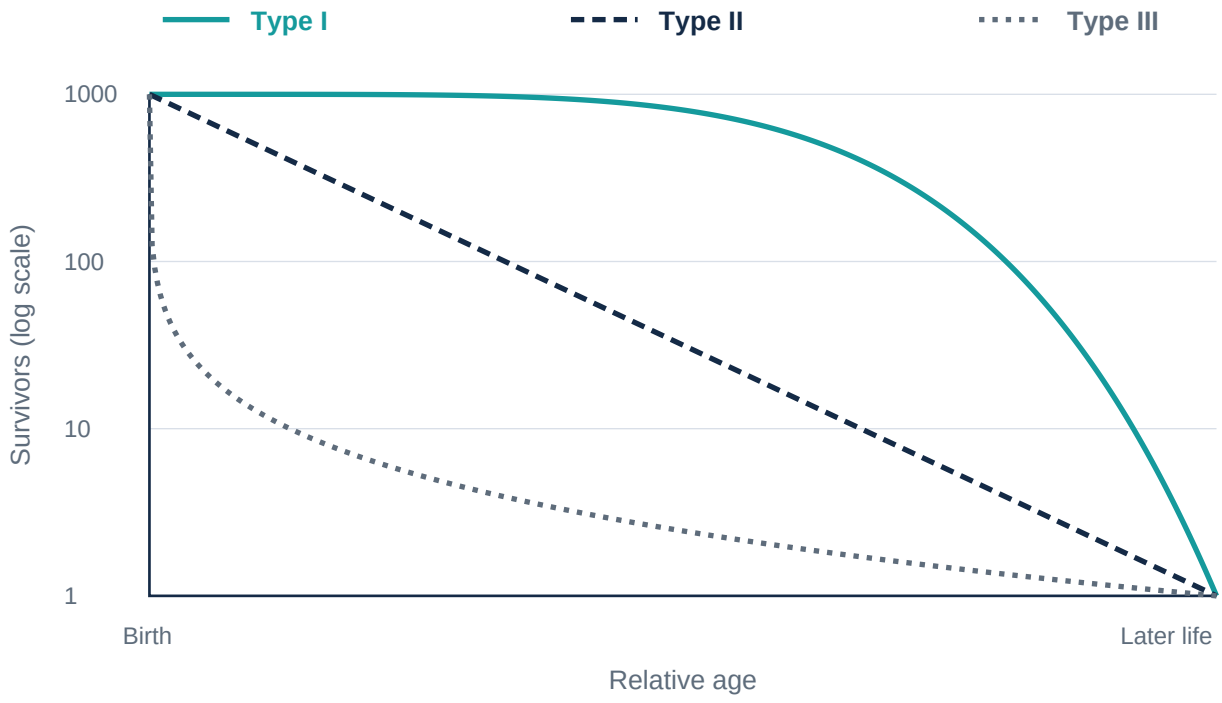
Read survival across a lifetime

A cohort is a group born during the same period. A survivorship curve tracks how many, or what fraction, of that original group remain alive as they age.

1. COMPARE THE TIMING OF MORTALITY



Illustrative curves, each starting with 1,000 individuals. Age is normalized for comparison; the lines are not measurements from named species.

2. READ THE AXES BEFORE THE SHAPE

Equal vertical steps here are tenfold changes: 1,000 to 100 to 10 to 1. A straight Type II line on a logarithmic scale means a constant proportional mortality risk, not the same number of deaths at each age.

A tracked birth cohort cannot gain members through new births. Its survival count stays level or falls; this is not a graph of the whole population growing over calendar time. Zero survivors cannot be shown on a logarithmic axis.

Cohorts and survivorship: College Board, ERT-3.C.1.
Survivorship curves and life tables: OpenStax, Biology 2e 45.1.

Scope: College Board AP Environmental Science CED, Topic 3.3, p. 67.

Three patterns, not three rigid boxes

Describe when mortality risk is greatest, then use reproductive traits to help explain the pattern. A curve alone does not prove the cause of death or the amount of parental care.

1. MATCH SHAPE TO AGE-SPECIFIC RISK

TYPE I

Most survive early and middle life; mortality rises strongly in old age.

Common example: humans and many large mammals.

TYPE II

The chance of dying over equal age intervals is approximately constant.

Often illustrated by some bird populations.

TYPE III

Mortality is high early in life; those that survive have lower risk later.

Common examples: oysters and many seed-producing plants.

2. CONNECT TO K- AND r-SELECTION

Greater investment in relatively few young can improve juvenile survival and is often associated with Type I. APES also links K-selected species with Type II, while r-selected species commonly show Type III: many offspring are produced, but only a small fraction survive early life.

3. USE THE PATTERN AS EVIDENCE, NOT A GUARANTEE

Real populations can combine patterns or shift with conditions. Early mortality might reflect predation, food shortage or other hazards. Parental care can help, but it does not remove all juvenile deaths or prevent aging. Type III survivors are not immortal.

Curve types and examples: OpenStax, Concepts of Biology 19.1.
Connections to reproductive strategy: College Board, ERT-3.C.2.
Life-history strategies form a continuum: OpenStax, Biology 2e 45.4.

Scope: College Board AP Environmental Science CED, Topic 3.3, p. 67.

Choose the right denominator

Survivorship from birth and survival through one age interval answer different questions. Use the original cohort for the first; use those alive at the interval's start for the second.

1. FOLLOW ONE COHORT

Age (years)	Number alive	Percent of original cohort
0	1000	100%
1	200	20%
2	160	16%
3	128	12.8%

Invented counts; all deaths are recorded and no individuals are lost to follow-up.

2. SAME COHORT, TWO DIFFERENT PERCENTAGES

Alive at age 2, out of the original 1,000:

$$\frac{160}{1{,}000} \times 100 = 16\%$$

Survived age 1 to 2, out of 200 alive at age 1:

$$\frac{160}{200} \times 100 = 80\%$$

From birth to age 1, 80% die. From age 1 to 2, only 20% of those still alive die. That higher early risk supports a Type III-like pattern over the ages observed; later-life data could reveal additional changes.

3. CONSTANT RISK DOES NOT MEAN CONSTANT DEATH COUNTS

A separate Type II example loses 50% each year: 1,000 -> 500 -> 250 -> 125. The deaths are 500, then 250, then 125. Equal proportional losses make a straight line on a log scale, but a curved decline on a linear scale.

Age-specific survival and mortality calculations: OpenStax, Biology 2e 45.1.
Population survival patterns: OpenStax, Concepts of Biology 19.1.

Scope: College Board AP Environmental Science CED, Topic 3.3, p. 67.