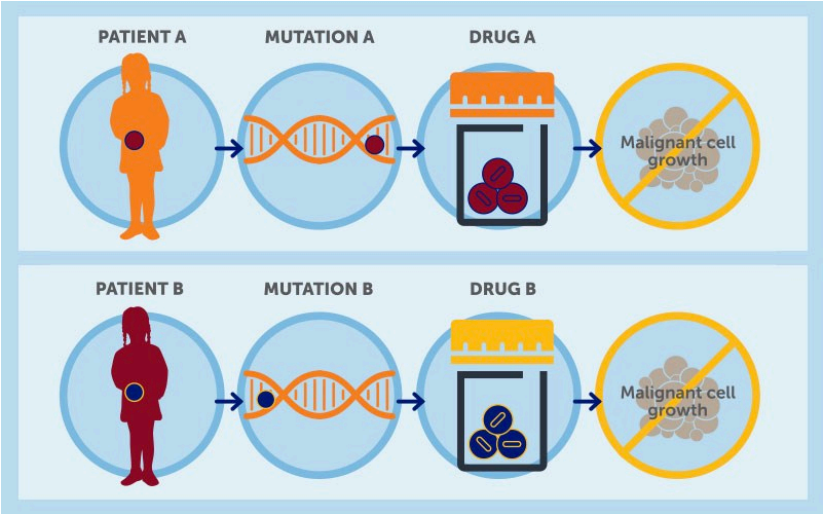
# STATISTICAL SIGNIFICANCE

*Precision (or personalized) medicine optimizes efficiency and therapeutic benefit for particular patients, frequently using genetic and clinical data. Statisticians are vital at all stages to get safe, effective treatments to patients. Below are examples illustrating several uses of statistics for the development of personalized preventative and curative care in cancer.*

## Personalized Cancer Prevention & Treatment

### IDENTIFYING RISKS:

Genetic makeup, environmental factors, and lifestyle frequently affect one's susceptibility to disease. Data collected from observational studies and experiments enable statisticians to identify factors that make cancer development more likely. In children with a genetic predisposition to cancer, statistical models have been developed to predict the age of tumor onset. Accurate predictions enable young children to forego unnecessary traumatic cancer screening procedures.




*Personalized medicine uses the genetic and clinical profile of a patient to identify the best treatment options. Statistics is required to develop accurate predictive models in the face of uncertainty. Source: Boston Children's Hospital.*

### EARLY DETECTION:

Cancer treatment is frequently significantly more successful when tumors are identified early, especially before they can spread throughout the body. However, a growing area of research is focusing on **cancer prevention**, which relies on detection so early that malignancy has not even developed yet. Tools like the University of Toronto's "cancer cell observatory" are powered by statistics: they allow researchers and clinicians to observe the progression of cancerous growth at a single-cell level. This precision and efficiency makes new levels of tumor detection possible, and has the potential to prevent thousands of cases of cancer every year.

### TARGETING TUMORS:

Cancer is not just one disease: there are over 200 different types of cancer. Furthermore, every human body is a unique combination of genetic and environmental factors and treatment outcomes are highly variable. Statistics quantifies this uncertainty and identifies treatments that work best for a particular patient, given their genetic profile and clinical history. Models of drug response can mitigate unnecessary prescriptions and substantially increase survival rates.

### MONITORING PROGRESS:

The treatment and recovery process in cancer requires rigorous monitoring of patient health. Statistical models recognize outliers - unusual responses to treatment - thereby aiding rapid and effective adjustment. Prediction tools help doctors recommend the optimal frequency of future check-ups once patients enter remission.

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