Experimental economics

Lecture I - **Introduction to behavioral experiments**

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References:

- Cartwright, E. (2018). *Behavioral economics*. Routledge.

What is behavioral economics?

- Behavioral economics is about understanding economic behavior and its consequences. It's about understanding why someone buys a hotdog, goes to work, saves for retirement, gives to charity, gets a qualification, sells an old car, gambles on a horse race, cannot quit smoking, etc. It's also about understanding whether people make good or bad choices, and could be helped to make better choices.

- Behavioral economics is about testing the standard economic model on humans, seeing when it works and when it does not, and asking whether it can be tweaked, or given an overhaul, to better fit what we observe.

- Behavioral economics is about applying insights from laboratory experiments, psychology and other social sciences in economics.

- If you combine all three definitions, I think we can strike a nice balance. Behavioral economics is about working constructively with the standard economic model to get a better understanding of economic behavior. The objective is definitely not to criticize the standard economic model, or to accentuate the negatives. Testing the standard model is a means to an end, and that end is to understand economic behavior as best we can.

- Behavioral economics has really come of age in the last 50 years or so, and so a lot of progress has been made. Various things could have happened as we started to put the standard economic model to the test. The model could have worked perfectly; that would have been fantastic news for economics, but not so exciting for the future of behavioral economics. At the other extreme, the model could have proved useless; that would be bad news all round (except for those who like to poke fun at economics). What has actually happened is an exciting mix in which the standard economic model sometimes seems to work very well, sometimes to work very badly, but most of the time is not far off, and with a bit of tweaking gets a lot better.

The history and controversies of behavioral economics

- It is difficult to say when behavioral economics began, but we can credit Adam Smith with being its founder. Any student of economics should be familiar with Adam Smith's book An Inquiry into the Causes of the Wealth of Nations, first published in 1776. In that book Smith famously explained the invisible hand of the market.

- Less well known to most economists is a book that Smith first published in 1759, called The Theory of Moral Sentiments. It was actually in this book that the invisible hand first made an appearance. More interesting, for our purpose, is how Smith explains that people are not motivated solely by self-interest, but also feel a natural sympathy with others, and have a natural sense of virtue.

- At the beginning of the twentieth century, however, economics turned away from psychology, and behavioral economics, if we can call it that, disappeared for over half a century. Psychology can be taken out of economics by focusing on choice rather than desire. Instead of trying to work out why people do things, we can make inferences based solely on what they do.This approach makes a lot of sense, because it allows to abstract away from difficult psychological questions and develop a mathematical theory of rational choice. If people are rational then they will reveal their desires through their choices, and so we need focus only on choice.

- Asking what happens if people are rational is a good, logical thing to do, because it provides a natural benchmark to work with. The same could be said of asking, as Smith did in discussing the invisible hand, what happens if people are selfish. Assuming for mathematical convenience that people are rational and selfish clearly does not mean, however, that people actually are rational or selfish.

- The problem is that these caveats can easily be forgotten in the beauty or simplicity of the argument. In the face of such appeal and convenience it became easy to overlook the fact that people are neither rational nor selfish; Homo economicus became king, and economics became very distant from psychology.

- To assume people are like rational and selfish Homo economicus is the most natural, objective place to begin thinking about modeling economic behavior. Indeed, economists often start by asking what a selfish, rational person would do. The crucial point, though, is that it is the start point and not the end point. It is the best way to start thinking about modeling economic behavior but not necessarily the best way to model economic behavior. A crucial distinction!

Behavioral economics is reborn

- From the 1960s onwards psychology gradually made a return to economics. First, Herbert Simon (Nobel Prize in Economics in 1978) seriously questioned the sense of approximating people by Homo economicus. For example, in a paper published in 1955, he solves for how a rational person should behave before stating: ‘My first empirical proposition is that there is a complete lack of evidence that, in actual human choice situations of any complexity, these computations can be, or are in fact, performed.’ Instead, Simon suggested looking at the information and computational capacities that humans possess, and using this as the starting point for economic models. Recognizing the limitations faced by humans led to the term ‘bounded rationality’.

- One thing notably lacking in much of what Simon wrote was proof that Homo economicus is not a good approximation of how people behave. He may have thought this was obvious (many do), but the lack of any formal proof made it easy for economists to ignore his work. The same could not be said of ‘your assumptions are wrong’ attack, and the main credit went to Daniel Kahneman and Amos Tversky. The approach is one of demonstrating that people really are very different from Homo economicus.

- Daniel Kahneman won the Nobel Prize in Economics in 2002 for ‘having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty’ (Amos Tversky was, unfortunately, no longer alive). However, their attack was still too easy to dodge for economists confident in the standard economic model. After all, was it not obvious that people are not like Homo economicus? The real issue is whether models in which people are approximated by Homo economicus make good predictions. The early work of Kahneman, Tversky and others had less to say on this issue.

- To illustrate the point, we can get to the third element - ‘markets work’ revelation, and give the main credit to Vernon Smith. Starting in 1955 Smith performed a series of experiments to see whether basic predictions of the standard economic model about markets would prove correct. Basically the predictions proved good. A stunning result! Maybe, therefore, it does not matter if people are not like Homo economicus; the standard economic model can still work. These initial experiments led to a continuing line of research on market institutions that provides the most important results to have come out of behavioral economics. In 2002 Vernon Smith won the Nobel Prize in Economics ‘for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms’.

Behavioral economics is reborn

- The final element I will call the ‘what equilibrium to choose?’ problem, and give the main credit to Reinhard Selten. The problem became apparent with the rapid progress of game theory in the 1950s and 1960s. Game theory looks to capture behavior in strategic situations, and meant the demands on Homo economicus became ever more stringent. Not only should he or she be selfish, rational and cleverer than any economist, Homo economicus also needs to be telepathic in order to predict what others will do (and even that is not enough). Basically, in strategic situations, it usually becomes ambiguous what Homo economicus should do; it is ambiguous what the rational thing to do is.

- The technical way to express this problem is to say that there are multiple equilibria. Somehow we need to try and say which of the equilibria ‘makes more sense’ or ‘seems more likely to occur’. That’s a bit like throwing darts at a dartboard while blindfolded. To have any chance of success it makes sense to question how people might think or reason in such strategic situations and observe what people do when they play games. In other words, it made sense to draw a little on psychology and to run controlled experiments.

- Selten won the Nobel Prize in Economics in 1994, together with John Nash and John Harsanyi, ‘for their pioneering analysis of equilibria in the theory of non-cooperative games’. More than anything else, I think that game theory was instrumental in the rebirth of behavioral economics. That’s because it meant that the next logical step in developing the standard economic model was to draw from psychology and use experiments. The standard economic model had hit a dead end, and behavioral economics was needed to move it forward.

Behavioral economics and policy

- If behavioral economics can improve our understanding of the economy then we should be able to put it to good use. Consequently, there is a fifth element to be added the mix. This fifth element has little to do with the rebirth of behavioral economics but is proving instrumental in its rapid growth. Let's call it the 'policies that work' problem. By its nature, economics is an applied subject; it should inform on how to alleviate poverty, avoid unemployment, regulate industry, and so on. Many, however, have become frustrated by the inability of economists to provide good answers to the important policy questions!

- Increasingly, this problem is being traced back to an over-reliance on the standard economic model. The standard economic model suggests that intervention is needed only when markets fail because of things such as externalities, imperfect information or imperfect competition; if markets work, then people make the rational decision. So, if people do not save for retirement, then they clearly want to end their life in poverty. If someone buys a mortgage they cannot afford then they knowingly gambled everything on house prices rising. Similarly, if someone becomes addicted to heroin then they chose to do so taking into account their financial constraints. To anyone other than economists these kinds of statements sound weird. They also sound weird to a behavioral economist.

- Once we take into account the mistakes people make and the difficulties of coordinating on an equilibrium, the rationale for intervention becomes stronger. But it is important to realize that behavioral economics does not prescribe big government; rather, it prescribes clever government. I would distinguish two different elements to this.

- One thing behavioral economics does is give fresh insight into what policies will work and what will not. For instance, the traditional approach to increase saving for retirement has been complex tax breaks; these are the kinds of things that appeal to Homo economicus but are ignored by Homo sapiens. A behavioral economics approach suggests things such as the save more tomorrow plans, these are the kinds of things that appeal to Homo sapiens but are ignored by Homo economicus. It is partly for his groundbreaking work in this area that Richard Thaler was awarded the 2017 Nobel Prize in Economics 'for his contributions to behavioral economics'.

Debate and controversy

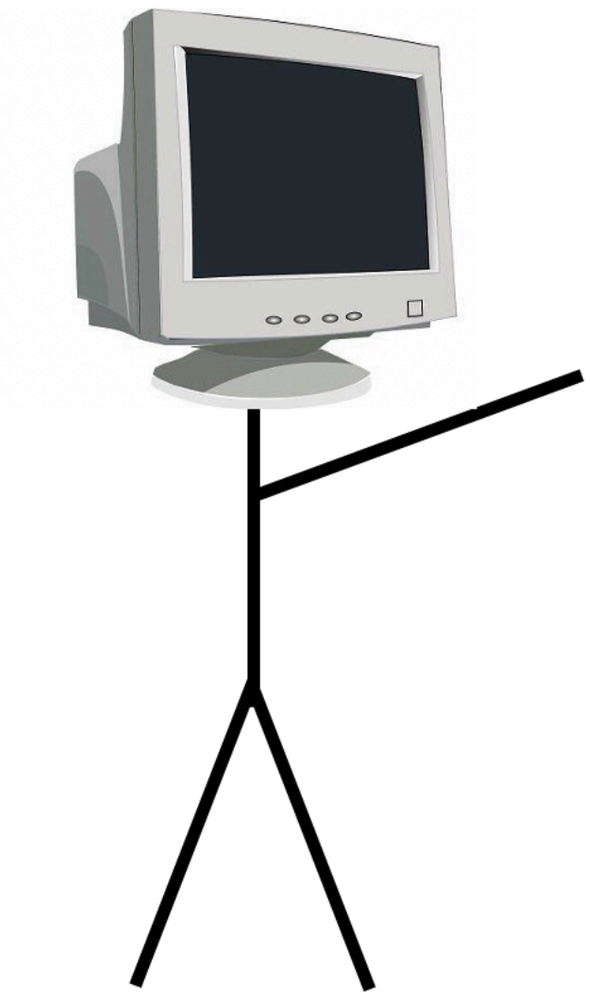
- Cognitive vs. Choice models: Is it enough to assume people can be approximated by Homo economicus, or do we need psychologically grounded assumptions?

- Assumptions vs. predictions: Should more emphasis be put on things that the standard economic model does well or badly?

- Half-full vs. half-empty: What should we conclude if the standard economic model predicts well only what experienced people do – i.e. people familiar with a task or decision?

- Should behavioral economics look to rewrite economics from a psychological perspective, or adapt the standard economic model to take account of psychological insight?

    - Overfitting, novel testable predictions, external validity of laboratory experiments



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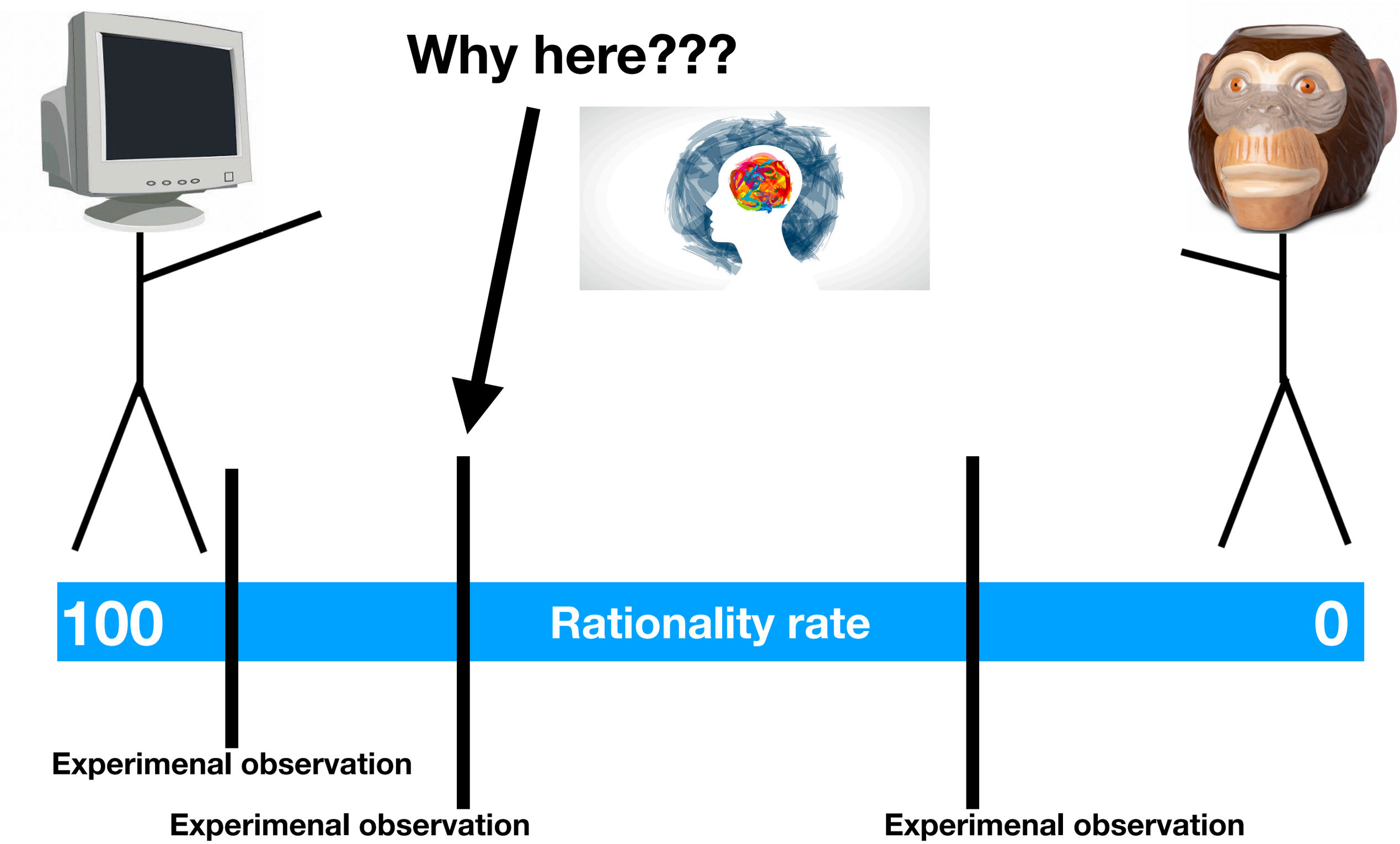
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Behavioral economics

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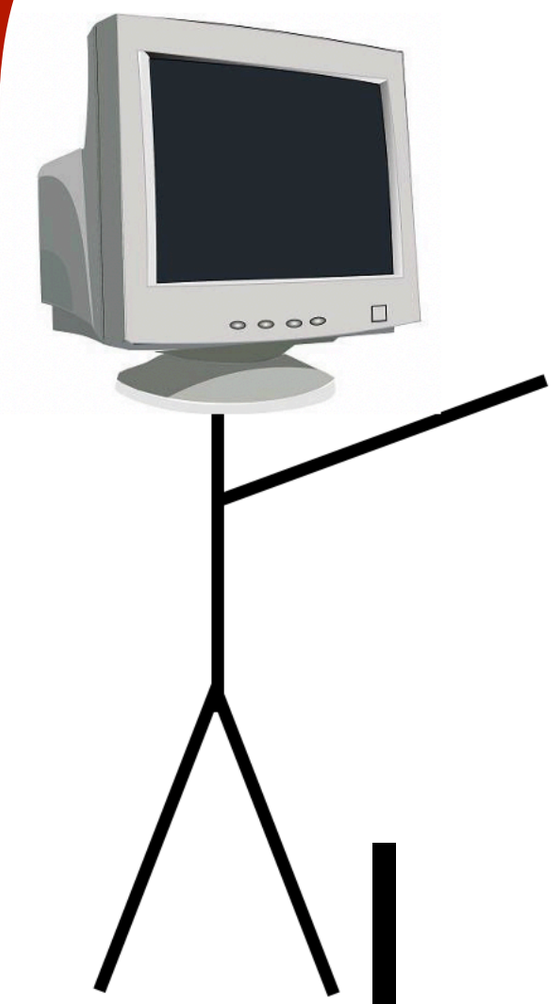

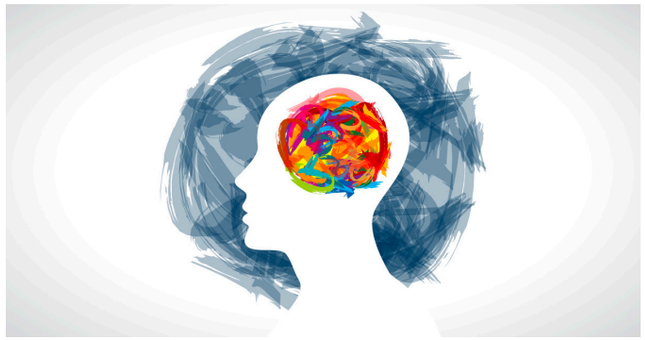

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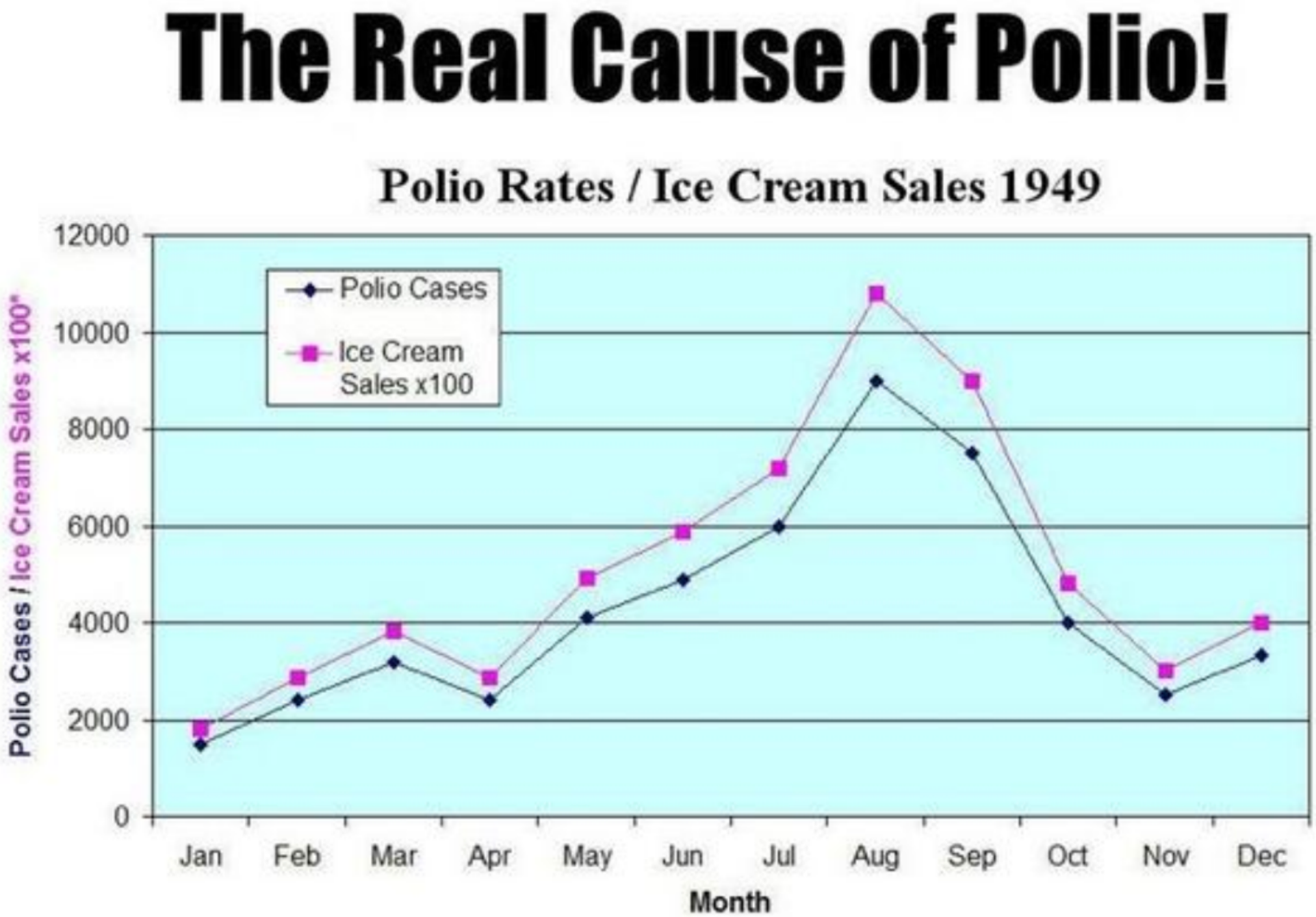
Hello Kidney

Correlation vs. Causation



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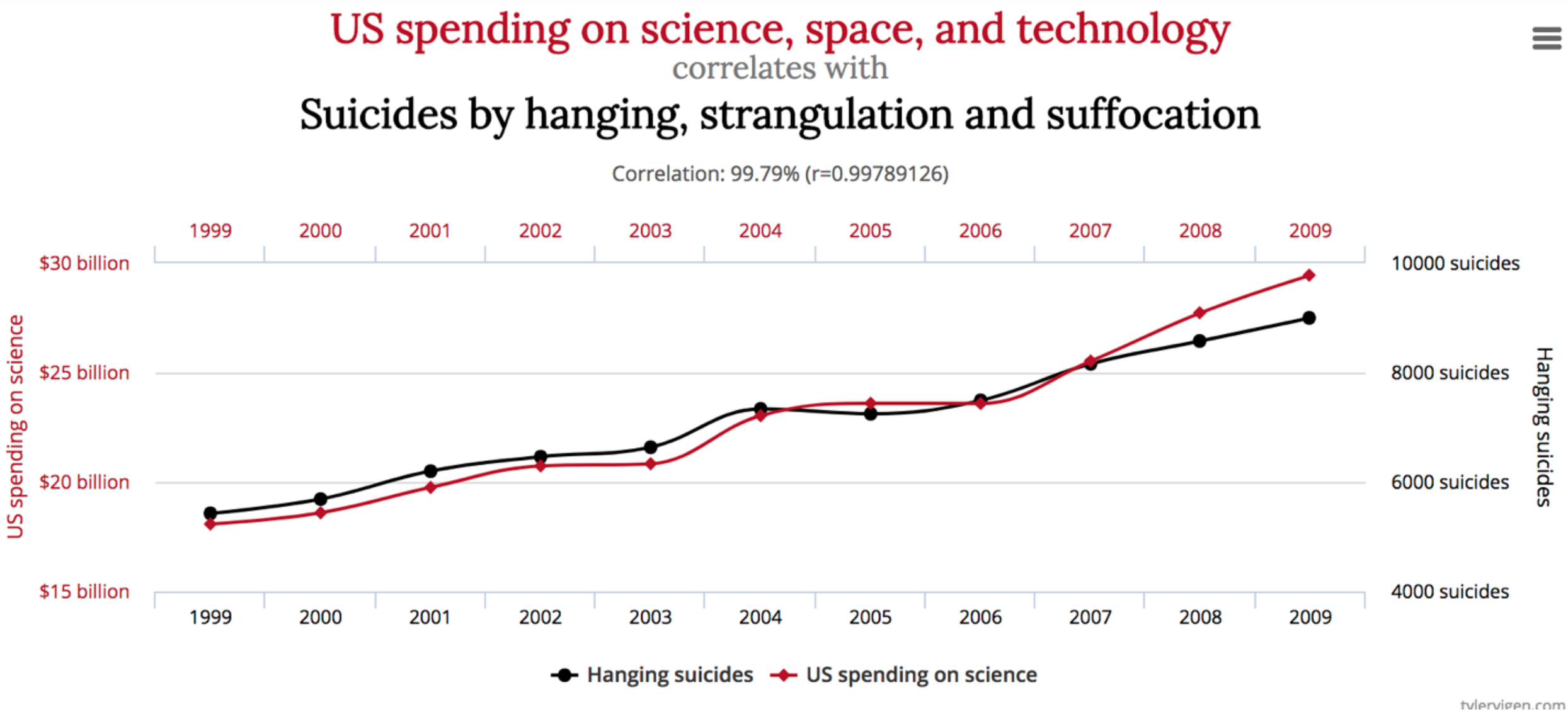

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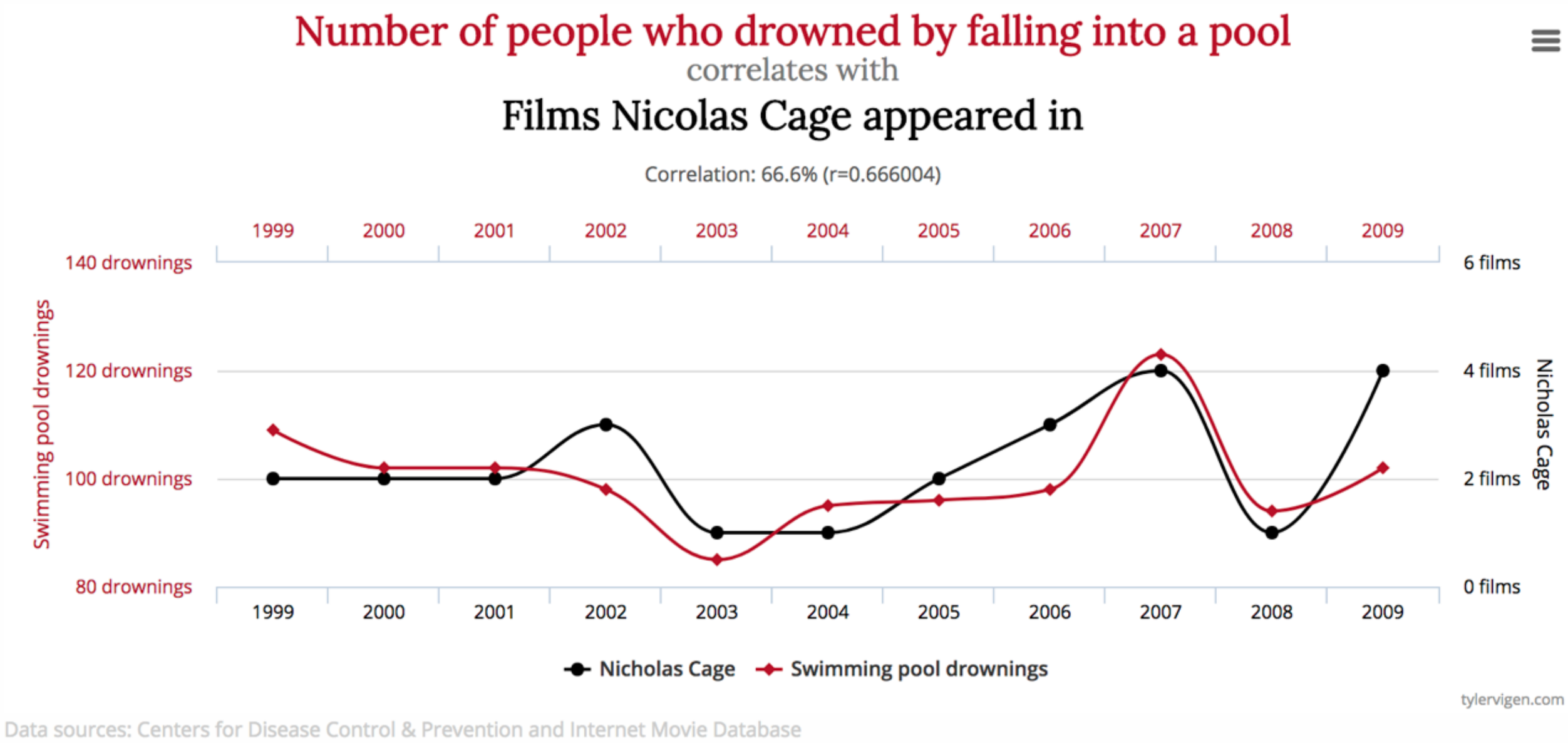


Correlation
Causality

Correlation vs. Causation
More examples

- Cholera in Russia
- SAT preparation courses vs. test scores
- Breast-feeding vs. malnutrition
- U20 ice hockey rosters

Correlation vs. Causation

- Analysis
  - Step 1: Document the correlation, that is whether data on two measures move together.
  - Step 2: Assess whether the movements in one measure are causing the movements in the other.
    - For any correlation between two variables A and B, there are three possible explanations, one or more of which could result in the correlation:
      - A is causing B.
      - B is causing A.
      - Some third factor is causing both.

Assessing causatiom

- SAT:
  - A -> B: SAT prep courses worsen preparation for SATs.
  - B -> A: Those who are of lower test-taking ability take preparation courses to try to catch up.
  - C -> A,B: Those who are generally nervous people like to take prep courses, and being nervous is associated with doing worse on standardized exams.
- Breast-feeding:
  - A -> B: Longer breast-feeding is bad for health.
  - B -> A: Those infants who are in the worst health get breast-fed the longest.
  - C -> A,B: The lowest-income mothers breast-feed longer, since this is the cheapest form of nutrition for children, and low income is associated with poor infant health.

Golden standard for assessing causation: Randomized trials

- We say that two economic variables are **correlated** if they move together. But this relationship is **causal** only if one of the variables is causing the movement in the other. The general problem that empirical economists face in trying to use existing data to assess the causal influence of one factor on another is that one cannot immediately go from correlation to causation. Knowing that two factors are correlated provides no predictive power; prediction requires understanding the causal links between the factors.

- **Identification problem**: given that two series are correlated, how do you identify whether one series is causing another?

- The gold standard for doing so is the randomized trial, which removes bias through randomly assigning volunteers into treatment and control groups.

- treatment group: The set of individuals who are subject to an intervention being studied.

- control group: The set of individuals comparable to the treatment group who are not subject to the intervention being studied.

Golden standard for assessing causation: Randomized trials

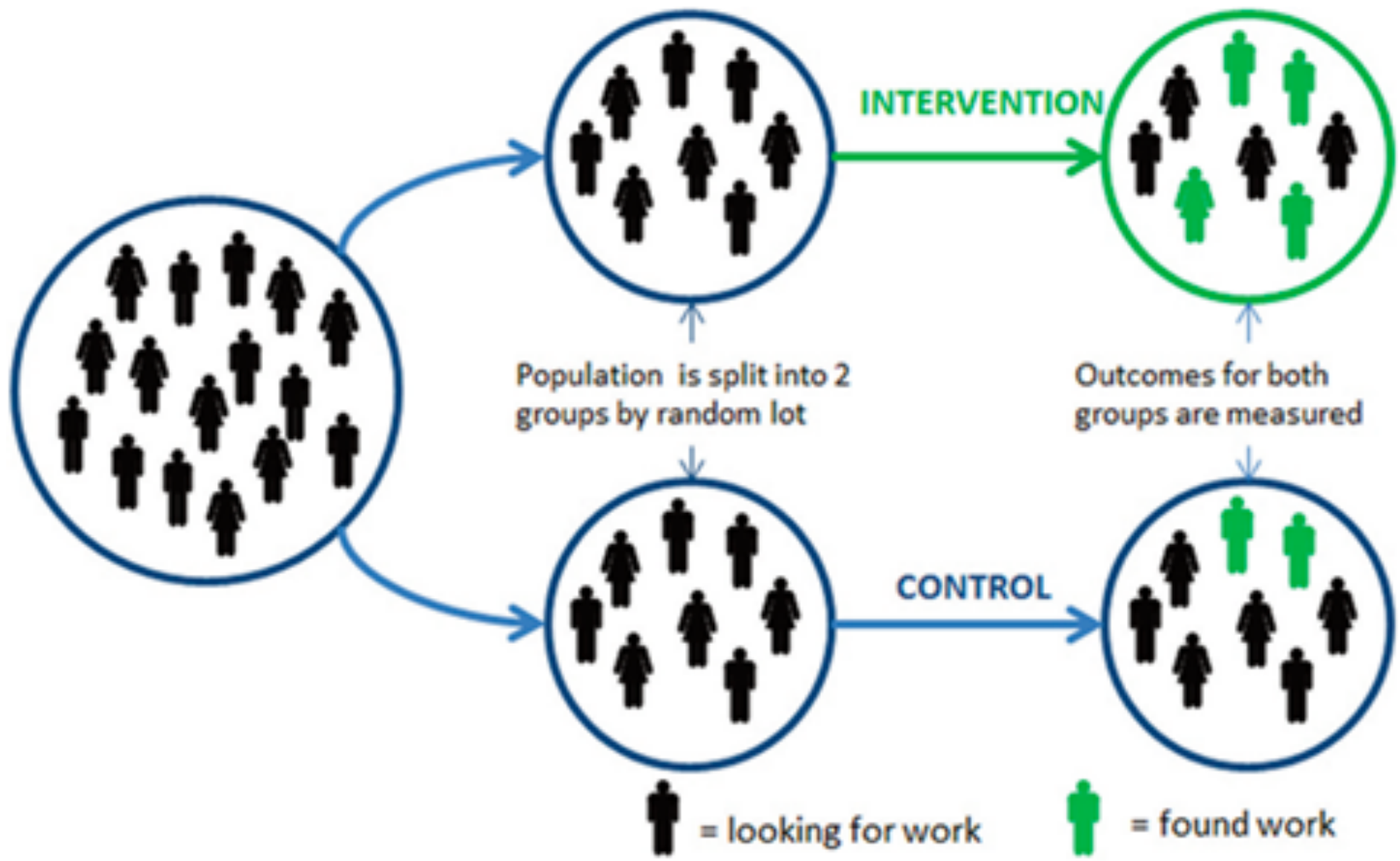

Figure 1. The basic design of a randomised controlled trial (RCT), illustrated with a test of a new 'back to work' programme.

The problem of bias

- We should always start our analysis of an empirical methodology with a simple question: Do the treatment and control groups differ for any reason other than the treatment?

- The non-treatment-related differences between treatment and control groups are the fundamental problem in assigning causal interpretations to correlations. We call these differences **bias**, a term that represents any source of difference between treatment and control groups that is correlated with the treatment but is not due to the treatment.

- By definition, such differences do not exist in a randomized trial, since the groups do not differ in any consistent fashion, but rather only by the flip of a coin.

- Thus, randomized treatment and control groups cannot have consistent differences that are correlated with treatment, since there are no consistent differences across the groups other than the treatment. As a result, randomized trials have no bias, and it is for this reason that randomized trials are the gold standard for empirically estimating causal effects.

- The description of randomized trials here relies on those trials having fairly large numbers of treatments and controls (large sample sizes). Having large sample sizes allows researchers to eliminate any consistent differences between the groups by relying on the statistical principle called the **law of large numbers**: the odds of getting the wrong answer approaches zero as the sample size grows.

Possible problems with randomized trials

- For many questions of interest, randomized trials are unfortunately not available, because they can be enormously expensive, take a very long time to plan and execute, and often raise difficult ethical issues (e.g new medical procedures)

- Moreover, even the gold standard of randomized trials has some potential problems. First, the results are only valid for the sample of individuals who volunteer to be either treatments or controls, and this sample may be different from the population at large. For example, those in a randomized trial sample may be less averse to risk or they may be more desperately ill. Thus, the answer we obtain from a randomized trial, while correct for this sample, may not be valid for the average person in the population.

- A second problem with randomized trials is that of **attrition**: individuals may leave the experiment before it is complete. This is not a problem if individuals leave randomly, since the sample will remain random. Suppose, however, that the experiment has positive effects on half the treatment group and negative effects on the other half, and that as a result the half with negative effects leaves the experiment before it is done. If we focus only on the remaining half, we would wrongly conclude that the treatment has overall positive impacts.

- attrition: Reduction in the size of samples over time, which, if not random, can lead to biased estimates.

- If data from randomized trials are not available, typically what the analyst has instead are observational data. Observational data are data generated by individual behavior observed in the real world, not in the context of deliberately designed experiments.

Quasi-Experiments

- A typical approach to identifying causal effects in observational data is cross-sectional regression analysis, a statistical method for assessing the relationship between two variables while holding other factors constant. Regression analysis has one potential advantage over correlation analysis in dealing with the problem of bias: the ability to include control variables. Control variables in regression analysis take into account other differences across individuals in a sample, so that any remaining correlation between the dependent variable and independent variable can be interpreted as a causal effect. However, in reality, control variables are unlikely to ever solve the problem of bias completely, as the key variables we want, are often impossible to measure in data sets.

- Is there any way to accurately assess causal influences without using a randomized trial? Is there an alternative to the use of control variables for purging empirical models of bias?

- Over the past two decades, empirical research has become increasingly focused on one potential middle-ground solution: the quasi-experiment, a situation that arises naturally when changes in the economic environment (such as a policy change) create nearly identical treatment and control groups that can be used to study the effect of that policy change. In a quasi-experiment, outside forces (such as those instituting the policy change) do the randomization for us.

- With quasi-experimental studies, unlike true experiments, we can never be completely certain that we have purged all bias from the treatment–control comparison. Quasi-experimental studies use two approaches to try to make the argument that they have obtained a causal estimate.The first is intuitive: trying to argue that, given the treatment and control groups, it seems very likely that bias has been removed.The second is statistical: to continue to use alternative or additional control groups to confirm that the bias has been removed.

Quasi-Experiments

- Difference-in-difference estimator: The technique that tries to combine time series and cross-sectional analyses to address the problems with each. By comparing the change in population A to the change in population B, the estimator controls for other time series factors that bias the time series analysis within population A. Likewise, by comparing the change within each population, rather than just comparing the two populations at a point in time, the estimator controls for omitted factors that bias cross-sectional analysis across the two populations.

- Searching for a change in variable X
    - 2 periods (Y, Z)
    - 2 populations (A,B)
    - In period Y, the policy is the same for A and B
    - In period Z, there is new policy for A, while the policy for B is not changed
- x (population A, year Y) - x (population A, year Z) = Treatment effect + Bias
- x (population B, year Y) - x (population B, year Z) = Bias
- Difference = Treatment effect

Quasi-Experiments

■ TABLE 3-1

Using Quasi-Experimental Variation

Arkansas			
	1996	1998	Difference
Benefit guarantee	$5,000	$4,000	–$1,000
Hours of work per year	1,000	1,200	200
Louisiana			
	1996	1998	Difference
Benefit guarantee	$5,000	$5,000	$0
Hours of work per year	1,050	1,100	50

In Arkansas, there is a cut in the TANF guarantee between 1996 and 1998 and a corresponding rise in labor supply, so if everything is the same for single mothers in both years, this is a causal effect. If everything is not the same, we can perhaps use the experience of a neighboring state that did not decrease its benefits, Louisiana, to capture any bias to the estimates.