

Opening Remarks

Integrative Longitudinal Lifespan Research and Within-Person Assessment in the Age of Precision Medicine

Scott M. Hofer

University of Victoria

The Integrative Analysis of Longitudinal Studies of Aging (IALSA; www.ialsa.org) research network is supported by a grant from the National Institutes of Health/NIA: 1P01AG043362; and previously by NIH/NIA 1R01AG026453 and the Canadian Institutes of Health Research: 200910MPA Canada-UK Aging Initiative.

Motivating Better Science and Care

Priorities: Canadian Institute of Health Research

- **Technology Evaluation in the Elderly Network**
 - Living independently at home: Frailty and associated health conditions
- **eHealth Innovations Partnership Program**
 - Identify patient-oriented eHealth solutions that will improve health outcomes, patient experience, and lower the cost of care
- **Precision Medicine**
 - Matching individual patients with specific therapies to optimize long-term success

Motivating Better Science and Care

Priorities: Canadian Institute of Health Research

- Canadian Longitudinal Study of Aging
 - Factors impacting health and in the development of disease and disability as people age



Motivating Better Science and Care

Priorities: Canadian Institute of Health Research

- **Canadian Consortium on Neurodegeneration in Aging (CCNA)**
- Research hub: To impact quality of life and the quality of services for individuals living with neurodegenerative diseases



Canadian Institutes
of Health Research

Instituts de recherche
en santé du Canada



Alzheimer's
Research
UK

The Power
to Defeat
Dementia

Société
Alzheimer
Society
CANADA

Canadian
Nurses
Foundation



Fondation des
infirmières et
infirmiers du Canada



Fonds de la recherche
en santé
Québec



MICHAEL SMITH FOUN
FOR HEALTH RESEAR
Discover. Connect. Engage.



New Brunswick
Health Research
Foundation



Fondation de la
recherche en santé
du Nouveau-Brunswick



NOVA SCOTIA
Health Research
FOUNDATION



ONTARIO
BRAIN
INSTITUTE

INSTITUT
ONTARIEN
DU CERVEAU

Converge. Discover. Deliver. Mobiliser. Découvrir. Produire.



Robin and Barry Picov
Family Foundation



Women's Brain
Health Initiative



prion
Alberta
Prion
Research
Institute



Alberta
Innovates
Bio
Solutions

Lifespan Development and Life Course Epidemiology

- Investigation of long-term effects on chronic disease risk and changes in physical and cognitive capabilities
 - Hazards (e.g., low SES, poor parenting, stress, lack of stimulation) during gestation, childhood, adolescence, young adulthood and later adult life, and across generations. Kuh & Ben Shlomo 1997, 2004
 - Focus on long periods of lifespan
 - Multiple cohort comparison (historical, generational)
 - Modifiability of risk factors; Critical periods for most impactful interventions (e.g., Hertzman, McEwen, Rutter, Suomi)
 - E.g., Life events and changes in socio-economic circumstances may modify early life experiences

Integrated Life Course Approach to Aging

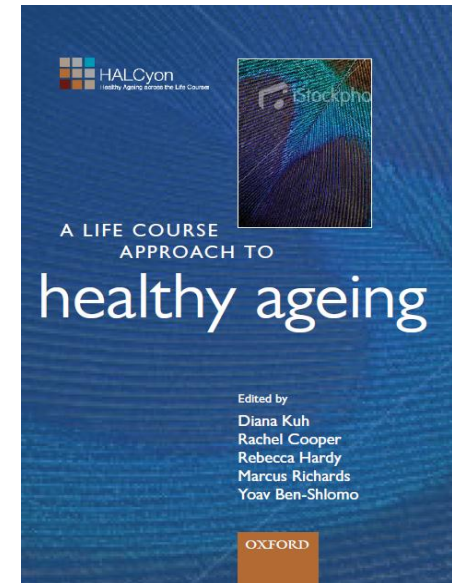
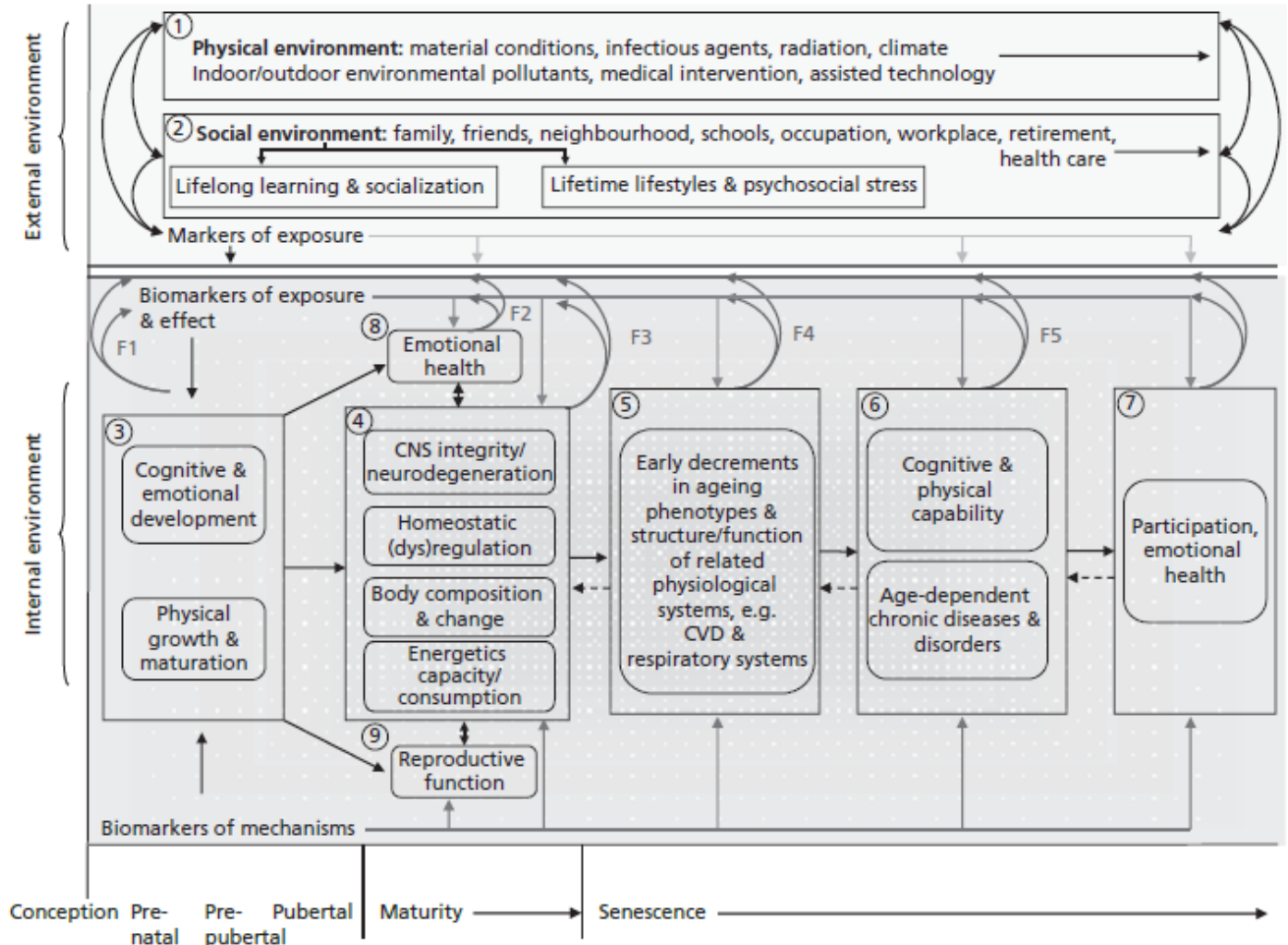
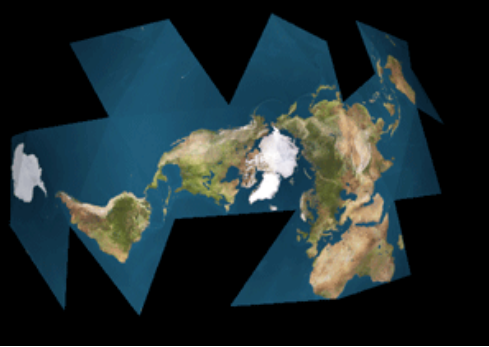


Figure 1.2 An integrated life course approach to ageing.

Large-Scale Data Resources

(Gallacher & Hofer, 2011)

- **Integrative Data Analysis**
 - Collaborative/Coordinated analysis of existing data resources
 - Biobanks (P3G; BioSHARE), longitudinal cohort studies (IALSA; HALCYON)
- **E-Epi Research/Remote Objective Measurement**
 - Optimize data acquisition across laboratory, clinical, and in-home settings
 - Longitudinal, detailed, and minimally obtrusive assessments
- **Embedded within Healthcare Infrastructure**
 - Integrated Electronic Health Record as a platform for sustainable longitudinal and frequent measurements
 - Basis for learning health care system / precision medicine



Integrative Analysis of Longitudinal Studies of Aging

www.ialsa.org

- The IALSA network (NIH/NIA 1P01AG043362) is comprised of over 100 longitudinal studies on aging, health and dementia.
 - Mix of samples aged from birth to 100 years, with birth cohorts ranging from 1880 to 1980.
 - Assessed from 1921 to the present.
 - Time between assessments ranges from 6 months to 17 years (the majority 1-5 years), with up to 32 (typically 3-5) measurement occasions spanning 4 to 48 years of monitoring within each individual.
- Collaboration with UK Healthy Ageing across the Life Course (HALCyon) and the Quebec Network for Research on Aging.
- Reproducibility of results (i.e., direction and pattern of effects) across populations, historical periods, measurements, designs, and statistical models.

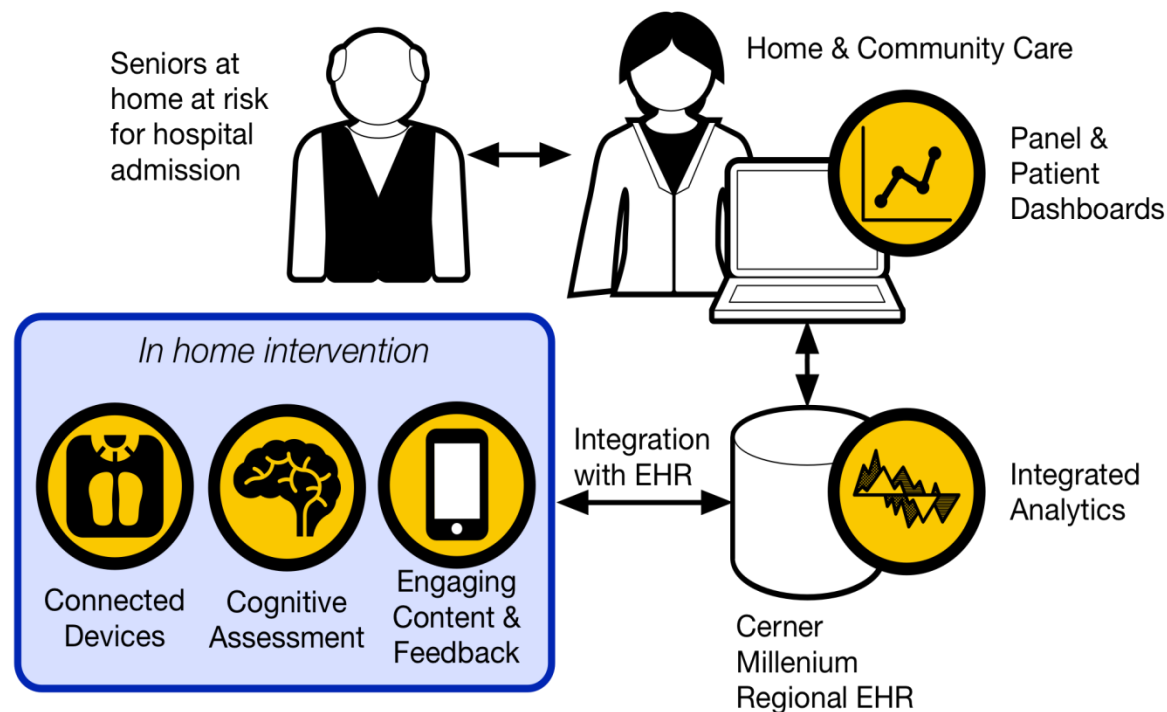
Precision Medicine:

Need for an Integrative Lifespan Perspective

- Analysis, replication, and synthesis of existing longitudinal observational studies
 - Evaluation of direct/indirect paths from early life cognition, SES, education to functioning and health outcomes in later life
- The course and prediction of “normative” aging-related functional decline will be better understood by accounting for preclinical health changes and early risk factors
 - Changes in midlife period (ages 40-60) likely
- Measurement intensive (e.g., burst) studies for age and disease-related change points

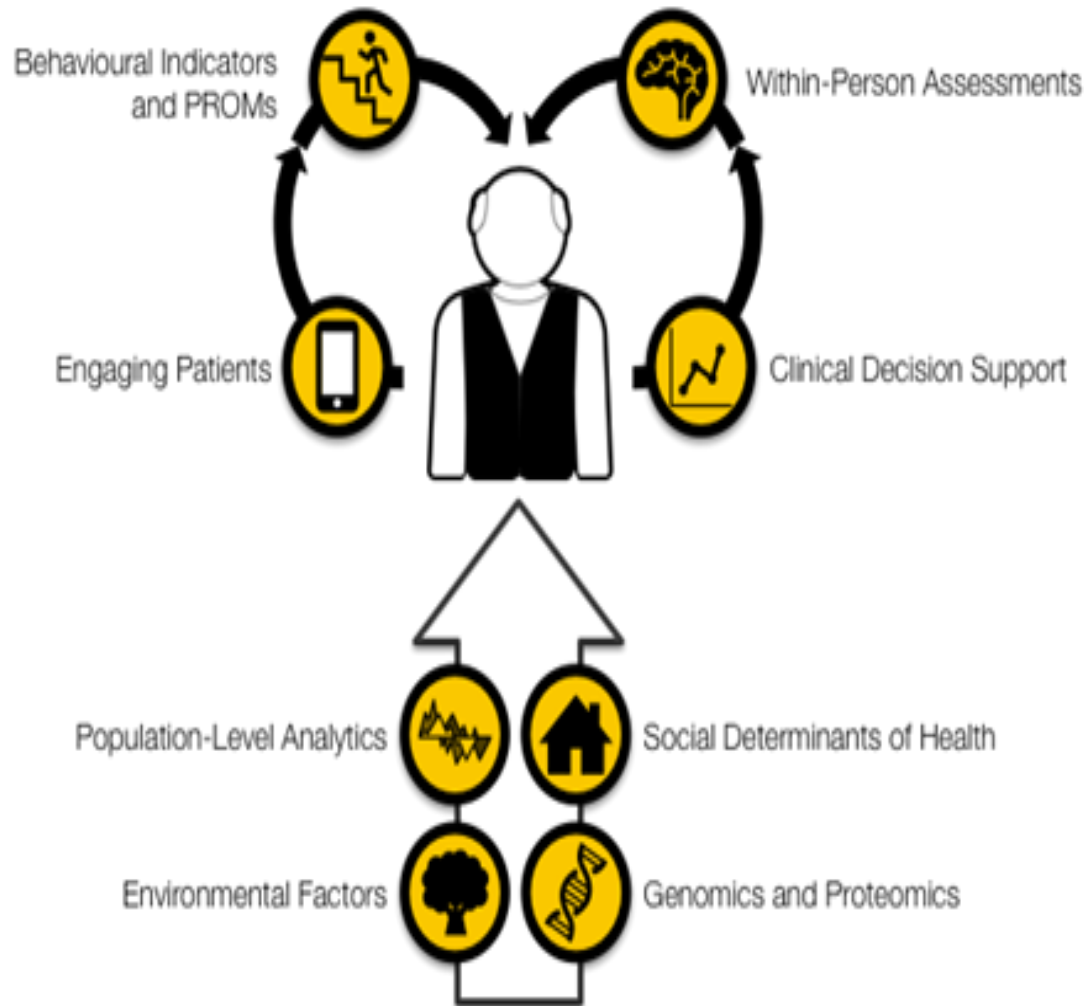
Utility of Enhanced Monitoring

- Changes in physical condition, neurocognitive status, functional capacity, and ability to carry out health-promoting activities require regular monitoring to better match the array of treatments and supports to the individual's changing spectrum of need



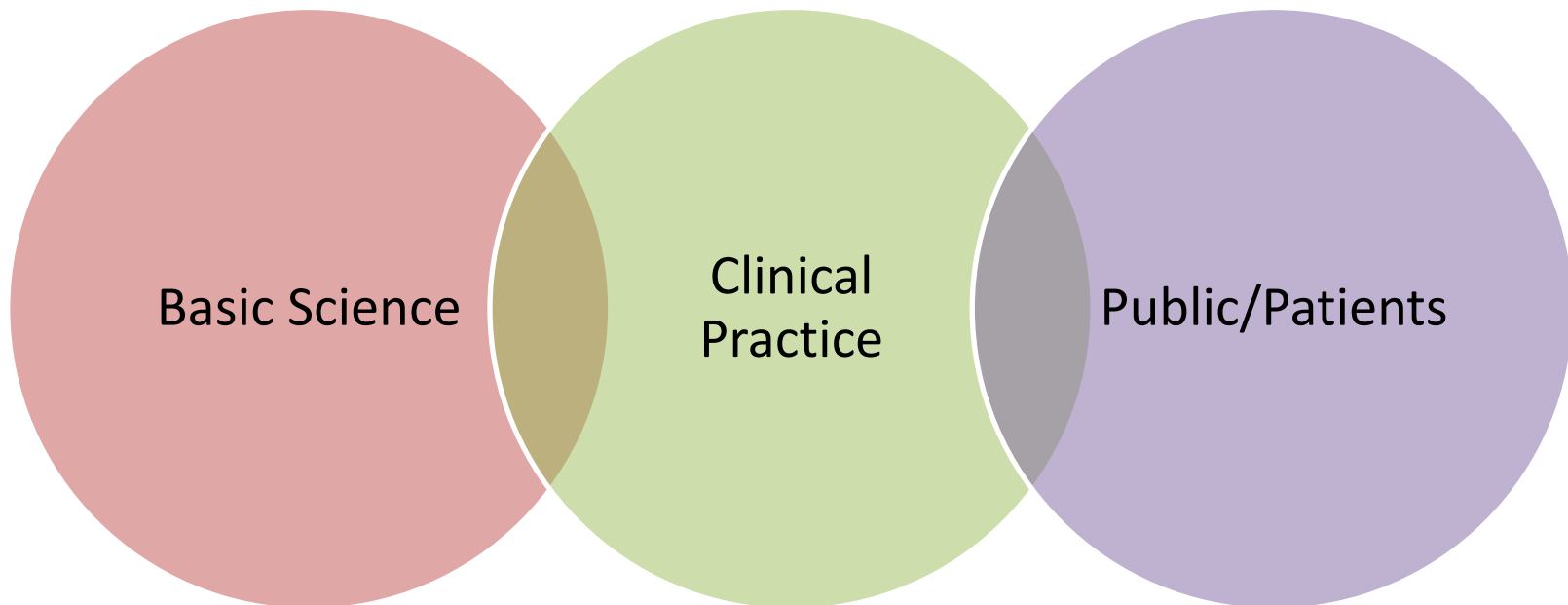
Within-Person Precision Medicine

- Preventative interventions, treatments, and management guidelines are tailored to individual characteristics



Integrating Practice and Research:

Benefits to Patients, Physicians, and Researchers



- ✓ Changes in normative health or performance
- ✓ Impact of changes in health behaviour and treatment

- ✓ Improved diagnostics (change from baseline)
- ✓ Evaluation of treatment outcomes (change from baseline)
- ✓ Post-discharge surveillance

- ✓ Understand impact of changes in lifestyle and health behaviours on health and well-being
- ✓ Self-management

Many Thanks

- Technology Evaluation in the Elderly Network
- Local Co-sponsors
 - Island Health
 - UVic Centre on Aging
 - UVic School of Nursing
 - Island Medical Program and Division of Medical Sciences