



## Population Dynamics

hhmi | BioInteractive

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Student Worksheet

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### INTRODUCTION

In the [Population Dynamics](#) Click & Learn, you'll explore a powerful tool for learning about populations: mathematical models. As you'll see by doing the Click & Learn and this activity, you can use models to answer questions, solve problems, and make predictions about all kinds of populations — from bacteria in your body, to wildlife across the world, to our own human populations.

### PART 1: Introduction to Population Dynamics

Open the [Population Dynamics](#) Click & Learn and read through the introduction on the first page.

1. Describe a specific question or problem related to population dynamics that interests you.

I would be curious about the growth and sustainability of the human population in the long term.

2. Do you think the question or problem you described could be investigated using a mathematical population model? Why or why not?

We could likely use the demographic transition model as it measures birth and death rates along with carrying capacity.

### PART 2: Exploring the Exponential Growth Model

Open the "Exponential growth model" tab and read the "Introduction" section.

3. The end of the "Introduction" describes how you could use a continuous-time, exponential growth model to simulate an *E. coli* population growing in a lab. Describe another specific population and situation that you could simulate with this type of model.

Other bacteria, populations in recovery from a disaster, or populations in ideal conditions for reproduction.

4. Complete the following table to explain the *biological* meanings of the symbols in the exponential growth model. For each explanation, give a specific example using the population you described above.

Symbol	Biological Meaning	Specific Example
$N$	The number in the population	how many bacteria are in the population
$t$	Time we are using as a measure	1 day
$dN/dt$	The change in population size over the change in reproduction time	In one day, there was an increase from $x$ bacteria to $y$ bacteria
$r$	Rate of reproduction	1.1 bacteria per minute.
$N_0$	Initial population	There were initially $z$ bacteria

5. Both  $dN/dt$  and  $r$  are types of growth rates. What are the differences between them?

While the first represents population growth rates as a whole,  $r$  is based more in birth/death rates per

# Population Dynamics Answer Key

**Robert Raymond Christian, Food and  
Agriculture Organization of the United  
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