Continuous age
(conceptual)

vs.

Discrete age
(data)

m

1

age

$\rightarrow$

% surviving

1

0.9

$e_0 = \dfrac{Area}{starting\ level}$

age

50

$e_{50} = \dfrac{Area}{starting\ level}$
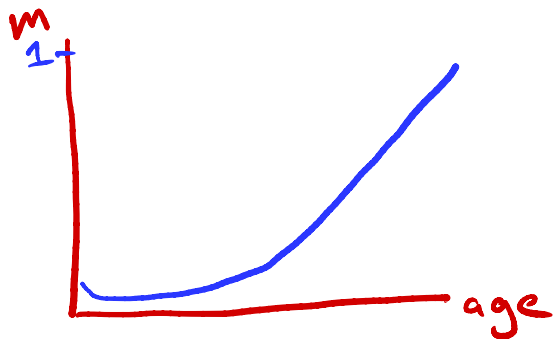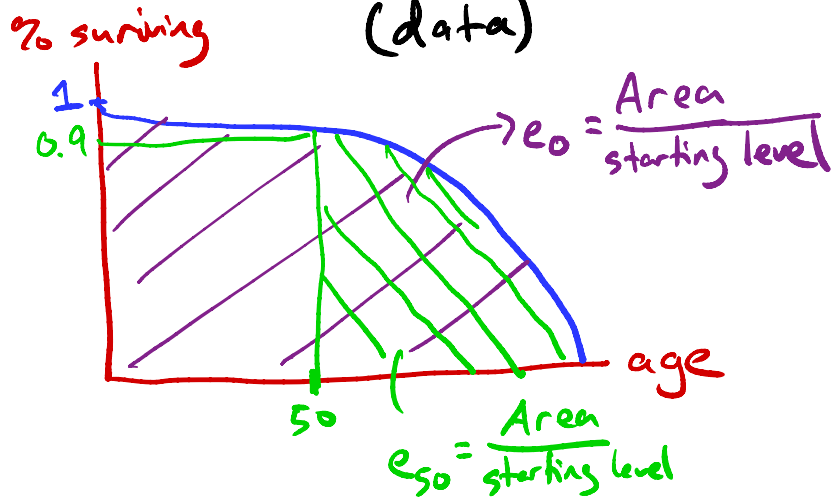
In discrete setup...

Pr[die before $x+1$|survive to x] = q_x

Pr[survive to $x+1$|survive to x] = $1 - q_x$

Pr[survive to $x+n$|survive to x] = $(1-q_x)(1-q_{x+1})\cdots(1-q_{x+n-1})$

Pr[survive to age 3] = $(1-q_0)(1-q_1)(1-q_2)$

Midterm topics

1. Population growth in long run
   - Demographic Balancing Eq
   - Malthus
   - Demographic Transition

2. Mortality
   - Stages of mortality decline: nutrition, public health, med
   - CMT, age-specific, age-standardized rates
   - Life table: $m_x \rightarrow l_x \rightarrow e_x$
     mortality $\rightarrow$ survival $\rightarrow$ life expectancy

③ Disease

- cause-specific mortality rates
- morbidity → incidence, prevalence
- ALYs: combine morbidity + mortality

④ Fertility

- fertility transition
- CBR, GFR, ASFR, TFR
- CEB_x, CFR