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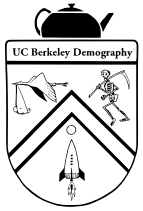

Morbidity and Mortality

Tim Riffe
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UC Berkeley Demography

THE UNIVERSITY OF CALIFORNIA
1868

THE UNIVERSITY OF EDINBURGH

A test title

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The problem

Projections show population **ageing**.

Robust mortality data, good projections.

Less reliable data on health. Less comparable. Cross-sectional surveys, subjective responses. Excluded populations.

Age-specific morbidity estimates key for predicting consequences of population ageing— Social and health care demands.

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Some morbidity scenarios

* assume mortality declines gradually, or similar.

Expansion

1) ASMR[1]↑ (or const) = morbidity vol. ↑
2) ASMR ↓ but insufficient to offset mortality decline = morbidity vol. ↑

Compression

3) ASMR ↓ fully offsets increased surv = constant morbidity vol.
4) Fall in ASMRs outstrips mortality decline = morbidity vol. ↓

[1] ASMR is age-specific morbidity here

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Literature

poor predictor

Current ASMR may be poor predictor of future ASMR

Behaviours

Impact of health behaviours: smoking, obesity, education, . . .

Innovation

Tech innovation can change healthcare demand for given morbidity

Pessimism

General Pessimism, esp. using secenario 1 (ASMR $\uparrow$, Surv $\uparrow$)

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more problems

Age standardization

Chronological age standardization of conditions that are related with death can degrade data rather than purge it of structure. Serious consequences.

Assumptions

Chronological age standardization makes morbidity follow OADR
Thanatological age standardization makes morbidity follow REDR, or similar.[2]

[2] Remember that finding about populations growing younger and older at the same time? Morbidity measurement needs to follow that...

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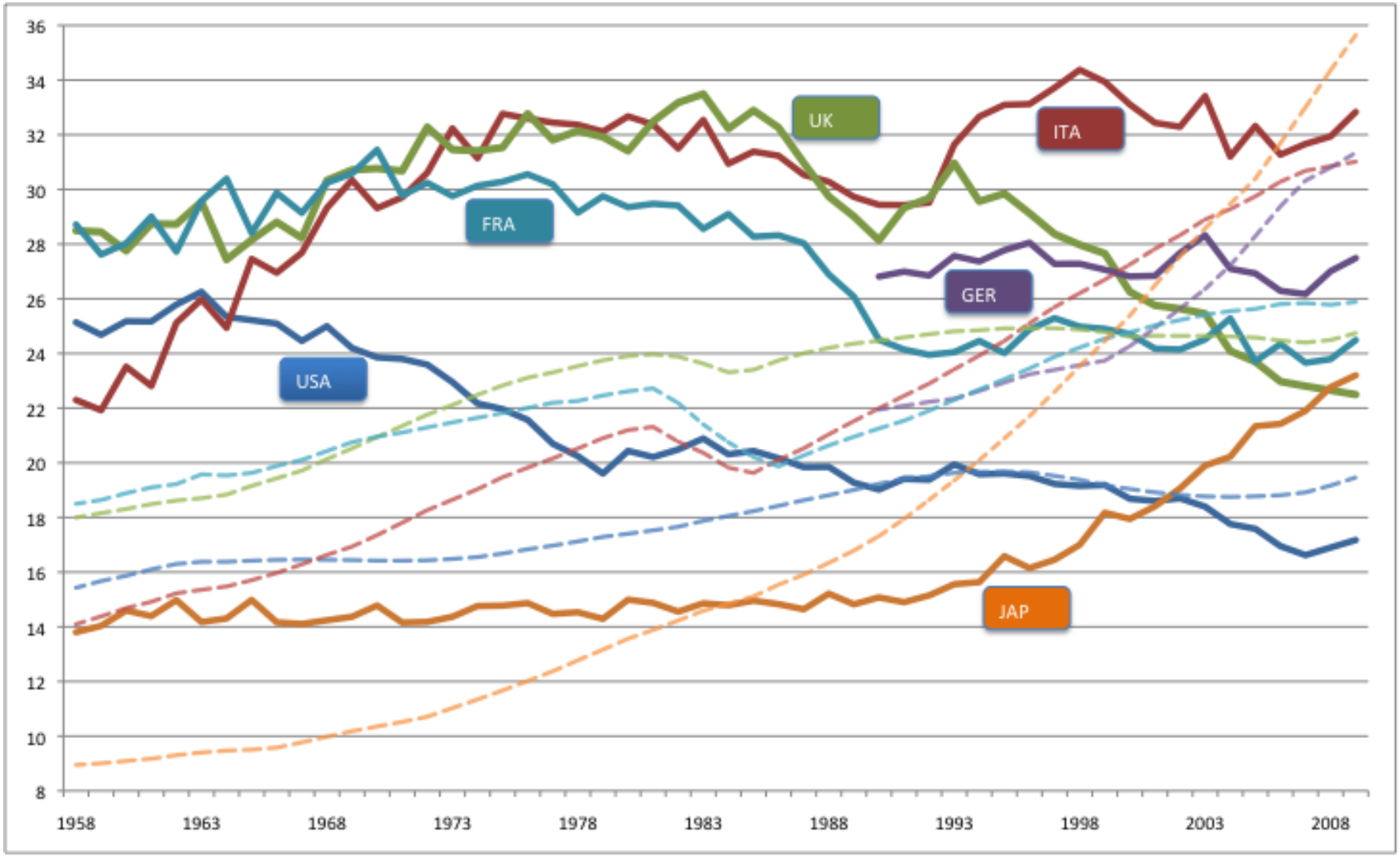
OADR vs REDR 1958-2009 various countries



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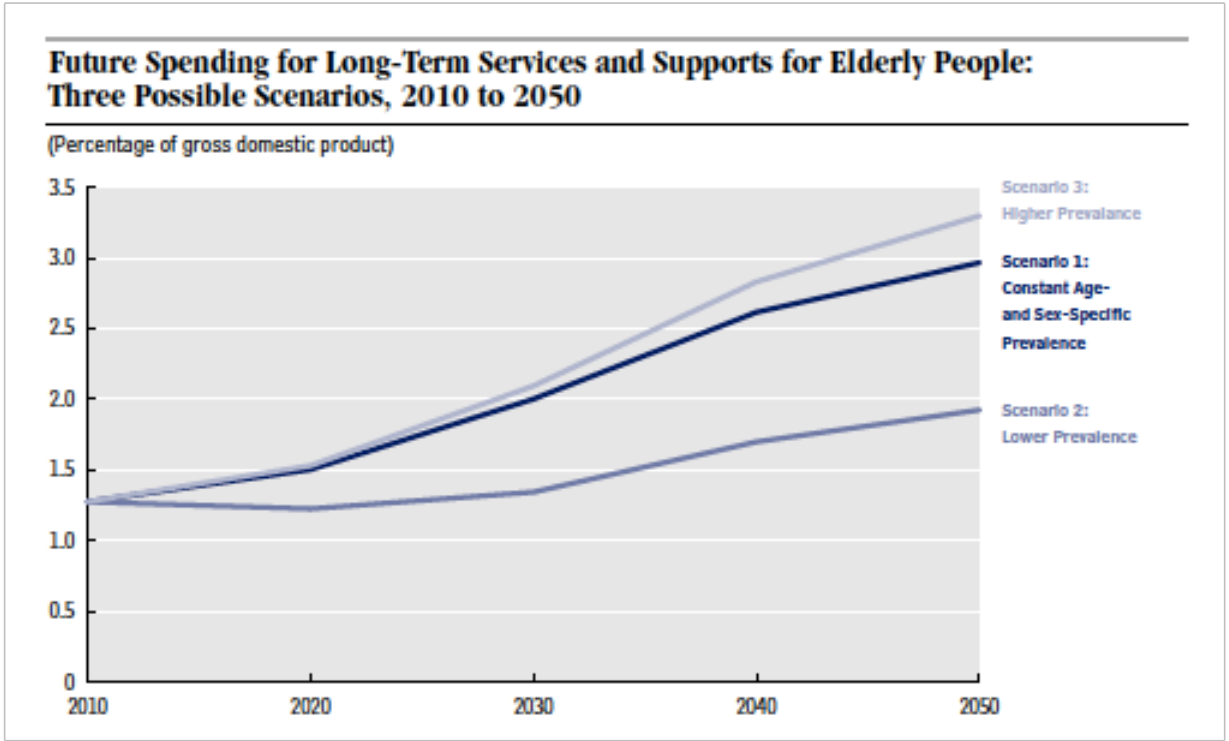
Bigger problem

Chrono age standardisation typically leads to (very) pessimistic future scenarios for volume of morbidity and assoc health/social care demand and quality of life e.g., US CBO 250% increase in GDP share going to elderly support by 2050.



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An alternative approach I

Understand temporal variation

When broken down by both chronological and thanatological age, morbidity conditions typically vary either as a function of thanatological age or as a function of both age perspectives. Very few conditions are functions of chronological age exclusively in elderly ages.

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An alternative approach II

Develop methods to deal with temporal variation

Morbidity measurement is currently distorted by mortality. These processes must be decoupled (for many conditions) in order to measure and predict trends in morbidity and make sound predictions.

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A demonstration

Definitions

y is thanatological age
a is chronological age
J is a health condition that varies by y [3]
$j(y)$ is the time-to-death function of J
$j'(a)$ is the apparent chrono-age pattern of J
$N(a)$ is population by age
$\ell(a)$ is the survival function
$\mu(a)$ is the force of mortality

[3] Imagine something that comes along with dying, even preceding it by a decade, but doesn't kill you per say (This is includes many survey health questions...)

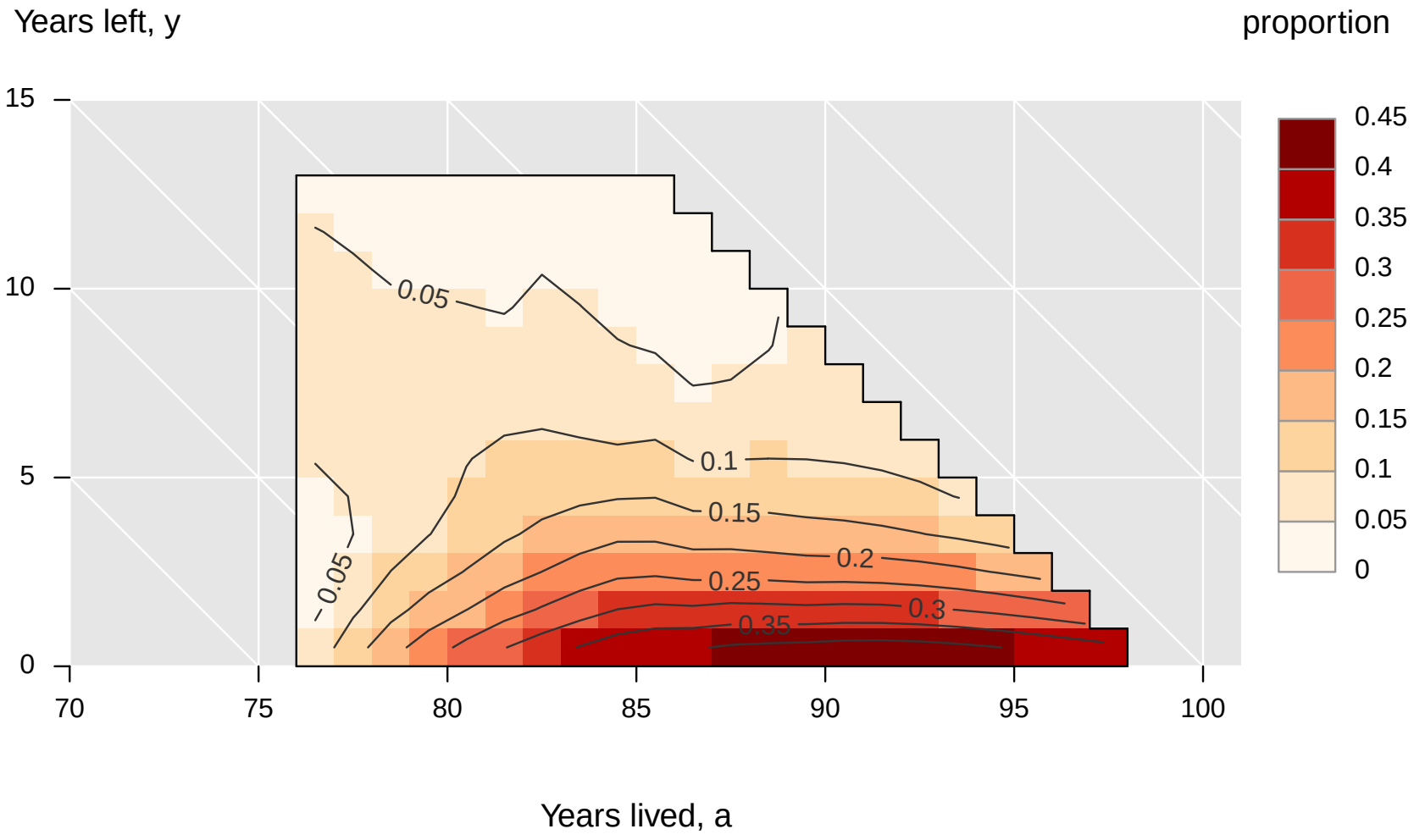
A demonstration

Reasonable assumption?

Is it reasonable to imagine J as a function of only y? No, actually it's more complicated than that, but for some conditions it appears to be pretty darn close.

A demonstration

ADL, 5 point index, HRS, USA Males, 1915 birth cohort[4]



[4]stuff life: eating, bathing, dressing, walking, getting up.

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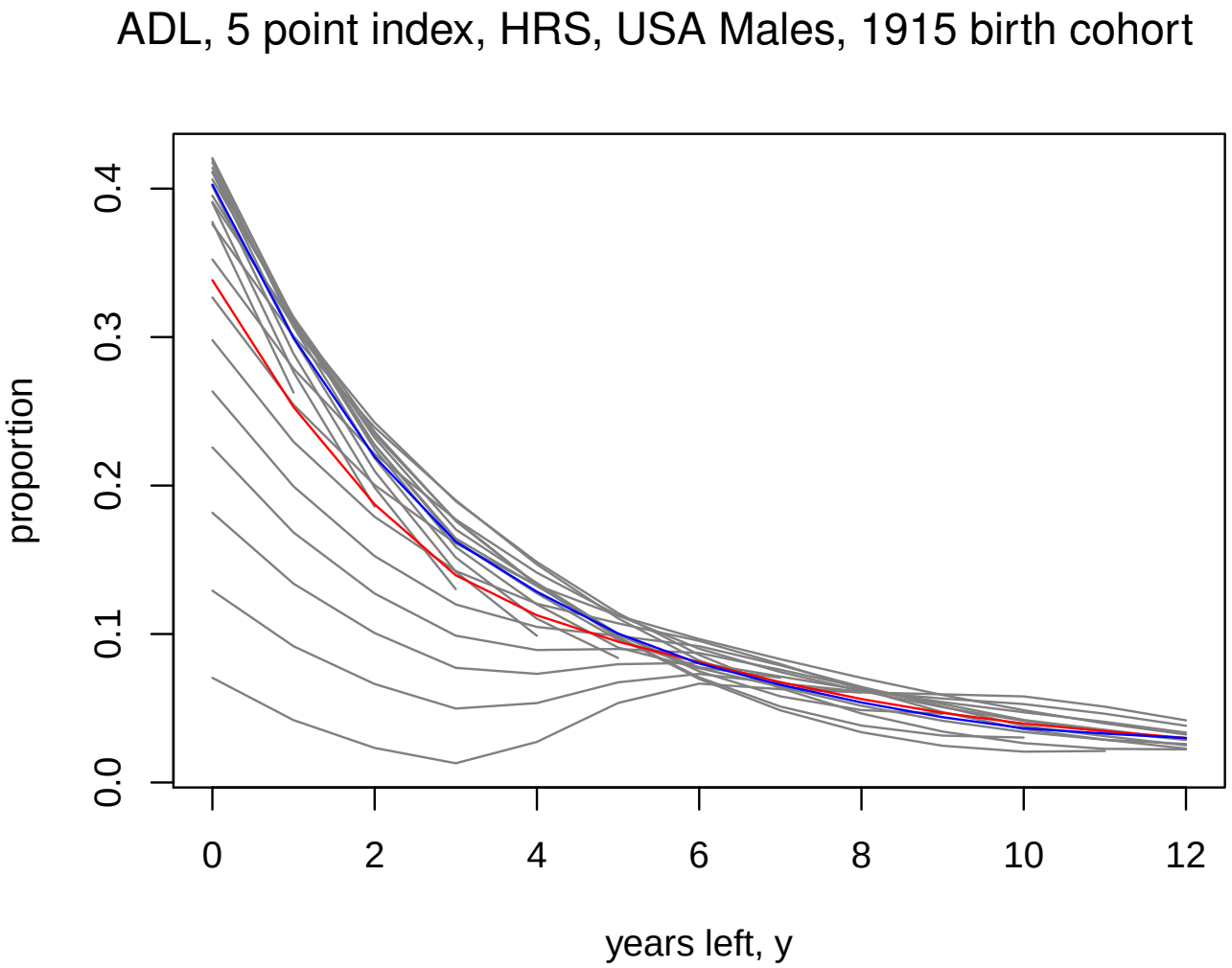
A demonstration



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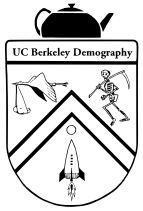

Reasonable assumption?

Yes, it's not bad to assume something like $j(y)$ might exist, so we're free to explore this assumption further.

red or blue line?

It doesn't matter, we'd learn the same thing. Will use red here.

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For items like $j(y)$

$j(y)$ gives an age pattern

Characteristics like $j(y)$ still have age patterns. They are tricky, shifty, aggregates. The translation to chronological age depends on mortality.

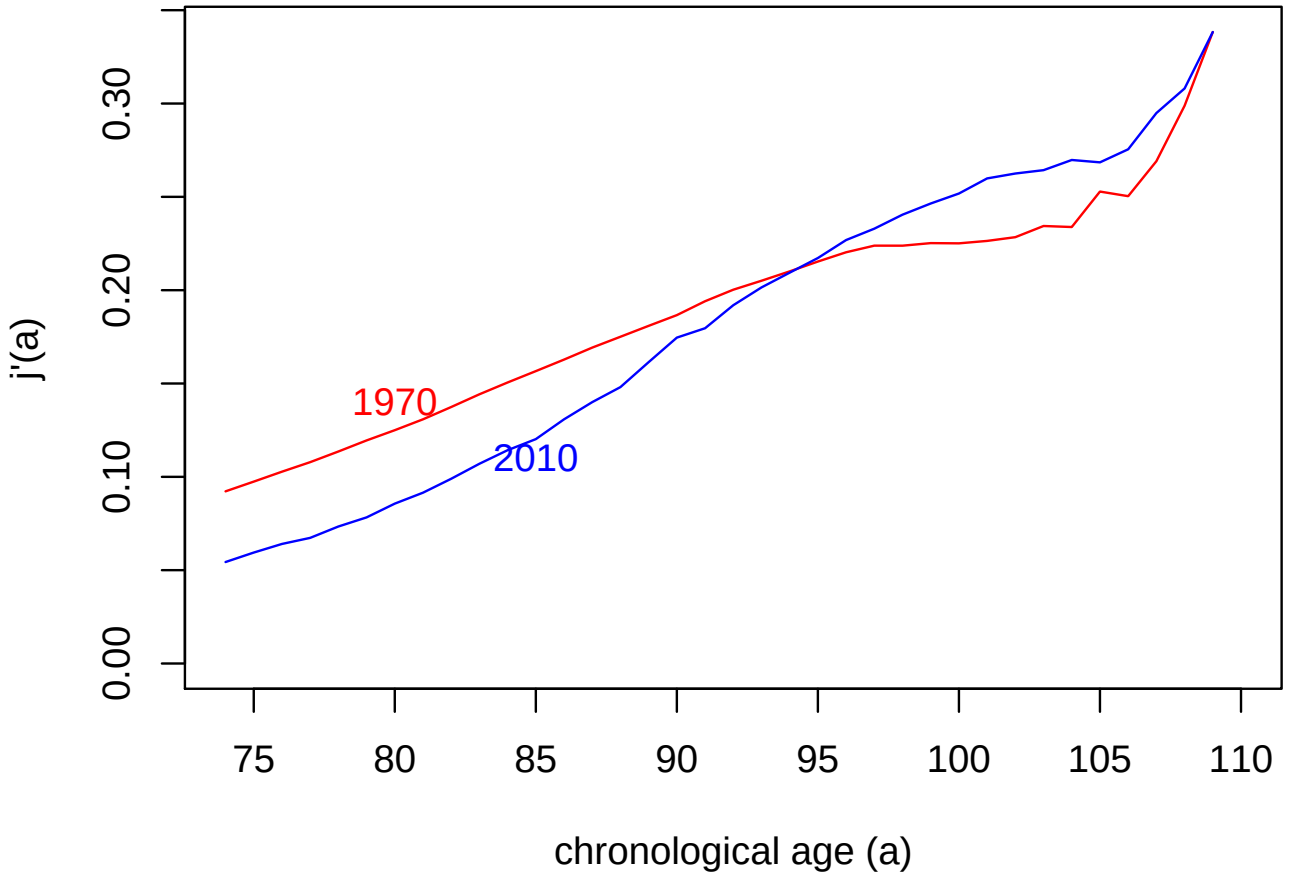
$$j'(a) = \frac{\int_0^\omega j(y)N(a,y)\,\mathrm{d}y}{N(a)} \tag{1}$$

$$= \frac{\int_0^\omega j(y)N(a)\mu(a+y)\frac{\ell(a+y)}{\ell(a)}\,\mathrm{d}y}{N(a)} \tag{2}$$

$$= \int_0^\omega j(y)f(y|a)\,\mathrm{d}y \tag{3}$$

What does $j'(a)$ look like?

Period $j'(a)$, assuming the red $j(y)$. Familiar-looking curves?[5]

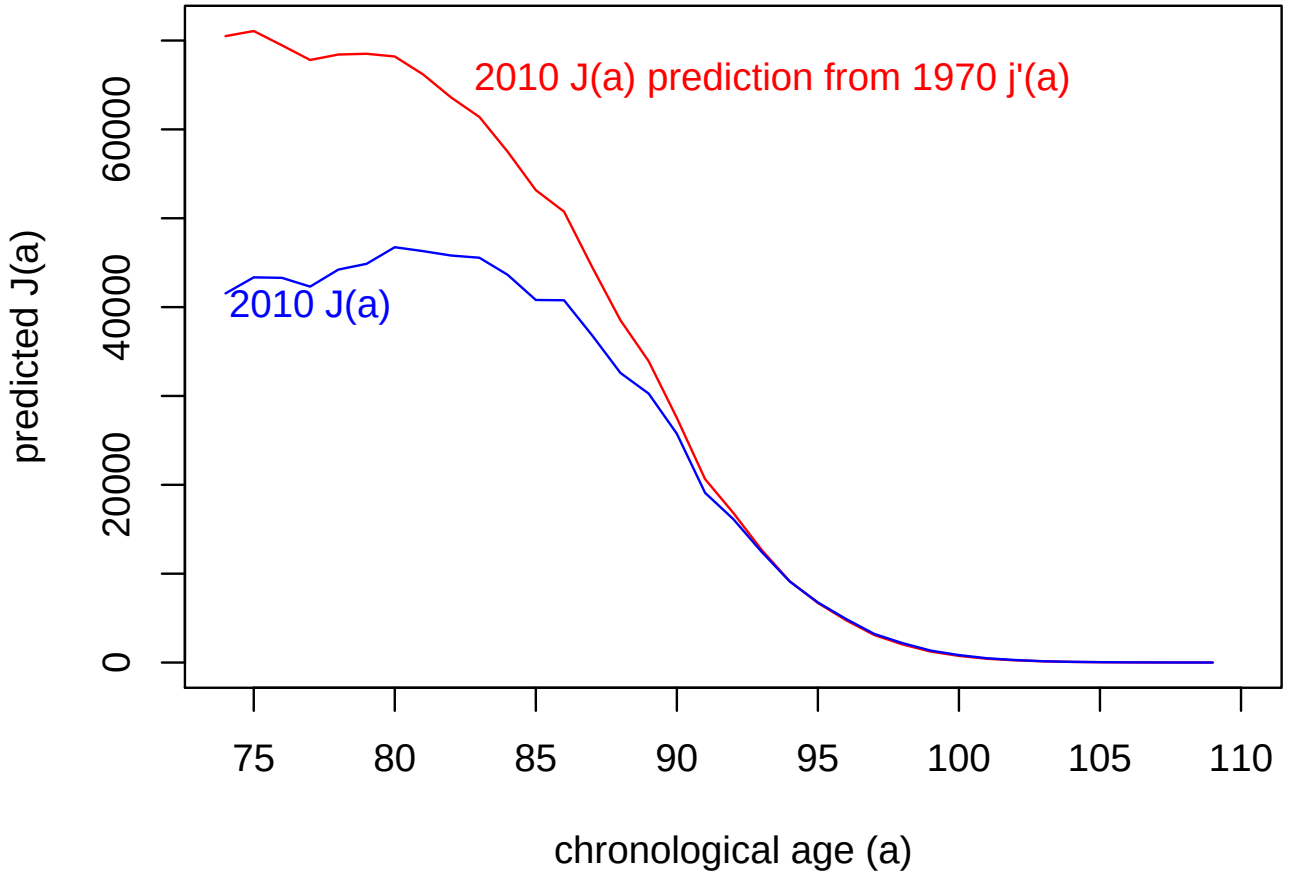


[5] Remember, we forced the same $j(y)$ on the whole series...

What does $j'(a)$ predict?

It's not so good at predicting. . .

2010 $J(a)$ predicted from 1970 $j'(a)$



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An alternative

Measure more thoroughly

Estimate $j(a, y)$ (surfaces), and predict the future with $j(a, y)$ together with a mortality forecast. Needed: panel data with mortality followup, or registers with good repeated health measures.

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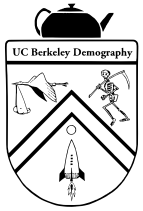

Comments or Questions?

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