

2.9 A 16 minute wicked case study – our battle with obesity

In this unit we will look at a complex problem and study it using the approach and tools we have learnt so far in this chapter.

I came across an article on bloomberg.com entitled “The World Is Getting Fatter and No One Knows How to Stop It”. The title of the article caught my attention. It corresponds to the sixth change scenario we saw in our first unit where actions have been taken to improve a situation but have had little or no effect. It is a problem calling out to be explored further using some systems thinking. So, let’s get to it.

We will once again ask our three questions to help organize knowledge about the situation: What is changing? How is it changing? And why is it changing?

We can find our answer to the first question in the first paragraph of the article. Across the world there are an increasing number of people overweight or obese. The focus of our thinking is the number of overweight or obese people in the world.

The answer to our second question can be found in the first chart entitled “Humans Are Getting Heavier”: the number of overweight people has doubled from 20% to 40% of the world population in the last forty years. Someone is considered overweight if their body mass index (BMI) is over 25 whereas they are considered obese with a BMI over 30. The BMI calculates your amount of tissue mass and is computed by dividing your weight in kilograms by your height squared in meters. Your score then categorizes you as underweight, normal weight, overweight, or obese.

We now need to look through the article for answers to our third question: why is it changing?

Before we go any further it would be a good idea to improve our operational thinking about weight gain and obesity. Often a single loop or a limited set of interconnected loops capture the essential dynamic of an issue.

A quick stop by Wikipedia or some other free online source of information is generally a good place to start. According to Wikipedia, “a person generally gains weight by increasing food consumption, becoming physically inactive, or both. When energy intake exceeds energy expenditure (when the body is in positive energy balance), the body can store the excess energy as fat”. As a general rule, when we consume more calories than we expend, we put on weight.

The difference between energy input and energy output is the main driver of weight gain and obesity. We can now look for variables that either directly or indirectly cause or are affected by energy intake and energy expenditure.

The article lists a number of linear causal relationships in the second paragraph: “Countries grow wealthier and increase consumption”; “People move from rural areas to cities, where they have ready access to inexpensive, processed foods”; “Machines do work that humans once did, decreasing the amount of energy people use”; “global trade means the reach of junk food has never been greater.”

The article also highlights an increase in consumption of more calorie rich foods such as vegetable oils, meat, sugar and sweeteners and industrially made, processed foods and a fall in physical activity as more and more people live in cities and new technologies such as computers, television and cars and so on change our work, play and transit habits.

Let's list our variables. Firstly, we group together like variables. Here, "weight" and BMI can be grouped together as "excess weight", "physical activity at work, play and in transit" can be called "physical activity", "consumption" and "consumption of more calorie rich food" can be grouped together and called "consumption of calorie rich food" and "access to inexpensive, processed foods" and "the reach of junk food" can be called "access to calorie-rich food". We should rename our variables as neutral nouns. "A move from the country to cities" could be called "degree of urbanization" and "an increase in income" can simply be called "income". We can add the other variables from our article to make up our list.

We are now ready to begin drawing the systemic structure. Let's draw this central engine of weight gain for a population in the middle of our page. We will build from this core outwards towards the periphery by adding all the variables that either directly or indirectly cause or are affected by energy intake and energy expenditure.

We will use a causal loop diagram and not a connection circle to model the systemic structure. Connection circles are well suited to situations where there are less than 10 variables interacting as they get cluttered quite quickly. Causal diagramming also has the advantage of highlighting feedback loops.

Drawing a causal loop diagram is like telling a story. The best place to begin is with the main variable. In this case it is the energy balance. We then tell the story by explaining how a change in the variable is caused by or affects other variables that we introduce into our story along the way. Don't forget that as you tell the story, you are reasoning "on average". We want to see the forest and not the details of each tree.

Let's start. What is the cause of an increase in energy balance? Based on our operational thinking, it is an increase in energy intake or a decrease in energy expenditure. And what causes these two variables to change? A fall in physical activity has a negative effect on energy expenditure, all other things being equal and an increase in the consumption of calorie rich food positively affects energy intake. An increase in energy balance positively affects average weight which in turn positively affects the number of overweight people in a population. As excess weight increases, people tend to consume more calorie rich food and do less physical activity. There are now two feedback loops that we can call "Weight driven calories consumed loop" and "Weight driven physical activity loop".

There are five variables left in our list: "use of technologies for work, transit and play", "degree of urbanization", "global trade", "income" and "access to calorie-rich food". Income and access both positively influence the consumption of calorie rich food. The degree of urbanization and global trade both increase access to calorie-rich food. The degree of urbanization and the use of technologies for work, transit and play both negatively affect physical activity.

We now have a model of the worldwide rise in obesity based on the information in the article. There are no doubt a number of other factors at work. For example, experts argue the importance of physiological factors such as fat mass and metabolism. Our goal is to efficiently build a systemic understanding of a complex situation based on a news article. It is a starting point to thinking complexity.

The bloomberg.com article notes that while there are common trends, "the story is different from country to country". Let's have a closer look at a populous country that is currently battling obesity: Mexico.

I found a second article, this time on cbsnews.com entitled “Mexico takes title of “most obese” from America”. It refers to a report from the UN Food and Agriculture Organization and the UN Special Rapporteur on the right to food, so I have downloaded and read through these documents as well.

The article reports that “70 percent of Mexican adults are overweight, a third of them very much so” and that “childhood obesity tripled in a decade”.

Obesity in Mexico is a serious problem. Weight-related diabetes, heart conditions and related ailments are now amongst the main causes of death. According to a report by the UN Special rapporteur on the right to food, the Mexican Ministry of Health also expects the direct costs of obesity to rise to 5.65 billion US dollars by 2017.

The article begins by listing the same variables we found in the previous article, notably “urban lifestyle”, “rising incomes” and “myriad consumption vices”. The FAO explains that this is the result of a process common to a large number of countries across the world called a “nutrition transition” that is characterized by increasing rates of urbanization and the emergence of centralized food-processing facilities, supermarkets and fast-food restaurants.

At first view, the structure of the model we drew earlier appears to apply to Mexico. Let’s work through this second article and look for any national differences as well as additional variables and causal relationships. We will use our first model as a starting point and modify it as we go.

In the fourth paragraph the article reports that “while cutting across class lines, the crisis disproportionately hits the poor and the young, malnourishment and obesity stalking them in tandem.” We previously modeled that an increase in income led to an increase in the consumption of calorie-rich food. We were not wrong: according to the FAO the more affluent do eat fast and processed food because they are easier and less time consuming to prepare. There must also be other factors at work that specifically drive low income families gain excess weight.

Let’s add a new variable to our model called “time available to prepare meals” that negatively influences the “consumption of calorie rich food”. As families spend less time preparing meals, the consumption of calorie rich food increases, all other things being equal of course. Families living in cities spend less time preparing meals so we need to add a positive link between “degree of urbanization” and “time available to prepare meals”.

The second half of the article provides a number of new variables and causal relationships.

Firstly, the main reason lower income families develop a preference for processed foods over healthier foods, such as vegetables, fruits and fish is their relative cost.

Junk food used to be expensive, but now it is not. One cause is the spread of US fast food restaurants and junk food snacks since the Mexican economy opened in the 1990s. Now, according to the article “relatively cheap chips, cookies and sugary soft drinks pack the shelves of the convenience stores and mom-and-pop groceries that are as common here as cacti”. On the other hand, healthier foods “tend to be more expensive for the Mexican poor and working class”.

We can add three new variables called “preference for processed food over healthy food”, “relative cost of healthy food to processed food” and “number of fast food restaurants and junk food snacks”. “Preference for processed food over healthy food” positively influences the consumption of calorie-rich food, “relative cost” is linked to “preference for processed food” and the “number of fast food restaurants” positively influences “access to calorie-rich food”.

According to the UN Special Rapporteur, the increased availability of processed foods in convenience stores is in part due to government trade policies “that favour greater reliance on heavily processed and refined foods with a long shelf life rather than on the consumption of fresh and more perishable foods, particularly fruit and vegetables.”

We can add a new variable called “government actions and policies favorable to calorie rich food” and link it to “access to calorie rich food”.

The article also reports that carbohydrate and fat rich Mexican foods such as tacos, tamales and tostadas that were previously reserved for special occasions are now consumed much more regularly.

The UN Special Rapporteur explains that government agricultural policies have favored this trend as they “encourage the production of grains, rich in carbohydrates but relatively poor in micronutrients, at the expense of the production of fruit and vegetables.”

As a result, it is becoming increasingly difficult for many Mexicans to switch to a healthier diet.

We can add a new variable called “share of grains relative to fruits and vegetables in agricultural production” that negatively affects the “relative cost of healthy food to processed food” and is influenced by “government actions and policies”. The “share of grains” negatively affects another new variable called “relative availability of healthy food to processed food” which in turn influences “preferences”.

The article mentions other barriers to switching diets including the addictive nature of fat and sugar rich junk foods and the “advertising and marketing of junk food” that make and keep junk food attractive. We can show addiction as a link between “consumption” and “preferences”: the more we consume, the more we prefer it. We can label this reinforcing loop an “addiction loop”. “Junk food advertising and marketing” by the food industry drives consumer demand for an increased variety and availability of calorie-rich food. We can add a new variable called “demand for calorie-rich food” and show it as a consequence of “consumption” and advertising.

Based on our lecture of the article and its sources, the diagram is complete. But it is not finished. We have a tendency to reason in causal lines rather than loops and we can see that happening here. There are quite a few loose ends. Let’s see if we can “close our loops”. Can you see any relationships and feedback loops that were not reported in the article but seem logical? I can see at least three.

Firstly, as demand for calorie-rich food increases, the number of fast food restaurants and junk food snacks on offer should also increase. This is simply good business. We can create a positive link between “demand” and the “number of fast food restaurants and junk food snacks”. This link creates a loop that is the main driver of growth for the calorie-rich food industry. We can call this reinforcing loop “demand driven calorie-rich food on offer loop”.

Secondly, the food industry may also seek to influence government policy through lobbying activities. According to the UN Special Rapporteur this notably happened in 2010 during negotiations for a national agreement for nutritional health between a number of ministerial departments, public authorities, non-governmental organizations, unions, the media and the agri-food sector.

“Owing to the pressure of the agri-food industry, represented by Conmexico, some important tools to influence consumer behaviour, including the raising of taxes on soda drinks and foods rich in trans fats or in sugars, were not made part of the national agreement [...] The agreement

itself is a soft-policy instrument, without binding targets being set out in legislation. It locates the problem of overweight and obesity in consumers' behaviour, when in fact this problem stems from the food system as a whole."

We can create a positive link between the "number of fast food restaurants and junk food snacks" and "government actions and policies favorable to calorie rich food". This link creates a reinforcing loop that we can call "lobbying loop". The economic power of the agri-food industry gives them lobbying influence which in turn favours production and consumption of calorie-rich food which increases their power even more.

Thirdly, as the consumption and production of calorie-rich food increases, increasing competition and economies of scale puts downward pressure on the cost of processed food relative to healthy food. We can add a link between "number of fast food restaurants and junk food snacks" and "relative cost of healthy food to processed food". This link makes a reinforcing loop that we can call "cost based diet preference loop".

Our model covers a large number of factors including individual behavior, the actions of the agri-food, government policy and changes in demographics and technologies. This is **horizontal thinking** at work.

Now that we have modeled our understanding of this complex situation, we can look for leverage points. Can you see any? The Mexican government is addressing the problem. For example, it recently imposed a sugar tax on sweetened beverages that has reduced consumption of high-calorie sodas.

As system thinkers we know that to change behavior we have to influence the systemic structure at the bottom of the iceberg. In the case of obesity, this means conjointly acting on behavioral, industrial and policy variables. As the FAO points out

"Every aspect of the food system must align to support good nutrition; any single intervention in isolation is therefore unlikely to have a significant impact within such a complex system. Interventions that consider food systems as a whole are more likely to achieve positive nutritional outcomes"