

Reproductive rate in population ecology ... and academia

[from Scott Freeman et al. (2014), *Biological Sciences*, 5th edition]

Net reproductive rate (R_0)

- Verbal definition: the growth rate of a population per generation; equivalent to the number of female offspring that each female produces over her lifetime
- Mathematical definition:

$$\text{Net reproductive rate: } R_0 = \sum_{i=0}^x \frac{\text{Sum of all ages}}{\text{Survivorship at age } x} \frac{\text{Fecundity at age } x}{m_x}$$

- (1) What is the range of possible values for R_0 ?
- (2) For which value(s) of R_0 will the population size decrease?
- (3) For which value(s) of R_0 will the population size stay constant?
- (4) For which value(s) of R_0 will the population size increase?

[from Navid Ghaffarzadegan et al. (2015), “A note on population growth in biomedical sciences,” *Systems Research and Behavioral Science* **32**: 402-405]

In academia, R_0 can be defined as “the mean number of new PhD’s that a typical tenure-track faculty member will graduate during his or her academic career.”

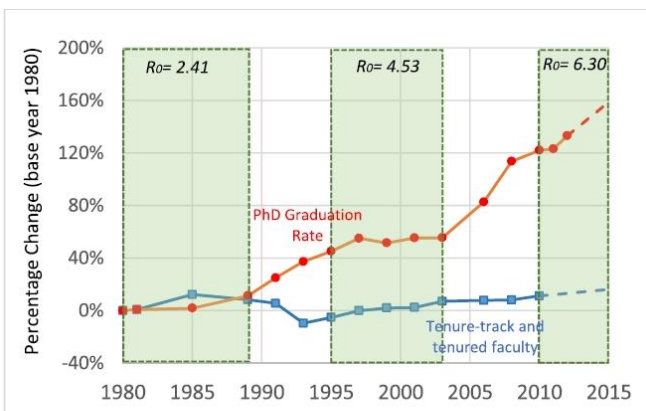


Figure 1 Change in number of tenure-track faculty members and PhD graduation rate in biological and medical sciences, and estimated R_0 in three time intervals²

- (5) What does this graph show, overall?
- (6) Do the R_0 values shown in the graph dictate the growth rate of the “population” of biology faculty? Why or why not?
- (7) Based on the information you currently have, what predictions would you make about biology faculty searches? For example, consider:
 - Number of applicants per position
 - Level of experience of successful applicants
- (8) If time permits: Do you think there is such a thing as an optimal R_0 ? If so, what additional information (if any) would help you decide on an optimal value?