



Advancing the Science of Aging through Life Course Interdisciplinary Research

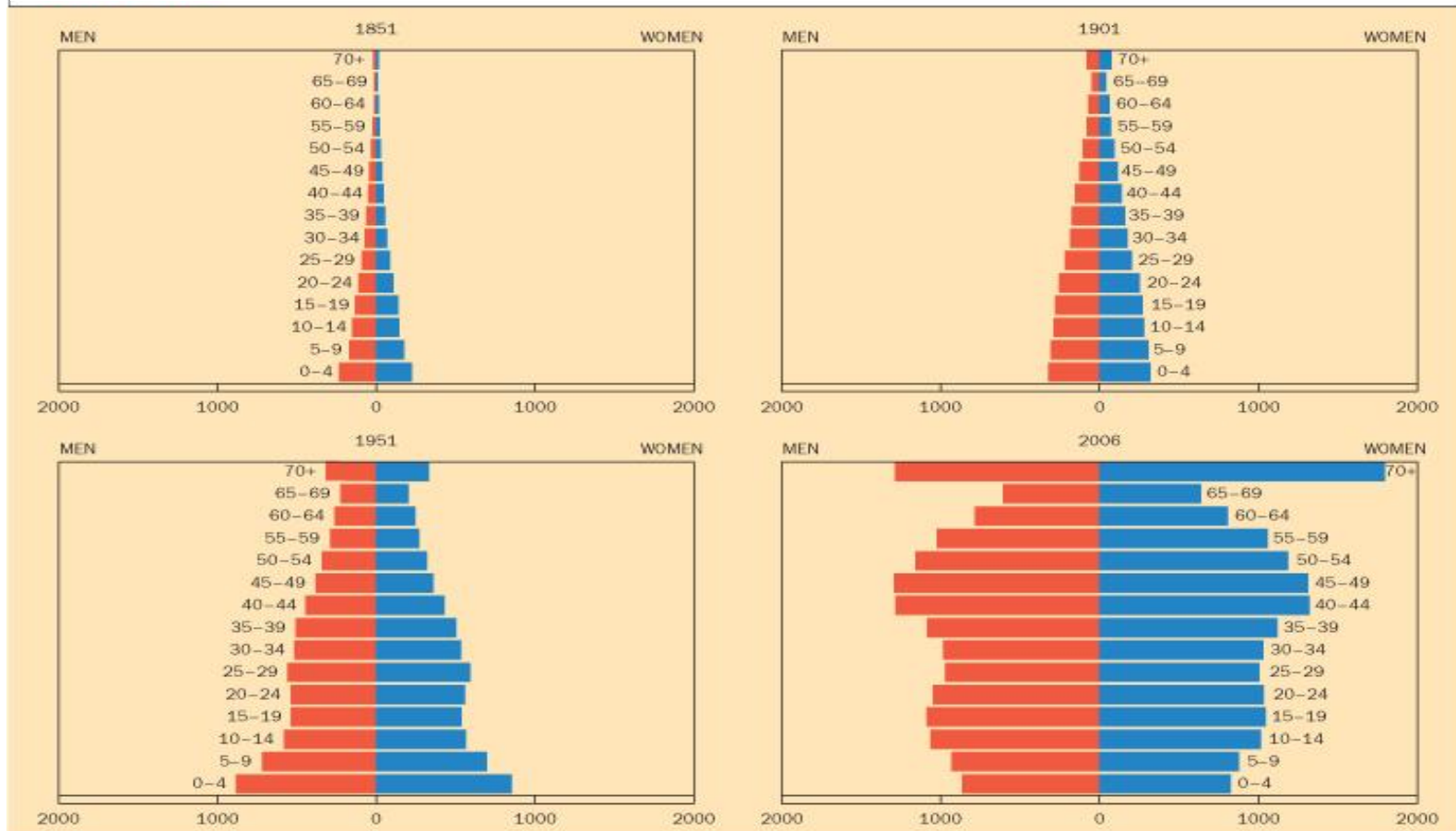
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SiforAge, Brussels, Belgium

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DEMOGRPAHIC SHIFT

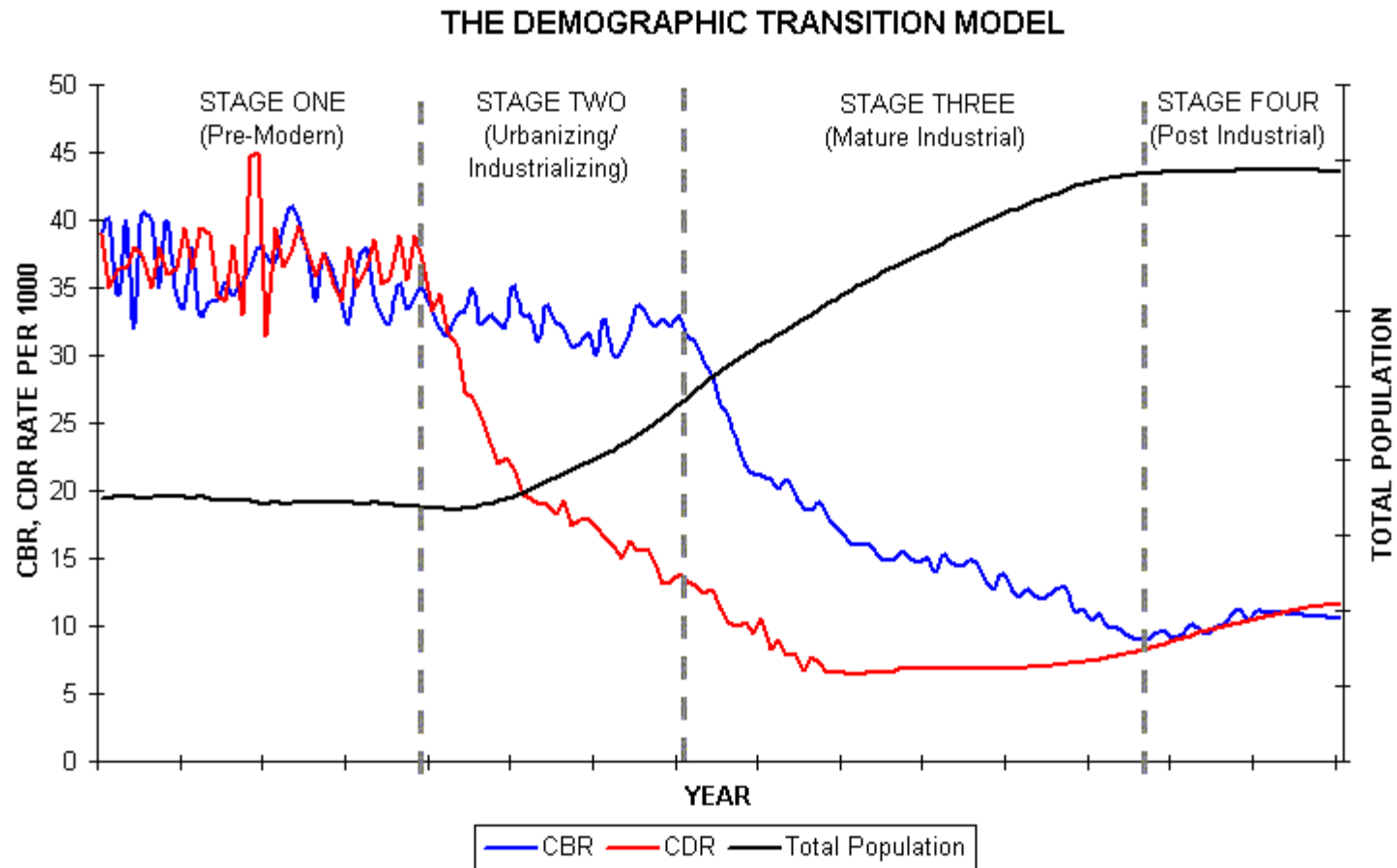


DEMOGRAPHY AND AGING

“Population aging is unquestionably the most important demographic force of the first half of the twenty-first century”.

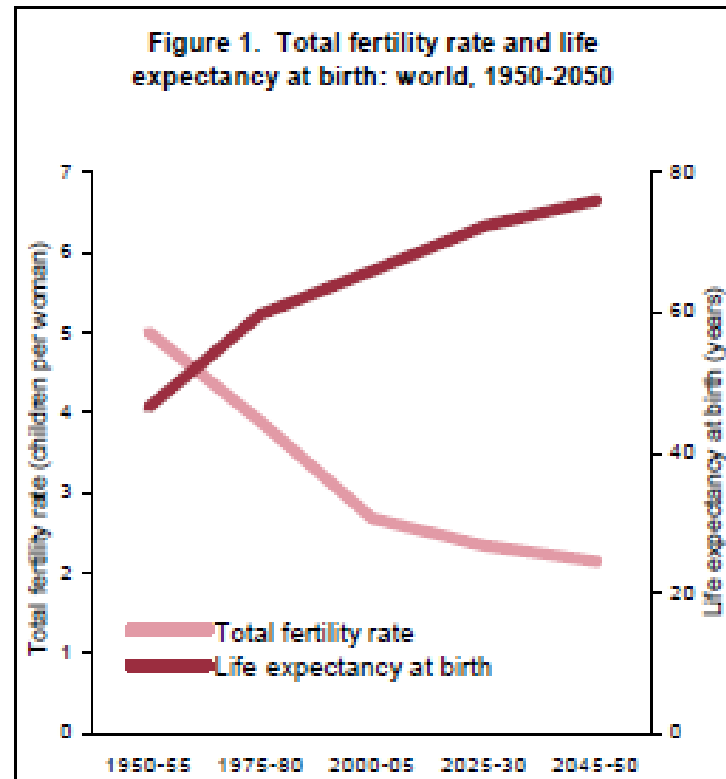
(Schoeni FR, Ofstedal MB. *“Key Themes in research on the Demography aging”* Demography, 47, 2010: S5-S15)

THE DEMOGRAPHIC TRANSITION



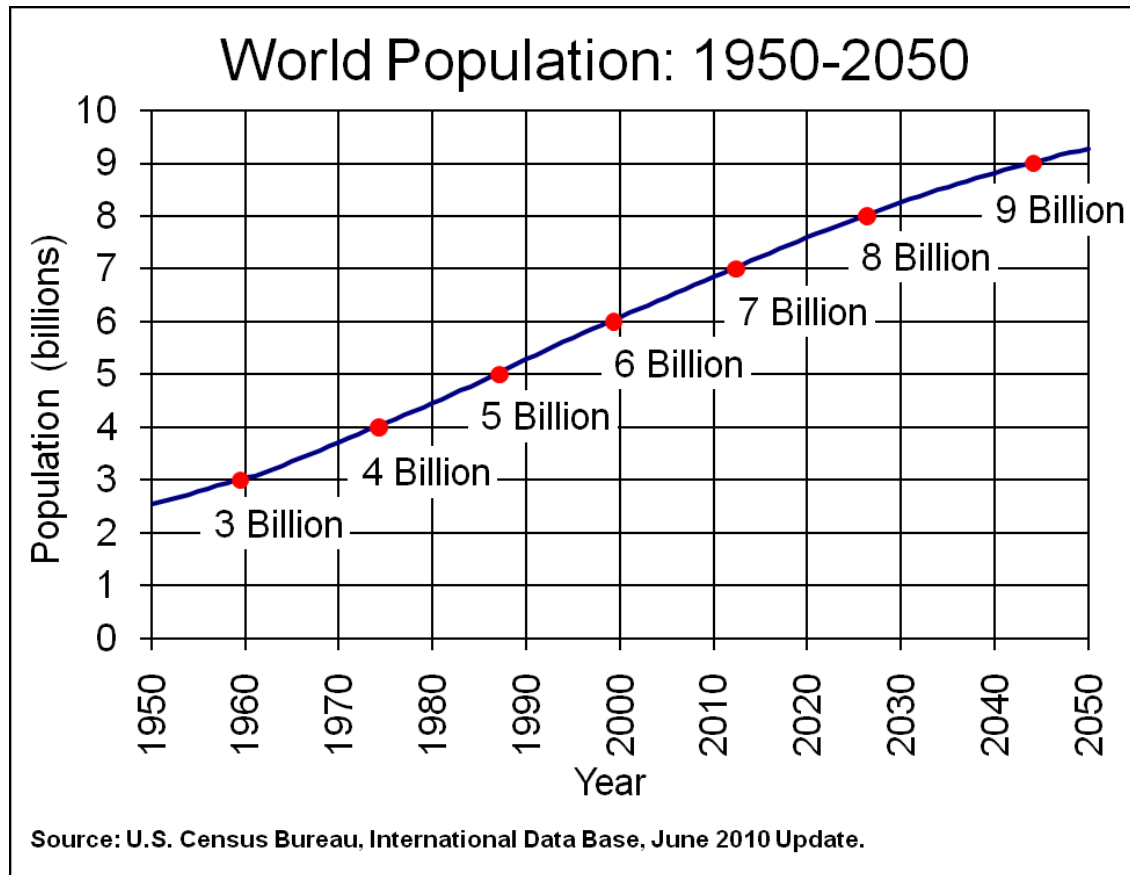
WORLD POPULATION AGING

During the last decades there has been a global decline of mortality and fertility from higher to lower levels.



WORLD POPULATION

The world population is rapidly growing:



WORLD POPULATION AGING

- World population is especially **growing older**:
 - ➔ the share of the population aged 65+ is expected to double between 2010 and 2040, from 7.8% to 14.7%
 - ➔ the number of older people will increase from 530 million in 2010, to 1.3 billion by 2040.

([U.S. Census Bureau, International Data Base](#))

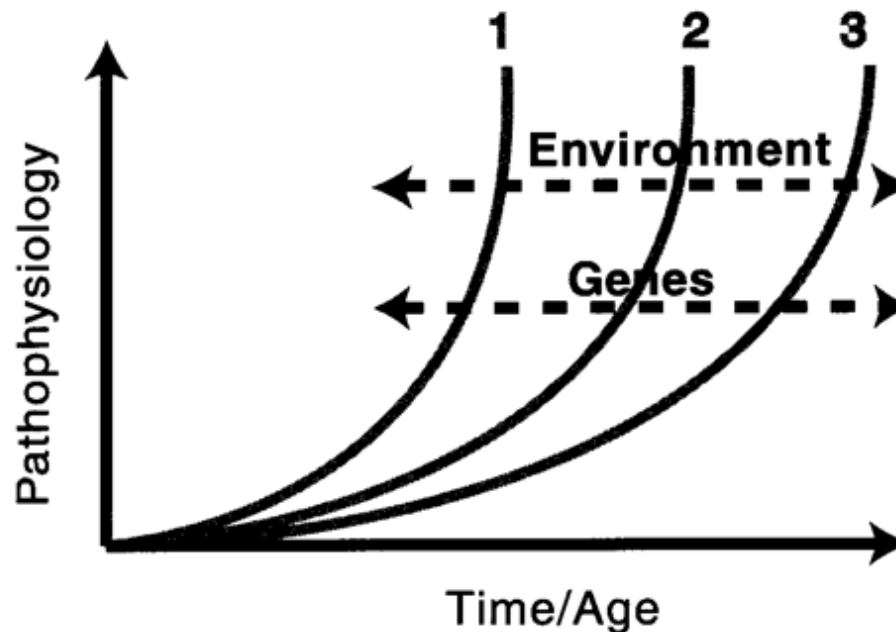
WORLD POPULATION AGING

- Another aspect of world population aging is **the aging of the older population**; the share of the older at ages 80+ (the “oldest-old”) is growing more rapidly than the older population itself.
- This growth will translate into a large increase of oldest-old within the world’s older population, from 16% in 2000 to 24% in 2040.

([U.S. Census Bureau, International Data Base](#))

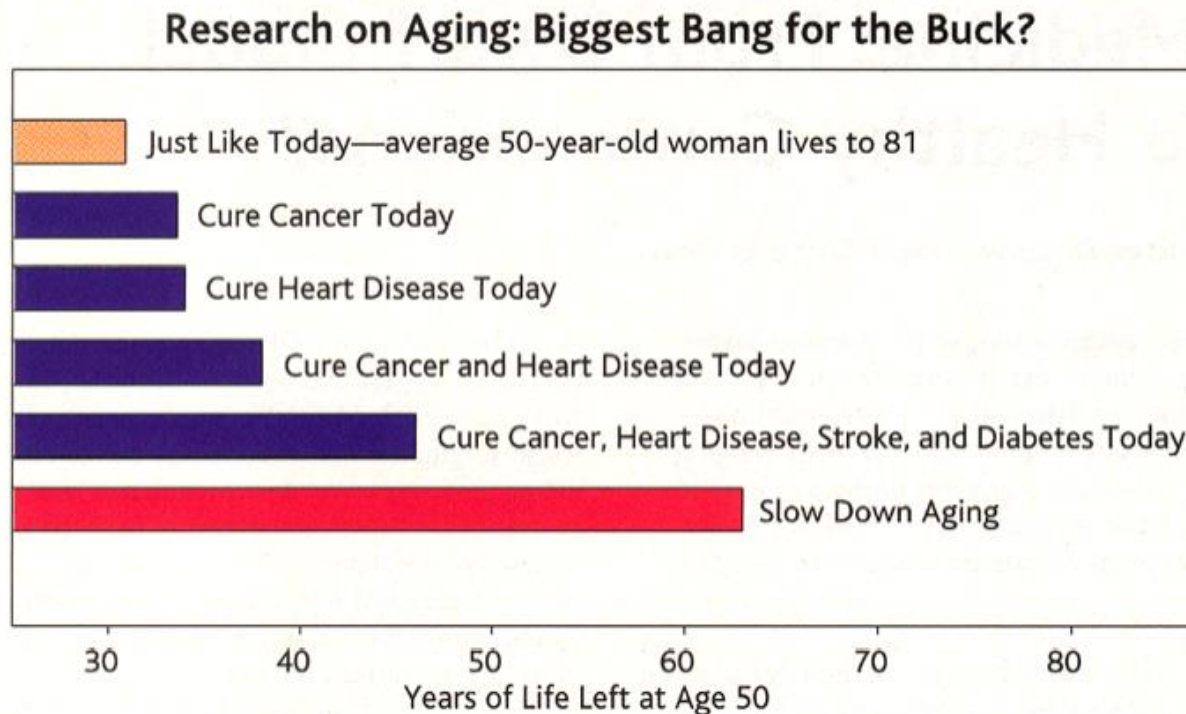
Why does Aging happen?

- What is “normal” in the aging process - primary aging
- More susceptibility to disease - secondary aging
- More heterogeneity in the elderly population
- Onset indeterminable and progression varied
- Genetic and environmental factors



Why does Aging happen?

- Gender is a significant factor
- Lifestyle a primary factor
- Various theories of aging attempt to explain the process
 - bottom line, there is disruption of homeostasis



Various Theories of Aging Process

- **Biological**

- How do cells age?
- What triggers the aging process?

- **Sociological**

- How does a society influence its old people?
- How do old people influence a society?
- How social and economic inequalities influence aging?

- **Psychological/Cognitive**

- How is behavior/cognition affected by aging?
- Do patterns of behavior/cognition change over time in any identifiable way?

- **Biomedical**

- How are aging and disease processes related, as well as different?
- How are disease processes impact function, quality of life and health care delivery?

Risk factors for Disease, Disability and longevity

- Risk factors
 - Many factors contribute
 - Gender difference remains unexplained
 - Loss of prediction
 - Paradoxes in prediction
- New opportunities
 - Larger number of very old people
 - Longer term follow-up
 - Longitudinal data – identify optimal trajectory
 - Common risk factors

Paradigm Shift

- Changing perspectives of Aging Process
 - Life Course and Multi-level
 - Individual factors
 - Contextual factors
 - Environmental factors
 - Expressed as dynamic models
 - traditional risk factors are being incorporated within broader ecological models that consider social and political determinants

Life Course/Longitudinal Perspective

Social, Cultural & Environmental influences
(e.g., rural, socio-economic, exercise, nutrition)

Chronic diseases
(e.g., diabetes, cancer, dementia, arthritis, cardio)

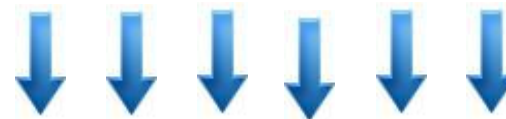


(e.g., telomeres/oxidative stress,
psychological & cognitive abilities,
immune functions)

Aging



infections



**Health and Social Services
Utilization**

Time



CLSA élcV
Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement

Life-Course Perspectives

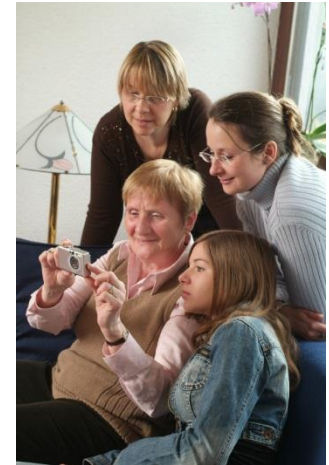
- Aging is from birth to death
- The past shapes the present and future too
 - Social conditions experienced in early life influence life choices and opportunities
 - Health behaviors adopted in childhood influence later life
 - Health in childhood influences health in later life
- It's never too soon to adopt healthy behaviors and never too late



Canadian Longitudinal Study on Aging
Étude longitudinale canadienne sur le vieillissement

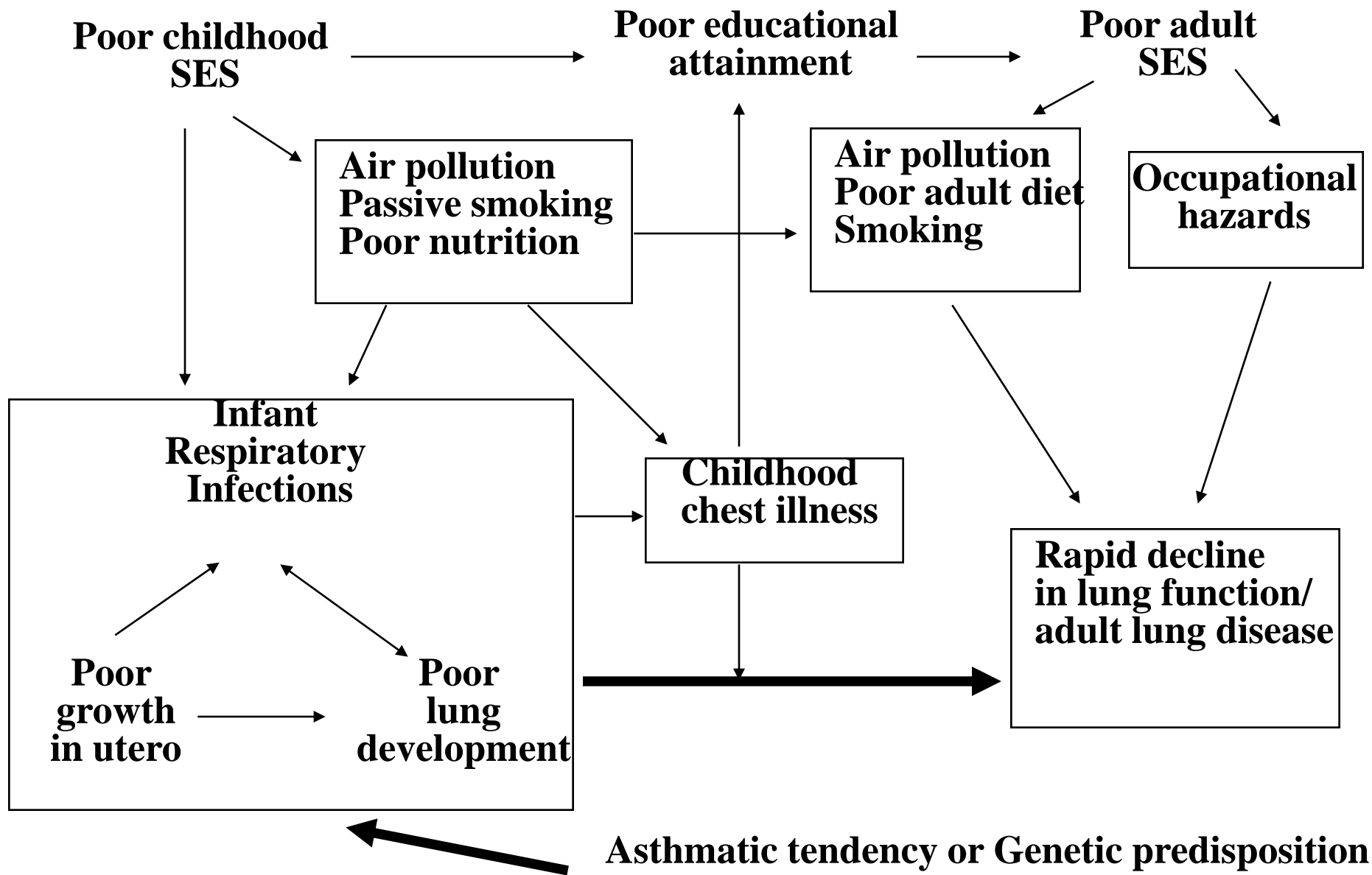
Life-Course Themes

- Each life transition presents a unique opportunity for interventions to inform policy and practice that can improve health and quality of life
- Interventions can be focused on particular stages or on the entire life-course
- Chronic diseases likely result from the complex interplay of critical and sensitive period, and trajectory and accumulation processes



What is a Life Course Health Development?

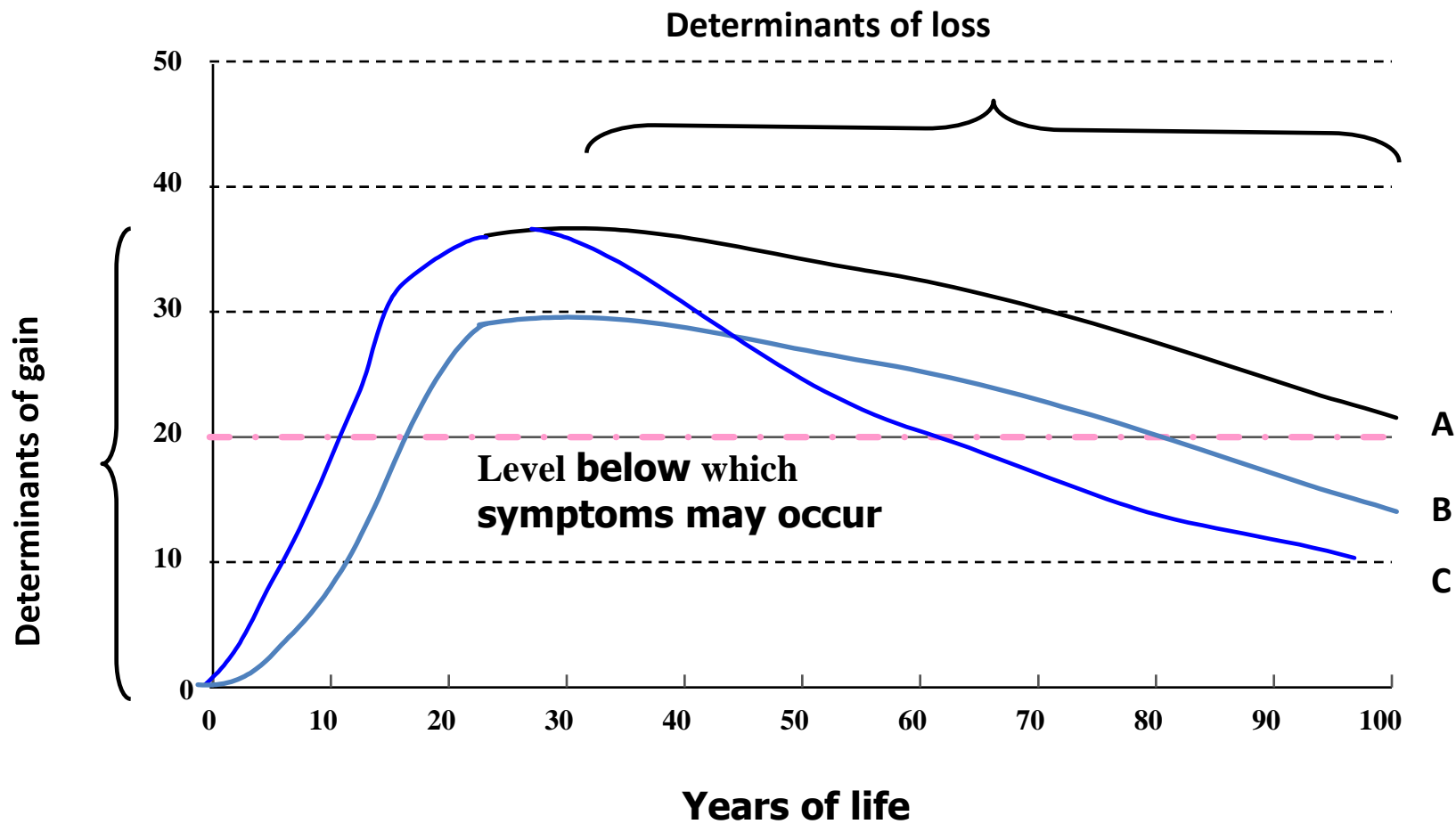
- Multiple determinants operating in contexts that change as a person develops (multiple contexts)
- Health development is an adaptive process composed of multiple transitions (design and process of health development)
- Different health trajectories are the product of cumulative risk and protective factors (variations in the trajectories)
- The timing and sequence of multiple determinants and experience influence health and development of both individuals and populations (critical and sensitive periods)



Example: Lifecourse influences on respiratory disease

(Ben-Shlomo & Kuh 1999)

Level of function

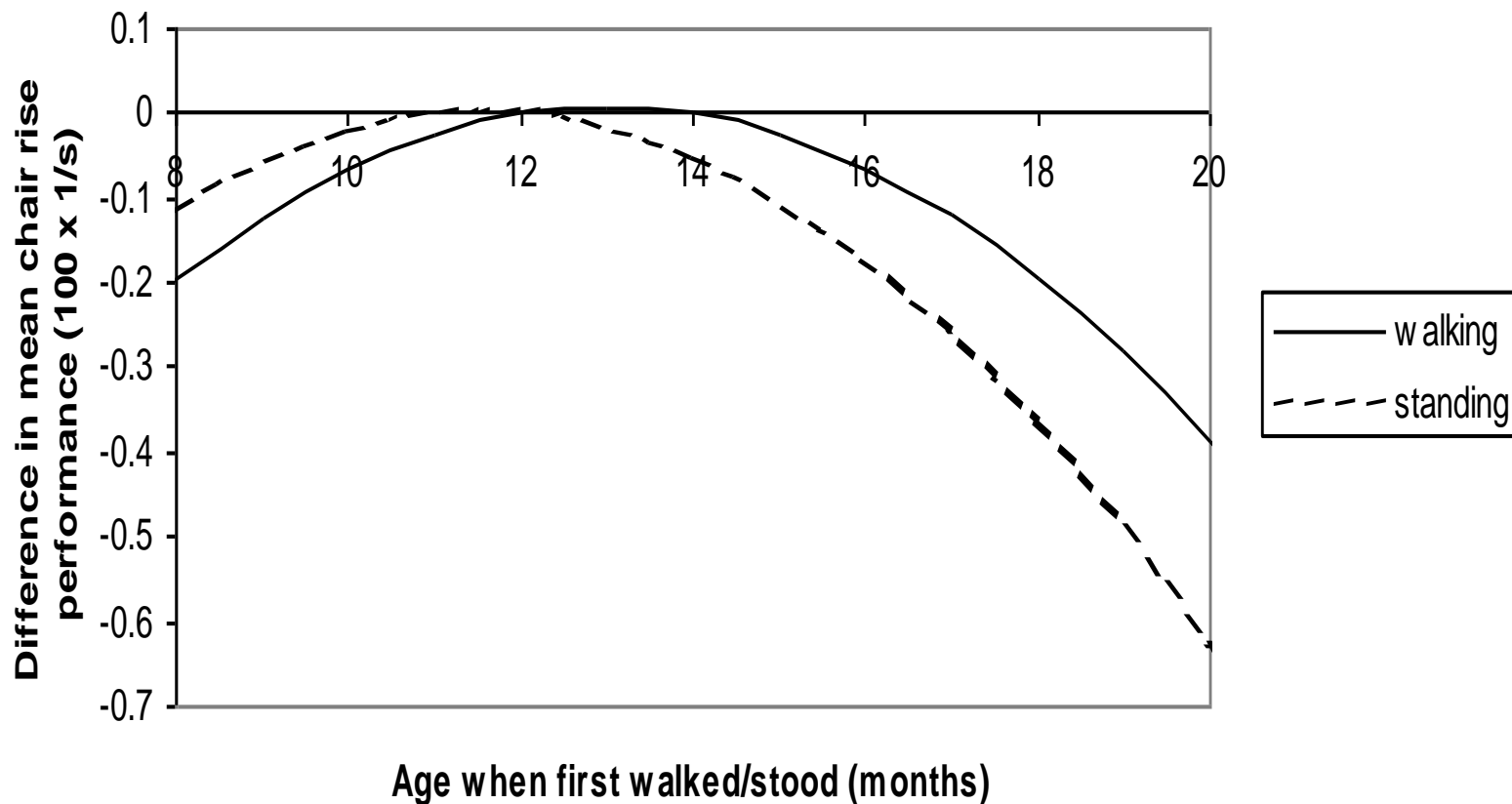


modified from Strachan and Sheikh (2004)

Example: Developmental origins of adult physical capability in the 1946 birth cohort from UK

- Pre-pubertal weight gain was beneficial for physical capability at age 53 in men but not women
- Pubertal and post pubertal weight gain was detrimental for physical capability at age 53 , particularly for women
- Indicators of CNS development (reaching motor milestones at the modal age, higher childhood cognitive ability and better adolescent motor coordination) were beneficial for standing balance and chair rising at age 53

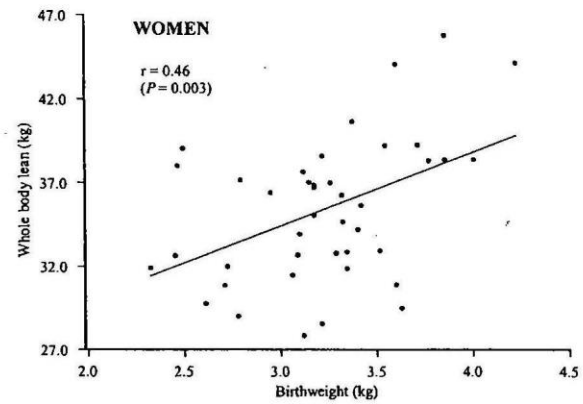
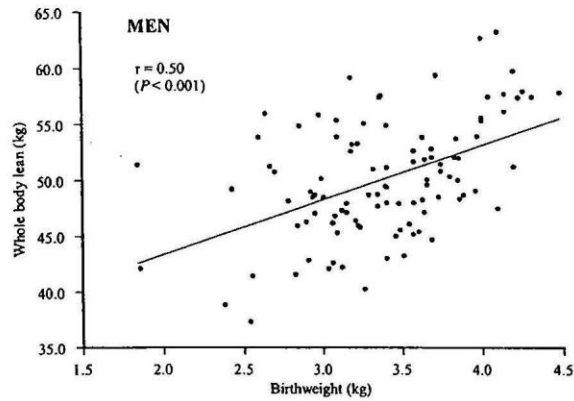
**Difference in mean chair rise performance by age when first walked/stood
(sex-adjusted) compared to performance at modal age (12 months)**



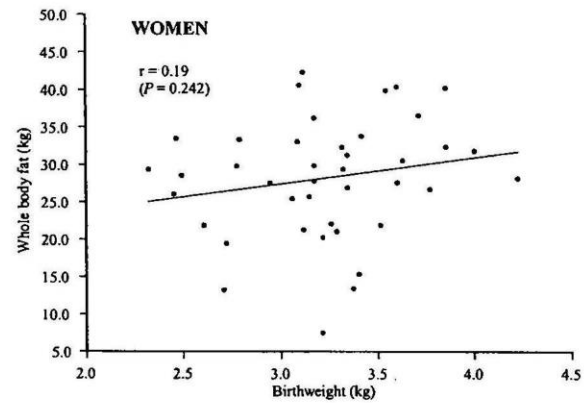
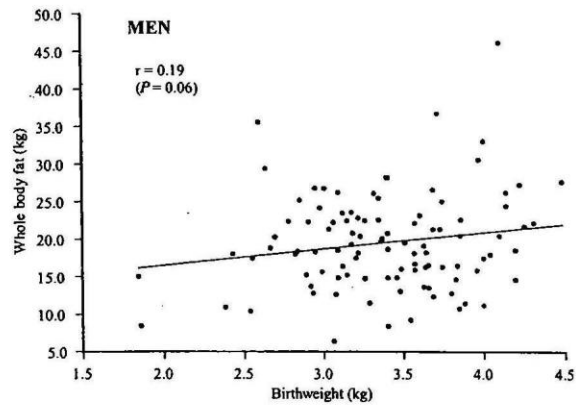
Odds ratio for low physical performance at age 53 by indicators of childhood socioeconomic circumstances (Guralnik et al, *J Gerontol*)

	OR Adjusted for sex	95% CI
Father's social class at age 4		
Non-manual	1.00	
Manual	1.69	(1.29, 2.23)
Father's education		
Secondary level	1.00	
Primary level only	1.79	(1.31, 2.46)
Mother's education		
Secondary level	1.00	
Primary level only	1.98	(1.37, 2.85)
Housing quality at age 4		
Good	1.00	
Intermediate	1.34	(0.99, 1.83)
Worst	1.68	(1.23, 2.32)
Care of house & child at age 4		
Best	1.00	
Intermediate	1.20	(0.86, 1.68)
Worst	1.38	(1.01, 1.89)

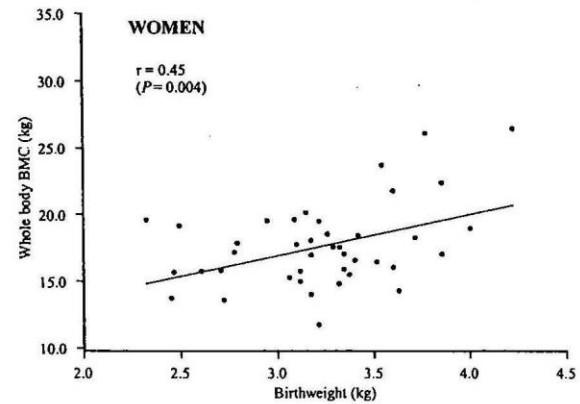
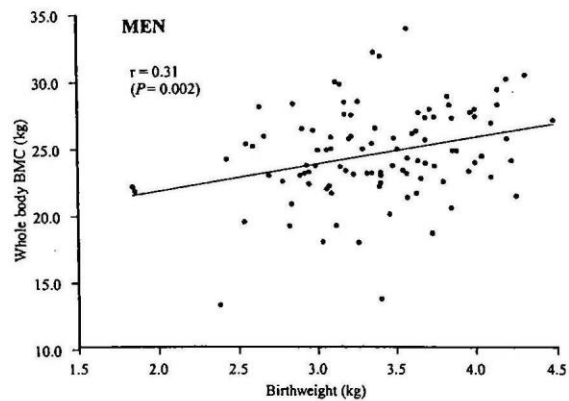
(a) Birthweight and lean mass



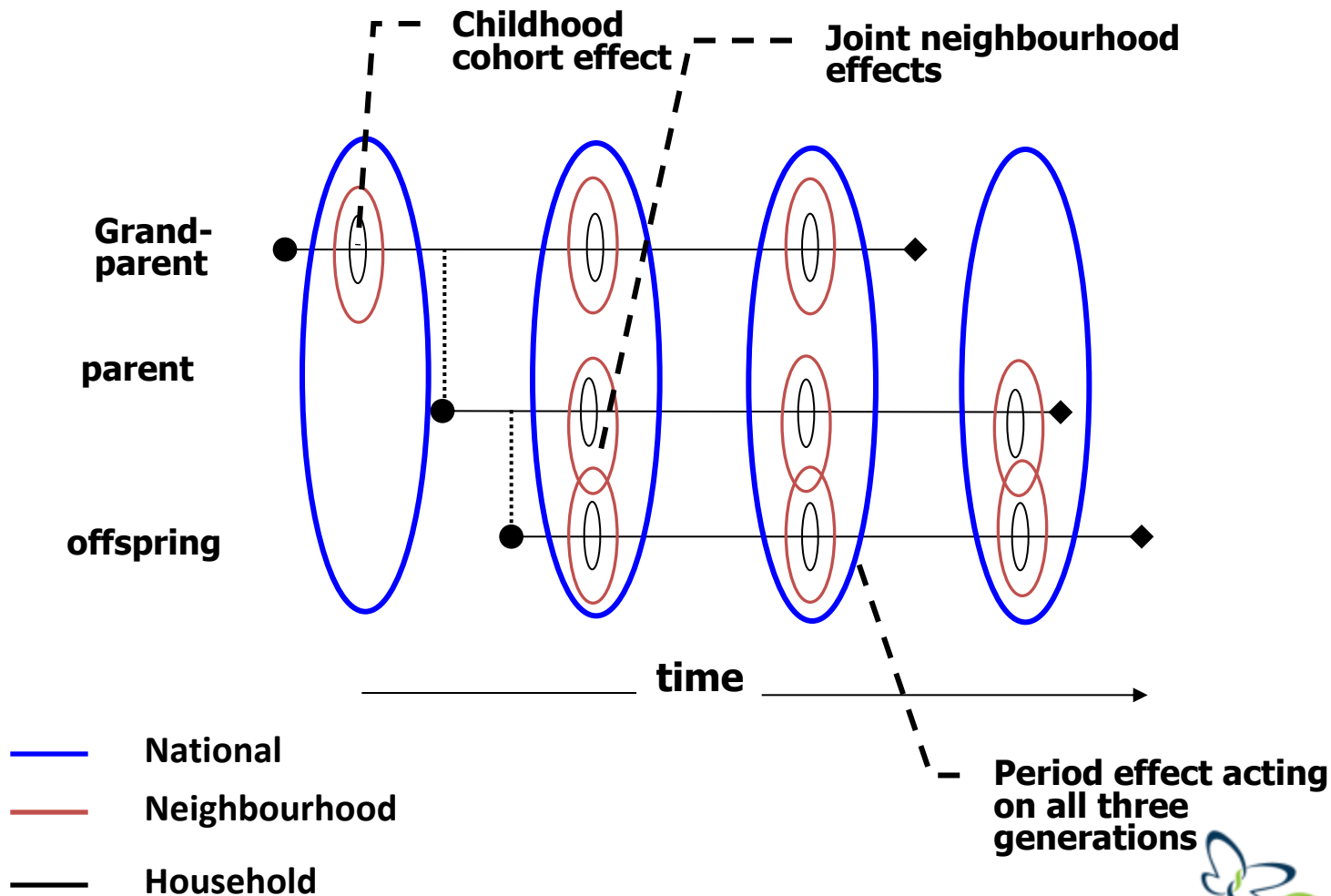
(b) Birthweight and fat mass



(c) Birthweight and whole body bone mineral content



Synthesis of ecosocial and life course influences across generations



Strengths and limitations of a life course approach to studying Aging

Limitations

- Few life course studies and absence of life course studies of aging
- Methodological challenges
- Expensive long-term investment
- Losses to follow-up (but know who is lost!)
- Complex ethical issues

Strengths:

- Life course models make researchers consider
 - the timing (critical),
 - duration (accumulation) and
 - temporal ordering (chains of risk or interactions) of exposures
- Integrates social, psychological, lifestyle and biological risk processes
- Promotes interventions earlier in the life course

What are examples of research questions for future research on aging?

- What is the relative importance of early life and later life risk factors on age-related changes in neuromuscular, neuroendocrine, inflammation and immune functions that underlie aging and age-related diseases?
- Do exposures early in life influence the development of social inequalities in older adults and how these social inequalities relate to disease, disability or psychosocial outcomes?
- Do changes in early life conditions from one generation to the next explain time trends in disease, and disability?
- Are there common lifetime risk factors and processes that promote the development and maintenance of cognitive and physical capability across the life course, reduce chronic disease risk and improve longevity?

What are examples of research questions for future research on aging? Contd..

- Long-term evaluations of early interventions
- Changing social & policy or health care context, secular trends in lifestyle
- Adaptation – develop this underlying concept. Escape from risk (biological and psychosocial). Short term benefits v. long-term costs of adaptation. Global or specific
- Interactive effects – sex and gender – biological and psychosocial-genes and environment
- Develop the concept of physiological, cognitive and psychosocial capital



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