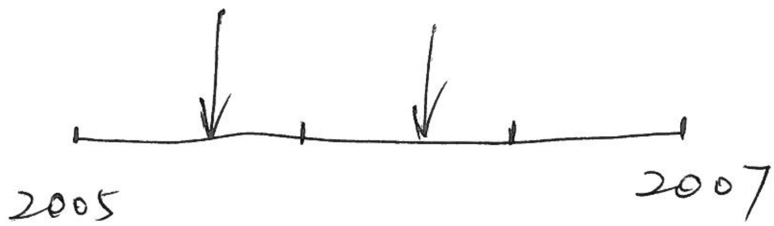
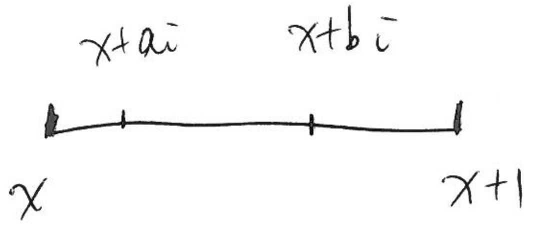
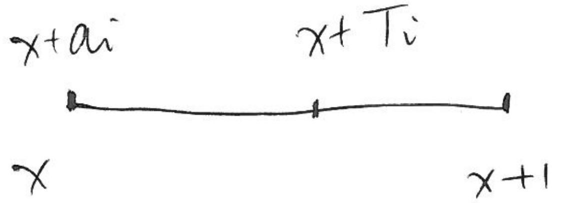
Lecture week 12

E_x is generally not observed because every one has different birthday.





individual 1



individual 2

$\mu_x = \frac{\delta}{v}$

(crude rate)

collect all information. calculate $v = \sum_{i=1}^{n} v_i$

calculate $\delta = \sum \delta_i$

Different to Life table (smoothed rates)

But in reality, we only have information at one time (or a few times) on the number of individuals aged x.

$$\mu_x = \frac{\delta}{v}$$

δ → no. of deaths aged x during study

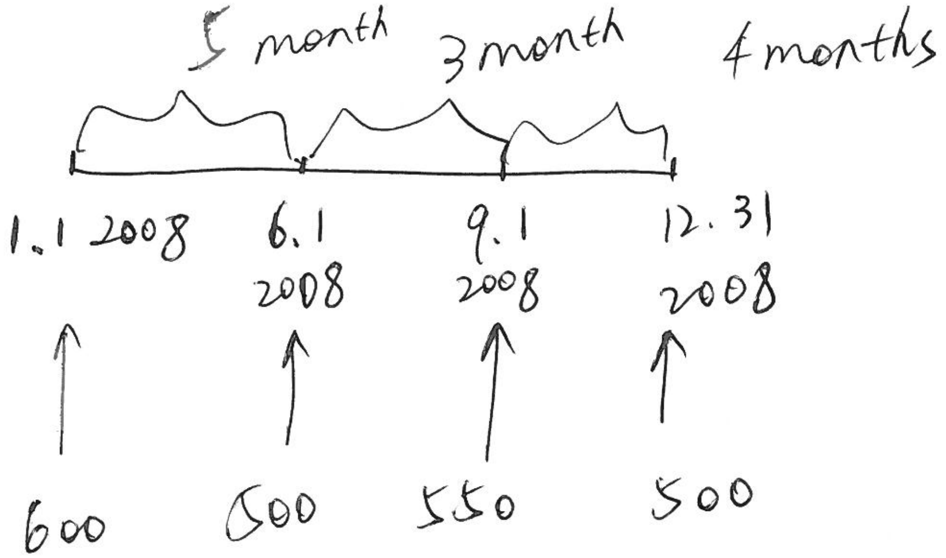
v → total waiting time for individuals aged x during study

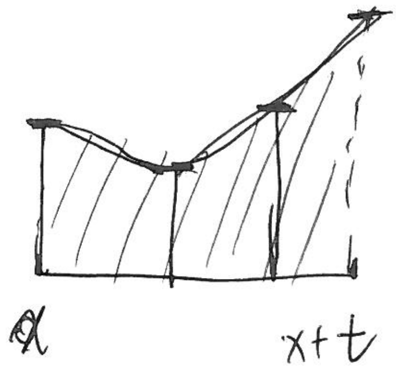
↓

not able to calculate in many situations

E_x^c can be approximated.

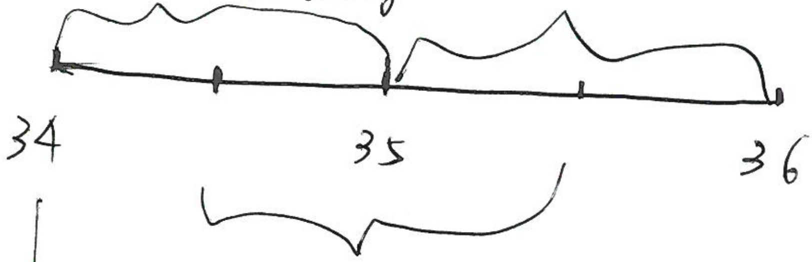
Example:





defined as age 35 = age next birthday

defind as age 35 = age last bd



defind as age 35 age nearest bd

age next bd: age at start of Rate interval is 34. so $\frac{d_x}{E_x}$ are actually estimating q_{34}

$= \hat{q}_x$

$\hat{q}_{35}$

individual aged 35

age next birthday q_{35}

individual aged 35

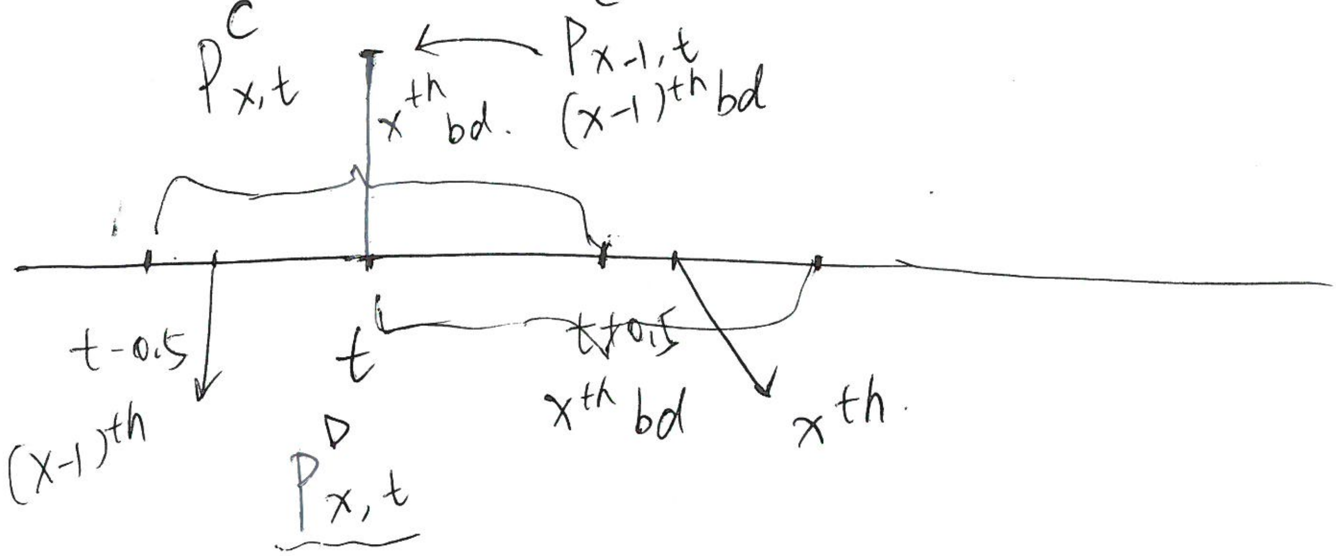
age last birthday

Past exam. at time t

part (b): No. of alive aged x for death (age definition: x next bd)

$$= P^{D}_{x,t}$$

for census: $P^{C}_{x,t}$



$$P^{D}_{x,t} = 0.5\left(P^{C}_{x,t} + P^{C}_{x-1,t}\right)$$

Assumption: birthdays are uniformly distributed over ~~the~~ their year

Note: those individuals who have x^{th} birthdays from $(t+0.5 \sim t+1)$ are exactly those who have their $x-1^{th}$ birthdays from $(t-0.5 \sim t)$