

16.2: Null Hypothesis Statistical Testing- An Example

There is great interest in the use of body-worn cameras by police officers, which are thought to reduce the use of force and improve officer behavior. However, in order to establish this we need experimental evidence, and it has become increasingly common for governments to use randomized controlled trials to test such ideas. A randomized controlled trial of the effectiveness of body-worn cameras was performed by the Washington, DC government and DC Metropolitan Police Department in 2015/2016 in order to test the hypothesis that body-worn cameras are effective. Officers were randomly assigned to wear a body-worn camera or not, and their behavior was then tracked over time to determine whether the cameras resulted in less use of force and fewer civilian complaints about officer behavior.

Before we get to the results, let's ask how you would think the statistical analysis might work. Let's say we want to specifically test the hypothesis of whether the use of force is decreased by the wearing of cameras. The randomized controlled trial provides us with the data to test the hypothesis – namely, the rates of use of force by officers assigned to either the camera or control groups. The next obvious step is to look at the data and determine whether they provide convincing evidence for or against this hypothesis. That is: What is the likelihood that body-worn cameras reduce the use of force, given the data and everything else we know?

It turns out that this is *not* how null hypothesis testing works. Instead, we first take our hypothesis of interest (i.e. whether body-worn cameras reduce use of force), and flip it on its head, creating a *null hypothesis* – in this case, the null hypothesis would be that cameras do not reduce use of force. Importantly, we then assume that the null hypothesis is true. We then look at the data, and determine whether the data are sufficiently unlikely under the null hypothesis that we can reject the null in favor of the *alternative hypothesis* which is our hypothesis of interest. If there is not sufficient evidence to reject the null, then we say that we “failed to reject” the null.

Understanding some of the concepts of NHST, particularly the notorious “p-value”, is invariably challenging the first time one encounters them, because they are so counter-intuitive. As we will see later, there are other approaches that provide a much more intuitive way to address hypothesis testing (but have their own complexities). However, before we get to those, it's important for you to have a deep understanding of how hypothesis testing works, because it's clearly not going to go away any time soon.

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