



جامعة المستقبل  
AL MUSTAQBAL UNIVERSITY

## College of Science Department of Intelligent Medical Systems

### Lecture\_Lab#4

### Sample Space and Events in Medical Probability

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## 1. What is Probability in Medicine?

Probability helps us **predict outcomes** when we deal with uncertainty—like test results, disease detection, or treatment responses.

In medical systems, probability helps answer questions like:

- What is the chance a patient tests positive?
- What are all possible outcomes for a group of patients?

## 2. Random Experiment (تجربة عشوائية)

A **random experiment** is something we do where the outcome is not known in advance.

### Example:

A COVID test on one patient

→ Possible results: Positive (P), Negative (N)

## 3. Sample Space (الفضاء العيني)

This is the list of **all possible outcomes**.

 Example: 2 Patients Getting Tested

Each patient can be Positive (P) or Negative (N)

```
Sample Space S = {  
    ('P', 'P'), # both positive  
    ('P', 'N'), # patient 1 positive, patient 2 negative  
    ('N', 'P'), # patient 1 negative, patient 2 positive  
    ('N', 'N') # both negative  
}
```

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## . Events (الحدث)

An **event** is just a subset (جزء) of the sample space.

We define events based on what we're interested in.

```
Event A = {
  ('P', 'P'),
  ('P', 'N'),
  ('N', 'P')
}
```

## 5. Complement of an Event (A')

This means: all outcomes that are **not** in Event A.

```
A' = {
  ('N', 'N') # both negative
}
```

## 6. Another Event: Patients with the Same Result

```
Event B = {
  ('P', 'P'),
  ('N', 'N')
}
```

## ◆ 7. Set Operations in Medical Terms

Operation	Meaning	Result
$A \cap B$	Both events happen	{{('P', 'P')}
$A \cup B$	Either or both happen	{{('P', 'P'), ('P', 'N'), ('N', 'P'), ('N', 'N')}} (full space)
$A'$	Not A	{{('N', 'N')}