Bristol Data & AI Showcase

Meetings

Settings

- JGI Exhibition Meeting 2022-05-13

Files

See `OneDrive - University of Bristol\Documents\Projects\JGI Exhibition`

Dates

- JGI Exhibition - 7 June
- Workshop - Friday 17 June 10:00-10:50
- Poster displayed with other items.
- Keen for interactive
- Demonstrations on iPads or other equipment
- Engage with the public
- Share the work of the CDT
- Audience a mix but members of public also

Examples:

- VR installation: the secrets of brain health
- We the curious do machines understand emotions

My Research

My research is about causal inference, and more basically about causation. What causes what? How do we know?

It would be good to explore this both from the point of view of my work, but also how to educate the public / attendees on scientific literacy and how to assess the validity of science?

For example, many studies are conducted on mice, with the assumption that their biology is quite similar to ours. Many headlines that grab attention such as "eating bacon causes cancer" may actually be that bacon eaten by mice causes the levels of a carcinogenic compound to increase. The chain of causation here would be the following:

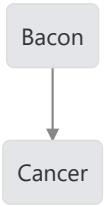
Eating bacon -> levels of carcinogen go up in mice -> carcinogen shown to be cancer causing -> will increase cancer in mice -> mice similar to humans -> eating bacon causes cancer in humans.

Not every link in the causal chain has actually been evaluated. This is purely an example , but one could imagine ideas related to this.

"Is this headline good science?"

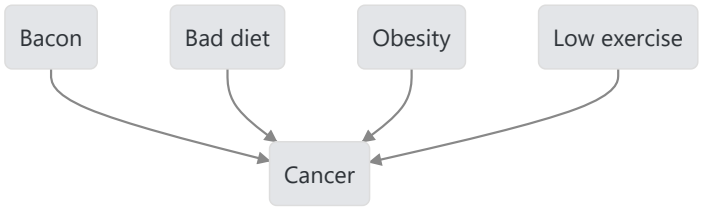
Much in the same way that we humans have biases, there are biases in causal networks. Oddly named, there are things such as colliders, mediators, and confounders. Each of these sounds unfamiliar, but analogies show that we do actually know each one.

If you wanted to look at the effect of A on B, where A is eating bacon and B is cancer rates, and you didn't do an intervention and instead looked at those who ate small amounts of bacon right up to those who ate huge amounts of bacon, you might find that cancer goes up more and more with the amount of bacon consumed.



Here the example would be a confounder. You would probably find that those who ate larger quantities of bacon also ate more of other foods, perhaps they are overweight, and their diet is not fantastic and they don't exercise very often. We know that diets high in fat, being

obese, and low exercise are all linked to increase cancer rates. These are confounders. So instead of just looking at A and B, we really had diet high in fat, being obese and low exercise as C,D & E respectively, where A,C,D,E **all** affect B.

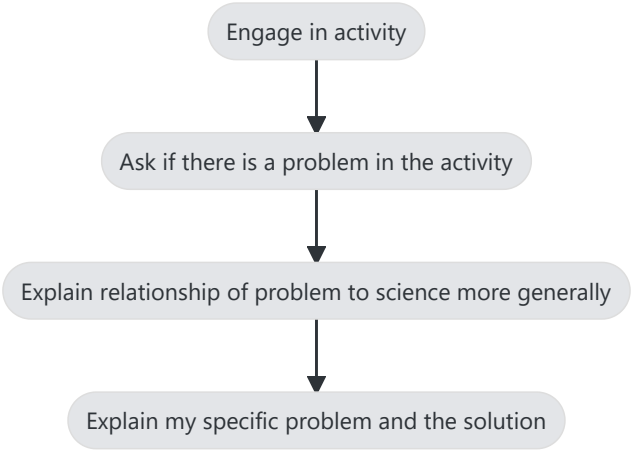


I think these sorts of ideas could be presented as a quiz. Perhaps a diagram could be presented alongside a real paper/study/headline.

There could also be conversations regarding the types of studies that attempt to eliminate such problems, such as randomized control trials for interventions.

Primary activities

The idea for these activities is to have something that is engaging that demonstrates the point, that acts as a shoehorn into both the more general idea I am trying to demonstrate, and ties into my research. The flow would be something like this:

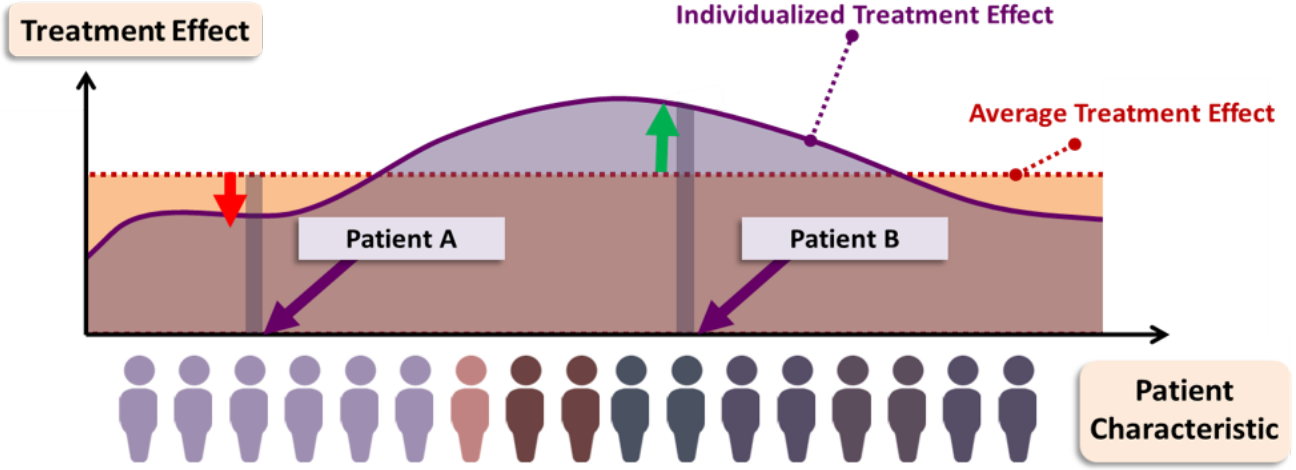


Average Treatment Effect vs Individual Treatment effect

- For demonstration, what is something that is different for every person, where the **average** is beneficial/good, but for some people the outcome is **terrible**. This needs to be something that is:
  - Engaging
  - Simple to understand
  - Clearly demonstrates the point
  - Something people are happy to do

One idea might be something that *if you are able to do it*, is beneficial, but if you can't, isn't. For instance,

Can use a visual aid like this to explain how not everyone benefits from treatment in the same way, but how statistics make us think that the average effect applies to the individual.



Can give the example of an operation: *x*% chance of success. Makes it sound like sheer luck. But really this % chance is a combination of many factors:

- The ability of the surgeon
- Your general health. The percentage survival may be based on your average 75 year old, who may have bad cardiovascular health, be overweight, and does little exercise. However you may be a keen allotment holder, who eats perfectly and runs every day. This would make your chances of survival much higher. You might also be treated by the world's top surgeon, who will have a much higher survival rate also.

This is slightly tangential, but does demonstrate the difference between the average and the individual.

Activity

Some people like the taste of coriander, others hate it, it tastes soapy.
Coriander lovers say it has a fresh citrus taste with a strong aroma, while the haters say it has a soapy taste and a pungent smell.

This is a great example, as it ties in individuality, as well as both environmental and genetic components.

Environmental

About 14–21% of people of East Asian, African, and Caucasian origin dislike coriander, while only 3–7% of people of South Asian, Hispanic, or Middle Eastern origin dislike it. The environment or culture in which one grows up could be a reason for this, as an environment is known to have a significant effect on the number of cells that are able to identify each smell or taste.

Genetic

There is a genetic component to coriander taste perception. This perception is believed to be a result of an enzyme that changes the way one senses the taste of coriander—a genetic trait that is still being researched upon.

Several studies have been done throughout the world to find out the genetics behind the difference in taste perception of coriander leaves. Through these studies, scientists were able to point out the fact that most cilantro haters shared a particular group of olfactory receptor genes called *OR6A2* that has the capacity to identify the smell of aldehyde chemicals that are present in coriander leaves as well as soaps. source

It would be nice to have a taste or smell activity, but curious about the health and safety of this type of thing. Okay if bought/manufactured, but not okay if I've made it?

Foods that have genetic taste preferences:

- Orange juice
- Broccoli
- Cottage cheese
- Chicken
- Sweetened cereal
- Hamburger

Smells that have genetic components:

- Malt
- Apple
- Blue cheese
- Violet

Violet

Newcomb and his colleagues found that the violet compound smelled “fragrant” and “floral” to those with a heightened sense, whereas less sensitive individuals described it as unpleasantly “sour” and “acidic.”

More on environment and smell preferences

Pregnancy can cause hypersensitivity to the point of disgust, and some believe overwhelming odors can even explain morning sickness.

Activity

- Can record how nice a smell or taste is throughout the day, and display the average.
- Based on this average, we can say "okay, the average rating of this smell was *x*, and based on this, we will give *everyone* this meal"
- Clearly a problem with this, as some people find some smells and tastes not just "not very nice" but "disgusting" or unenjoyable.
- Draw a parallel with treatment of medical conditions. Again, environmental and genetic components. Some people will respond well, some really well, some not at all, and some will be made worse off.

- Narrow down to my problem of interest, with respect to the choice of antibiotics. Influenced by the individual, as well as what they are infected with. AND the genetics of the associated pathogen they are infected with. The pathogen may have genes for resistance, so the antibiotic might not work. The person may have sensitivity to the toxicity of the antibiotic if it's broad spectrum, so it might wipe out their good bacteria and give them a *C.dificil* infection. It might cause toxicity to their kidneys. BUT, most people will benefit, and that's the crucial point.

Correlation vs Causation

Here we want to show how correlation can lead to spurious associations. Science isn't always explicit.

I was thinking of showing real newspaper headlines that make bold claims. Things such as bacon causes cancer.

x causes y, IN MICE

There is a great twitter account that retweets scientific papers with potentially misleading headlines, that just retweets the article and adds "**IN MICE**".

Nicotine example

Article with headline: https://www.studyfinds.org/vaping-heart-teenage-boys-girls/
Actual paper: https://www.ahajournals.org/doi/abs/10.1161/CIRCULATIONAHA.121.057613

Legitimate research, inadvertently misled

This would be research in humans, well conducted, randomised control trial. But the correlation is still spurious.

Discussion

- Could tie in the mice activity to the workshop. Not necessarily about the research, but tying into science communication and how data is misleading.
- Would it be better to not do computing memory game, but do something maybe with antibiotics and puzzle pieces. Background knowledge of how antibiotics work, lead onto the why.
- Can have joined-up stand. Taste/smell interactivity good.

- Giant magnet board or poster board to do stats on. Could have TV to show running average/total. Morgan had running tally - who won, robot or person? Update score in real time.
- Health and safety for food - pre-packaged okay? Prepared self not okay?
- Maybe parma violets sweets? Check if they have same compound/chemical.
- Puzzle route - card with illustrations, laminated. Design team might be able to make ACTUAL PUZZLES. Bespoke puzzle companies...

Resources

- Violets
- TV
- Could make sachets / paper with violet essential oils on.
- Printing headlines/poster/info
- Coriander/food

DEADLINE FOR ORDERING SUPPLIES

- 17 May