

Biodemography

A Case Study of Reproductive Aging

The University of Colorado Population
Center & Institute of Behavioral
Science

Summer Course in Biodemography
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Reproductive Aging

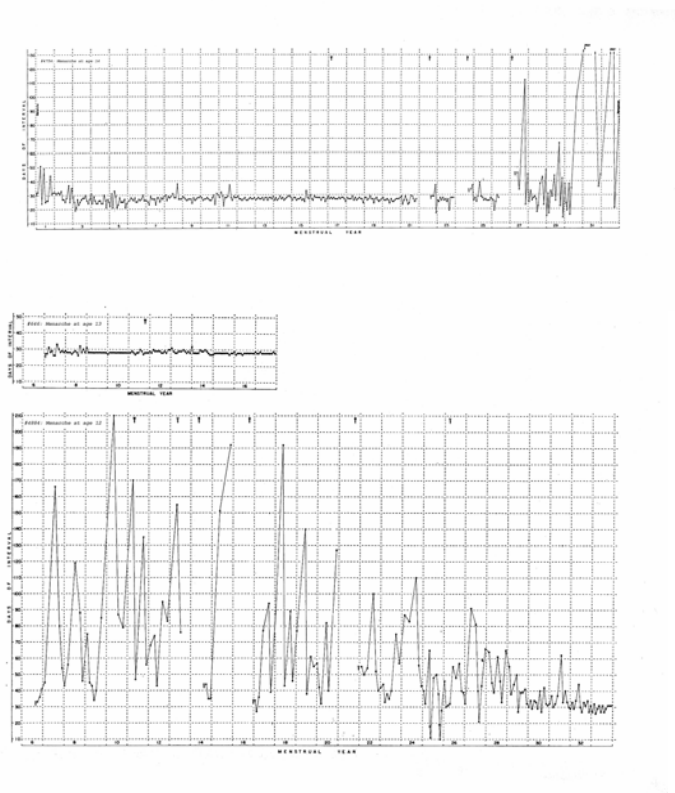
The “...reproductive system ages faster than the body as a whole and by age 45 can be said to be in the state that a woman’s other organs have reached by eighty.”

Gosden, 1996. Cheating time: science, sex and ageing.

Presentation Outline

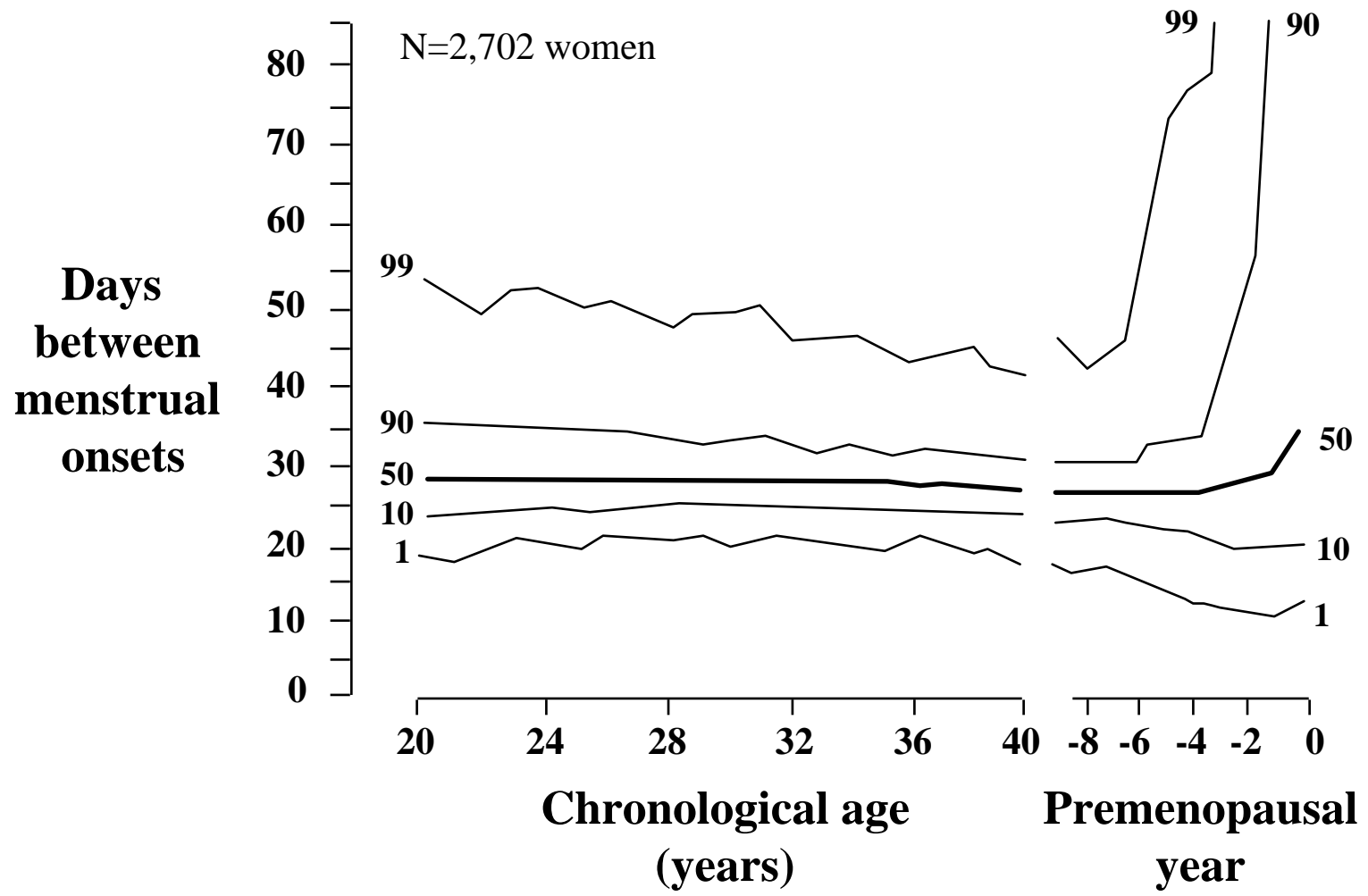
- The ovarian (menstrual) cycle
 - what they look like and a review of some biology
- Aging and the reproductive axis
 - hallmark features of reproductive aging
 - competing hypotheses on the primary determinant of reproductive aging
- BIMORA Project
 - project description
 - follicular depletion model
 - health consequences of reproductive aging
 - unopposed estrogen across the transition to menopause

Cycle Histories Differ and those Differences Matter



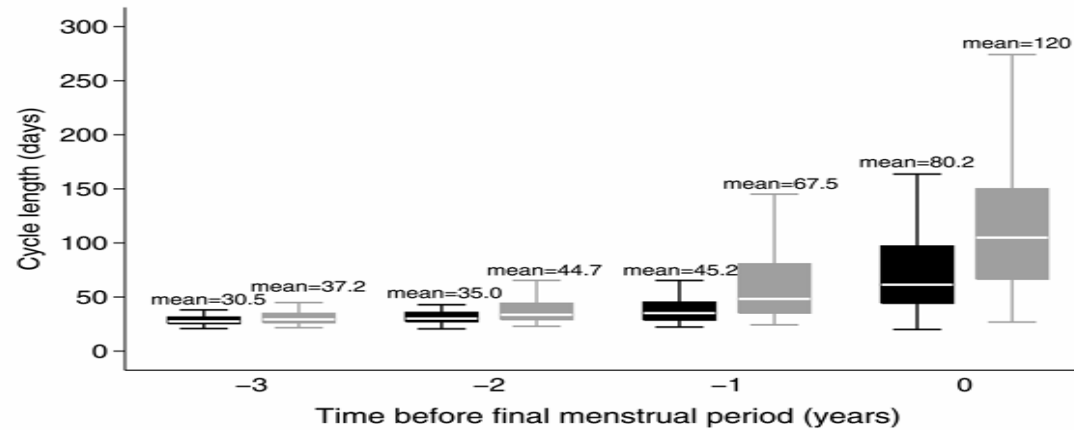
Figures reproduced from Treloar et al., 1967

Population and Individual Levels of Variation Change in cycle length with age



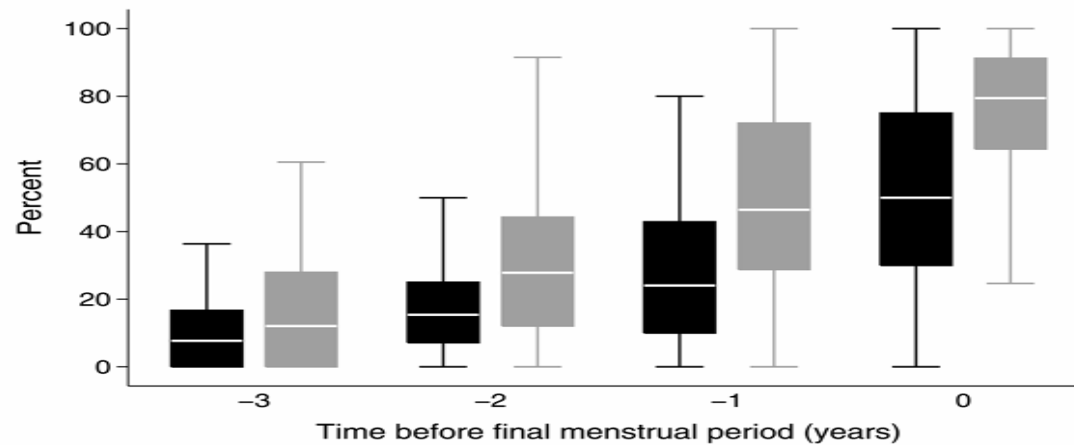
Redrawn from: Treloar et al. (1967) *Int J Fertil* 12:77-126

Re-analysis of change in cycle length with age



A

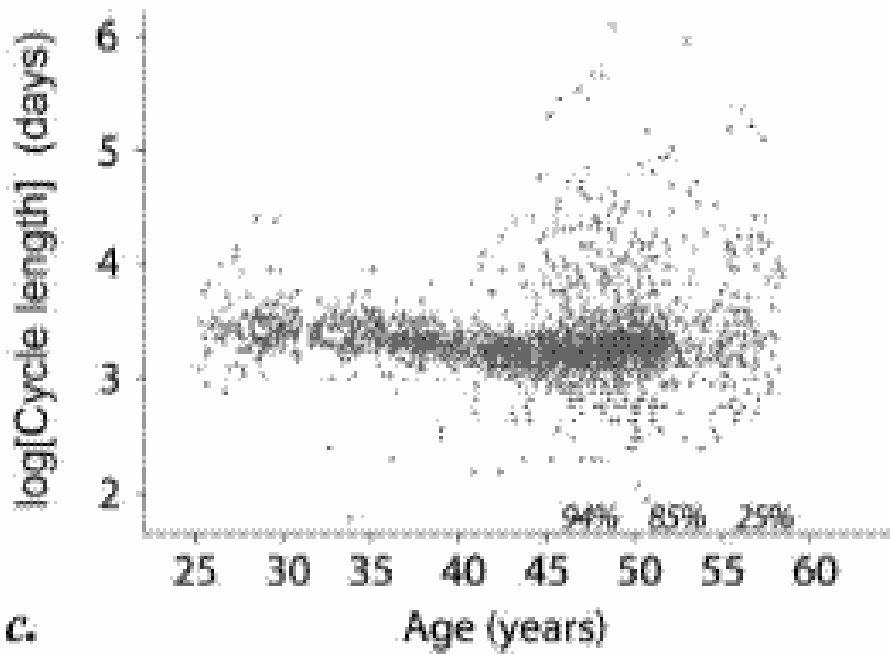
■ Distribution of individual mean cycle lengths (cycle-level mean) ■ Distribution of individual mean daily cycle length experience during the year (day-level mean)



B

■ Percentage of cycles ending in the year that were ≥ 40 days long ■ Percentage of days during the year that were spent in cycles ≥ 40 days long

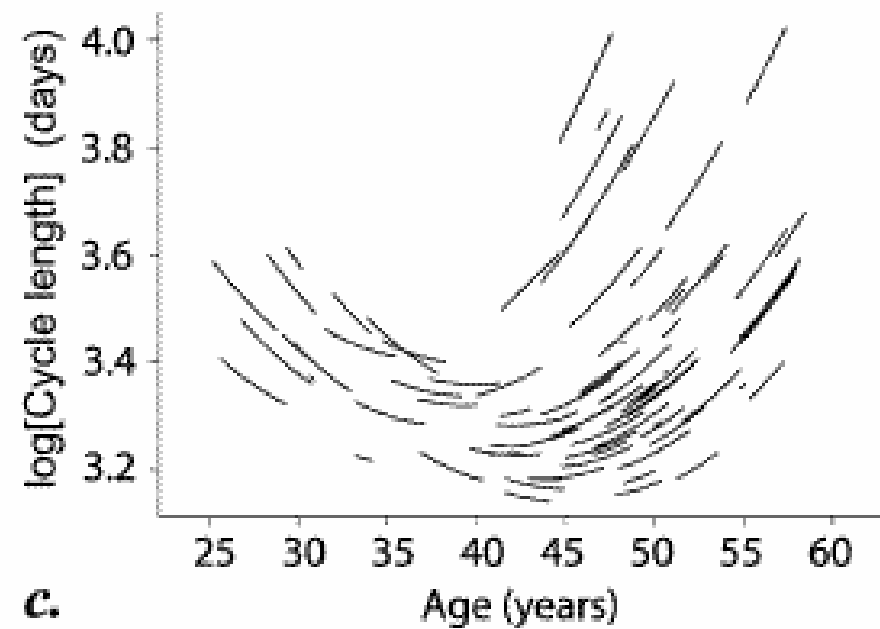
From: Ferrell et al, 2006, *Fertility and Sterility*



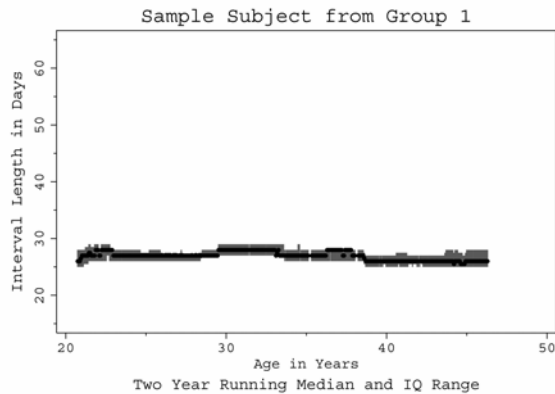
Cycle length by age
(N=145 women)

Aggregate plot

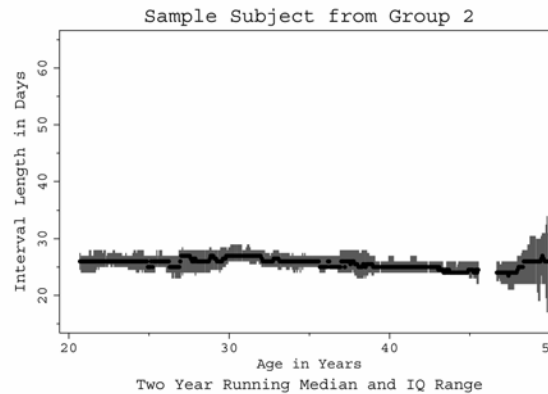
Individual trajectories



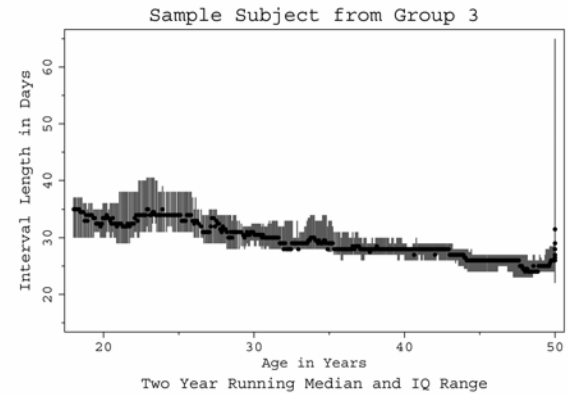
Histories Cluster



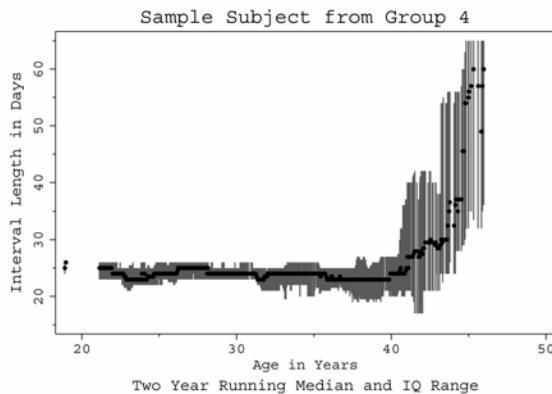
Very Stable History.



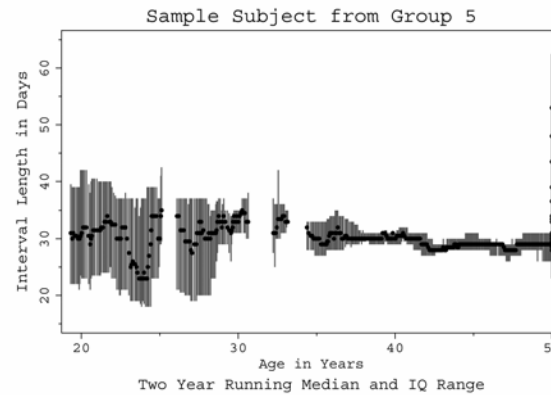
Stable, more variability in mean cycle length



Oscillating and erratic cycles with a downward slope



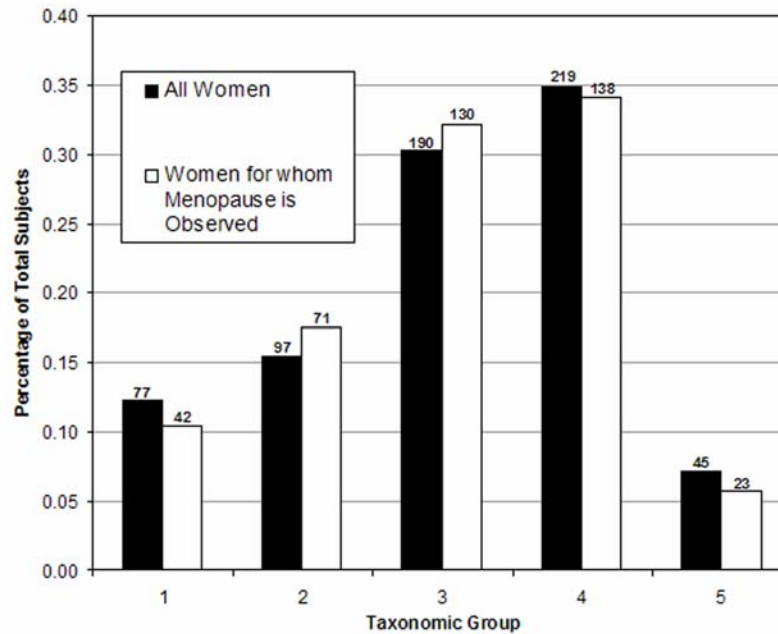
Oscillating and Erratic means, medium and high mean IQR's, upward slope



Highly erratic and variable history

Each black data point and whisker represents 2 years of cycles. The median cycle length is marked by the solid black dot and the IQR is marked by the whisker.

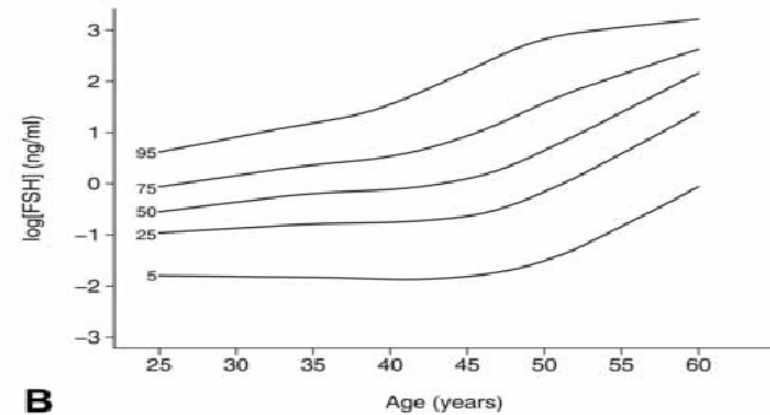
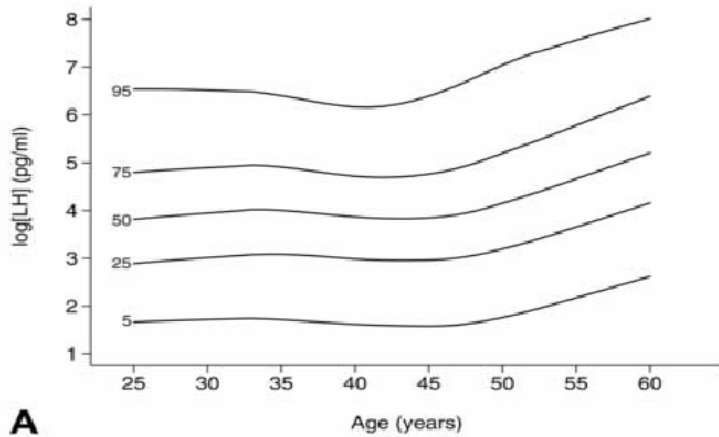
Distribution of Cycle Histories



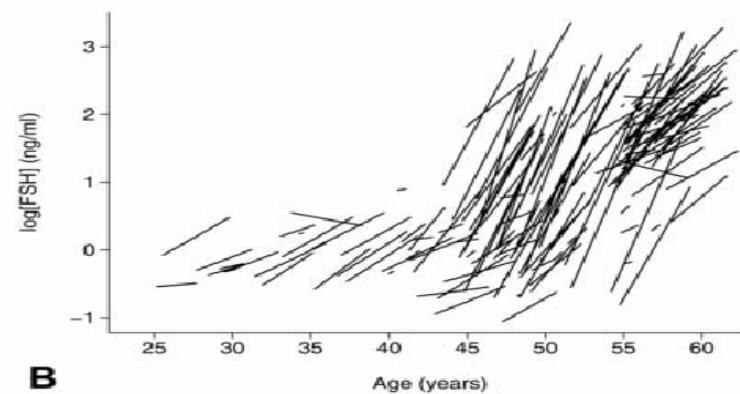
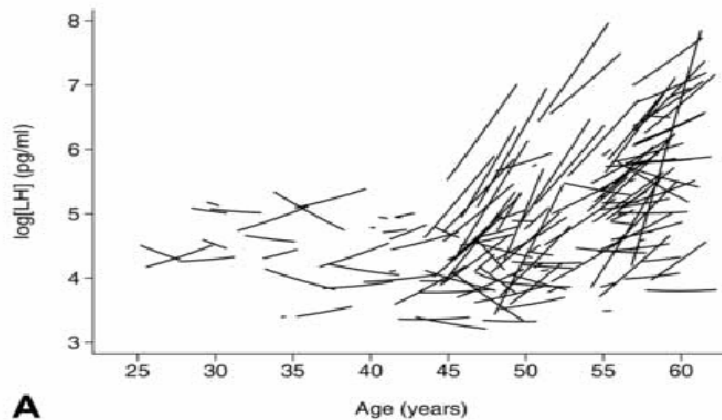
Cycle Histories are Linked to Reproduction

Characteristic	Stable (I & II)	Unstable (III, IV, V)
% menarche \geq 14	5.8	11.2
% \leq 1 birth	35.6	24.4
% menopause $<$ 48	6.3	13.2

Aggregate LH and FSH by age (N=145 women)



Individual-level trajectories of LH and FSH by age (N=145 women)



Aggregate E1G and PDG by age (N=145 women)

