Wrapping up

Goals for the semester

In addition the the learning objectives listed in your syllabus our overarching goals for the semester are to develop:

▶ your ability to critically assess statistical information presented to you in scientific and non-scientific fora
▶ your sense of how to approach answering real world questions with data
▶ your ability to concisely and accurately describe statistical methods and results

Day 1 argument: This is a relevant class

I hoped to convince everyone here that statistics is relevant to everyone

You make many decisions during your day that are influenced by statistics

Statistics is not just relevant for public health, but also for other professions, including: policy, journalism and law

As we have tried to illustrate via the recurring "statistics is everywhere" segments, statistics is useful for understanding the news and the world around us - certainly during this pandemic we have seen a lot of public health and statistics in the news.

Statistics is Everywhere!!

Coronavirus   Live updates   U.S. map   World map   FAQs   Newsletter   Your life at home   Your money

PostEverything · Perspective

Antibody tests might be deceptively dangerous. Blame the math.

Figuring out who is immune is important — and harder than it seems

Statistics is Everywhere!!

From Washington Post April 30,2020: "But there's an even more basic problem with immunity passports: They might fail entirely because of false positive test results. When it comes to PCR testing for the active virus, false negatives get most of the attention, because they open the door to the disease being spread by people who wrongly think they don't have it. But in the context of immunity passports, false positives are especially pernicious: People would stop social distancing yet would continue to be at risk of infection. In its haste to provide access to tests, the Food and Drug Administration apparently approved the sale of some very inaccurate tests. But even those that appear on the surface to be very accurate could prove highly problematic in practical use."

What concept from our class does this highlight?

Statistics is Everywhere!!

Remdesivir Shows Modest Benefits in Coronavirus Trial

Hope soared nonetheless. The F.D.A. is likely to issue an emergency approval, a senior official said.

Until now, high expectations for remdesivir have been fueled largely by anecdotal reports of Covid-19 patients who took the drug and recovered. Two such reports were published in the prestigious New England Journal of Medicine, lending credibility to what researchers said were actually uncertain results.

Statistics is Everywhere!!

A separate study of remdesivir, published on Wednesday in The Lancet, which randomized 237 patients, found no benefit to the drug, compared with placebo. Adverse events were reported in 102 (66%) of 155 remdesivir recipients versus 50 (64%) of 78 placebo recipients. Remdesivir was stopped early because of adverse events in 18 (12%) patients versus four (5%) patients who stopped placebo early.

Statistics is Everywhere!!

Table 3 Outcomes in the intention-to-treat population

		Remdesivir group (n=158)	Placebo group (n=78)	Difference*
Time to clinical improvement		21·0 (13·0 to 28·0)	23·0 (15·0 to 28·0)	1·23 (0·87 to 1·75)
Day 28 mortality		22 (14%)	10 (13%)	1·1% (−8·1 to 10·3)
	Early (≤10 days of symptom onset)	8/71 (11%)	7/47 (15%)	−3·6% (−16·2 to 8·9)
	Late (>10 days of symptom onset)	12/84 (14%)	3/31 (10%)	4·6% (−8·2 to 17·4)

Statistics is Everywhere!!

From an April 29,2020 article

PHYS ED

The 4-Second Workout

Intense bursts of exercise throughout the day may have surprising metabolic benefits.

Statistics is Everywhere!!

From the Journal article No differences ($p>0.05$) between interventions were found for plasma insulin or glucose AUC. However, SPRINTS displayed a 31% (408 ± 119 vs. 593 ± 88 mg/dL/6h; $p=0.009$) decrease in plasma triglyceride incremental AUC and a 43% increase in whole body fat oxidation ($P=0.001$) when compared to SIT.

Non-statistical considerations

Remembering that in our interpretation process we want to think about not just the statistical results. . . .

Some examples - what tests?

Example 1

August 8, 2019 NEJM

Vitamin D Supplementation and Prevention of Type 2 Diabetes Anastassios G. Pittas, M.D., Bess Dawson-Hughes, M.D., Patricia Sheehan, R.N., M.P.H., M.S., James H. Ware, Ph.D., William C. Knowler, M.D., Dr.P.H., Vanita R. Aroda, M.D., Irwin Brodsky, M.D., Lisa Ceglia, M.D., Chhavi Chadha, M.D., Ranee Chatterjee, M.D., M.P.H., Cyrus Desouza, M.B., B.S., Rowena Dolor, M.D., et al., for the D2d Research Group*

BACKGROUND Observational studies support an association between a low blood 25-hydroxyvitamin D level and the risk of type 2 diabetes. However, whether vitamin D supplementation lowers the risk of diabetes is unknown.

Example 1 cont.

METHODS We randomly assigned adults who met at least two of three glycemic criteria for prediabetes (fasting plasma glucose level, 100 to 125 mg per deciliter; plasma glucose level 2 hours after a 75-g oral glucose load, 140 to 199 mg per deciliter; and glycated hemoglobin level, 5.7 to 6.4%) and no diagnostic criteria for diabetes to receive 4000 IU per day of vitamin D3 or placebo, regardless of the baseline serum 25-hydroxyvitamin D level. The primary outcome in this time-to-event analysis was new-onset diabetes, and the trial design was event-driven, with a target number of diabetes events of 508.

RESULTS A total of 2423 participants underwent randomization (1211 to the vitamin D group and 1212 to the placebo group). By month 24, the mean serum 25-hydroxyvitamin D level in the vitamin D group was 54.3 ng per milliliter (from 27.7 ng per milliliter at baseline), as compared with 28.8 ng per milliliter in the placebo group (from 28.2 ng per milliliter at baseline). After a median follow-up of 2.5 years, the primary outcome of diabetes occurred in 293 participants in the vitamin D group and 323 in the placebo group (9.39 and 10.66 events per 100 person-years, respectively).

Example 2

You are conducting an evaluation of a program to reduce HIV transmission from mothers to infants. You have enrolled 500 clinics and have measured the incidence of HIV in infants born to mothers who attend that clinic before the program was started and 1 year after the program was started.

Example 3: Fresh brewed?

We want to test the hypothesis that the average Berkeley student can taste the difference between freshly brewed coffee and instant coffee. We randomly recruit 50 students and offer them two cups of coffee, one cup of freshly brewed 100% arabica and one cup of generic brand instant coffee. We ask each student which coffee they prefer. 31 students prefer the fresh brewed. How would we test our hypothesis?

► what is the outcome?
► what is the null?
► What test would we use?

Example 4: Staph infections

Researchers recruited 917 patients who had tested positive for staphylococcus Aureus and randomly assignmed them to a staph-killing nasal ointment or placebo. They were interested in testing weather this drug was associated with a reduction in post-surgical infections. In the active treatment group17 of 504 patients developed infections, in the placebo group 32 of 413 patients developed infections.

► What are the exposure and outcome variables?
► What kind of a test would you use for these data?
► What is the null hypothesis of this test?