



## AMC TECHNICAL BRIEFS

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### Random sample

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Chemical analysis is undertaken to help us make decisions about particular masses of a test material. Does this shipment of peanuts fall within the permitted limit for the concentration of aflatoxins? What should I pay for this batch of tin ore? How much phosphate fertiliser should I apply to this field? Can we release today's effluent stream into the river? Is the iridium content of this geological layer higher than that of the adjacent beds? In instances like these we need information about a large amount of test material (the target), but we can only remove for analysis a much smaller amount, the *sample*.

As a first step in the analysis process, we must decide how to obtain a representative sample from the target. This is where sampling bias comes in. Sampling bias is the difference between the properties of the sample and the properties of the target. It is important to understand what sampling bias is and how it can be minimised.

### The meaning of sampling bias

Bias is a word that has many meanings. In this context, it means the difference between the properties of the sample and the properties of the target. If the sample is representative of the target, then there is no bias. If the sample is not representative, then there is bias.



Geological outcrop showing different rock layers and mineral veins. The sample is taken from one of these layers.

There are two main types of sampling patterns: random and systematic. Random sampling is a method of selecting samples from a population without any specific pattern or rule. Systematic sampling is a method of selecting samples from a population by following a specific pattern or rule.

### Random and systematic sampling patterns

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$a_1, a_2, \dots, a_n$  are called the elements of the set.

Example:  $\{1, 2, 3, 4, 5\}$  is a set of 5 elements.

## The pros and cons of randomisation

Pros:

- F. 1A) It is a good way to ensure that the treatment groups are comparable.
- F. 1B) It can help to reduce bias by ensuring that all participants have an equal chance of receiving each treatment.
- F. 2A) Treatment allocation can be randomised to reduce bias.
- F. 2B) Randomisation can help to reduce selection bias by ensuring that all participants have an equal chance of being included in the study.

