



Integrative Analysis of Longitudinal Studies on Aging

Reproducible International Research through Coordinated Analysis

Improving Within-Person Assessments and Dynamic Cohort Designs

Scott M. Hofer

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Major research aim: To maintain and enhance cognitive and physical health and well-being throughout the lifespan

Detecting within-person change:

- Why do these changes occur (e.g., health)? Can these changes be prevented, delayed, or treated?
- Is this individual changing more rapidly than they have in the past?

Contextual and lifespan factors:

- What is the impact of early life characteristics (e.g., childhood cognition; early life distress) and changing cohort contexts (e.g., SES, education, nutrition) on later life outcomes?

Within-person dynamics:

- Improvements in within-person measurement and design to better predict future outcomes (e.g., change in health)



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.
- **Are results (i.e., direction and pattern of effects) comparable populations, historical periods, measurements, designs, and statistical models?**

IALSA Metadata Catalogue and Harmonization Platform

<https://www.maelstrom-research.org/mica/network/ialsa>

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Integrative Analysis of Longitudinal Studies of Aging

[Study Catalogue](#)

[Domain Coverage](#)



The IALSA collaborative network was formally established in 2005 for the coordination of interdisciplinary, cross-national research aimed at the integrative understanding of within-person aging-related changes in cognitive and physical capabilities, health, personality, and well-being. It is comprised of investigators associated with over 45 longitudinal studies on aging, including the UK Healthy Ageing across the Life Course (HALCYon) network and the Quebec Network for Research on Aging. These population-based and longitudinal studies permit the evaluation of how factors across the lifespan determine and moderate the risk and progression of cognitive impairment and provide a basis for early detection of neurodegenerative disorders such as dementia. Network activities will encourage the examination of cross-cultural and cross-cohort effects and provide a strong basis for synthesizing evidence across longitudinal studies. IALSA is funded through an NIH/NIA Program Project Grant (P01AG043362; 2013-2018) to Oregon Health & Science

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Acronym:

IALSA

Website:

www.ialsa.org

Contacts:

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Studies:

1970 British Cohort Study (BCS70)
 Aberdeen 1936 Birth Cohort (ABC)
 Adult Changes in Thought Study (ACT)
 Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE)
 Ageing in Women and Men: A Longitudinal Study of Gender Differences in Health Behaviour and Health among Elderly (GENDER)
 Alzheimer's Disease Neuroimaging Initiative (ADNI)
 Australian Longitudinal Study of Ageing (ALSA)
 Avon Longitudinal Study of Parents and Children (Children of the 90s) (ALSPAC)
 Baltimore Longitudinal Study of Aging (BLSA)
 Boyd Orr (BOYD)
 Brain Ageing in Abbiategrasso Study (InveCe.Ab)

IALSA Approach: Reproducibility

- Coordinated/Parallel analysis
 - Aim: To maximize the data value from each study while making results as comparable as possible
 - Expect similar *conclusions* regardless of the exact variables used.
 - Construct-level comparison
 - Common statistical models
 - Emphasis on cross-culture, cross-study comparisons
 - Evaluation of sensitivity to statistical model
 - Contributes to Meta-Analysis / Systematic Review

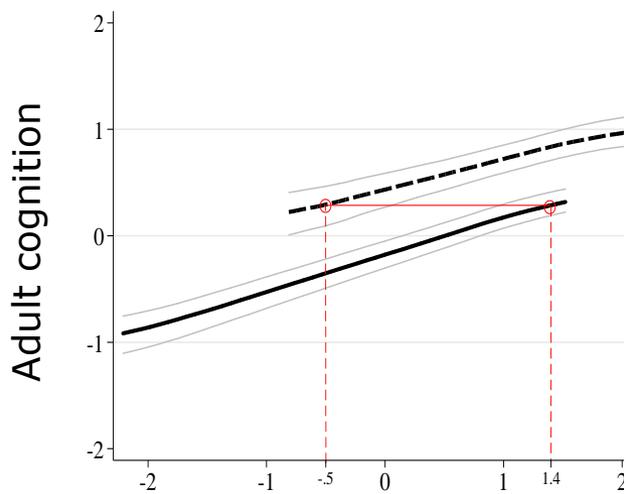
Benefits of Educational Attainment: Midlife fluid cognition associated with childhood cognition and level of educational qualifications (Clouston et al., 2013, IJE)

Wisconsin 1939 birth cohort

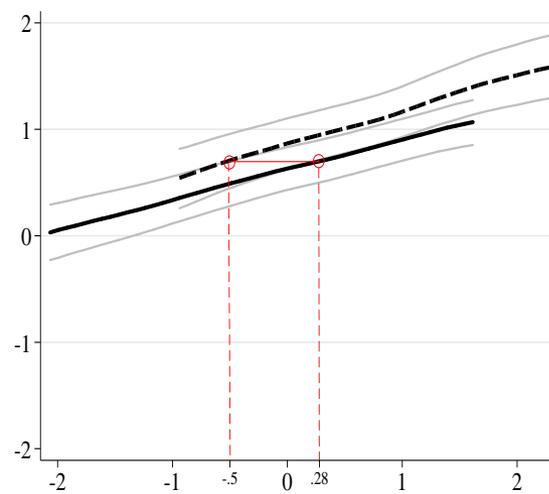
NSHD 1946 birth cohort

NCDS 1958 birth cohort

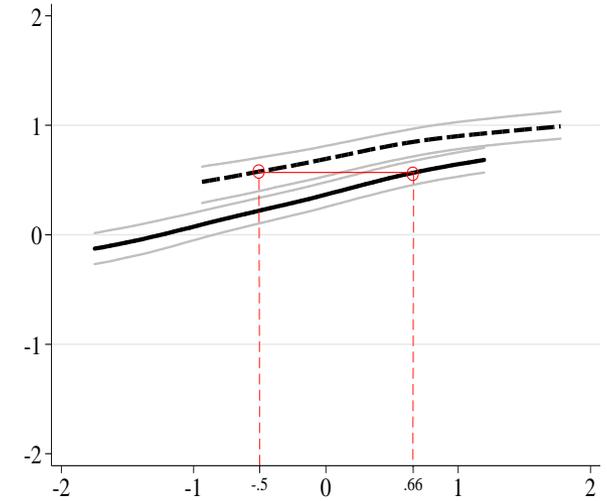
- ■ ■ ■ University degree
- Secondary qualifications
- Cognitive offset



Childhood cognition



Childhood cognition



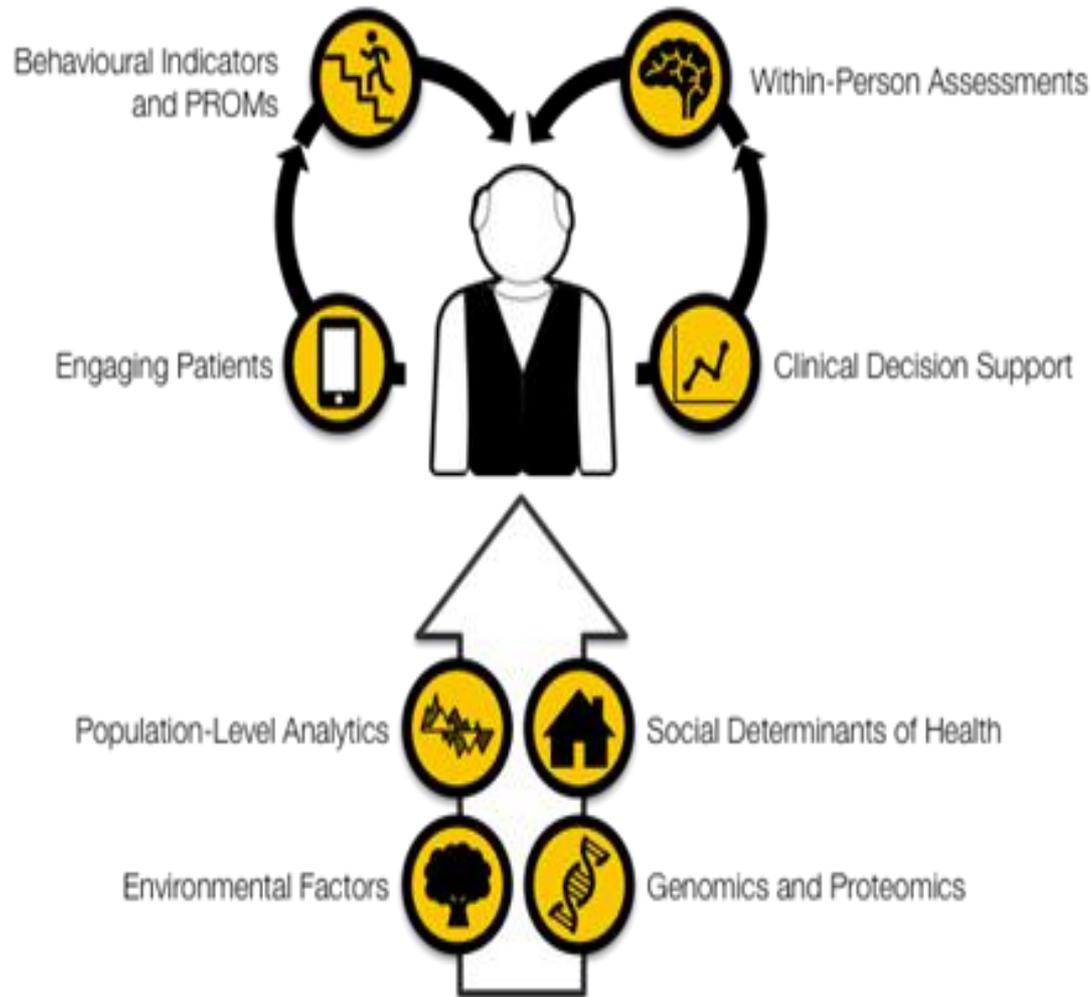
Childhood cognition

Standardised scores.
Adjusted for gender & father's social class

Clouston et al IJE 2013
IALSA/HALCyon collaboration

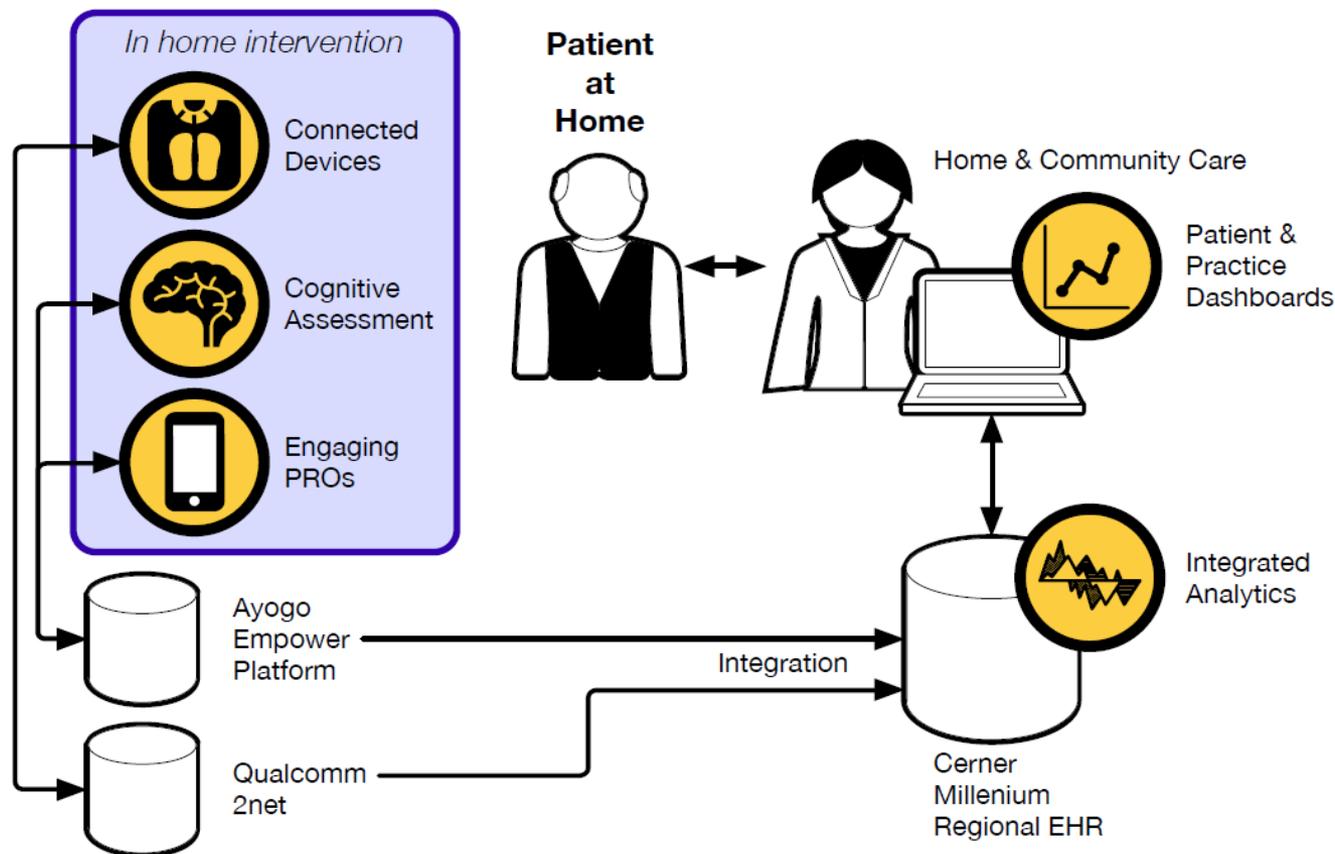
Within-Person Precision Medicine

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



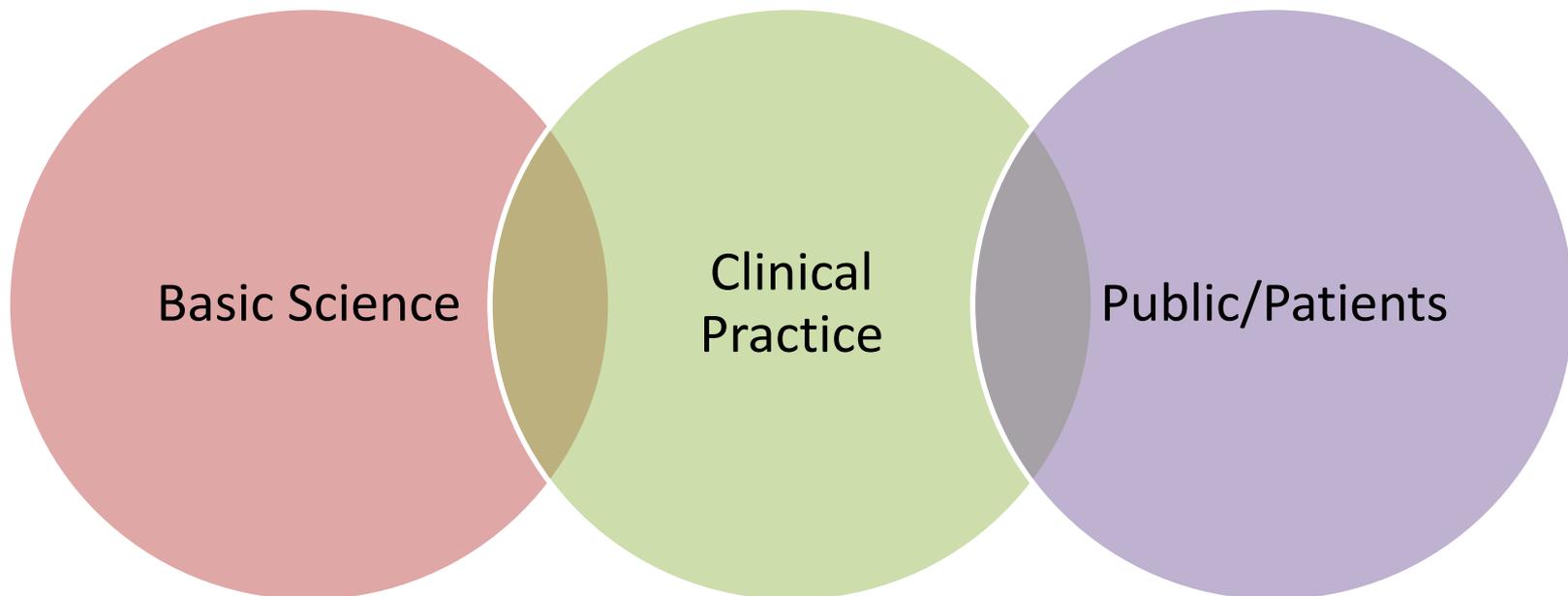
Utility of Enhanced Monitoring

- Regular monitoring to better match the array of treatments and supports to the individual's changing spectrum of need



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