The Grass is Always Greener on the Other Side

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Introduction

Summer is rubbish for two fundamental reasons. One: wasps set about stinging everything with two legs without doing anything useful with their time like making honey or pollinating stuff. Two: girlfriends always want to go off on picnics. Avoiding having to eat *al fresco* was the sole reason our ancestors stopped messing about in trees and found some good caves instead. Picnics are inherently stressful; the apple juice invariably leaks into the bag, the Sports section blows away, and it is always always impossible to find a spot good enough to settle down on. The problem is that as soon as you approach that idyllic lush area of grass you spied from afar it starts looking nasty and patchy. The grass really does seem to always be greener on the other side, or at least further away.

But the *Null Hypothesis* can reveal the facts behind this illusion, and help spare you picnicking anguish. It's all to do with selective biases, which are also lurking behind other annoyances like always seeming to be in the wrong queue at a supermarket or the slowest lane in a traffic jam on the motorway.

Method

Grass is not distributed uniformly and there are often scattered patches of bare earth, especially if everyone else has recently been blackmailed by their girlfriend into going for a picnic and the park/common/other unspecified recreational land area is becoming scuffed and worn out. The majority of these bare patches vary in size from 5cm in diameter to around 15cm, with the larger examples in this distribution being disproportionately disruptive of a pleasant dining experience. Other important parameters are the mean height of blades of grass, taken here to be 5cm, and the height above ground of an average person's eyes, taken to be 160cm. Figure 1 schematically represents the scenario facing a picnicker during the site-hunting stage. The situation depicted is the limiting case, where an unsightly patch of bare earth just remains hidden from view by blades of grass. If the observer advances any closer then the patch will no longer be completely occluded by grass, and will become apparent to the prospective picnicker as an ugly spot of mud in an otherwise blemish-free area of grass.

The geometry of this limiting case is clarified in the inset to Figure 1. The maximum earth patch diameter, grass height, and eye elevation are labeled d_1, h_1, and h_2 respectively. d_2 is the unknown distance that we hope to calculate. It describes the 'despair horizon' - the boundary of a perfect circle centred on the picnicker whereby anything beyond looks plush and perfect for splaying out on with a spot of luncheon. The locus within the despair horizon contains grass appearing scuffed and unappealing. Thus,

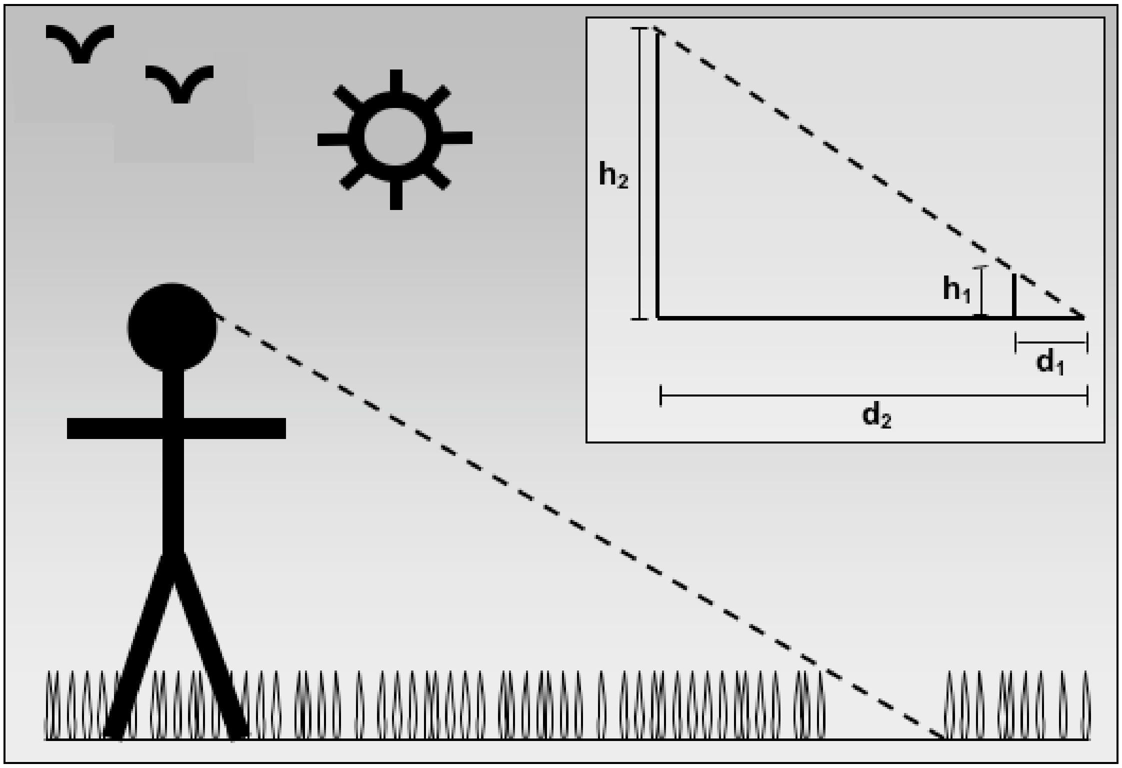

Figure 1. The limiting case for seeing a patch in the grass, illustrating the despair horizon.

as a picnicker roams the recreational land area he is perpetually surrounded by a zone of nasty-looking ground, and as soon as any potentially acceptable spot crosses the despair horizon it immediately looks less hopeful.

The three measured parameters and one unknown distance form a set of two *similar* triangles. The two pairs of lengths are in proportion, and so the unknown side, d_2, can be easily found.

$$d_1/h_1 = d_2/h_2$$
$$15/5 = d_2/165$$
$$d_2 = 495\text{cm}$$

Discussion

The despair horizon exists at a range of almost 5 meters from a picnicker. As soon as an area breaks this threshold it appears minging, and so wandering after those perfect patches of grass you see from a distance is not unlike a dog chasing its own tail, although much less fun. This picnic problem is an example of an observational bias – your viewpoint imposes a slant on the events that you witness. Patches of bare earth can *only* be seen when they're nearby, so it should come as no surprise that you appear to always be surrounded by a nasty-looking zone whereas the grass looks greener elsewhere. Selective biases like this are caused by intrinsic limitations on your view-point, equipment, or experimental design, and can be very subtle and difficult to spot. For example, isn't it dead uncanny that the Earth orbits a nicely stable Sun at exactly the right distance for the oceans and warm atmosphere that we depend on to survive? *Of course* it isn't, because if things were any different we wouldn't be alive to notice them. This extreme form of observational bias has been termed the 'Anthropic Principle'.

Selective biases must be taken into account when the results from any scientific observation are interpreted. But are we careful about doing this? Like hell we are. Not only does the pernicious evil of selective bias suck any potential enjoyment out of summer picnicking, but our whole life seems to be touched by similar misunderstandings. The two examples we'll explore here are why you always seem to choose the wrong queue at the supermarket checkout and why it seems other lanes on a motorway are going faster than yours in a traffic jam.

Supermarkets

There are many different kinds of delays that can befall the unwary queuer at the local Sainsbury's. The receipt printer could get jammed, the price tag might have fallen off a special offer, and 'Customer Service Attendants' are often confused by the difference between an avocado and kiwi and have to call their supervisor over for help. Assuming that these stoppages occur within a random distribution then each queue has an equal probability of experiencing one. So on average you will suffer hold-ups in the same proportion as hastle-free shopping trips. However, it is still true to say that on the majority of visits the queue next to yours will move faster. This is not a paradox, but a fact of probabilities. Considering only your local checkout environment, i.e. your queue and the two neighbouring ones, the three queues can be ranked in order of speed. On two thirds of visits one of the next-door queues will move faster than yours. Even worse, on a third of the visits your queue will be the slowest one, and you'll stand there angrily tapping your feet as both queues next to you race ahead.

So why don't we notice the 1 in 3 occasions when our queue *is* actually the best one to have picked? This is simply the result of observational bias. The fact is that you tend to only look around and compare with other queues when you have been in yours for a while and are becoming frustrated - i.e. when you are already experiencing a delay.

There is another reason that you might think you always pick the wrong queue. People are much more likely to remember unlucky events than good outcomes - the unfairness of it all sticks in your mind. So when you think back on the past and conclude that you do seem to always pick the wrong queue you are falling prey to yet another case of observational bias - selection of the negative cases. A counter-example of this would be people that read their horoscope and are stunned by how accurately it predicts their day. Horoscopes are always very broad and vague, allowing supporters to focus on the points that do happen to be true, and brushing over those they don't agree with - selection of positive cases. This differential memory is an example of 'counting the hits but ignoring the misses', distorting the sample group that you then draw your conclusions from.

Thinking that you always choose the wrong queue in supermarkets is as much a misunderstanding of probabilities as it is a problem of selection bias. The next example is also closely related to observational bias.

Motorways

It's a bank holiday weekend and Dad wants to get some family bonding done on his time off and so decides on a family outing to Brighton, let's say. But the motorway is absolutely rammed with identical families. The most frustrating thing is that for the majority of the journey down the slow-moving road you seem to be being overtaken by the next lane rather than moving at any speed yourself. Another case of observational bias? Absolutely. When you're driving you do in fact spend much more of the time being overtaken than you spend overtaking other cars yourself. But again, there is no paradox here. Figure 2 below shows the situation.

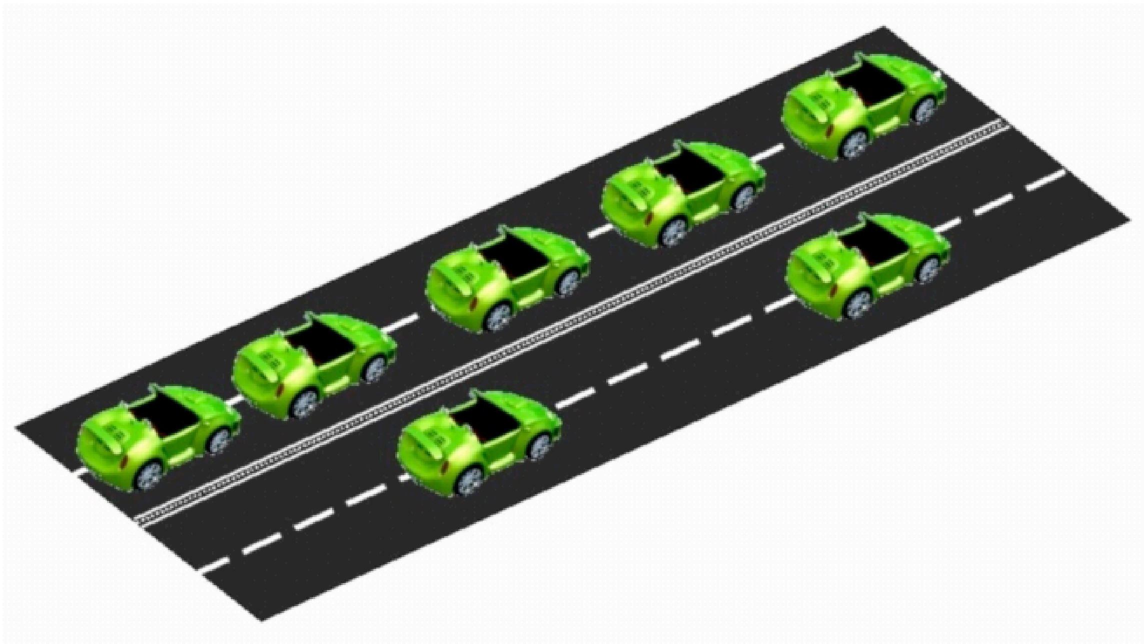

Figure 2. The bunching up of cars in the slow lane, and spacing out during over-taking.

Cars tend to bunch up closely together when they're moving slowly or stationary, and space out more when moving faster and so overtaking other lanes. When you're overtaking you quickly reach the next hold-up and have to slow down. It is therefore self-evident that over the course of an entire road trip you spend a much greater proportion of time moving slowly than moving quickly. So at any random point in time you are more likely to be overtaken than doing the overtaking yourself. This gives drivers the frustrating illusion of making slower progress than most other cars.

But it must also be true that you overtake the same number of cars that overtake you, unless you are genuinely moving slower than the average. During the short periods of overtaking you pass many other cars as they are bunched up, and during the longer slow periods fewer cars overtake you as they are well-spaced. These two effects exactly cancel to ensure that overall you overtake and are overtaken an equal number of times. However, even when you are really driving faster than the average this imbalance in time spent being overtaken/overtaking can give you the illusion that you are moving slower than most other cars.

Of course, psychology comes into it as well. Drivers are more likely to be looking around at other lanes of traffic when they themselves are stationary and caught in a jam. This is another case of observational bias – it is mostly the occasions when you are being overtaken that tend to get selected for observation.

Conclusion

Selection, or observational, bias is all around us. In all three cases looked at here an illusionary effect has been created by the action of a selective bias operating in the background. These frivolous examples illustrate the dangers of ignoring this pernicious effect. But the implications for empirical science as a whole are significant – results must never be accepted at face value, but should be critically analysed to check for the presence of a selective bias lurking in the experimental design. Understanding such effects may explain some of the major aggravations of life, but then again it probably won’t alleviate the pain of being caught behind some innumerate idiot in the ‘5 items or less’ line.