STAT 021 S22 HW 8

Malavika Eby

TOTAL POINTS

10 / 10

QUESTION 1

1 Description 3 / 3

✓ **+ 3 pts** **Correct**

QUESTION 2

2 Identify possible mistakes 3 / 3

✓ **+ 3 pts** **Complete**

+ 0 pts Incomplete

QUESTION 3

3 Connection to ASA guidelines 4 / 4

✓ **+ 4 pts** **Correct**

STAT 21 - HW #8 - "Bad Statistics"

I. Describe the statistical analysis and research question

The example of “bad statistics” I chose is from a research article written by the University of Pennsylvania and CHOP and published in the scientific journal, Nature, in 1999. The study/analysis was referenced as “bad statistics” in this post I found on Quora.

The study investigates the association between nearsightedness and children’s habit of sleeping with a light on until the age of two. According to CBS News, 479 questionnaire responses from sampled parents revealed that “[a] total of 172 of the[ir] children slept in darkness; 10 percent developed nearsightedness. A total of 232 slept with a night light; 34 percent had become nearsighted. An additional 75 slept with a lamp on; 55 percent developed myopia.”

The lead researcher, an ophthalmologist, concluded that sleeping with a lamp on cannot definitively predict myopia but recommended parents to keep their children in darkness when sleeping. The study also declared that infants who sleep with the light on are at a “significantly higher risk” for developing near-sightedness.

II. Identify where you think mistakes occurred and why you think they occurred.

This research was conducted with the use of retrospective questionnaires given to parents of kids who were patients at the CHOP doctors’ eye clinic. Sampled parents were asked to remember whether their children slept in the dark, with a night light, or with a lamp on when they were between the ages of zero and two.

In terms of design, the study could have improved its quality of results by conducting a controlled longitudinal experiment such that different children are randomly assigned to use night lights, lamps, or dark rooms when asleep. Later, the investigators could have followed up with the parents of the children to inquire about the kids’ eye health.

These are a few other major mistakes I noticed:

1. All the kids sampled visit the same eye clinic, which suggests that this sample is likely not an appropriate representation of all American children between the ages of zero and two. They all live in the same region and are likely from similar ethnic/racial and financial backgrounds.
2. The questionnaires used in the study are retrospective, meaning that parents had to report from memory about the lighting conditions of their children’s bedrooms as infants. Since human memory is not very reliable, there is a good chance that the data is only a partial report of the children’s actual lighting conditions for sleeping.
3. The study did not account for confounding variables that could interfere with the results, like other sources of light and genetic factors of myopia. Even if kids slept with all their lights off, other light could have streamed in through the window which parents would be

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3. The study did not account for confounding variables that could interfere with the results, like other sources of light and genetic factors of myopia. Even if kids slept with all their lights off, other light could have streamed in through the window which parents would be

very unlikely to remember to report or even know. Myopia is a highly heritable trait, but the study did not collect any data about parents' eye health, which means the researchers made it impossible to control for that and separate out its effect on the response variable from that of the predictor (light when sleeping).

4. Immediately after the study was published in Nature, many physicians and researchers reportedly spoke out about the validity of the study according to CBS News, stating that the sampling methods were unreliable and that the study did not account for confounding variables. This makes me wonder whether the investigators of this study did not consult with their peers before completing and publishing their work.

Interestingly, something else was brought to my attention by the Quora user who initially listed this study as an example of bad statistics. A study by OSU published eight months later in the same journal collected data about *parents*' eye health in addition to infants' light conditions when sleeping and their eye health. The results revealed that though there did not seem to be a correlation between bedroom lights and nearsightedness, myopic parents were more likely to have myopic children, and to use nightlights in their kids' rooms (possibly due to their own poor eyesight, proposed the article). So, there was a second relationship at play in the results of the original study which went undetected due to the limited quality of the data collected.

III. Connect the analysis to the ASA's guidelines for Ethical Statistical Practice.

I think the principle of "Integrity of Data and Methods" was violated, as well as that of "Professional Integrity and Accountability." Interestingly, the research was published in 1999 so I initially thought that the ethical statistics guidelines of that time were such that the mistakes conducted by these researchers were commonplace. However, the CBS News article I found in criticism of this study, as well as the statements from many professionals were all from 1999 as well, meaning that the errors in the study design and analysis were possibly a result of negligence rather than ignorance.

The researchers involved in this study worked for the Children's Hospital of Philadelphia and at least one of them were ophthalmologists themselves, suggesting that they have great domain knowledge relevant to the study. In this case, it is difficult to understand why the investigators did not collect data about other important contributors to myopia, or why they were quick to declare that "Children who sleep with a light on in their bedrooms at night before the age of 2 may be at significantly higher risk of developing myopia," based simply on a correlative study using retrospective questionnaires.

However, I do not think that physicians and researchers of the University of Pennsylvania and CHOP had anything (obvious) to gain from recommending parents to put their kids to sleep in dark rooms. As such, it's unlikely that these mistakes and ethical violations were intentional.

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