# Developing A Provisional Explanation For A Single Event Or Symptom

When you begin looking for an explanation you need to beware of hasty assumptions and conclusions, otherwise you will conscientiously be solving what *didn't* cause the problem! What you need is a reliable method for sorting the probable reason from the plausible possibilities. In scientific research, we develop multiple alternative explanations (we call them hypotheses). For example, if your company's sales are 20% lower this quarter, possible explanations could be:

- The economy has fallen into yet another recession;
- Your largest client went bankrupt;
- Your top salespeople left;
- The previous quarter was unusually high, so this one looks worse in comparison;
- One of your competitors launched an amazing new product or service;
- Your products/services have been criticised recently in the news media;
- and so on.

You test the validity of the various competing hypotheses by asking questions such as:

- Which of these possible explanations are inconsistent with the data you already have?
- If this explanation is correct/true, then what else would you expect to observe?
- Which observations would be inconsistent with one or more of your possible explanations and thereby prove they are incorrect?

For example, if the explanation that the economy has fallen into another recession is correct, then *all* businesses would be suffering lower sales and the stock-market would have fallen. If stock prices have not fallen and only your business is suffering, then the hypothesis about the economy could be eliminated as incorrect. After you have eliminated as many explanations as you can with the data available, you would continue by seeking further information concerning whichever hypotheses remain.

Eventually, you might decide that the sales drop was caused by media criticism of your company's products/services. So you would dig deeper to discover what's happening with your products/services.

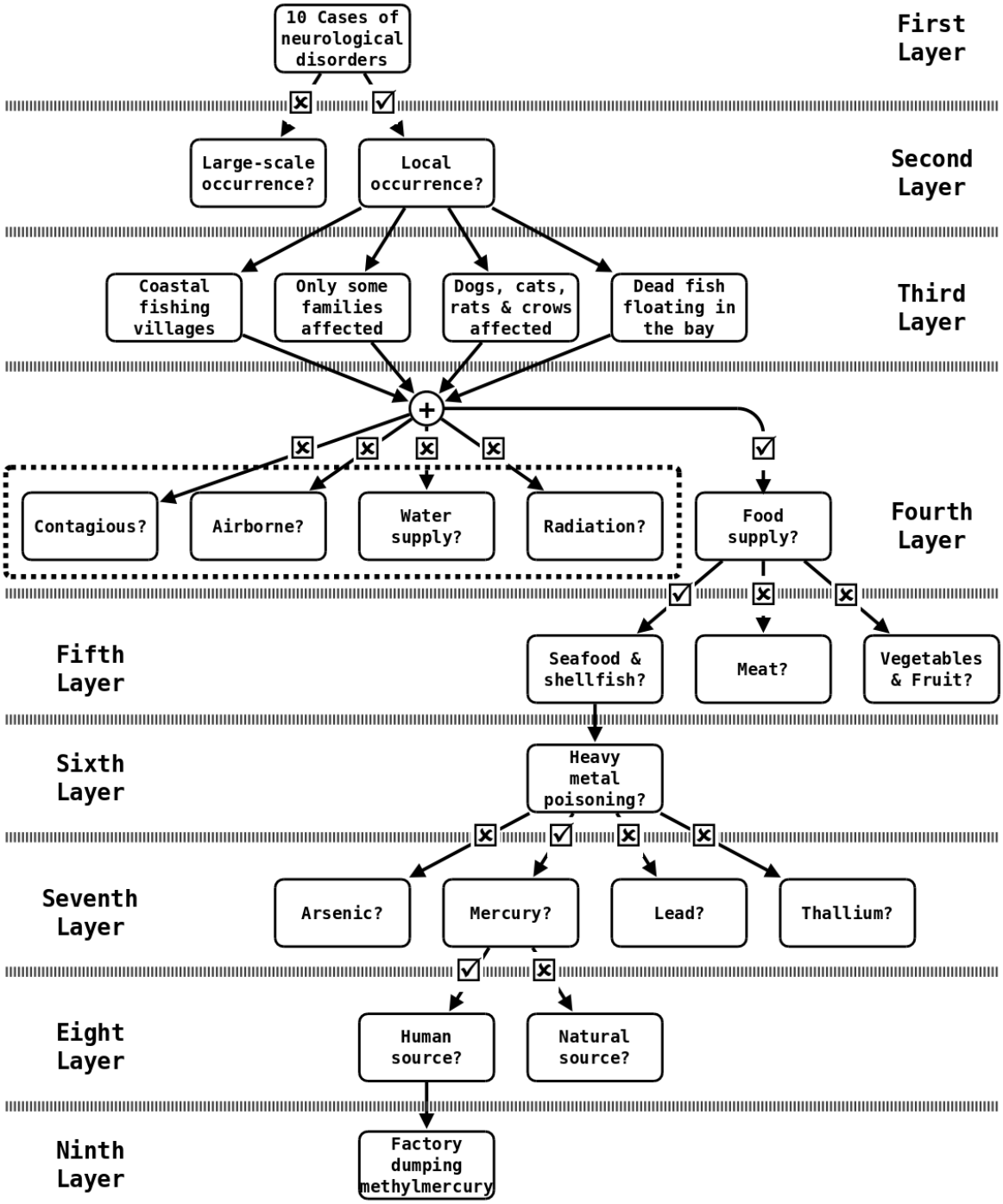
To illustrate this process, let's look at the example of Minamata Disease that was first noticed in Japan in 1956.

## First Layer – Initial Situation

It began with a five year old girl and her sister who were admitted to hospital because they had difficulty speaking and walking and they were suffering convulsions. Within a month, eight further patients, all neighbours of the two girls, were admitted to hospital with the same symptoms. The doctors became concerned about an epidemic of a new contagious neurological disease.

Because of the doctors were concerned about a possible epidemic, their first questions concerned the scope or scale of events:

- "How widespread is this?" or "Is this a large-scale or local outbreak?"




## Second Layer

If this was a widespread or large-scale outbreak, the doctors would have expected to see cases from across a larger area of Japan or even the world. This prediction was not observed and the doctors eliminated this possibility.

If this was a local outbreak, then the doctors would expect to see cases from a single region, which is what they observed. The doctors continued drilling-down from this possibility.

Note: Each of the two possibilities made *different predictions* about what should be observed if it was correct.

## Third Layer

Given that they were considering this to be a local outbreak, what had been happening locally? There were reports of:

- Patients from coastal villages around Minamata Bay;
- Only some families were affected;
- Dogs, cats, rats and crows were affected; and
- Dead fish had been reported floating on the surface in the bay.

Note: The ⊕ symbol in the diagram indicates this *combination of factors* feeding is taken collectively.

## Fourth Layer

What was the source of the condition? Was it airborne, water-borne or in the food? Was this some kind of radiation poisoning? Was it a contagious disease?

The possible causes (contagious, airborne, water-borne and radiation) are shown in a dashed box because all of these would predict widespread symptoms among the local population. The fact that only some families were afflicted was *inconsistent* with these possibilities. The fact that dogs, cats, rats and crows were also exhibiting the same symptoms was inconsistent with it being a contagious disease, because a disease that affects five different species is unknown.

The only explanation that couldn't be eliminated was something in the food. This was consistent with only some families being affected, because not all families have the same diet. It also explained the affliction of dogs, cats, rats and crows which were all known to eat food scraps.

## Fifth Layer

Since the source was now considered to be dietary, it was necessary to look at the diets of the families that were afflicted. What did they eat that was in common? What were the differences in diet between the families that were and weren't afflicted?

These comparisons and contrasts indicated that eating seafood & shellfish was the critical dietary factor. The facts that the patients lived in coastal villages around the bay and the presence of dead fish floating in the water were also consistent with this possibility.

Note: Chemically testing the meat, vegetables and fruit would also serve as additional confirmation that these dietary sources should be eliminated.

## Sixth Layer

What was the contaminant in the seafood & shellfish? It could have been pesticides, fertiliser, chemical compounds from a factory, just about anything. At this point in the investigation, they caught a lucky break when a visiting British neurologist noticed that the symptoms were characteristic of heavy metal poisoning.

## Seventh Layer

Based upon the symptoms, the most likely possibilities were arsenic, mercury, lead and thallium.

A consideration of the detailed symptoms as well as tests (blood, urine, hair, nail-clippings, ...) revealed it was mercury poisoning.

## Eight Layer

What was the source of the mercury? Was it from a human source or a natural/geological source?

If the source was natural/geological, we would expect this to be a long-term and gradually developing condition. This explanation would also require the presence of geological formations that were rich in mercury. And finally, the form of mercury in the patients would be in its elemental form. None of these predictions were correct.

In fact, the floating dead fish began appearing in the early 1930s, which is too sudden for it to be consistent with a long-term geological process. And the form of the mercury that was poisoning the people, animals and fish was methyl-mercury, which is not naturally occurring.

## Ninth Layer

And there was a factory nearby that used methyl-mercury in its processes.

In this article, our example was a situation where a single event or issue was sufficiently important to trigger action. The article entitled *Developing A Provisional Explanation For A Collection Of Symptoms* shows a different technique for handling a collection of smaller and seemingly unrelated issues.

"Nothing is more dangerous than an idea when it is the only one you have." –
Emile Chartier

"The thing is, it's very dangerous to have a fixed idea. A person with a fixed idea will always find some way of convincing himself in the end that he is right." –
Atle Selberg

"Convictions are more dangerous enemies of truth than lies." –
Friedrich Nietzsche

This material has been adapted from:

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