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A unified framework of demographic time

Tim Riffe
Jonas Schöley
Francisco Villavicencio

Demographic time

Demographic time measures

- P: period, calendar year
- A: chronological age
- C: birth cohort
- T: thanatological age (TTD)
- D: death cohort
- L: ultimate complete lifespan

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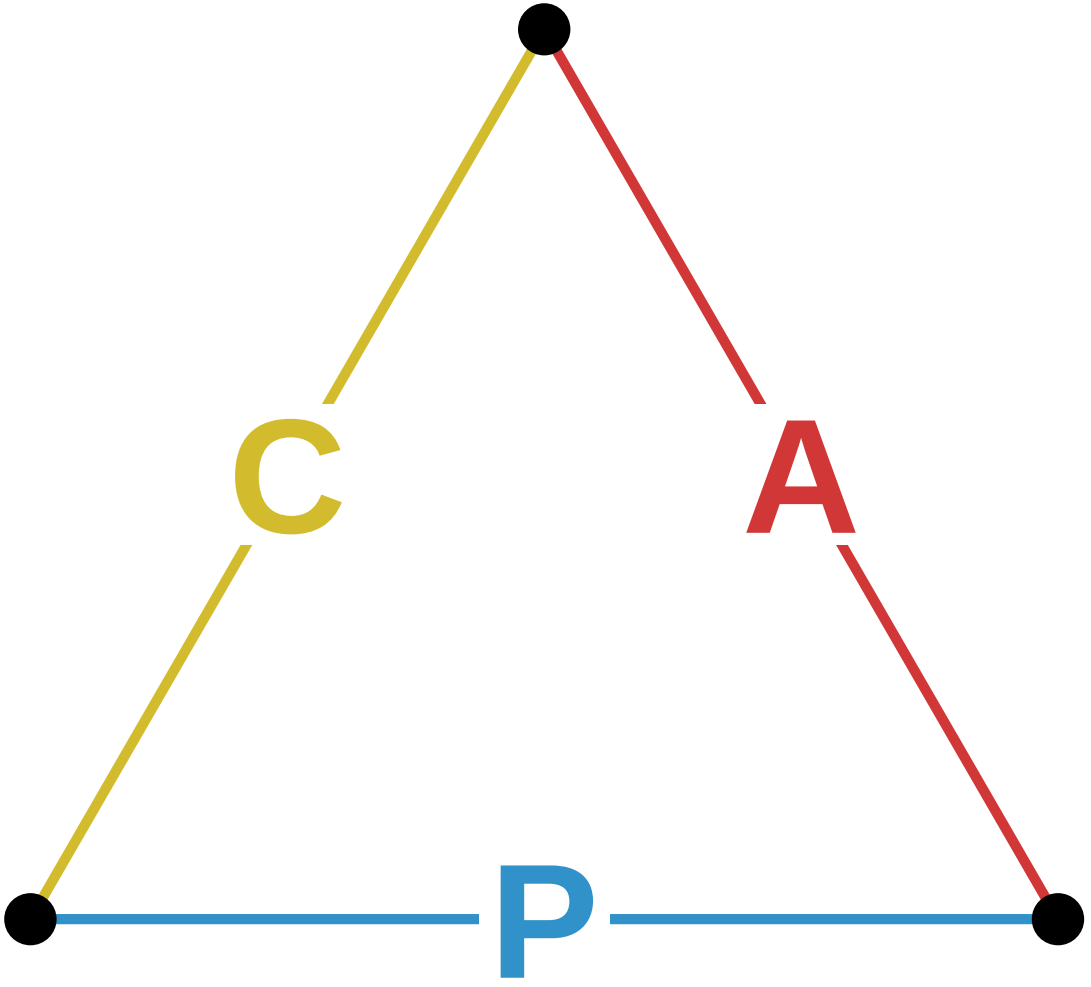
objective

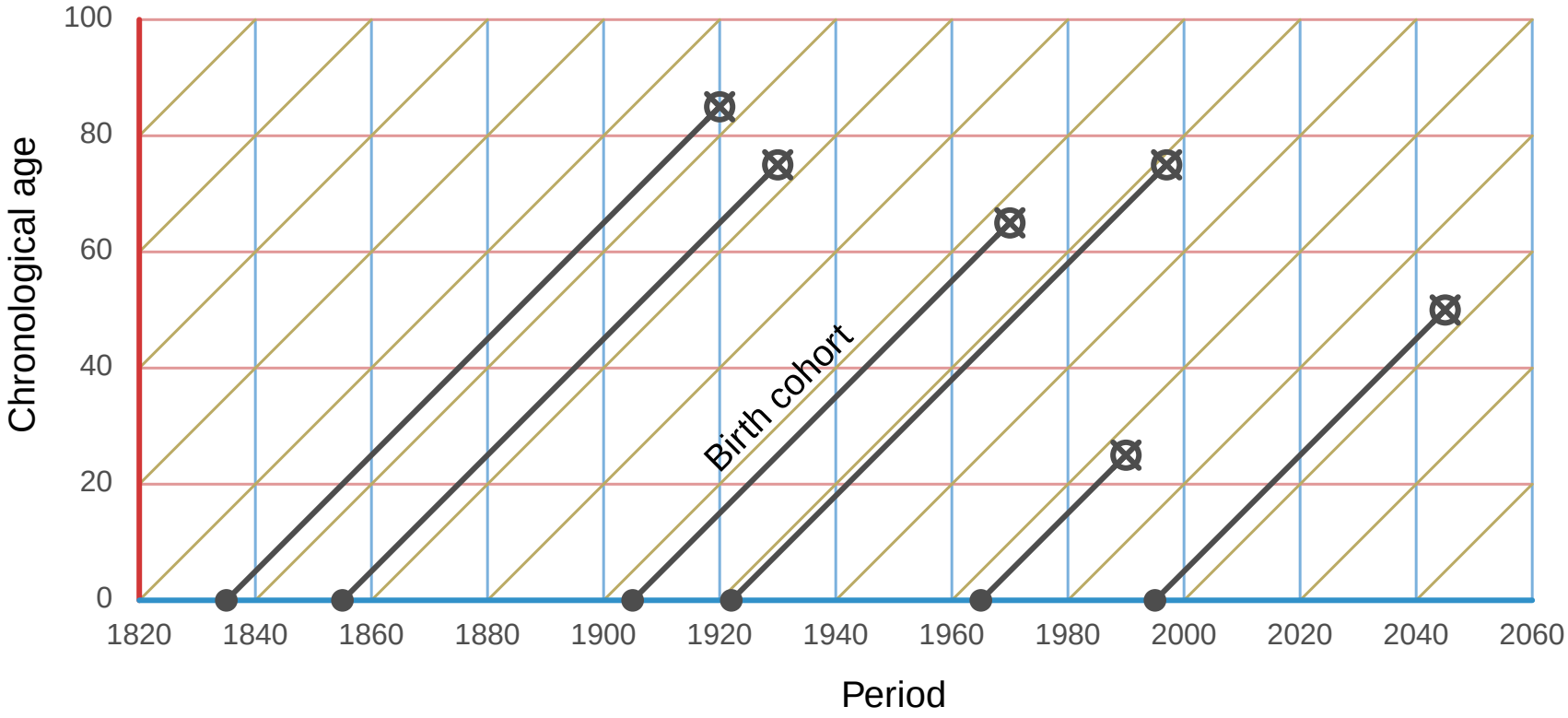
We add a third dimension to the Lexis diagram to account for time-to-death. This results in three *new* kinds of 2D Lexis diagrams, and a 3D Lexis diagram that is the intersection of the four *degenerate* diagrams.

(It turns out Lexis himself did something eerily similar, but not identical. Happy to explain how it works too)

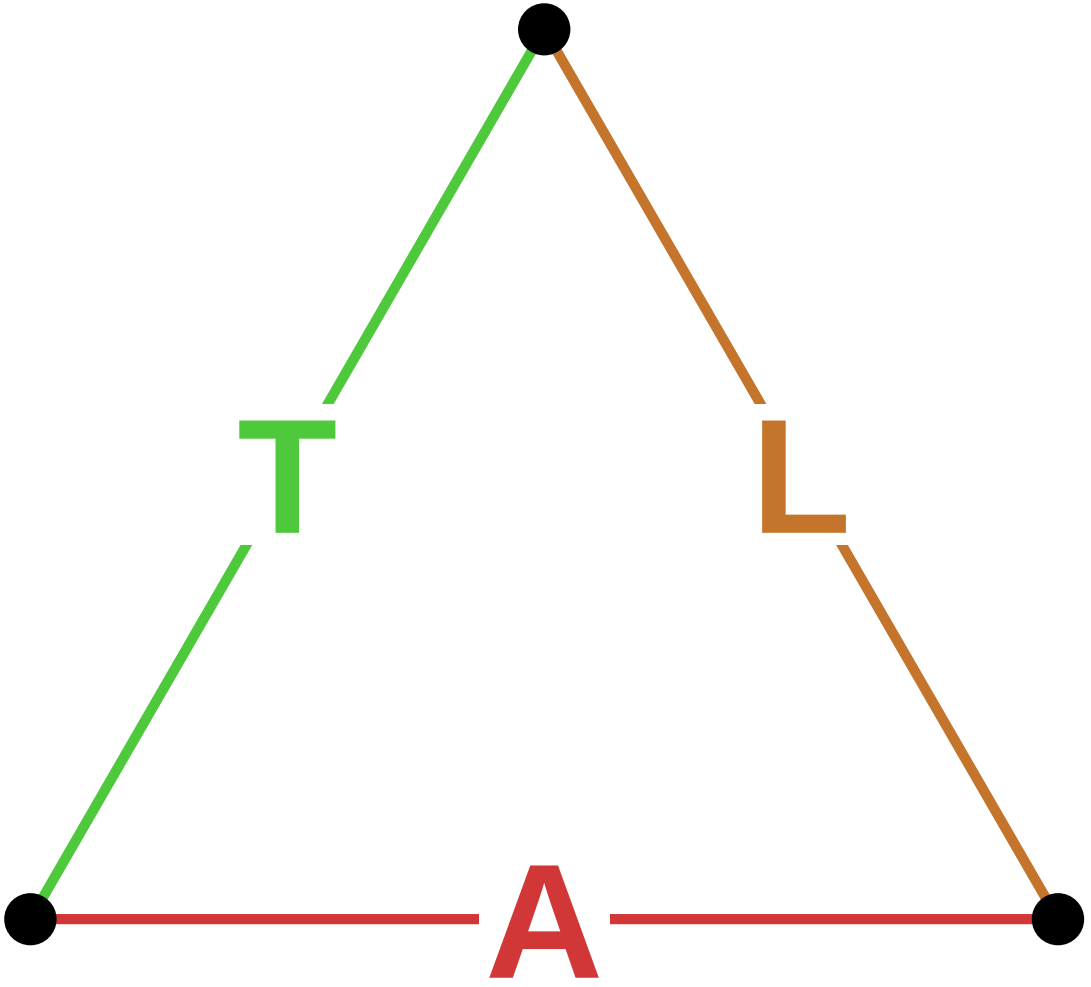
The APC demographic time identity



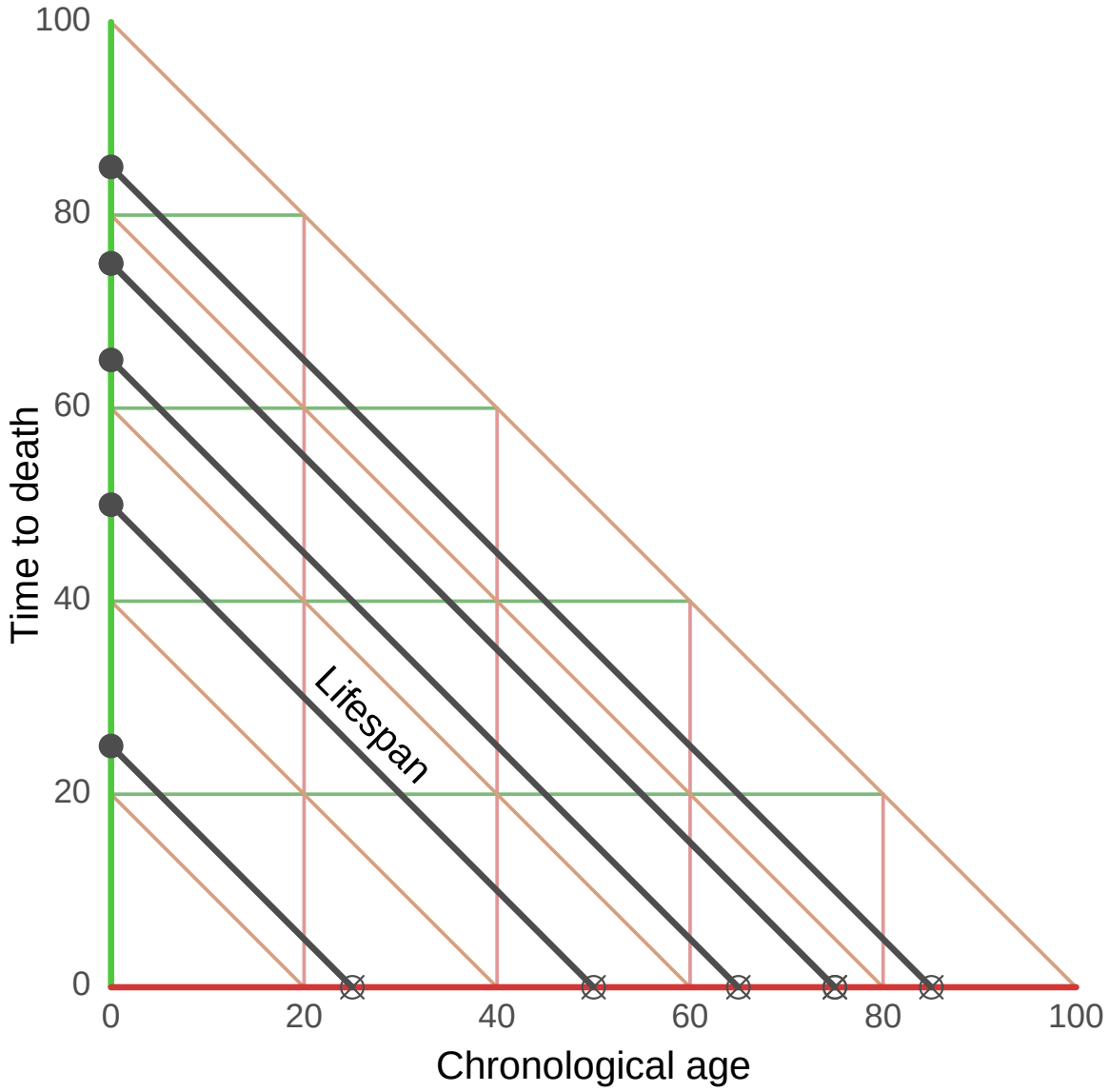
APC diagram (Lexis diagram)



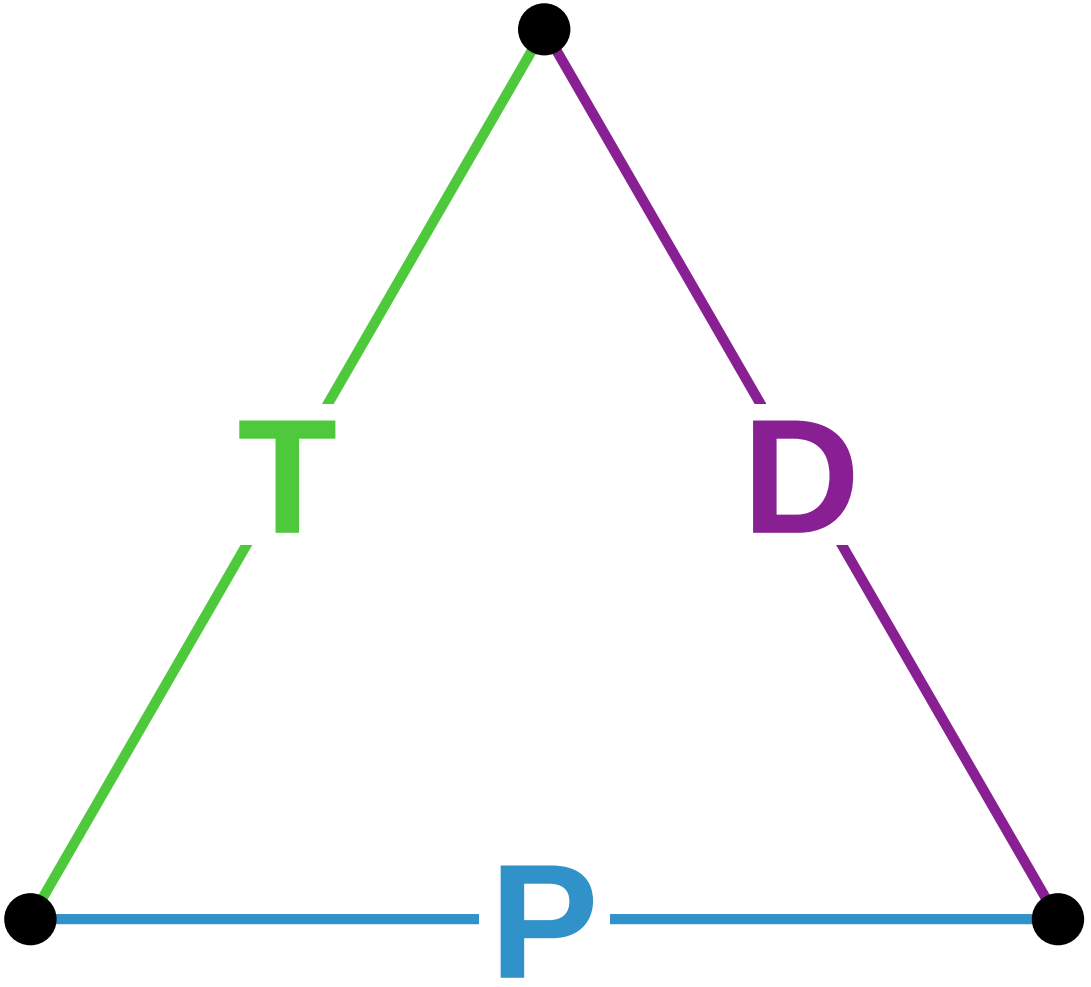
The TAL demographic time identity



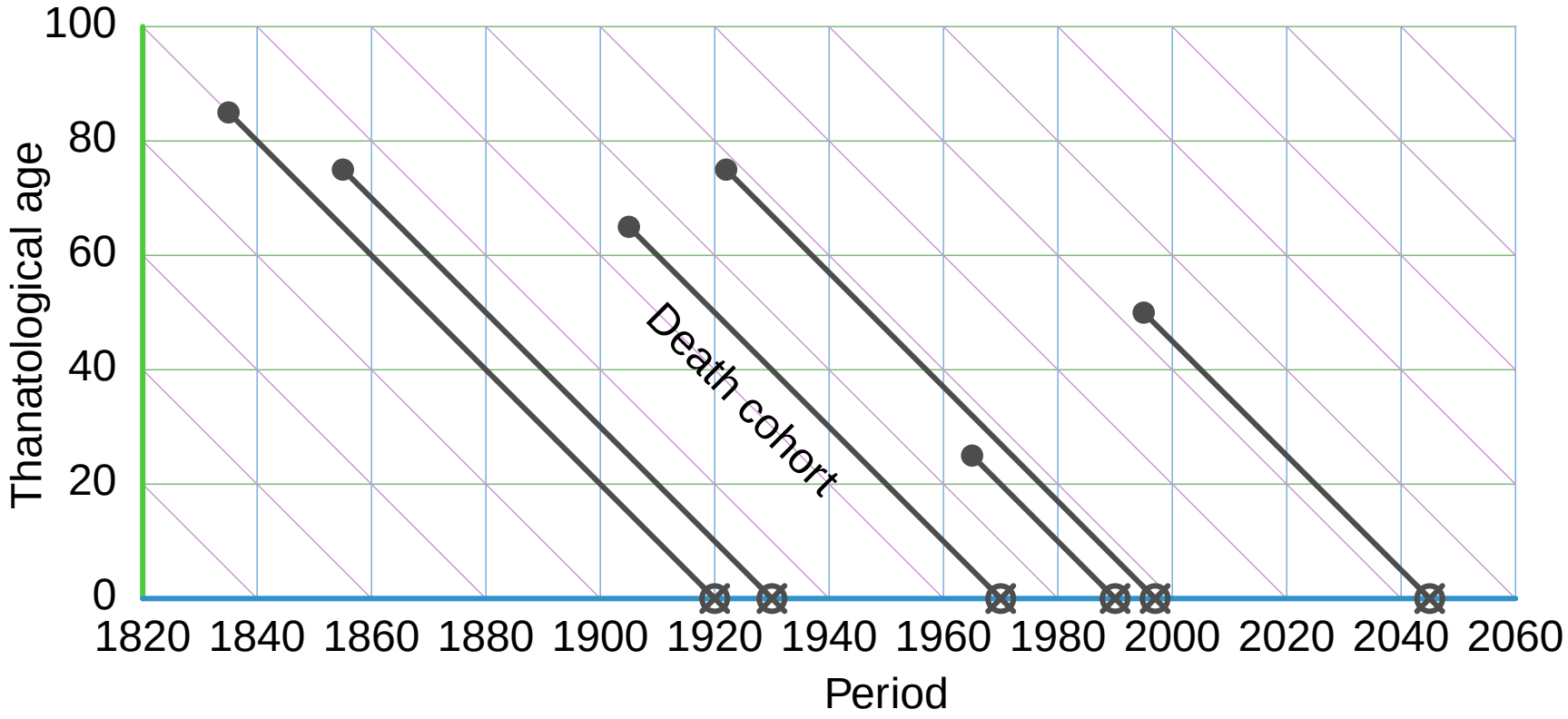
TAL diagram


100
80
60
40
20
0
Time to death
Lifespan
0
20
40
60
80
100
Chronological age

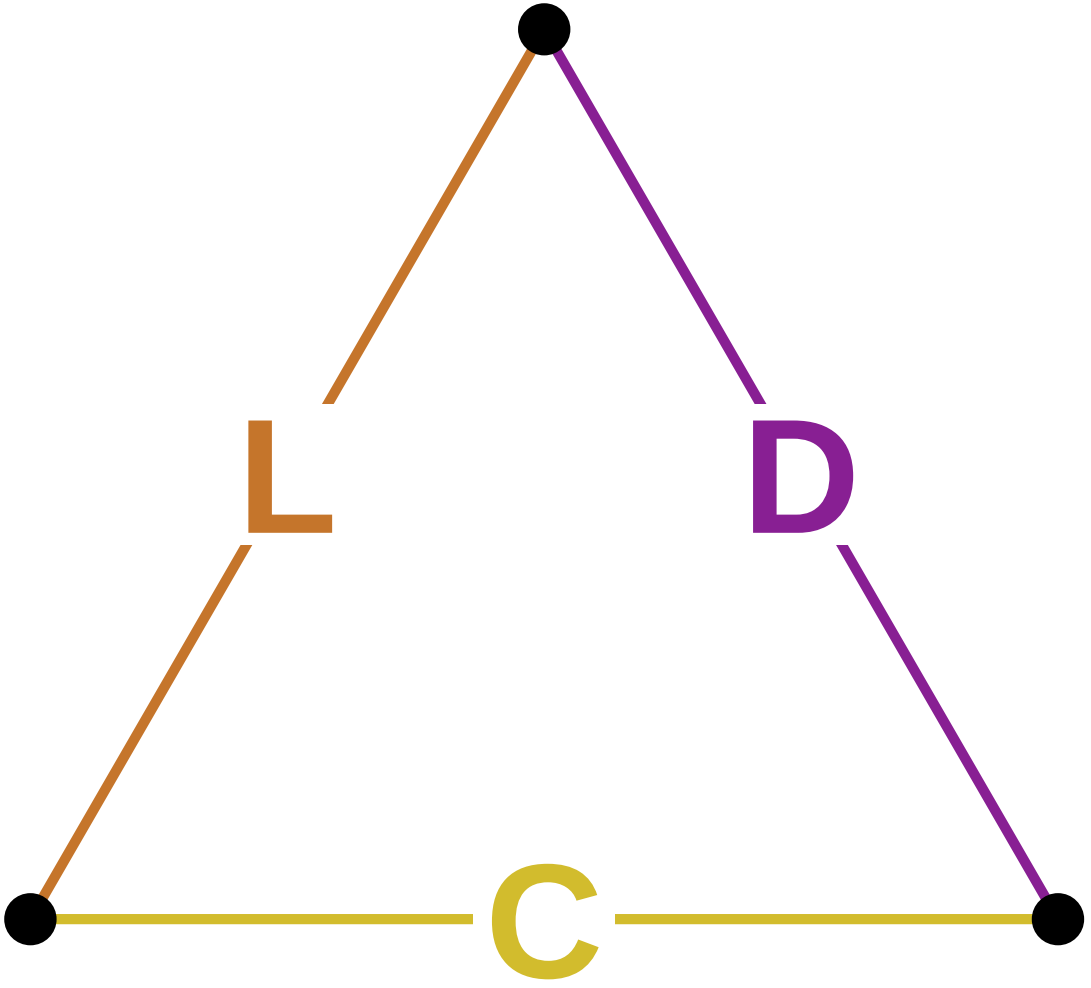
The TPD demographic time identity



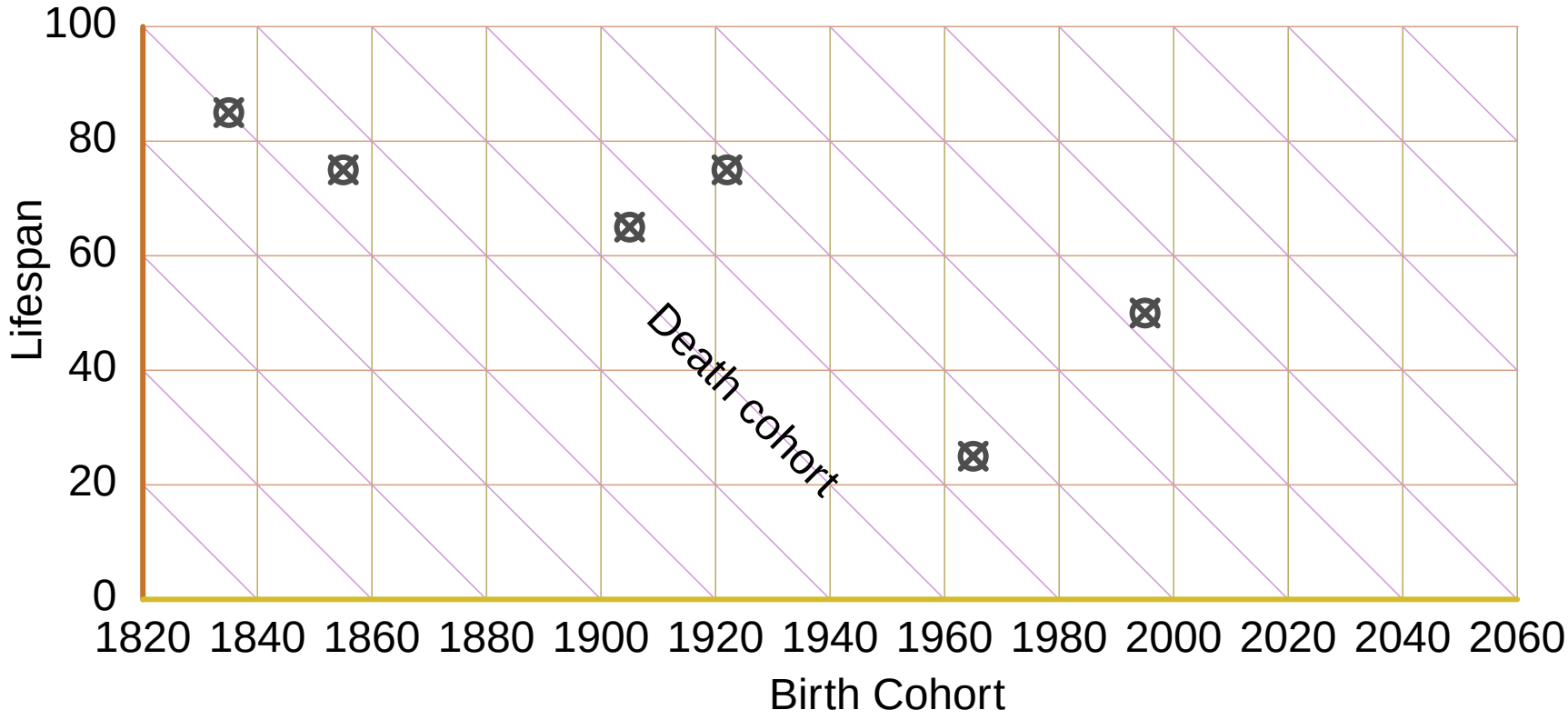
TPD diagram


100
80
60
40
20
0
Thanatological age
1820 1840 1860 1880 1900 1920 1940 1960 1980 2000 2020 2040 2060
Period
Death cohort

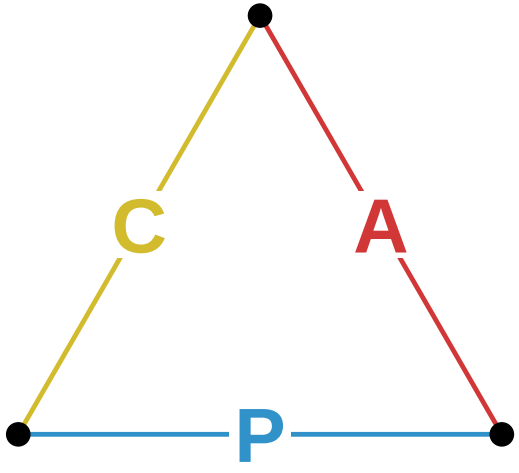
The LCD demographic time identity

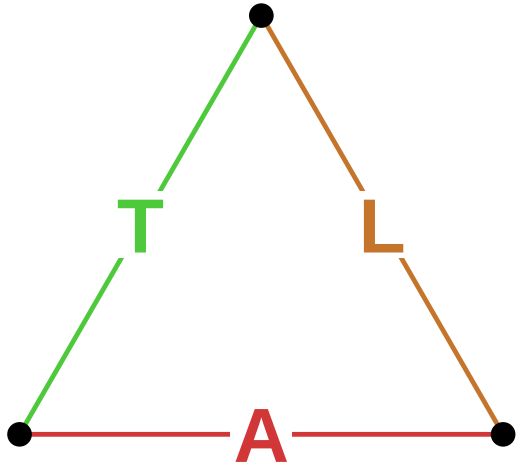


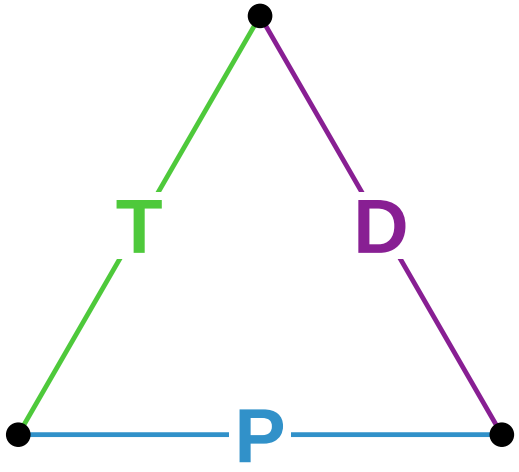
LCD diagram

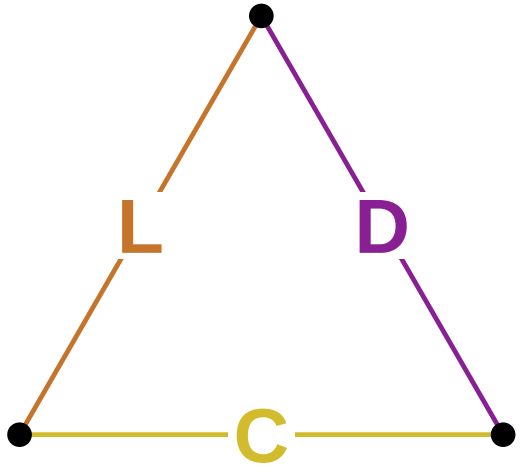

100
80
60
40
20
0
Lifespan
Death cohort
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
2020
2040
2060
Birth Cohort

Four demographic time identities

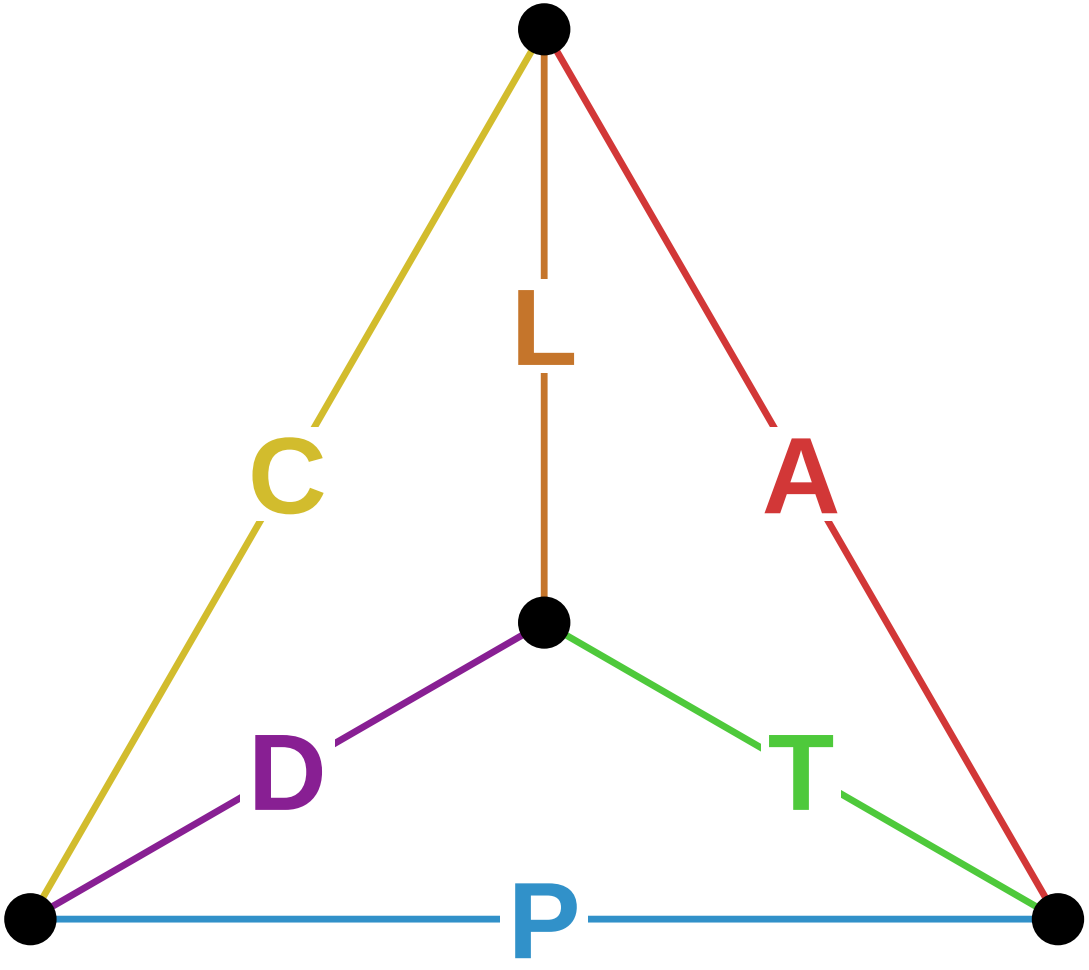




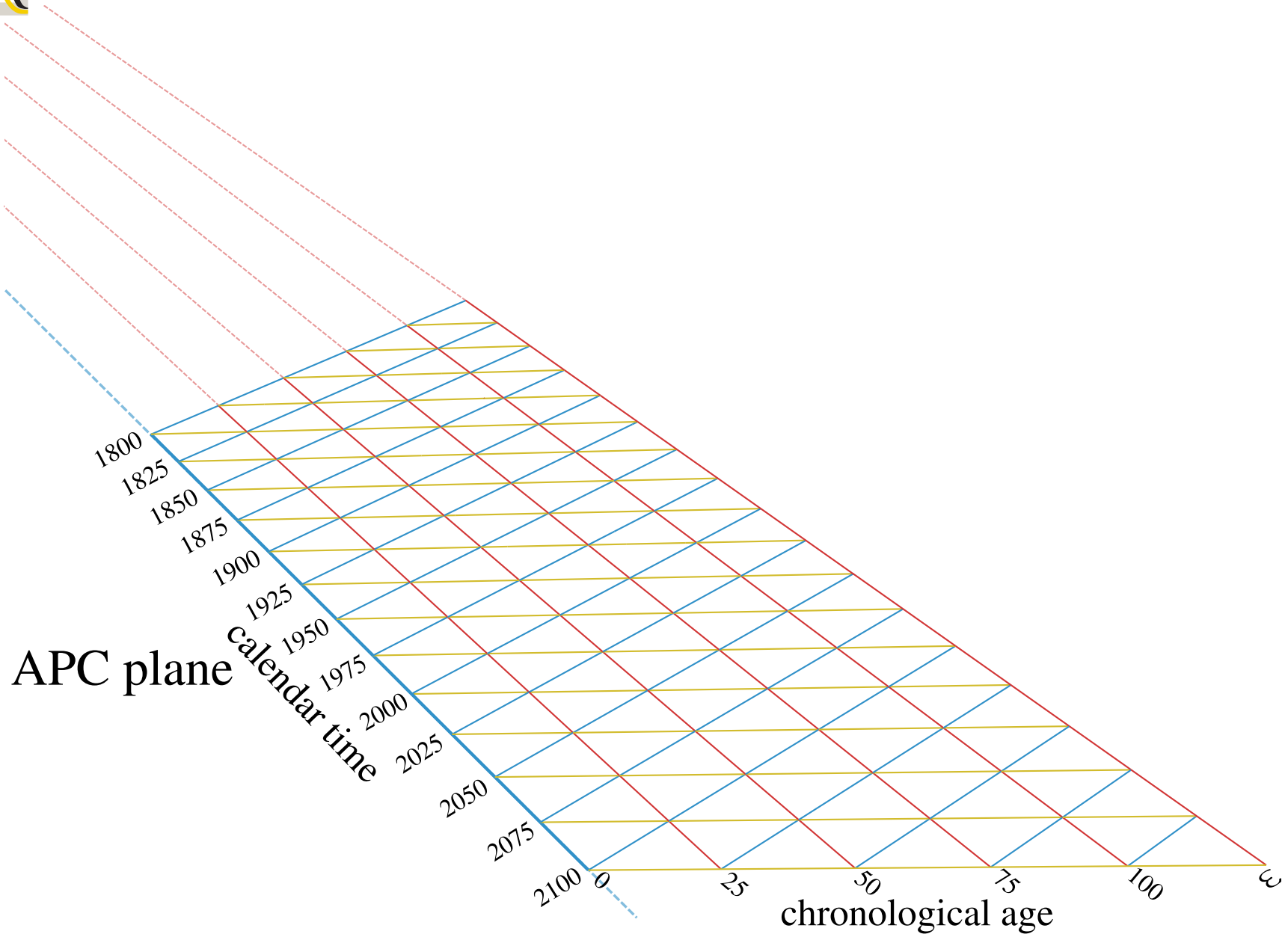




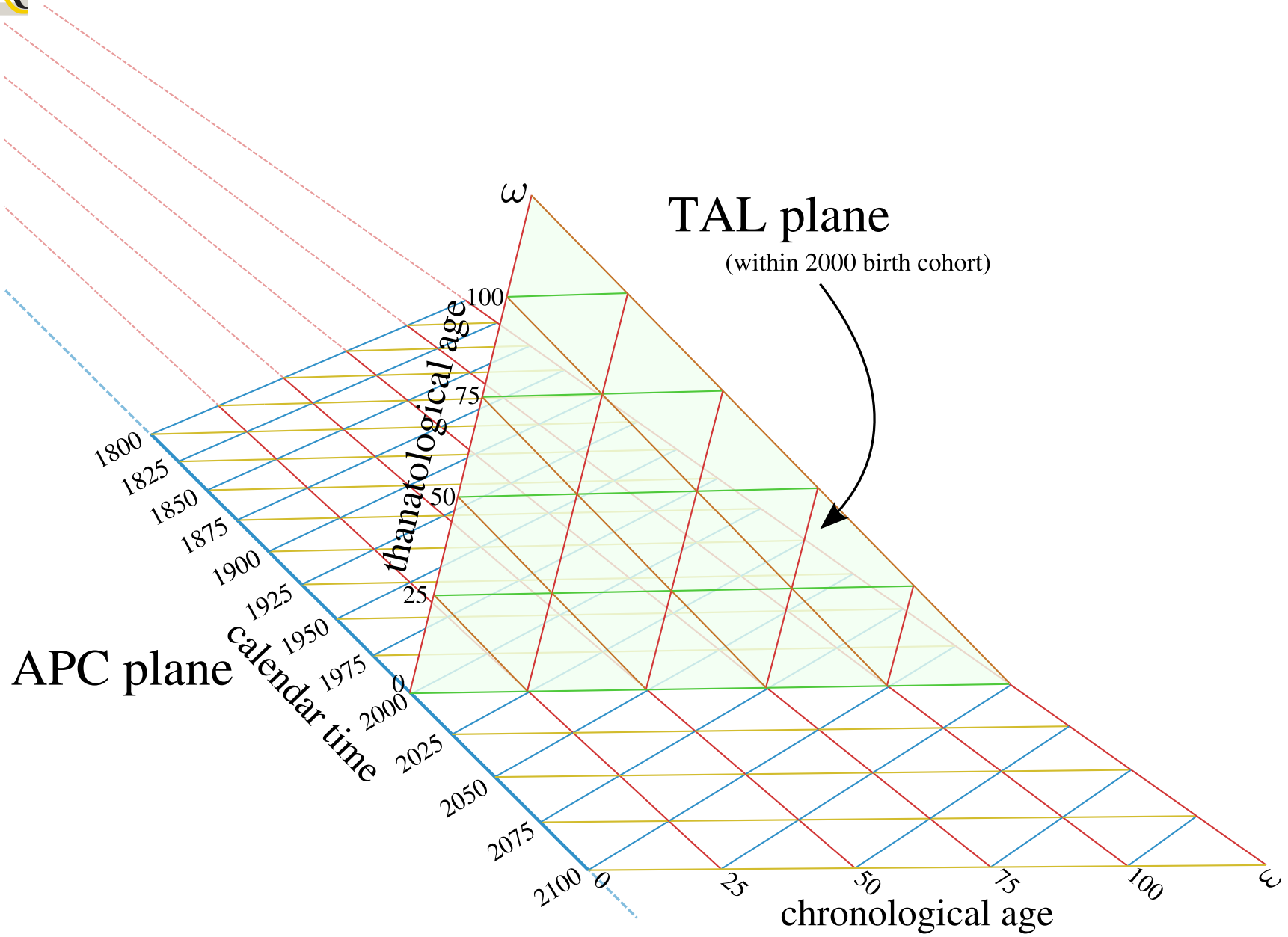
The demographic time identity



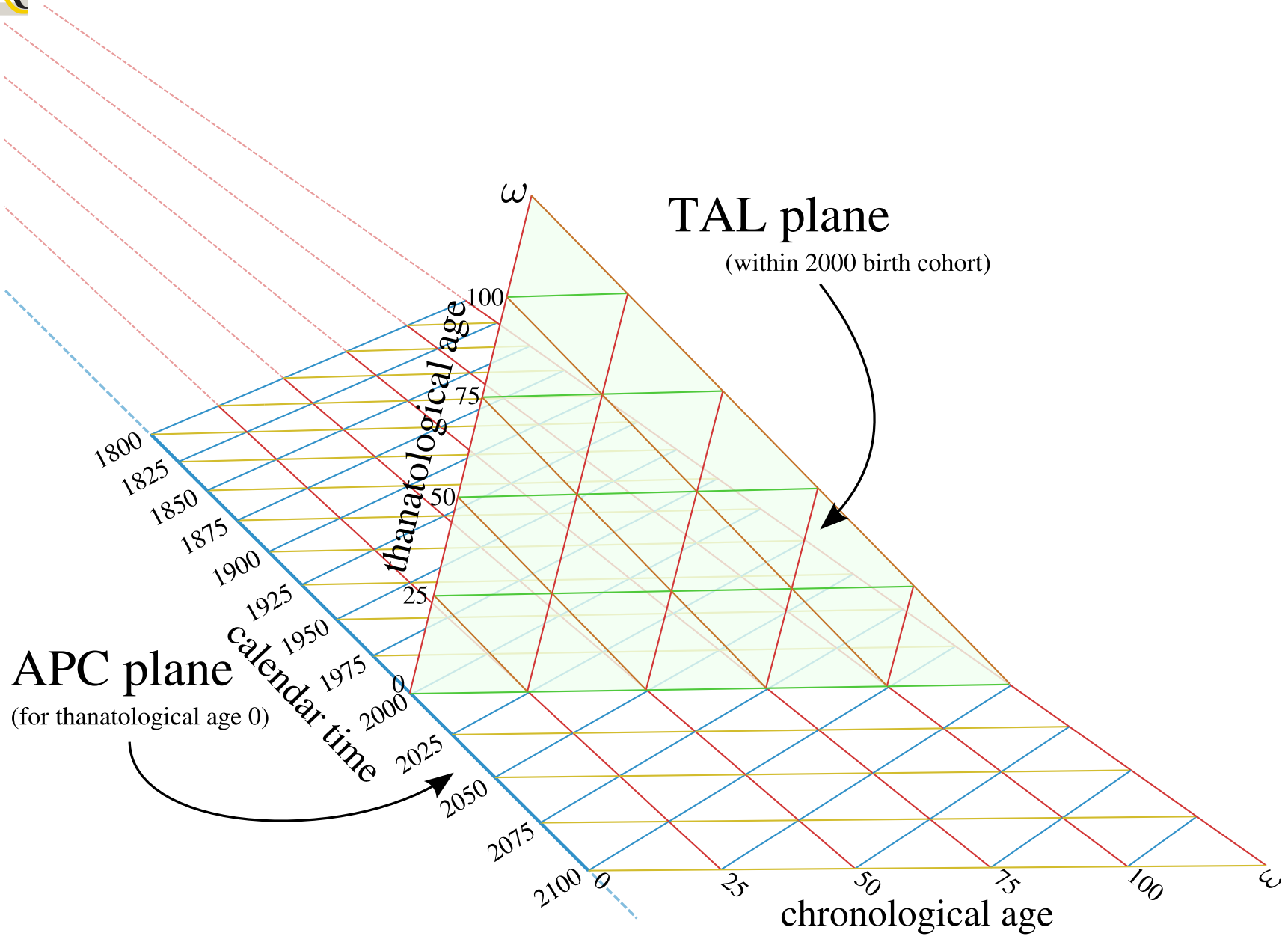
Building the demographic time diagram (1)



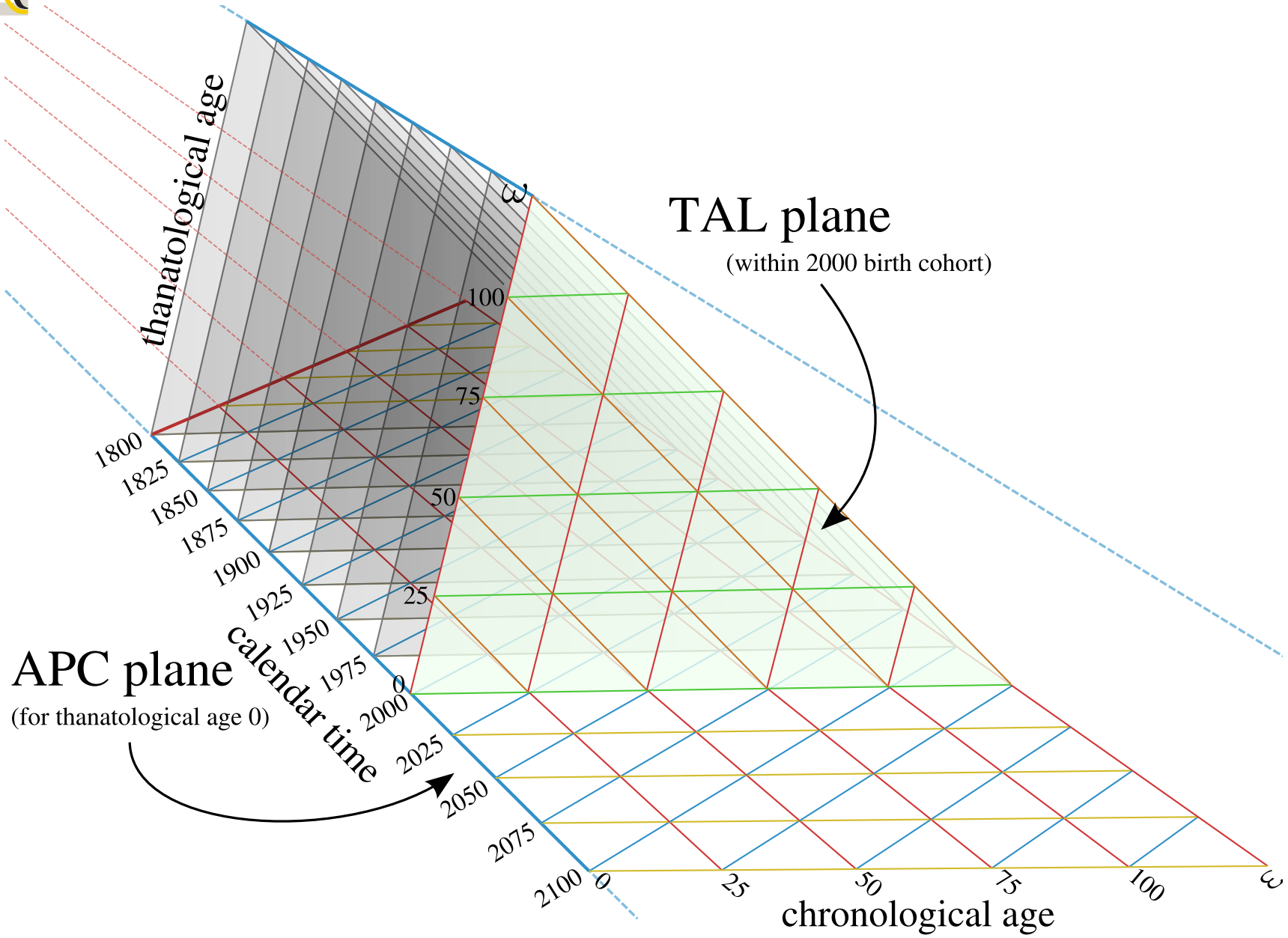
Building the demographic time diagram (2)



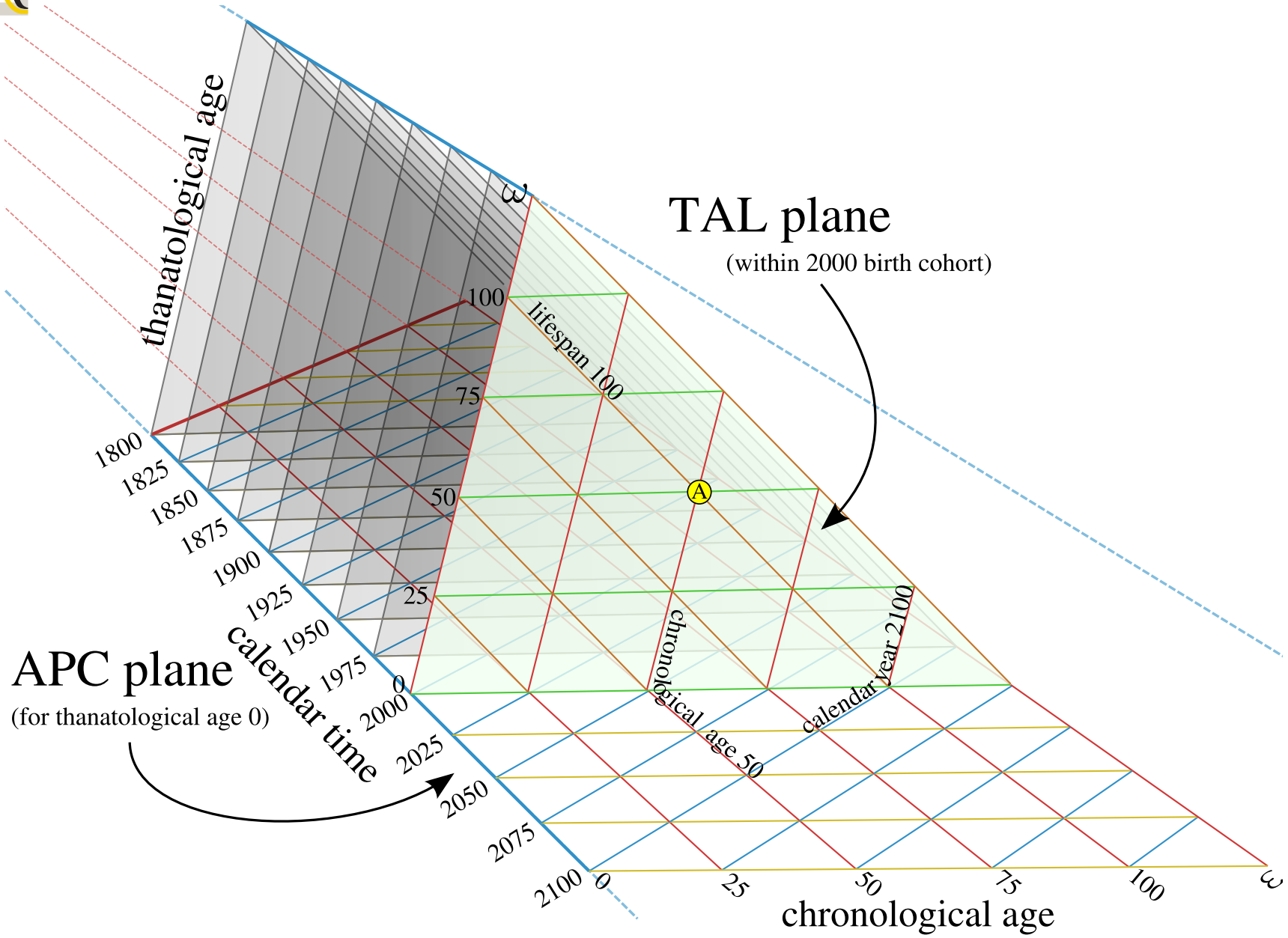
Building the demographic time diagram (3)

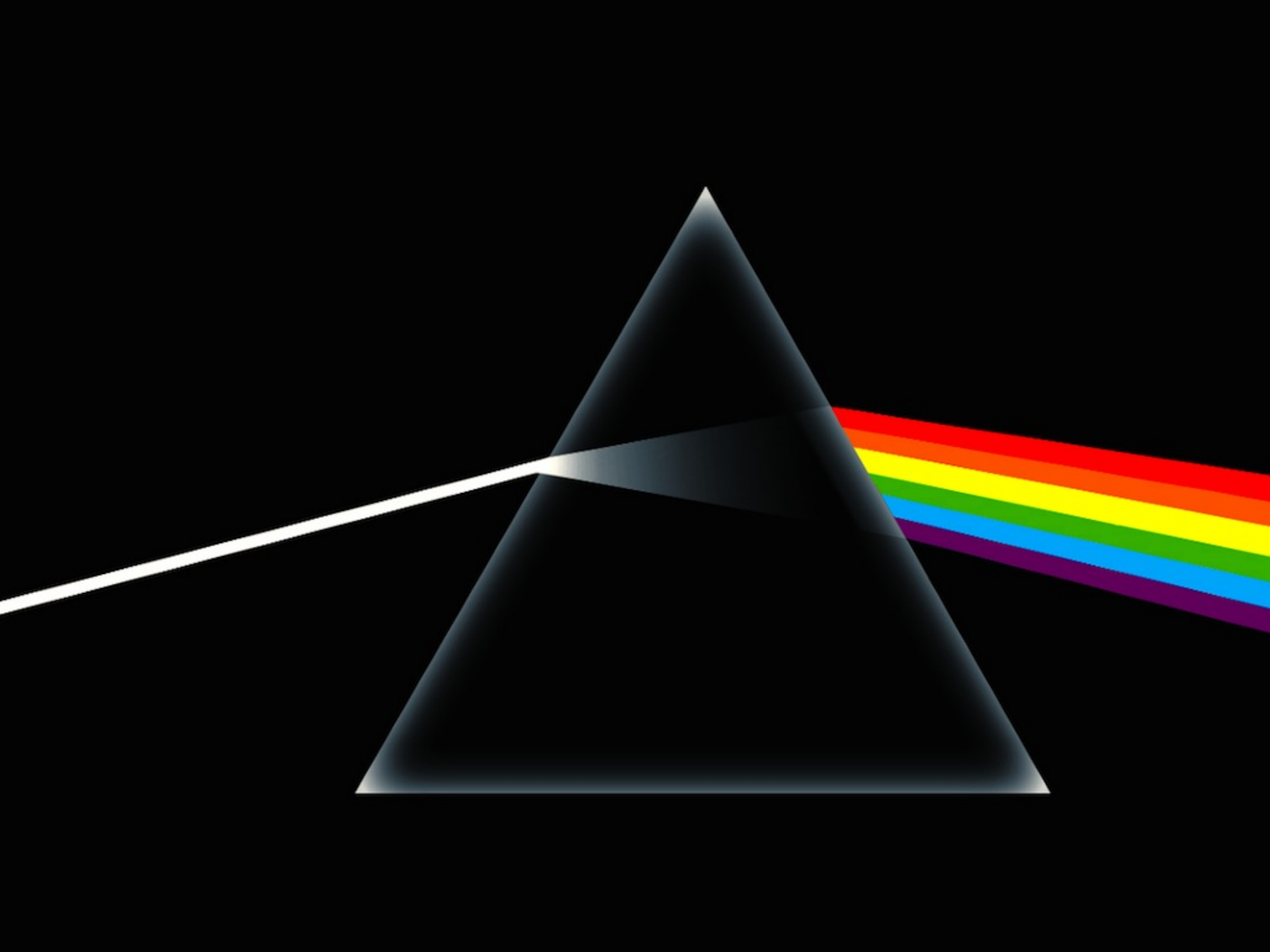


Building the demographic time diagram (4)



Building the demographic time diagram (5)





So why more planes?

- to uncover more patterns
- to improve measurement
- to make better models
- to understand processes

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- visualize data structured in this way ASAP, because you might see new and exciting things

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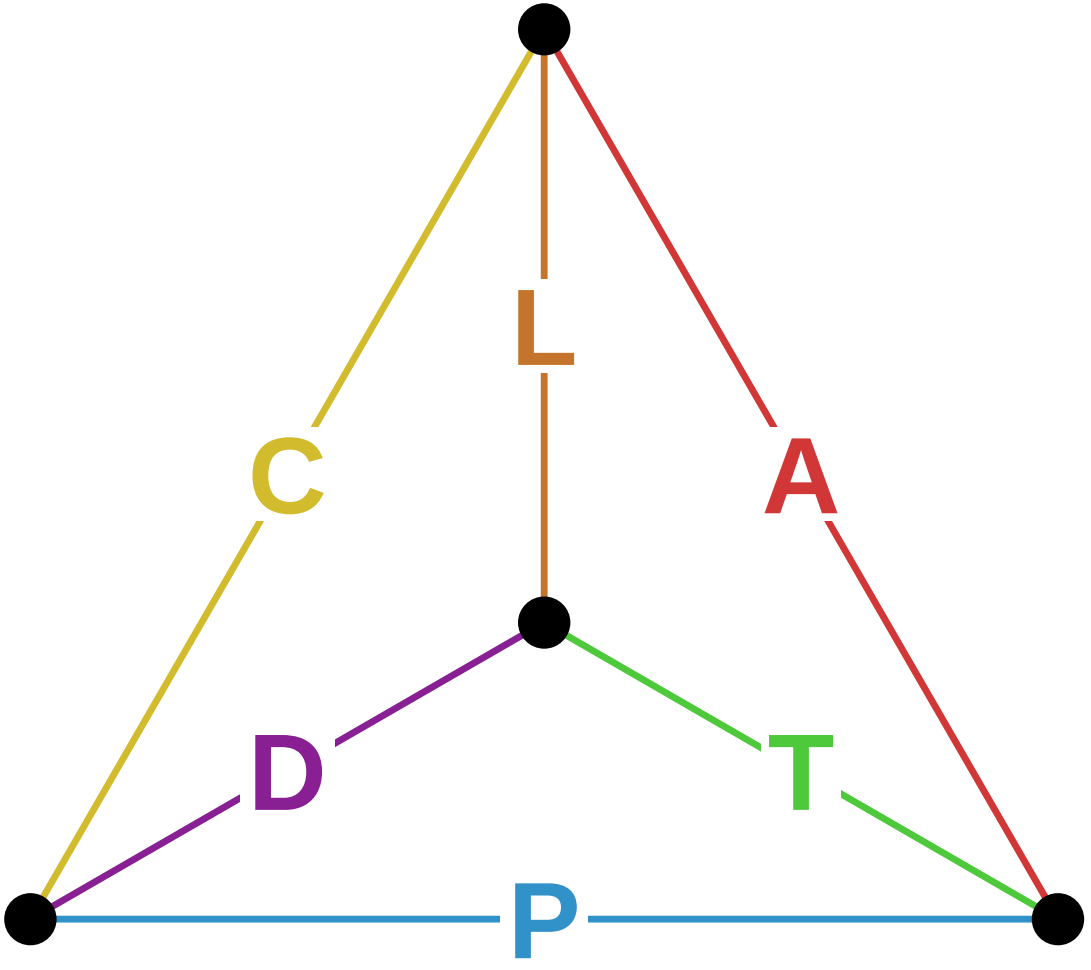
Thanks!



An example inquiry

- compare end-of-life trajectories for several birth cohorts (1905 - 1925)
- HRS (Rand), waves 1-11 (years 1992-2012)
- use TAL plane to uncover patterns that APC hides
- this example: prevalence of poor self-reported health

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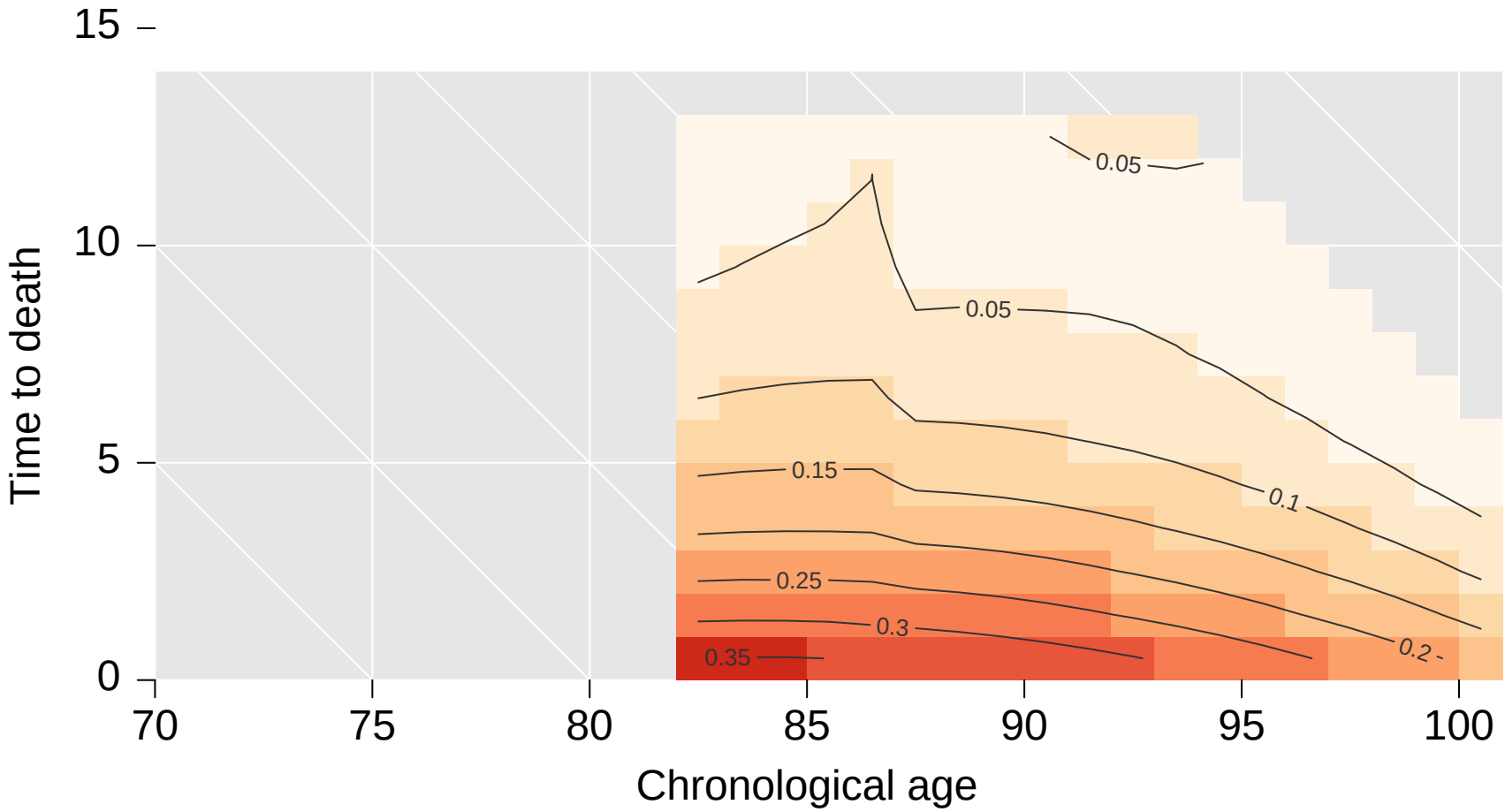
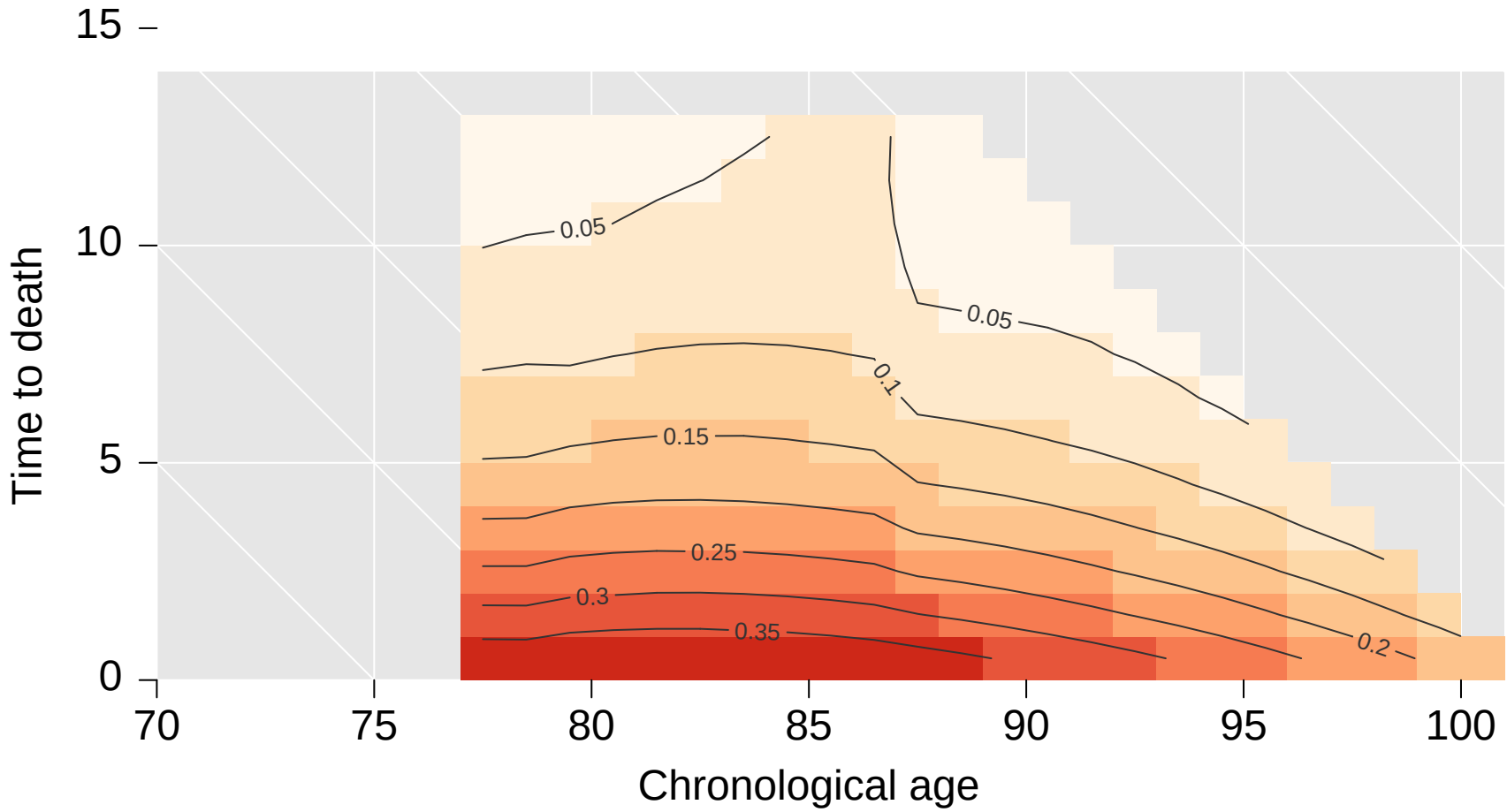
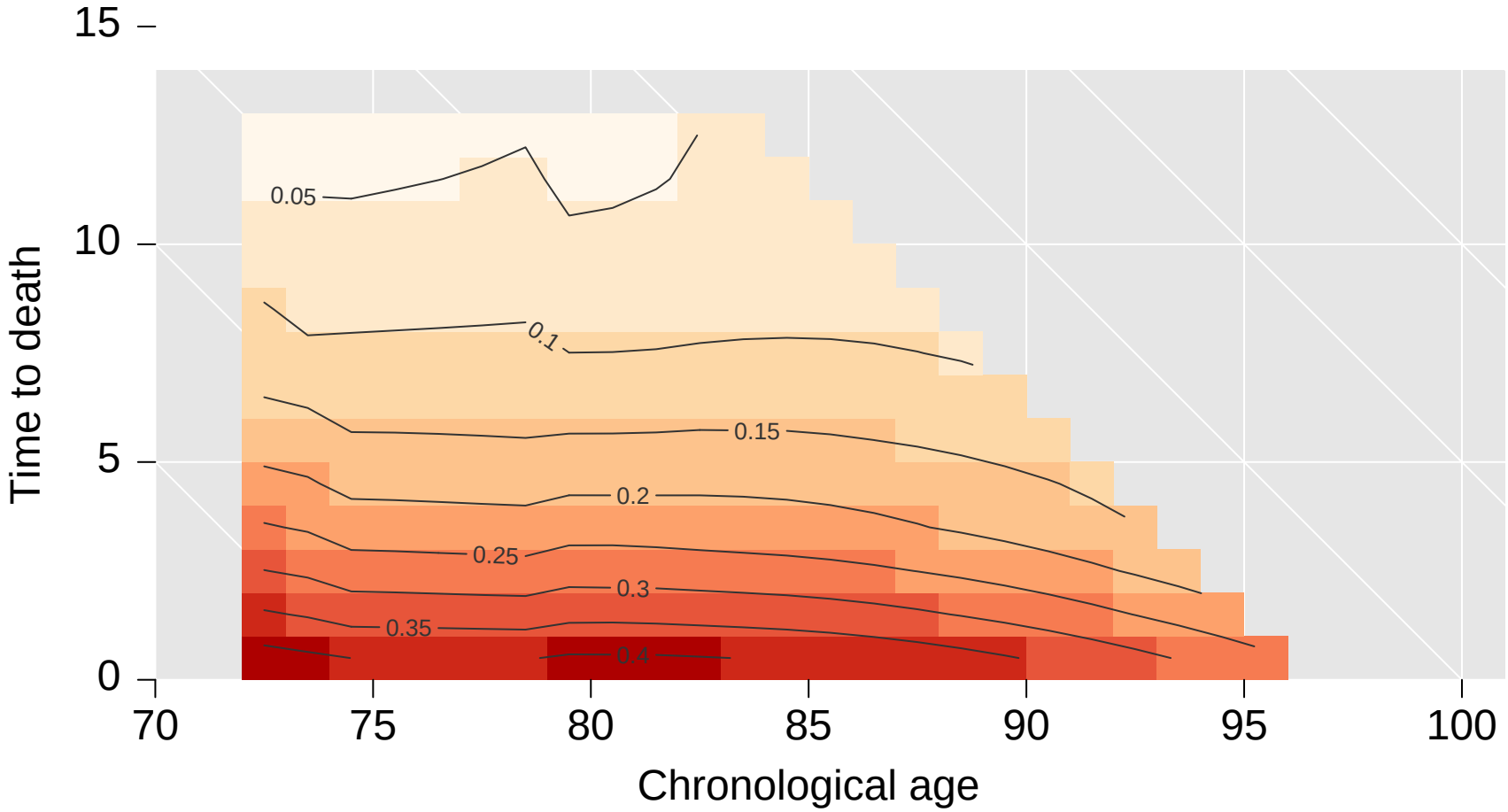
1905 cohort


15
10
5
0
Time to death
70
75
80
85
90
95
100
Chronological age
0.05
0.05
0.15
0.1
0.25
0.3
0.2
0.35

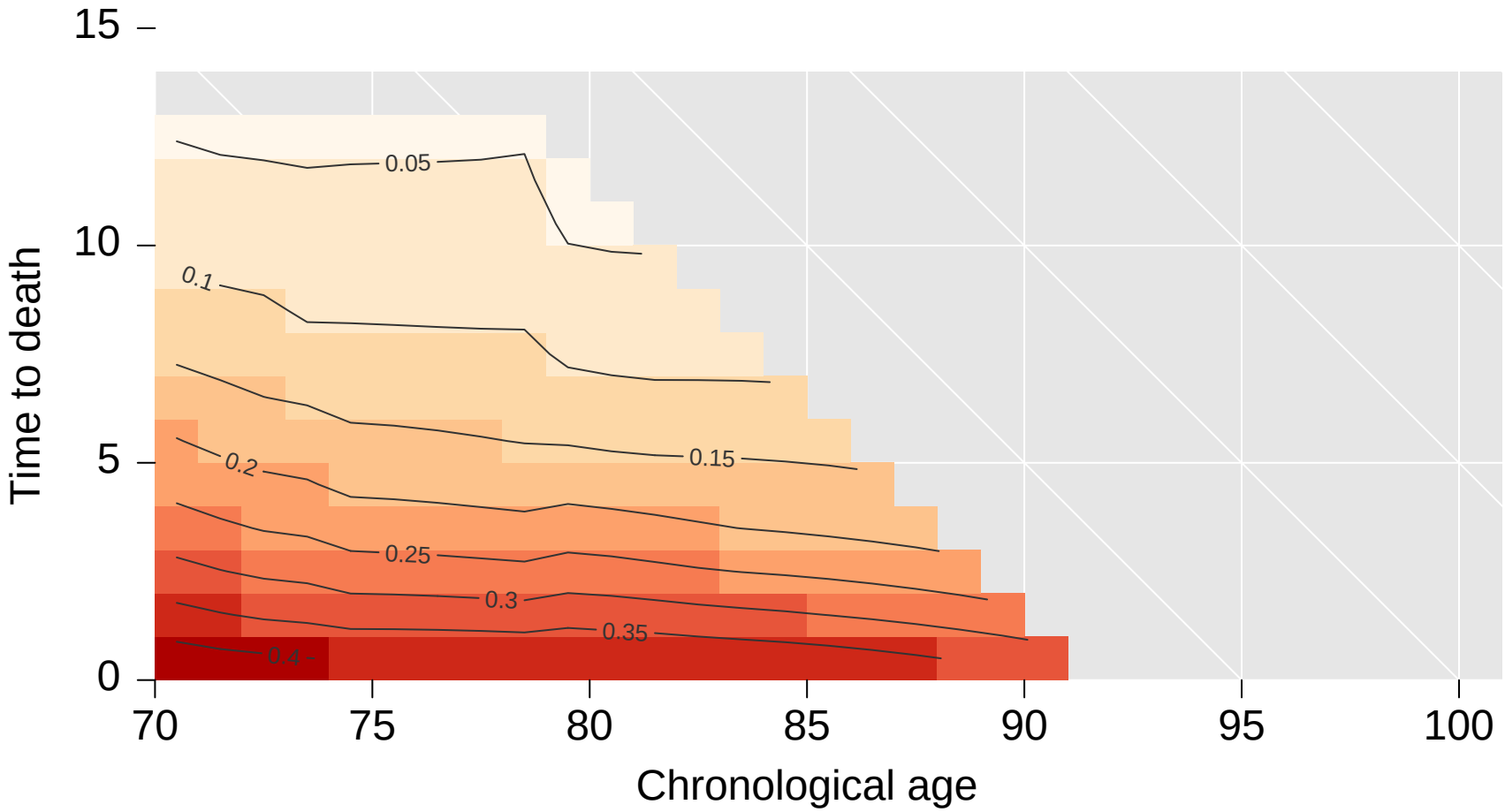
1910 cohort, looking pretty similar



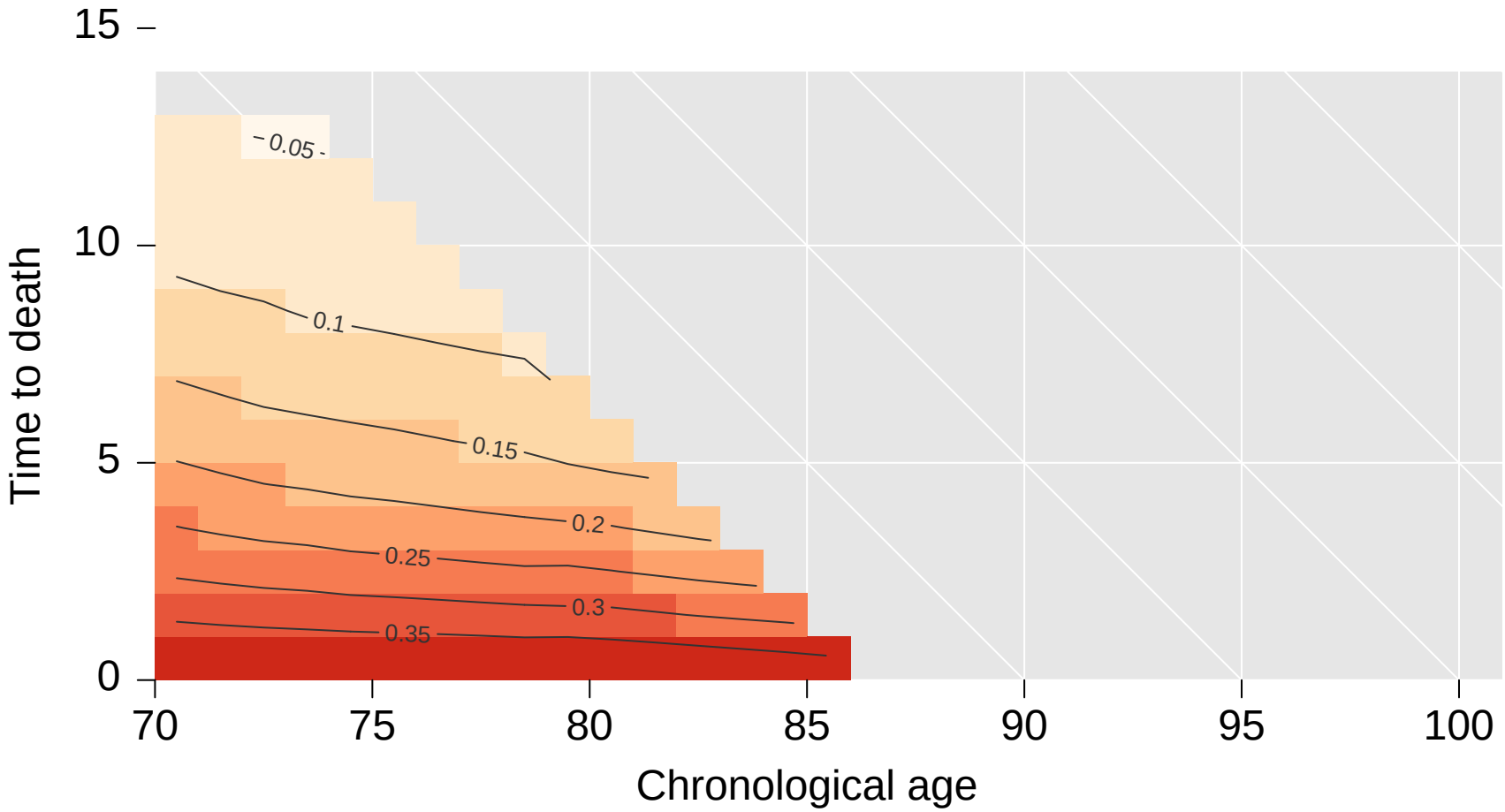
1915 cohort, looking pretty similar



1920 cohort, looking pretty similar



1925 cohort, looking pretty similar



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