Life course health science: understanding and improving health development

PAHO Webinar
Health and Development: The Absence of Disease is not Enough
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Objective

Develop an understanding of the emerging field of Life Course Health Science and its transdisciplinary principles
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Fields Synthesized in Life Course Health Science

- Biomedicine
- Life course epidemiology
- DOHaD/Epigenetics
- Evolution/Evo-Devo
- Lifespan psychology
- Life course research
- Developmental systems theory
- Complexity
Changing Contexts of Health Development:
Multiple Factors, Dimensions, & Levels Dynamically Transacting

DYNAMIC RELATIONAL ENVIRONMENT

- Capabilities
- Process
- Caregiving
- Care Environment
- Community Assets
- Service Quality
- Neighborhood Infrastructure
- Chemical Environment
- Organizations
- Financing

Time Specific
Biological, Behavioral Conditioning

Emergent Influences

Time Dependent, Cumulative Effects
Variable Adaptive Responses:
Plasticity & Optimization of Regulatory Processes

Psychological Functioning, Adaptation, Experiences
- Self regulation
- Learning
- Emotions and affect
- Communication

Physiological Functioning, Adaptation, Experiences
- Growth
- Stress response
- Metabolic Processes
- Inflammatory & Immune Responses

Social Functioning, Adaptation, Experiences
- Belonging
- Friendships
- Play
- Roles and identity

Dynamic Relational Environment
Dynamics of Health Development: Phases, Trajectories and Outcomes

Health Development Trajectories

Patterns of changes in health assets over time, affected by environmental and intrinsic factors.

Latent Effects
Resulting from experiences, particularly during sensitive periods, that influence health later in life.

Cumulative Effects
Resulting from experiences that accumulate over time & manifest in health.

Pathway Effects
Resulting from multiple, converging environmental and genetic influences, regulated by an array of specific developmental switches that set people on certain health development trajectories. (Combination of latent & cumulative effects)

Phases of Health Development

Generativity  Acquisition  Maintenance  Decline
LCHS Model

Person

Time

Environments

Health Capabilities & Experiences

Agency

Life Plans & Projects

Opportunities/Choice Sets
Relative Magnitude of Influence

Age (years)

5 10 15 20 30 40 50 60 70 80

Functional Phase of Lifespan

Generativity

Acquisition of Capacity

Maintenance of Capacity

Managing Decline

Family

Day Care

School

Community

Workplace

Individual

Modified from Rivista Italiana di Pediatria 4:3-20.
Unfolding and Growth

• “As a record of individual health experiences . . . growth unfolds as a complex adaptive system.”
• Sensitive to changing environmental conditions
• Variability in growth is an “evolutionary robust strategy”

• Human body “unfolds” as a result of growth (increases in size) and maturation (acquisition of adult features) as an result of $p \leftrightarrow e$ and developmental time

Source: Mummert, Schoen, Lampl. Growth and Life Course Health Development. In Handbook of Life Course Health Development; 2018
Health results from interactions in complex adaptive systems

• Nonlinear change

• Change influenced by feedback loops

• Hierarchies: systems within systems
  – Multilevel

• Emergent
HD Trajectories and Their Influence
Timing and HD non-linear effects

• Time-specific effects
  – Biological conditioning that occurs during sensitive periods, when systems are most adaptable and plastic
  – Same exposures can lead to different outcomes if they occur at different time periods of the lifespan

• Most common in fetal and early life
Down Stream Health Problems Related to Time-Specific and –Dependent Adversity

2nd Decade
- School Failure
- Teen Pregnancy
- Criminality
- Substance abuse
- Anxiety Disorders

3rd/4th Decade
- Obesity
- Elevated Blood Pressure
- Depression

5th/6th Decade
- Coronary Heart Disease
- Diabetes
- Renal Disease
- Arthritis

Old Age
- Premature Aging
- Memory Loss

Source: Hertzman
Summary of LCHD Principles

Health and development are unified into a single construct (Health-Development principle) that adaptively unfolds over the life course (Unfolding principle) according to the principles of complex adaptive systems (Complexity principle). Change in health results from time-based processes (Timing principle) that influence biobehavioral systems during sensitive periods when they are most susceptible (Plasticity principle). Health-development provides instrumental assets that enable individuals and populations to pursue desired life projects (Thriving principle).
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