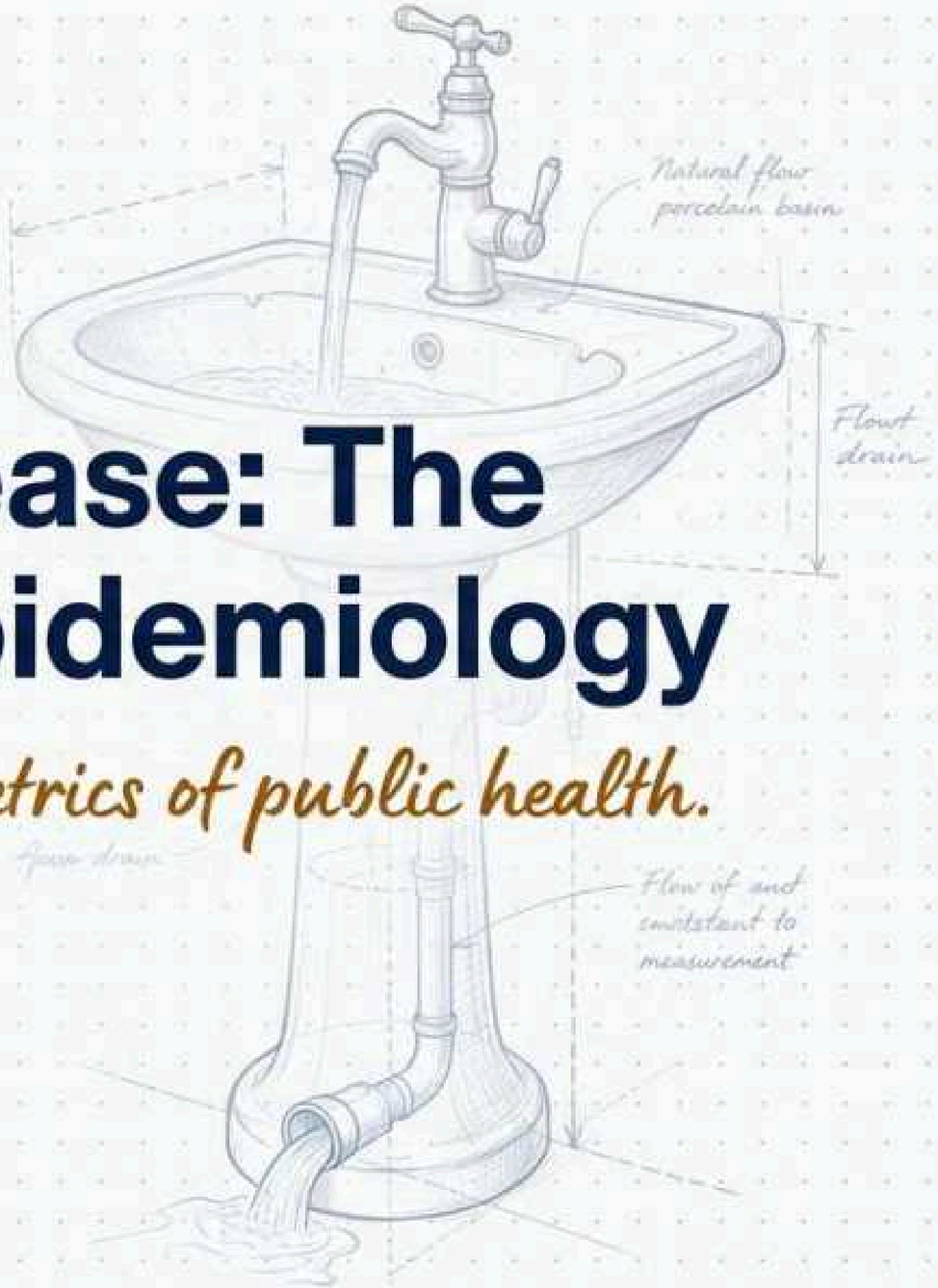
Measuring Disease: The Architecture of Epidemiology

Mastering counts, rates, and the metrics of public health.



Why raw counts fail.
200 cases mean entirely different things in a small village versus a sprawling metropolis.

¶ 1.1

Just a count

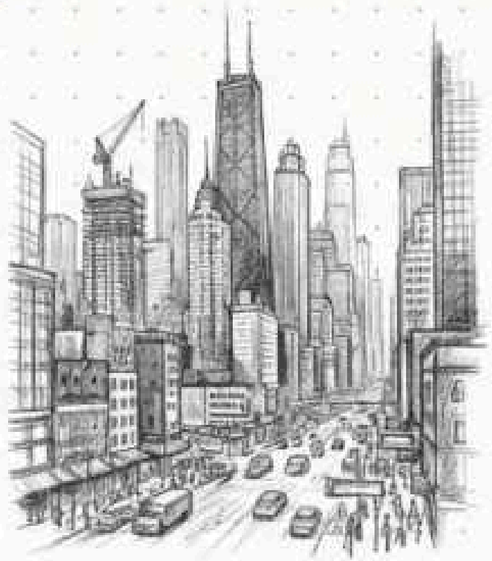
Number of Cases

Population at Risk

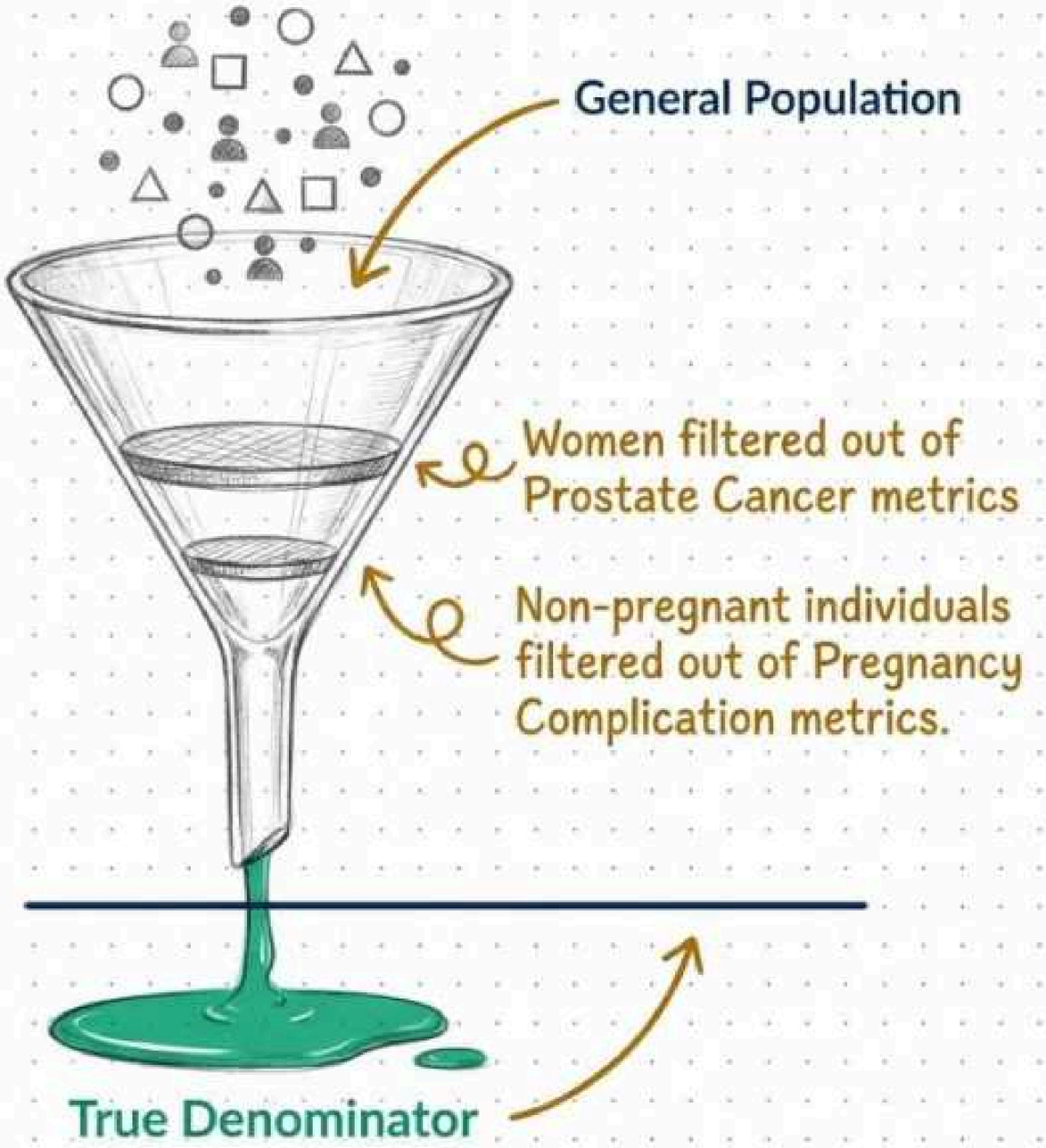
Period of Time

The context that creates a Rate



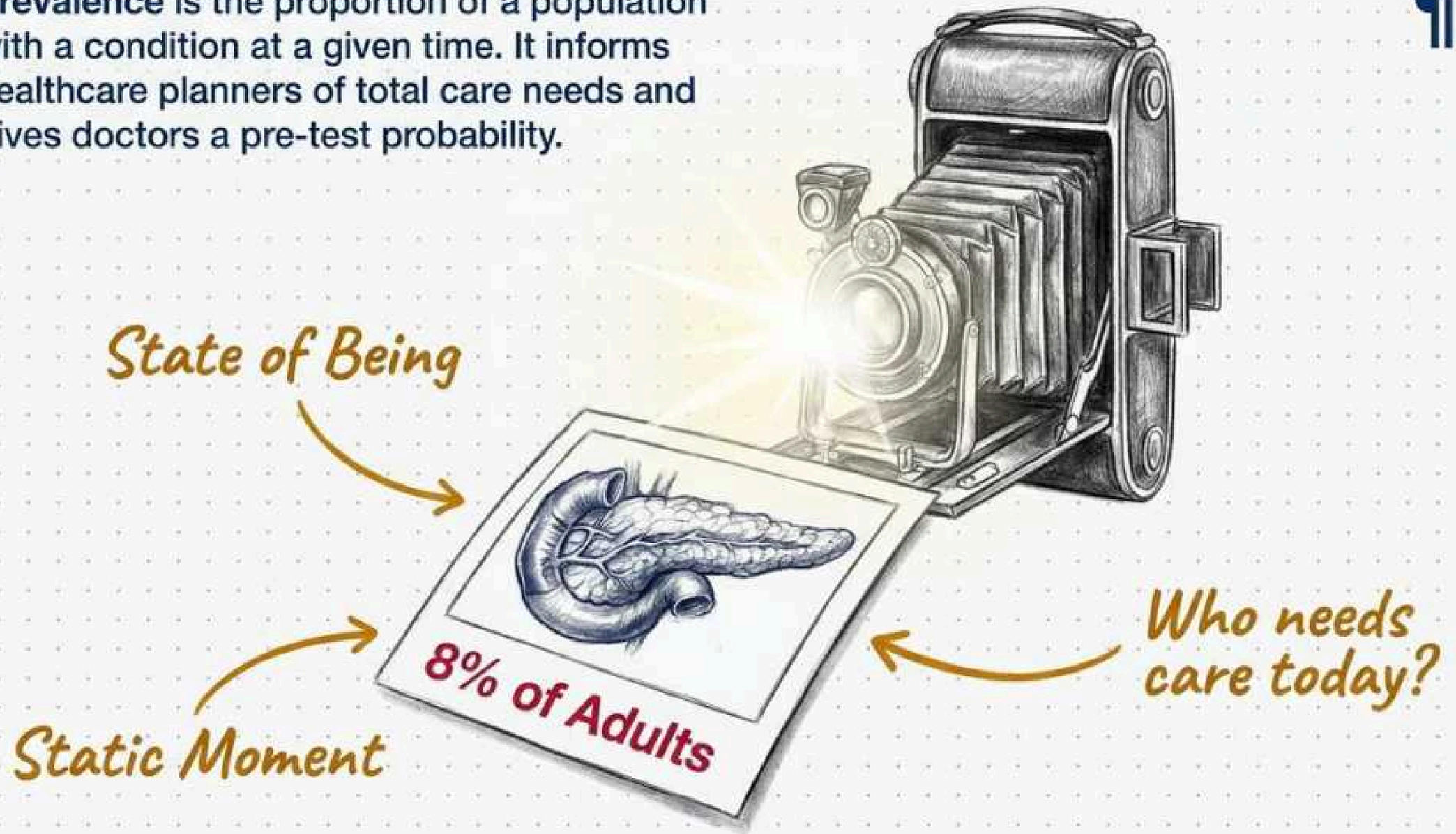


A wrong denominator yields a wrong rate, regardless of an accurate count. The population at risk must strictly include only those who could develop the condition.



¶ 1.3

Prevalence is the proportion of a population with a condition at a given time. It informs healthcare planners of total care needs and gives doctors a pre-test probability.

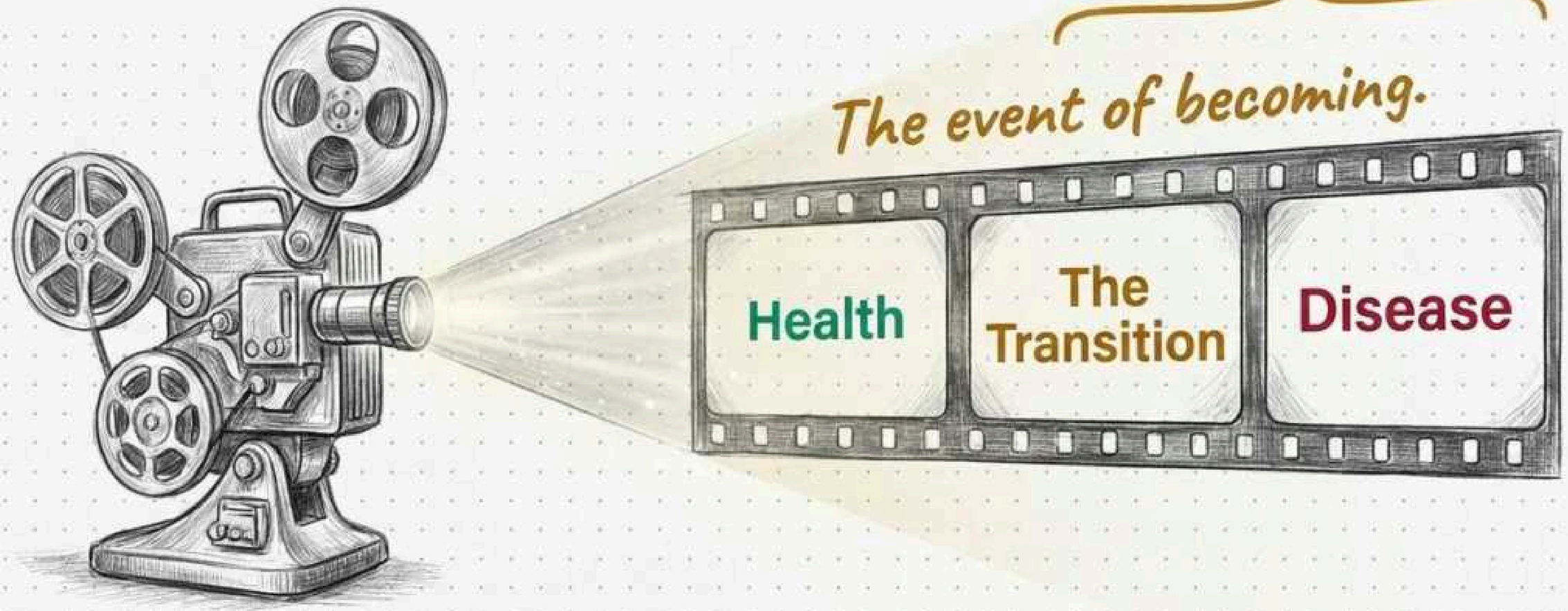


Incidence measures new cases arising over time in an initially healthy population. It is the superior metric for studying the root causes of disease.

¶ 1.4

Crucial for studying causes.

The event of becoming.



Incidence splits into Cumulative Incidence (a set period) and Incidence Rate (accounting for varying follow-up times).

Gantt Chart of Health

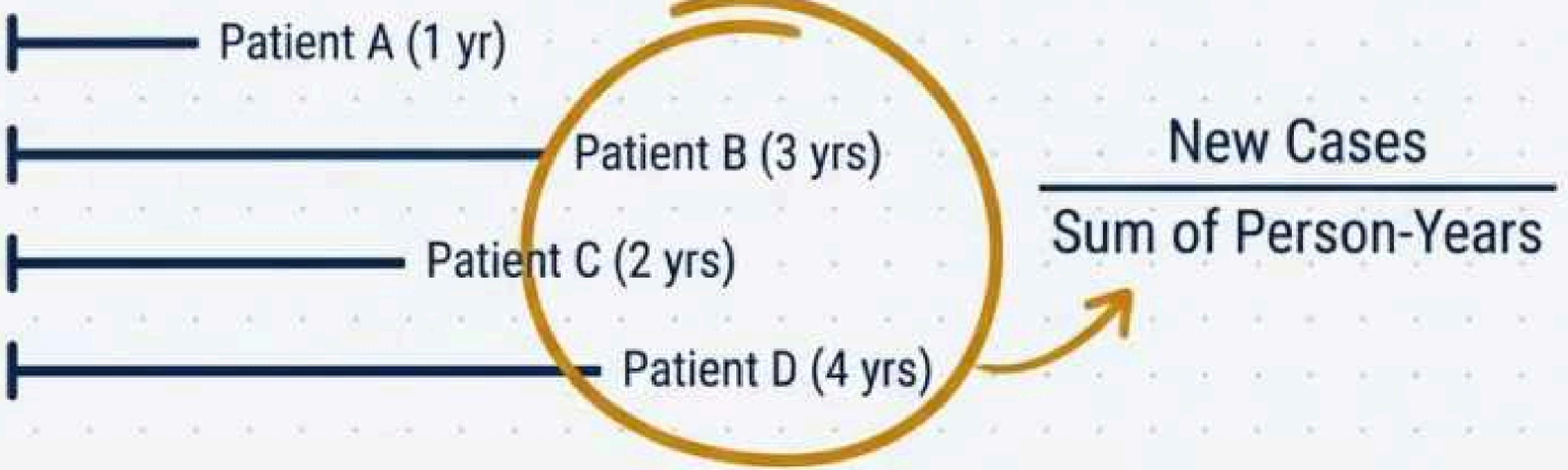
Cumulative Incidence

Proportion over a set period.

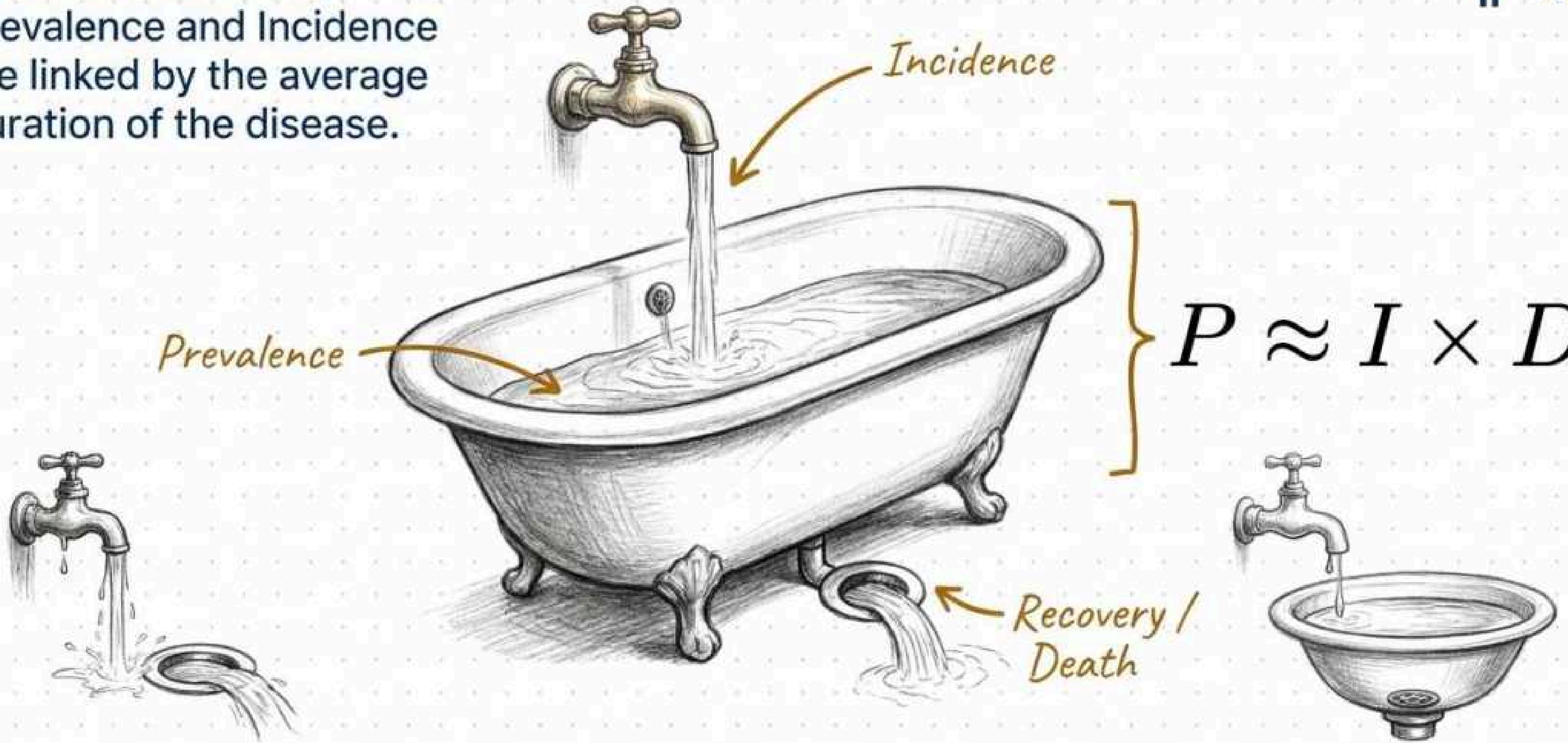


Incidence Rate

Total Time = Person-Years.



In stable conditions, Prevalence and Incidence are linked by the average duration of the disease.

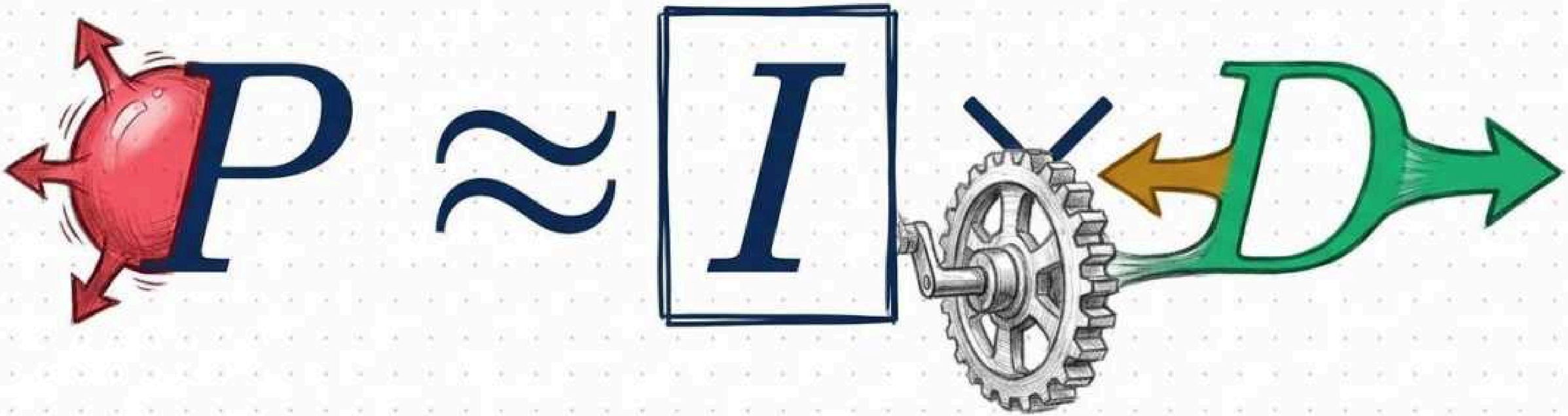


$$P \approx I \times D$$

The Common Cold:
High I, Low D = Low P

Chronic Conditions:
Modest I, High D = High P

A rising prevalence is not always a failure. When chronic treatments prolong life without curing, the metric inevitably rises.

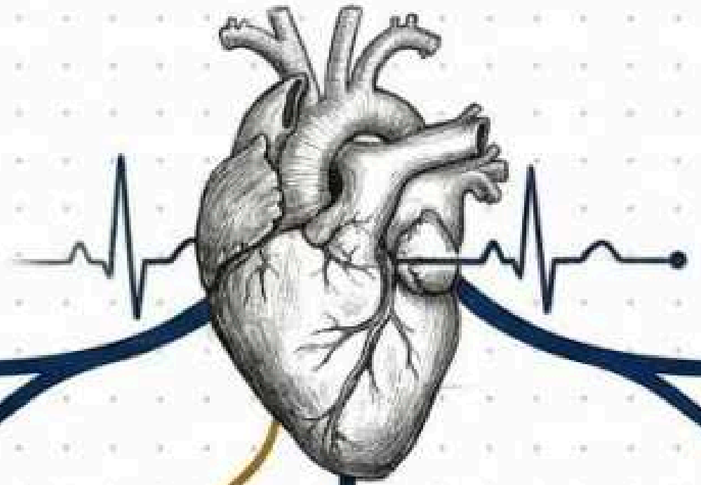


Nobody is catching it more, they are just surviving longer.

Mortality measures capture death. Infant mortality acts as a crucial barometer for a population's overall health.

Architectural Tree of Mortality

¶ 1.8



Mortality Rate

Overall burden

$$\frac{\text{Total Deaths}}{\text{Entire Population over a Period}}$$

Case Fatality Rate

Severity indicator

$$\frac{\text{Deaths from Disease X}}{\text{People WITH Disease X}}$$

Restricted pool

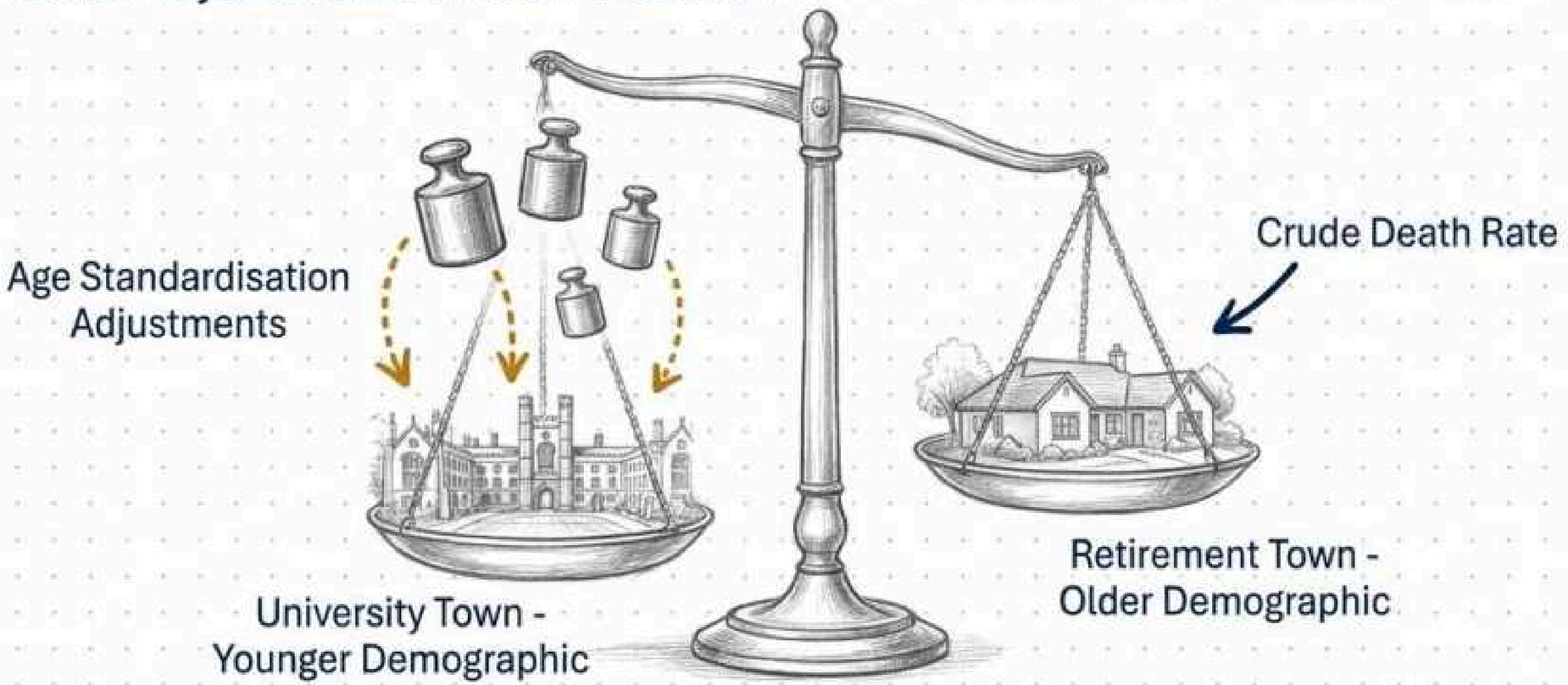
Infant Mortality

Future health

$$\frac{\text{Deaths in First Year of Life}}{\text{Total Live Births}}$$

The gold-standard indicator of overall population health.

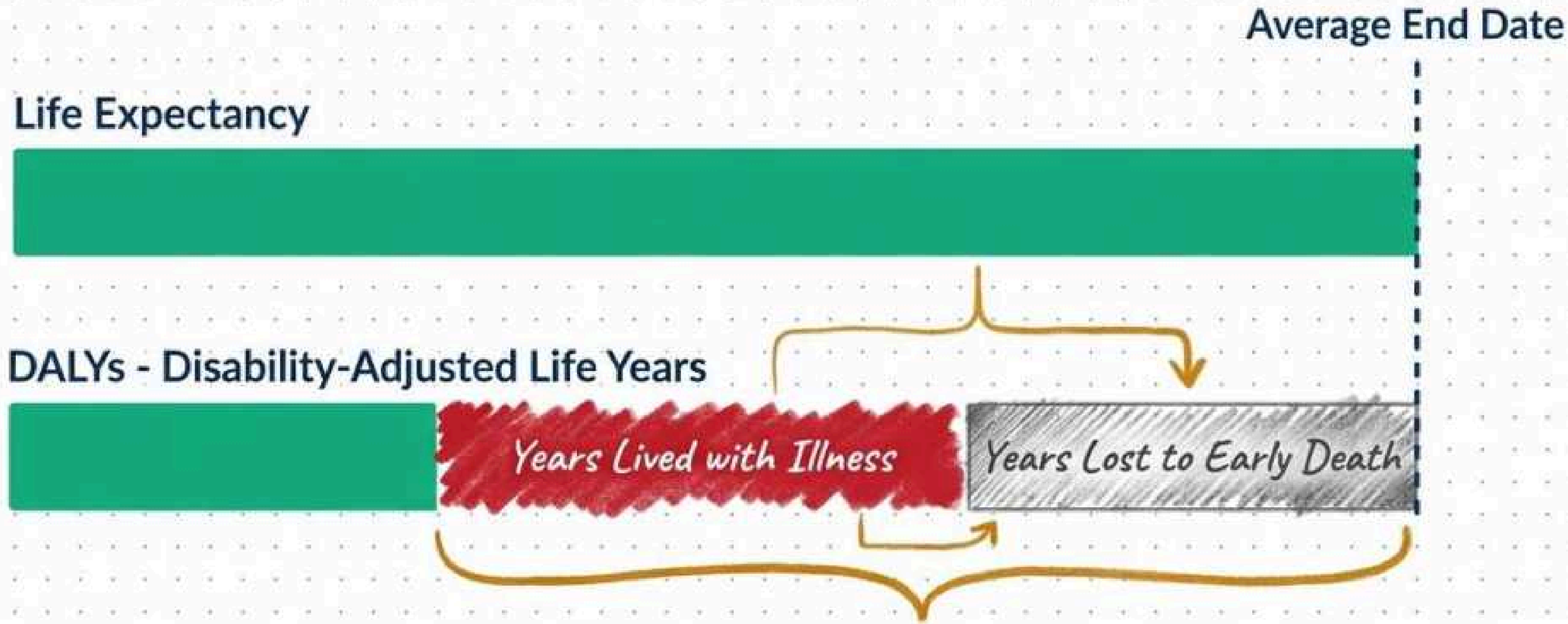
Comparing crude rates between populations is misleading due to differing age structures. Standardisation adjusts to a common baseline.



Levels the scale so comparisons reflect true health, not just calendar age.

Life expectancy summarises mortality into a single figure. DALYs capture the total burden by adding the weight of illness to the tragedy of early death.





Diagnostic Table of Disease Measurement

	Numerator	Denominator	Time Dependency	Primary Clinical Use
Prevalence	Existing Cases	Total Population	Static Snapshot	Healthcare Planning
Cumulative Incidence	New Cases	Initially Healthy Group	Set Period	Total Risk Assessment
Incidence Rate	New Cases	Sum of Person-Years	Variable Follow-up	Root Cause Analysis
Mortality Rate	Total Deaths	Total Population	Set Period	Population Barometer



Next Up: Study Design & Causation.