Salad-bar strategy: The battle of the buffet

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Competition, greed and skulduggery are the name of the game if you want to eat your fill. Smorgasbord behaviour is surprisingly complex

(Image: Randy Duchaine/Alamy)

A mathematician, an engineer and a psychologist go up to a buffet… No, it's not the start of a bad joke.

While most of us would dive into the sandwiches without thinking twice, these diners see a groaning table as a welcome opportunity to advance their research.

Look behind the salads, sausage rolls and bite-size pizzas and it turns out that buffets are a microcosm of greed, sexual politics and altruism - a place where our food choices are driven by factors we're often unaware of. Understand the science and you'll see buffets very differently next time you fill your plate.

The story starts with Lionel Levine of Cornell University in Ithaca, New York, and Katherine Stange of Stanford University, California. They were sharing food at a restaurant one day, and wondered: do certain choices lead to tastier platefuls when food must be divided up? You could wolf down everything in sight, of course, but these guys are mathematicians, so they turned to a more subtle approach: game theory.

Applying mathematics to a buffet is harder than it sounds, so they started by simplifying things. They modelled two people taking turns to pick items from a shared platter - hardly a buffet, more akin to a polite tapas-style meal. It was never going to generate a strategy for any occasion, but hopefully useful principles would nonetheless emerge. And for their bellies, the potential rewards were great.

First they assumed that each diner would have individual preferences. One might place pork pie at the top and beetroot at the bottom, for example, while others might salivate over sausage rolls. That ranking can be plugged into calculations by giving each food item a score, where higher-ranked foods are worth more points. The most enjoyable buffet meal would be the one that scores highest in total.

In some scenarios, the route to the most enjoyable plate was straightforward. If both people shared the same rankings, they should pick their favourites first. But Levine and Stange also uncovered a counter-intuitive effect: it doesn't always pay to take the favourite item first. To devise an optimum strategy, they say, you should take into account what your food rival considers to be the worst food on the table.

If that makes your brow furrow, consider this: if you know your fellow diner hates chicken legs, you know that can be the last morsel you aim to eat - even if it's one of your favourites. In principle, if

you had full knowledge of your food rival's preferences, it would be possible to work backwards from their least favourite and identify the optimum order in which to fill your plate, according to the pair's calculations, which will appear in *American Mathematical Monthly* (arxiv.org/abs/1104.0961).

So how do you know what to select first? In reality, the buffet might be long gone before you had worked it out. Even if you did, the researchers' strategy also assumes that you are at a rather polite buffet, taking turns, so it has its limitations. However, it does provide practical advice in some scenarios. For example, imagine Amanda is up against Brian, who she knows has the opposite ranking of tastes to her. Amanda loves sausages, hates pickled onions, and is middling about quiche. Brian loves pickled onions, hates sausages, shares the same view of quiche. Having identified that her favourites are safe, Amanda should prioritise morsels where their taste-ranking matched - the quiche, in other words.

Not surprisingly, Levine and Stange found their two-person buffet strategy didn't work when they applied it to a scenario with more people. Even so, they found that rushing into grabbing favourites is not always advisable. This time, however, they modelled two general approaches: the "boorish lout" who would always pick their favourite food and the "gallant knight" who makes selections that take into account the enjoyment of others as well as their own. They found that if any of the diners act boorish, everybody ends up with a less satisfying meal than if every person acts gallantly (arxiv.org/abs/1110.2712). So it can pay to be altruistic - but not if there are any selfish diners.

Indeed, sometimes the only way to satisfy an appetite at a buffet is to pile your plate high while you can - and here's where some engineering know-how can apply.

Software engineer Shen Hongrui, who lives in Beijing, China, found a way to fit an astonishing amount of food into one dish: piles reaching up to a metre tall. Shen had noticed that patrons of the salad buffet in Pizza Hut were asked to follow the rule: "one bowl, one visit". So he worked out how to build towers from salad items, and so maximise his haul. He even, with tongue firmly in cheek, published equations, diagrams and instructions online so others could repeat the feat.

The key is to build a cylindrical tower using a base of radiating carrot sticks balanced on the bowl rim. "The foundations are very important, so choose dry and strong material," Shen advises. Then build walls of cucumber slices or fruit blocks, before filling the inside of the tower with any food items you want.

Bear in mind you may be thrown out for such mischief, though. Shen and his fellow salad architects were thwarted when Pizza Hut banned the practice in China.

So, back to our hypothetical buffet. The engineers are busy building towers while the mathematicians scribble strategies on napkins. What are the psychologists up to?

When they approach a buffet, they are more interested in spying on other people than eyeing up the food. Their findings could help explain many of the extra pounds you will inevitably pile on during the festive season.

Supersizing strategy

For example, Brian Wansink and colleagues at the Food and Brand Laboratory at Cornell University noticed that people with a high body mass index (BMI) sit on average 5 metres closer to a buffet than those with an average BMI, and 71 per cent face the food, compared with 26 per cent of people of average weight (*Obesity*, vol 16, p 1957). They were also more likely to go back for seconds. It's hardly earth-shattering news that larger people like food, of course, but with the right triggers anybody can be encouraged to gorge. Indeed, researchers at Georgia State University in Atlanta have shown that group size dramatically affects the number of calories consumed. If you are with one other person, you will eat 35 per cent more calories than if you dine alone. In a group of

eight, you're looking at a whopping 90 per cent increase (*Physiology & Behavior*, vol 51, p 121).

The gender of eating companions also influences the food people eat - but it's more likely to influence women. In unpublished experiments, Wansink noticed that if a woman is next to a man at a buffet, about 12 per cent of what ends up on her plate will be determined by what he takes. If she's next to another woman, that jumps to 44 per cent. So women are influenced by both sexes. By contrast, men's choices were unaffected by either.

Clearly then, deciding between the sandwiches and pork pies is not such a straightforward task after all. A scientific mindset can be a terrible burden at the buffet. You can only imagine the hand-wringing that goes on at dessert.

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