote Matthews in the following sentences:

” The white stork (Ciconia ciconia) is a surprisingly common bird in many parts of Europe, and data on the number of breeding pairs are available for 17 European countries (Harbard 1999, pers. comm.); the latest figures, covering the period from 1980 to 1990, are given in table 1, along with demographic data taken from Britannica Yearbook for 1990.”

Part of Table 1 is shown below

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Country** | **Area (km^2)** | **Stork Pairs** | **Humans (millions)** | **Birth Rate (thousands/year)** |
| Albania | 28,750 | 100 | 3.2 | 83 |
| Austria | 83,860 | 300 | 7.6 | 87 |
| Belgium | 30,520 | 1 | 9.9 | 118 |
| Bulgaria | 111,000 | 5000 | 9 | 117 |
| Denmark | 43,100 | 9 | 5.1 | 59 |
| France | 544,000 | 140 | 56 | 774 |
| Germany | 357,000 | 3300 | 78 | 901 |
| Greece | 132,000 | 2500 | 10 | 106 |
| Holland | 41,900 | 4 | 15 | 188 |

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Does living in a big city among strangers discourage people from being generous or fair to others? Researchers, from the University of Miami, published a study in the journal called Natural Human Behavior, that attempted to answer this question. They put 200 volunteers into one of two situations. One, being alone, where there was no incentive or punishment for how they treated others. Second, interacting with other people and suffering social consequences for their actions. Each volunteer played a game where they invested money. Then, they chose whether they were to combine their money with other people and donate the money to a charity.

Let’s say 100 were randomly assigned to play alone. The other 100 played the game with others. The researchers recorded if a person decided to combine their money with other players and donate it to charity.

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In 1972, [researchers from Stanford University](https://en.wikipedia.org/wiki/Stanford_marshmallow_experiment) studied if children, from the United States, were patient enough to wait 15 minutes to eat a marshmallow. If they waited long enough, they were rewarded with a second marshmallow.

Let’s say you were interested in studying if jumbo marshmallows caused children to be less patient than a regular marshmallow. Miraculously, you gathered a random sample of 150 kids. You chose whether a kid got a jumbo marshmallow or a regular marshmallow. You recorded a “yes” if the kid waited for 15 minutes and didn’t eat the marshmallow. You recorded a “no” if they ate the marshmallow before time was up.

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