Health Over the Life Course: The Integration of Research, Health Care, and Policy

Neal Halfon MD MPH
Professor of Pediatrics, Health Services, Public Policy
UCLA Center for Healthier Children Families and Communities

Research for a Lifetime: A Scientific Colloquium to Commemorate the NICHD's 50th Anniversary

December 5, 2012

UCLA CENTER
FOR HEALTHIER CHILDREN,
FAMILIES AND COMMUNITIES

National Health Policy Challenge

- Triple Aim
  - Better Health
  - Higher quality care
  - Lower cost
- Challenge
  - Enormous disparities-
  - Rapidly rising rates of chronic disease
  - Relentless cost increases
- Wrong Strategy
- Old Outdated Operating System

Think Differently

- Most health disparities start early in life with small differences compounding over time
- Most chronic diseases also start early in life –
  - Adversity
  - Behaviors
  - Pathways and Trajectories
- In order to Shift the Cost Curve we need to Shift the Health Curve
- New Approach: Developmental Health System using 3.0 operating system

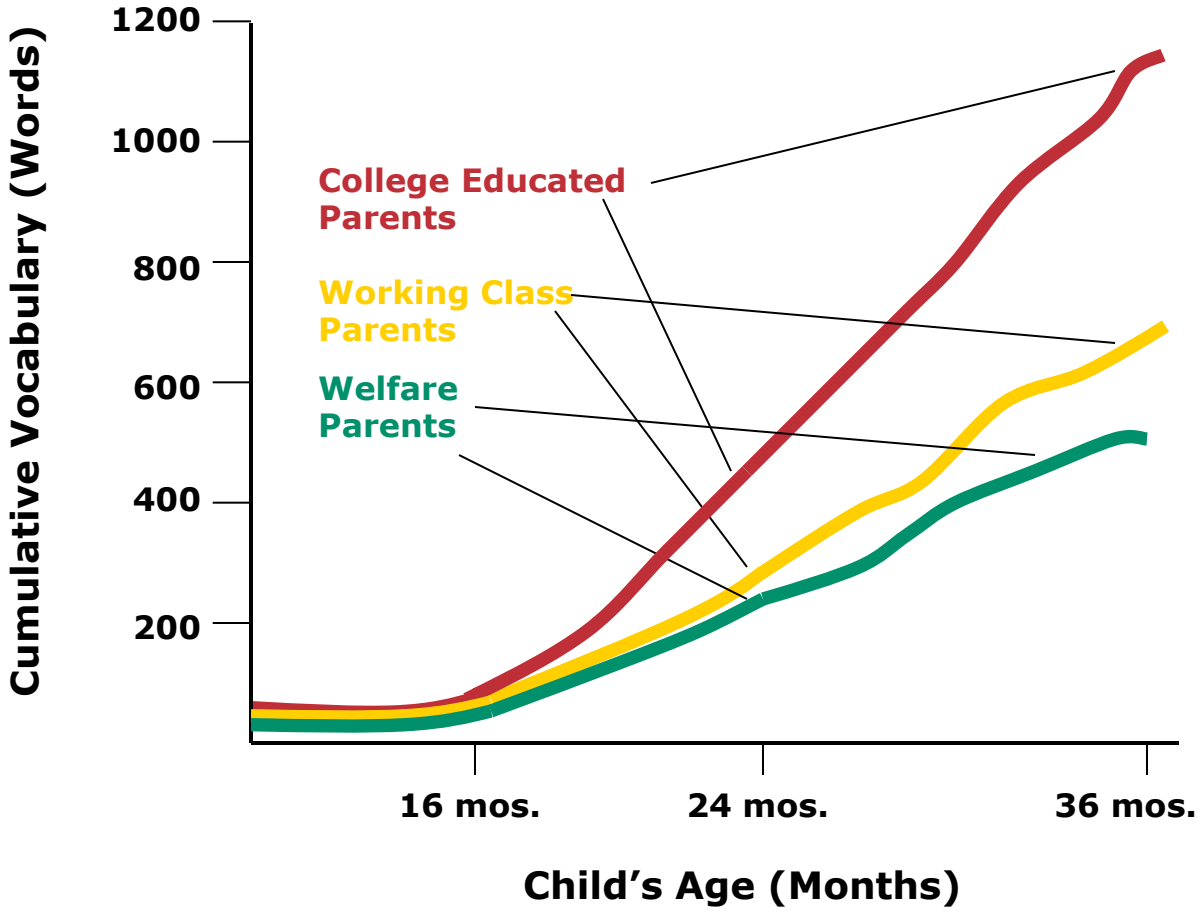
Sub-optimal Child Health Development: What's at Stake

- School failure and additional costs due to expenditures for second chance programs
  - Special education
  - Mental health, juvenile justice
- Diminished potential to form strong social and family relationships
- Long-term costs in social dependency
- Sub-optimal productivity-economic, social,
- Sub-optimal life-long health
  - Higher rates of chronic health conditions
  - Higher costs

Economic Adversity and Child Outcomes

- Born early, smaller, more fragile, and at risk
- Worse physical, cognitive, emotional health
- Hospitalized more, more obese, more asthma, more mental health problems, more disability
- Lower health trajectories, greater brain drain
- Carry the burden of their social status into adulthood
- Programmed into how their biology – an how their immune, endocrine, neurological systems develop, function and perform

Barriers to Educational Achievement Emerge at a Very Young Age



Source: Hart & Risley (1995)

Down Stream Health Problems Related to Early Life

- School Failure
- Teen Pregnancy
- Criminality
- Substance abuse
- Anxiety Disorders

- Obesity
- Elevated Blood Pressure
- Depression

- Coronary Heart Disease
- Diabetes
- Renal Disease
- Arthritis

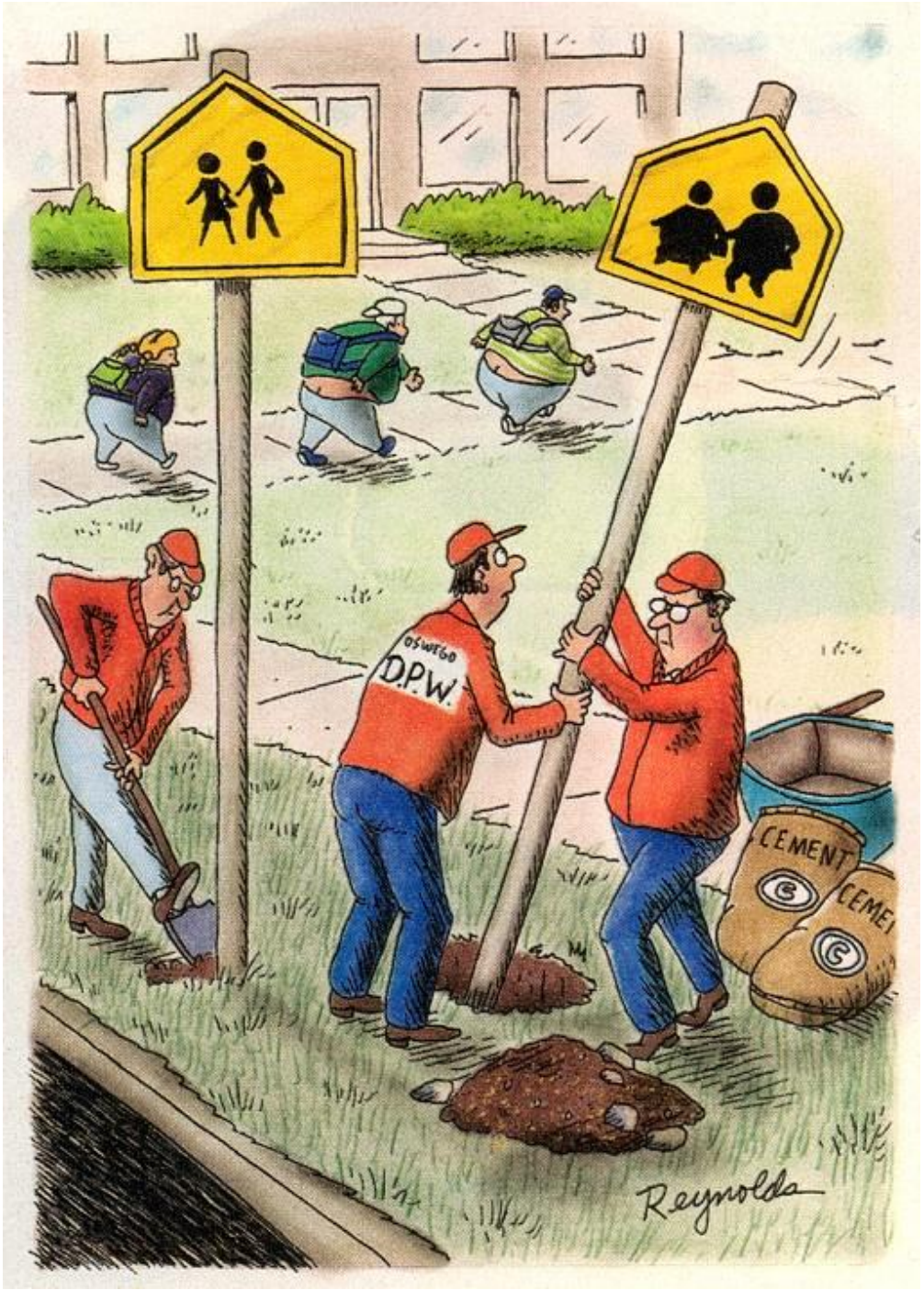
- Premature Aging
- Memory Loss

From Hertzman

How are the Children?

Trends in Child Health

- Mortality Rates Continue to Decrease
- Morbidity is decreasing for many Medical Conditions
- Disparities in Health Outcomes are increasing (societal inequality + for profit medicine)
- Emergence of New Morbidities and Concerns (obesity, ADHD, mental health)
- Patterns of Exposure and Risk are changing (squeezed families, hurried children, toxic environments)

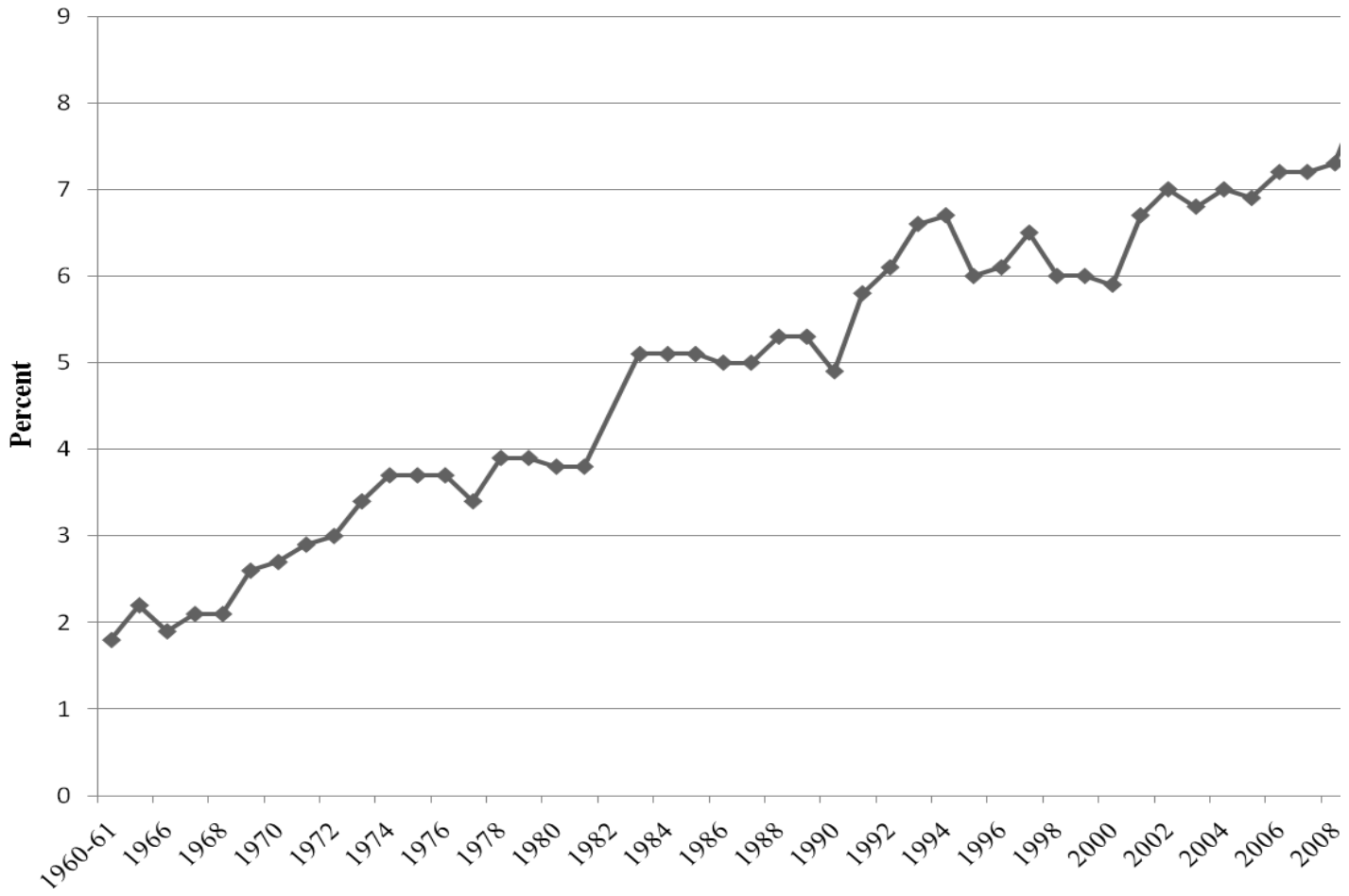

OSWEGO
D.P.W.
CEMENT
CEMENT
Reynolds

Changing Pattern of Childhood Morbidity

- Increase in chronic health problems (16%-33%)
- Growing prevalence of mental health disorders (15-20%)
- Greater appreciation of role and impact of developmental health problems – learning, language (10-17%)
- Growing number of children with multiple conditions (co-morbidities) e.g. asthma, obesity, ADHD

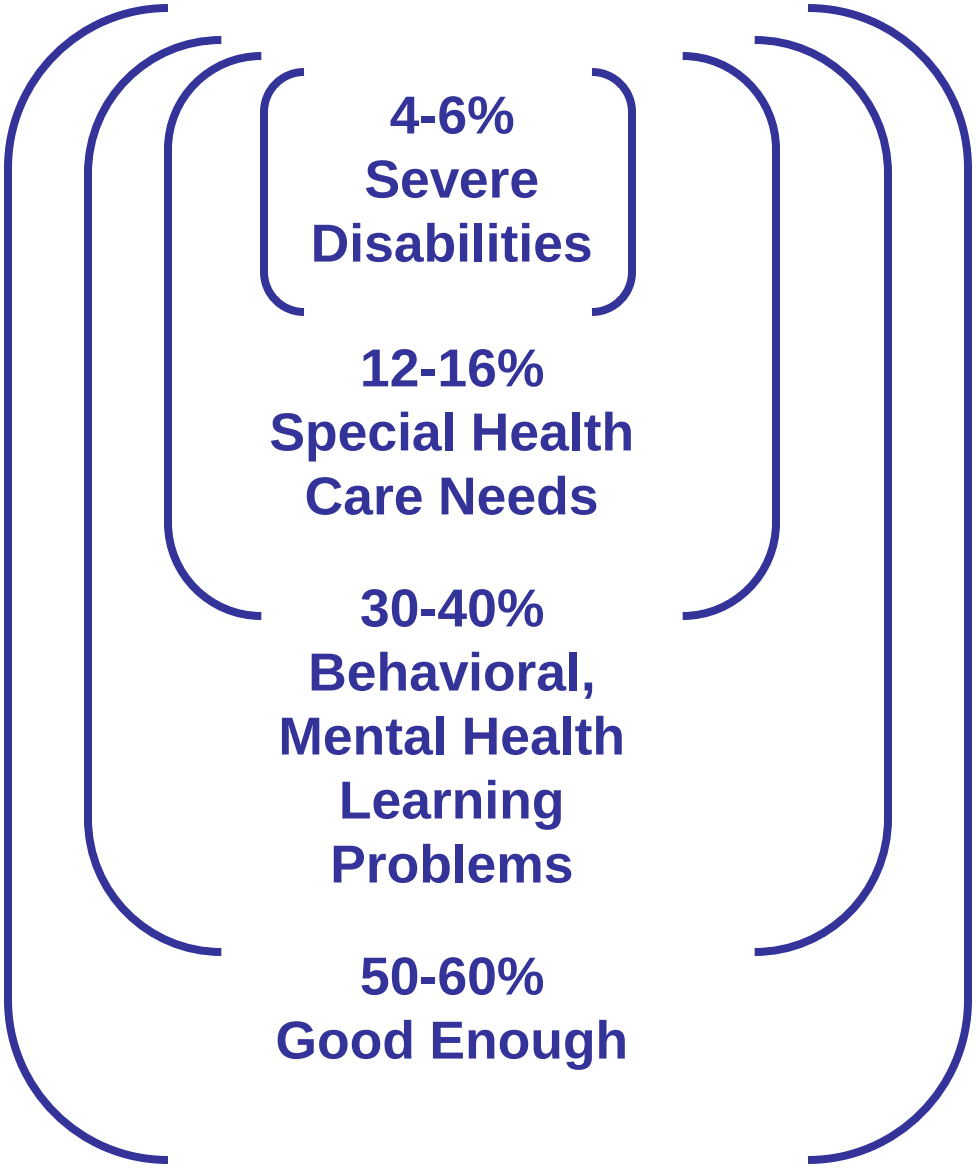
Trends in Childhood Disability- U.S.

(Limitation of Activity due to Chronic Conditions for U.S. Children, NHIS, 1960-2009)



From Halfon, Houtrow, Larson, Newacheck Future of Children 2012

Children at Risk



What % are thriving ?

30% ?

40% ?

50% ?

Poor Performance of Child Health System

- Fragmented service delivery
- Difficulty accessing services and huge inequities
- Low and Uneven quality
- Models of care is outmoded and don't match current needs, or capability
- Limited local responsibility
- Operating under enormous constraints

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

The Quality of Ambulatory Care Delivered to Children in the United States

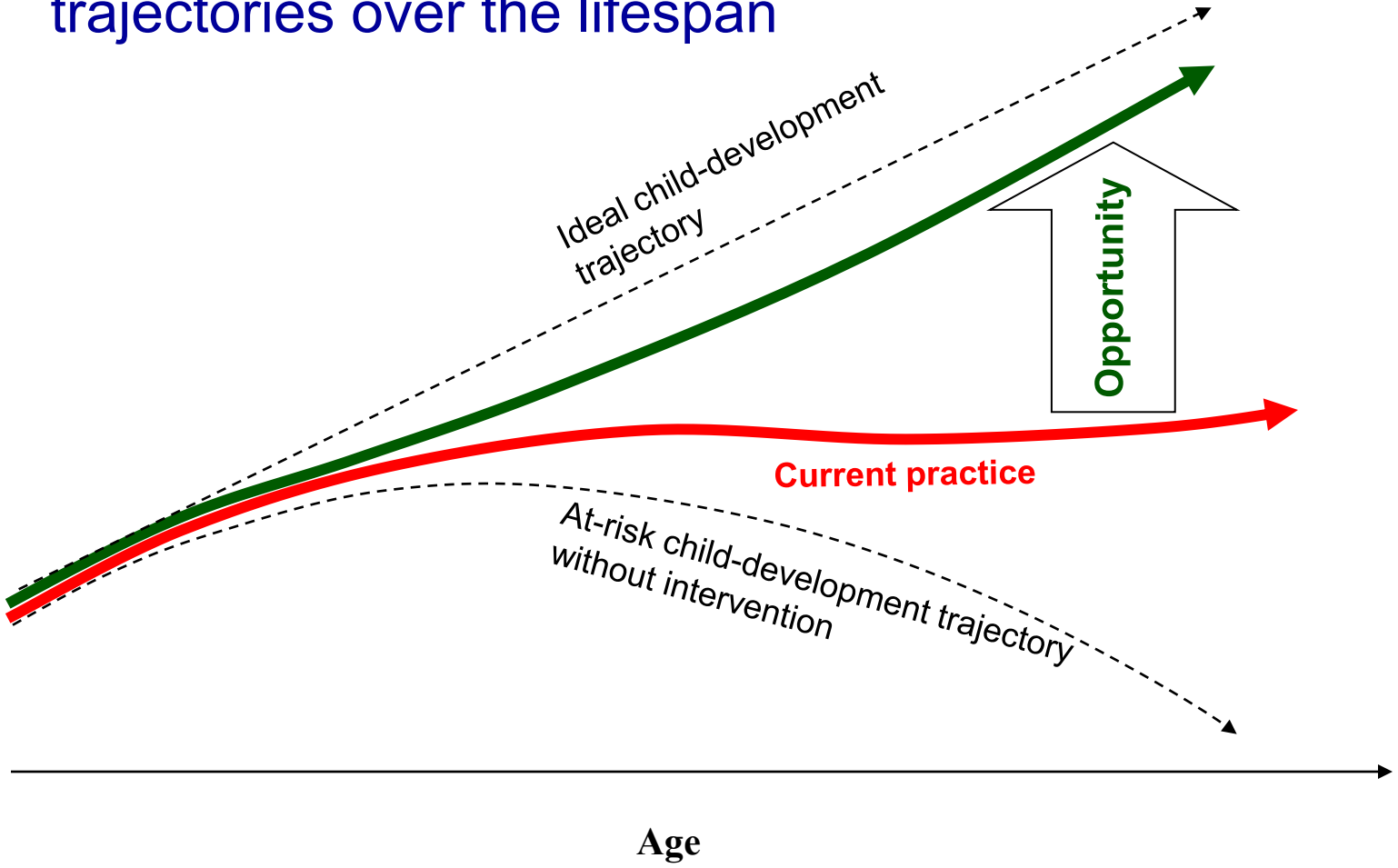
Rita Mangione-Smith, M.D., M.P.H., Alison H. DeCristofaro, M.P.H., Claude M. Setodji, Ph.D., Joan Keesey, B.A., David J. Klein, M.S., John L. Adams, Ph.D., Mark A. Schuster, M.D., Ph.D., and Elizabeth A. McGlynn, Ph.D.

Table 3. Adherence to Quality Indicators, Overall and According to Type and Function of Care.

Variable	No. of Indicators	No. of Eligible Children	Total No. of Times Indicator Eligibility Was Met	Weighted Adherence Rate (95% CI)
				percent
Overall care	175	1536	11,886	46.5 (44.5–48.4)
Type of care				
Preventive	57	1528	8,809	40.7 (38.1–43.4)
For acute condition	77	862	2,077	67.6 (63.9–71.3)
For chronic condition	41	394	1,000	53.4 (50.0–56.8)
Function				
Screening	55	1514	6,419	37.8 (34.6–41.0)
Diagnosis	32	378	1,018	47.2 (43.3–51.1)
Treatment	64	1056	2,981	65.9 (62.4–69.4)
Follow-up	24	754	1,468	44.7 (40.9–48.5)

Not Optimizing Healthy Development

Addressing the factors shaping health development trajectories over the lifespan



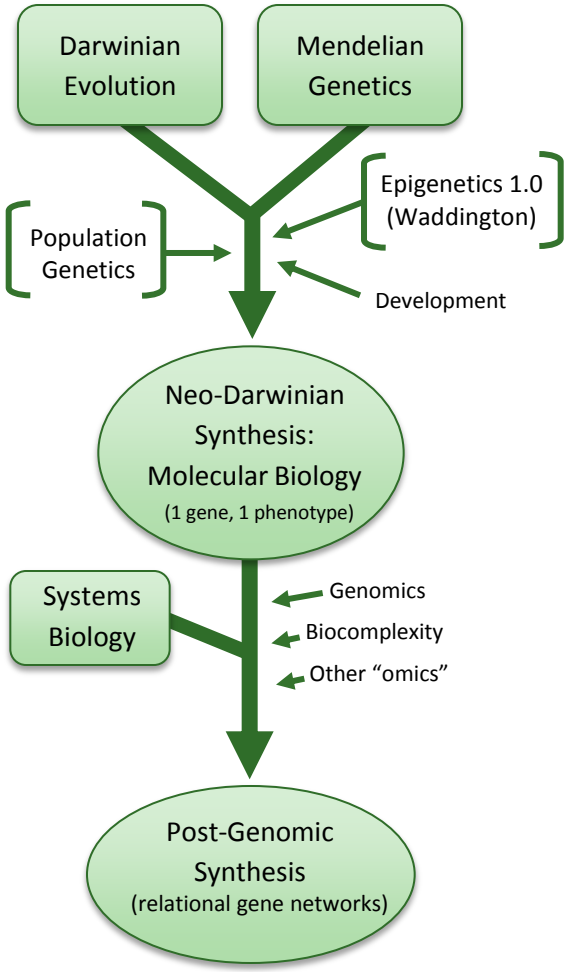
New Challenges
New Paradigms
New Strategies

New paradigm of systems biology

New paradigm of health development

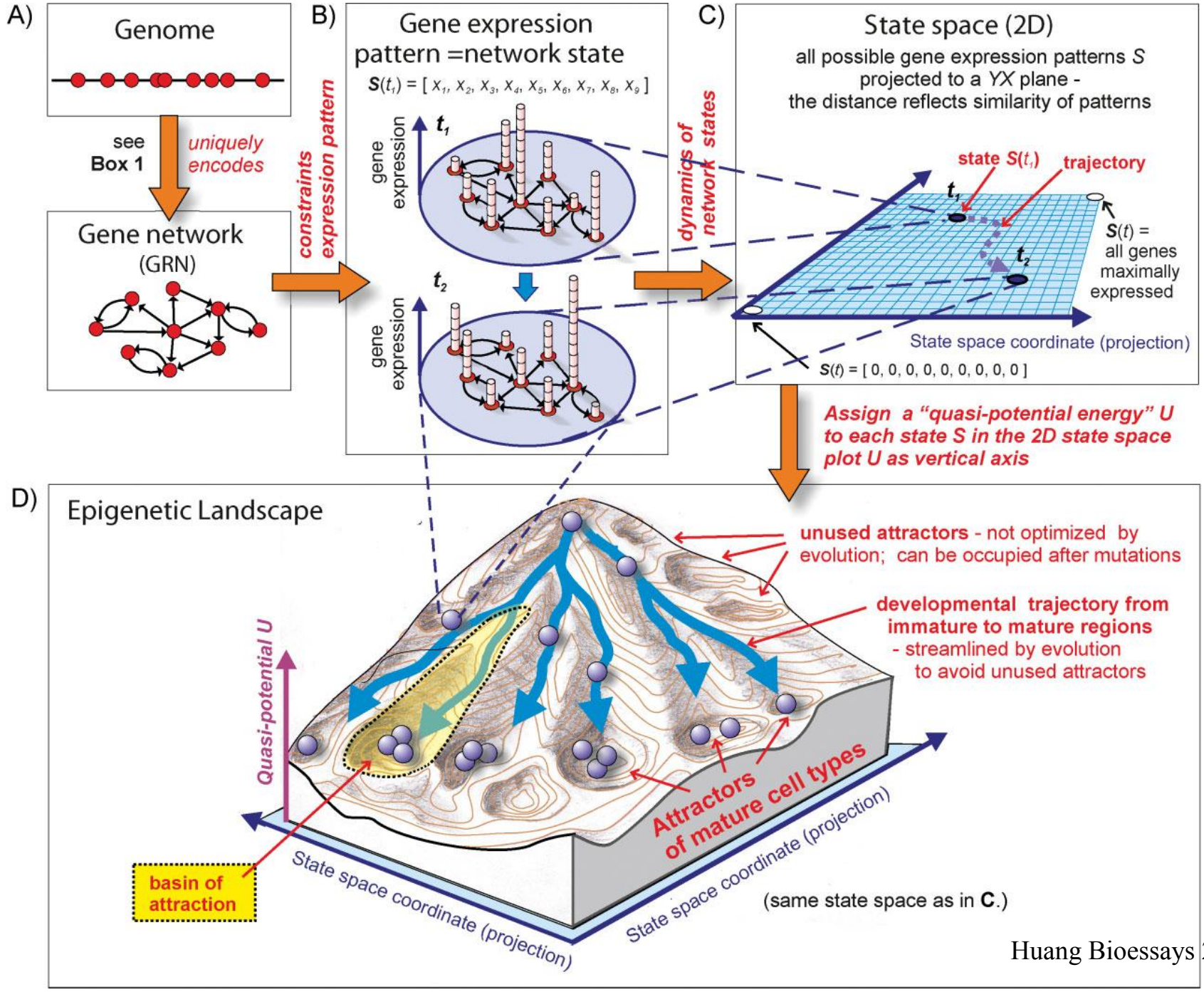
New era of health care organization and delivery

Biological Systems Ideas and Theories



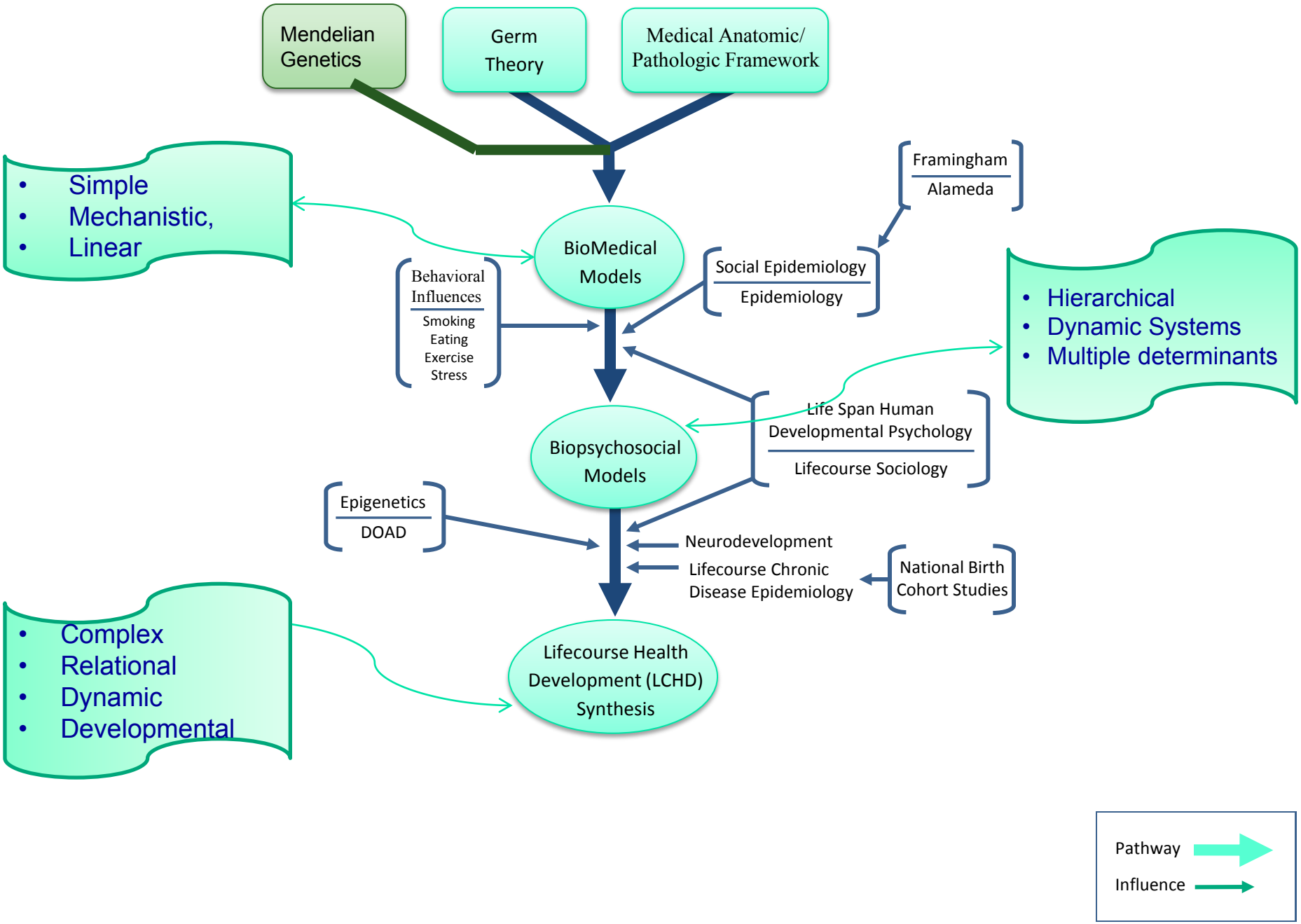
Pathway

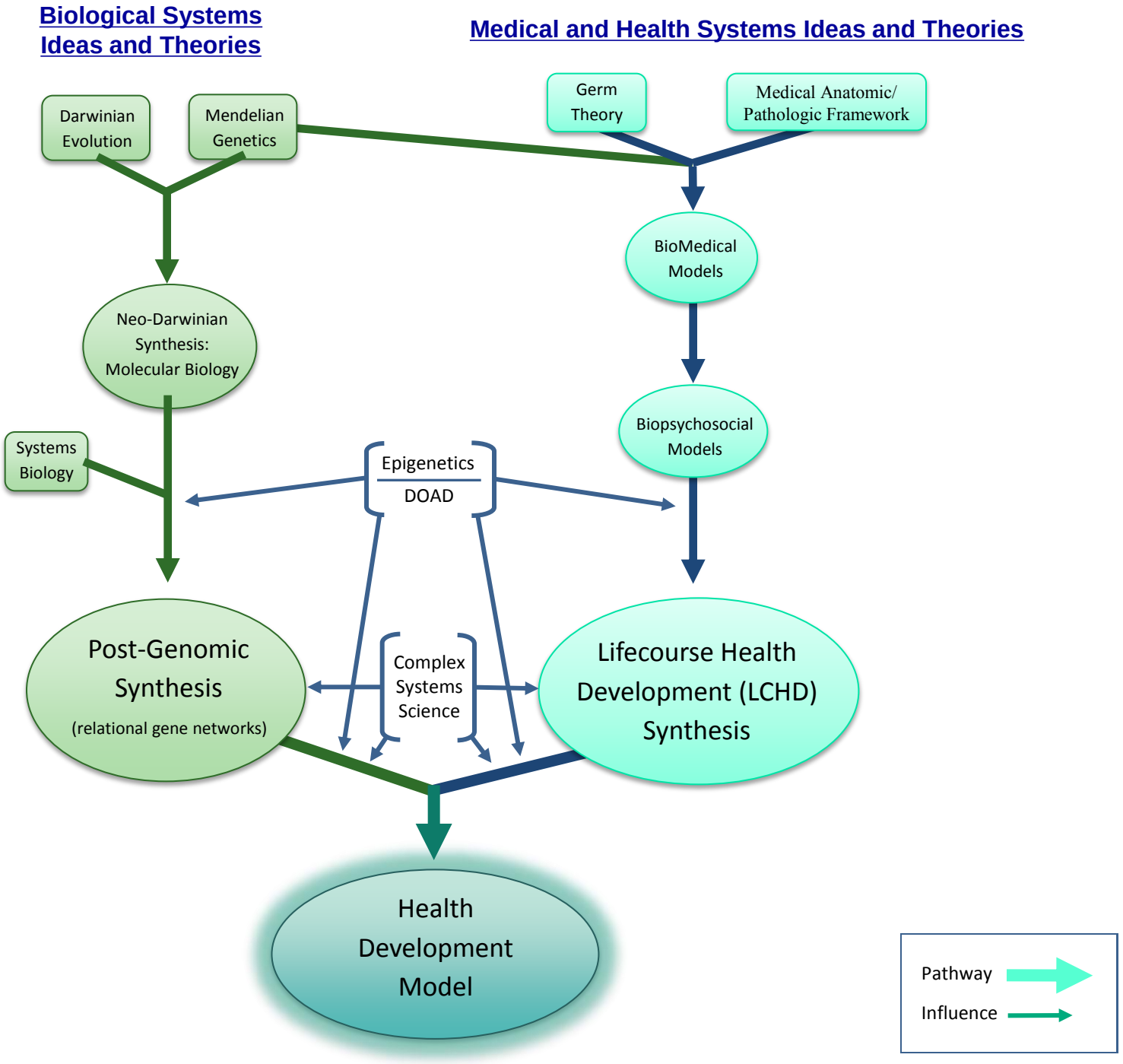
Influence



Huang Bioessays 2011

Evolving Conceptual Models of Health Development




Biological Systems Ideas and Theories
Medical and Health Systems Ideas and Theories
Darwinian Evolution
Mendelian Genetics
Germ Theory
Medical Anatomic/ Pathologic Framework
BioMedical Models
Neo-Darwinian Synthesis: Molecular Biology
Biopsychosocial Models
Systems Biology
Epigenetics
DOAD
Post-Genomic Synthesis
(relational gene networks)
Complex Systems Science
Lifecourse Health Development (LCHD) Synthesis
Health Development Model
Pathway
Influence

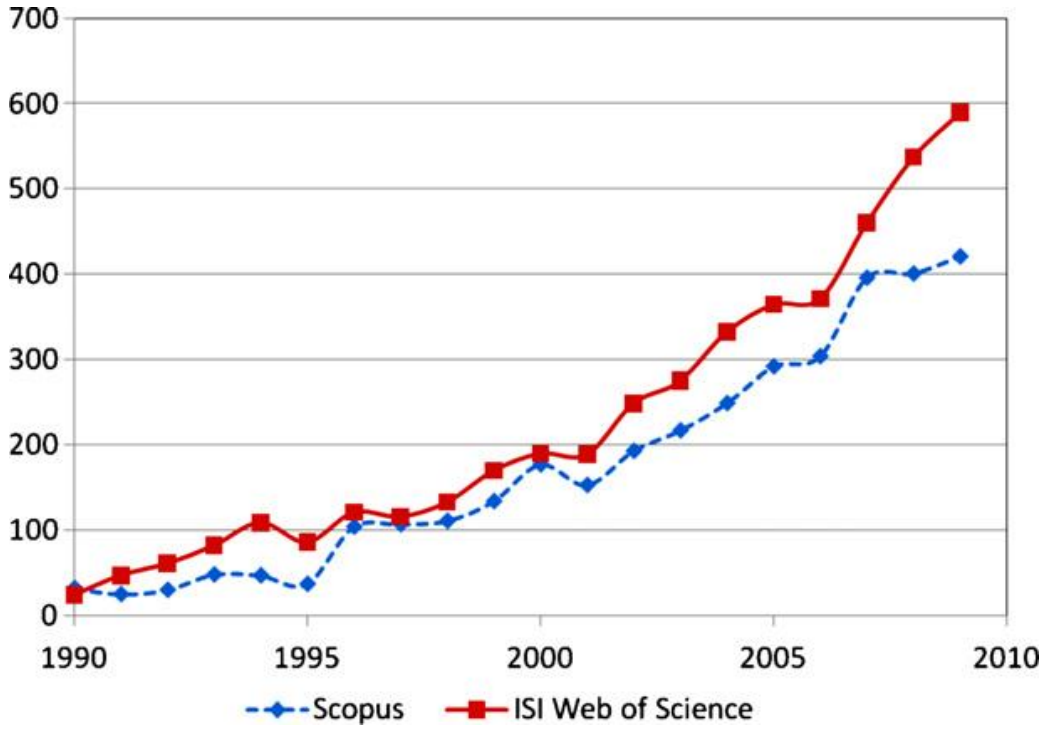


Fig. 1. Annual number of publications listed in interdisciplinary databases using "life course" as a keyword, 1990–2009.

Source: Own elaboration on data from the Scopus and ISI Web of Science databases, extracted on September 26, 2009. Data for 2009 are estimates.

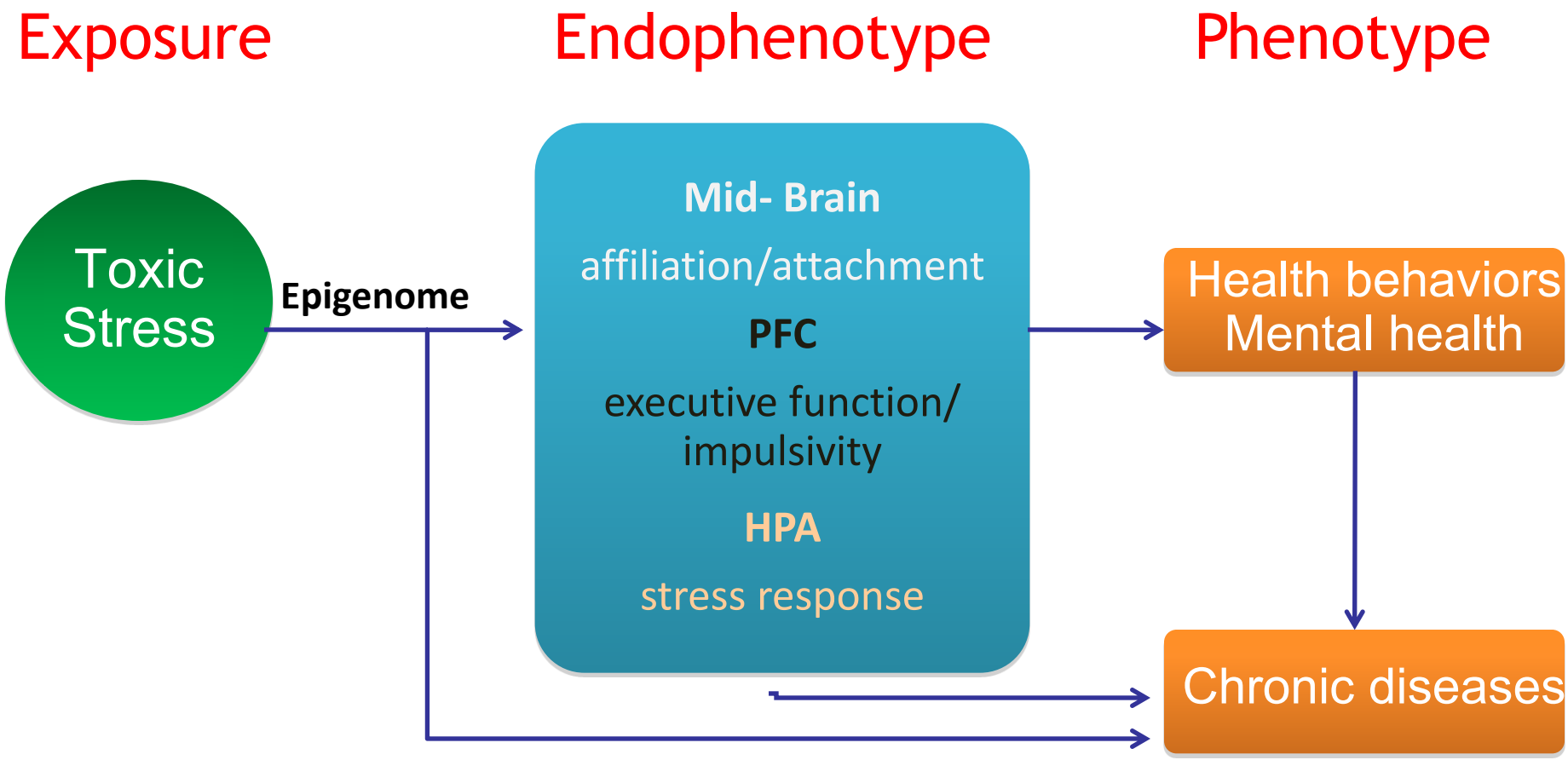
Life Course Health Development

- Health is an emergent quality of human development
- Health development is a complex, non linear, adaptive process that occurs continuously across the lifespan
- The health development process is multidimensional, multidirectional, multilevel, self organizing and multiphasic

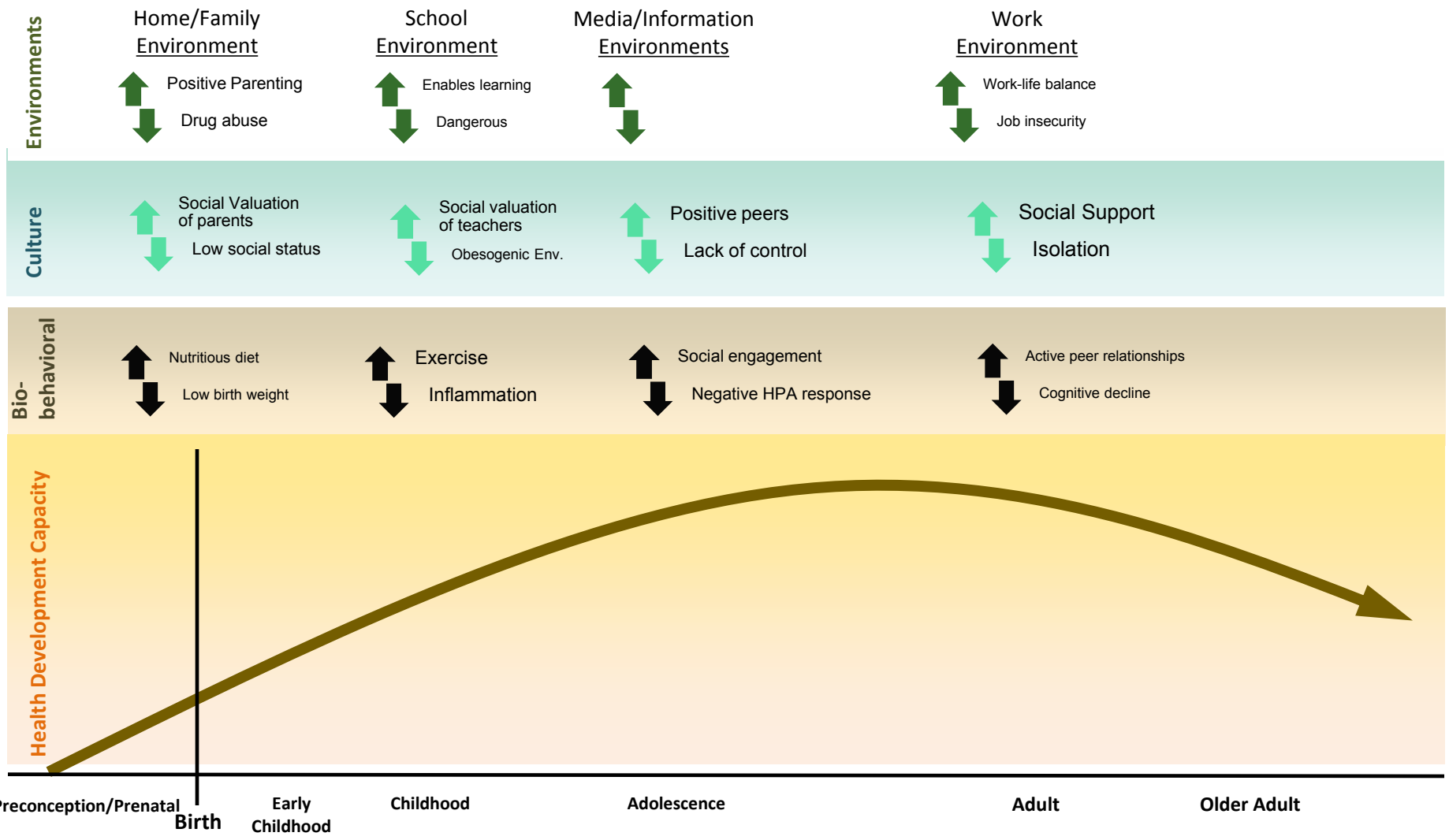
Life Course Health Development

- Health development is imbued by evolution with plasticity strategies to promote resilience and adaptability to changing environmental contexts
  - Selective optimization
  - Predictive adaptive responses
- Health development pathways are
  - Time specific (sensitive periods /biological embedding)
  - Time dependent (cumulative impacts)
  - Socially Structured

Time Sensitive Pathways of Influence

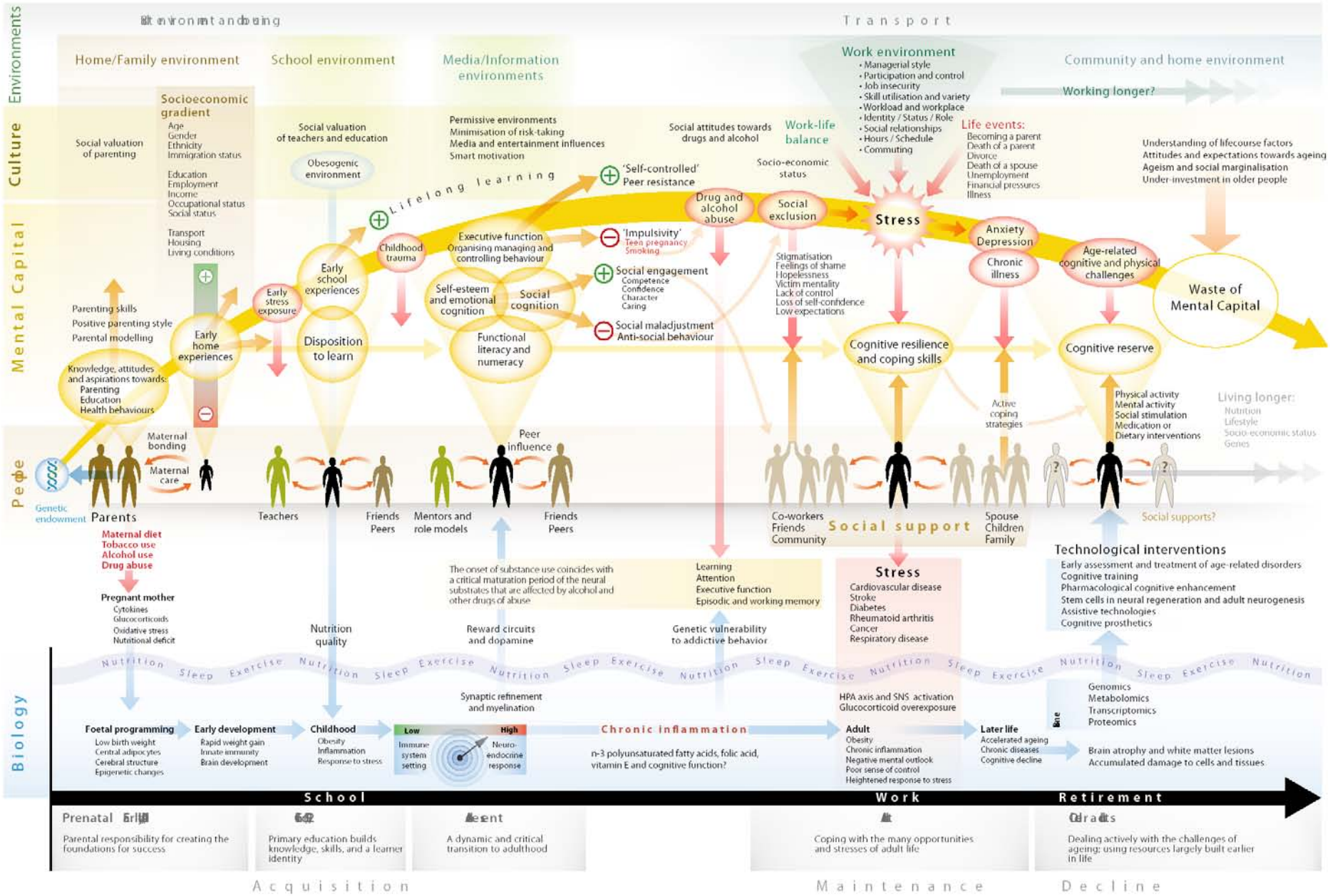


From Hertzman



Life Course Health Development

Appendix B: Synthetic view of the mental capital trajectory and factors that may act upon it



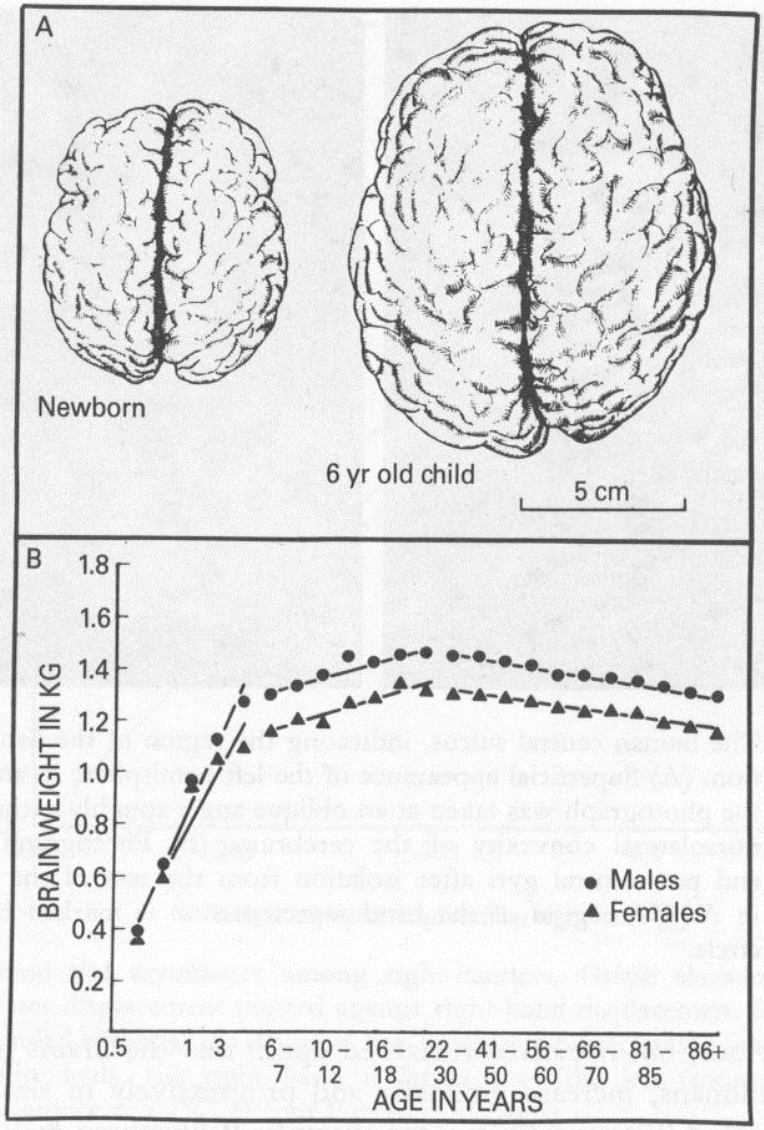
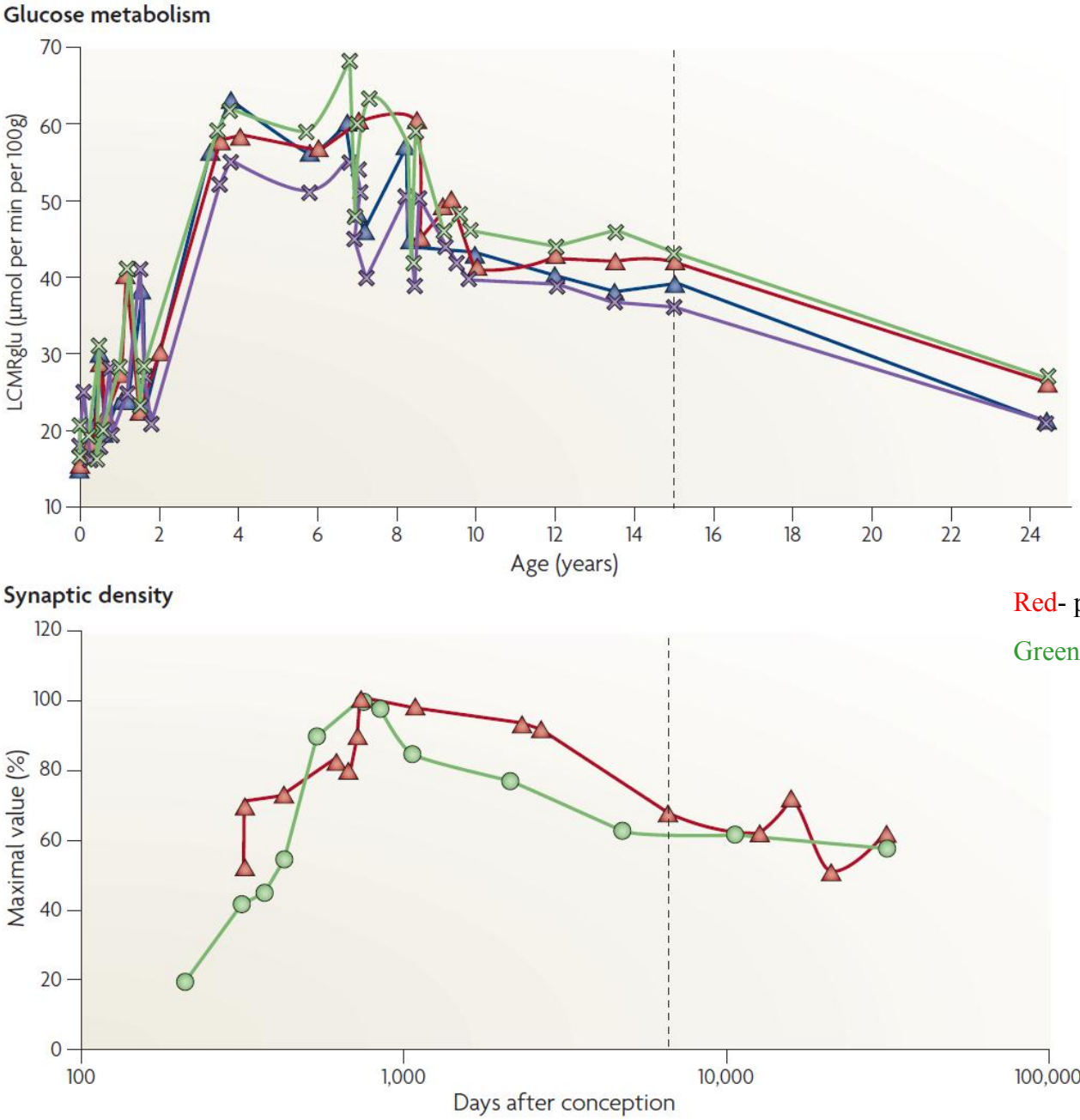


Figure 8.6. Postnatal growth of the human brain. (A) Dorsal view of a normal brain at birth (left) and at age 6 years (right). (B) The duration of human brain growth (according to brain weight). The growth of the brain (here based on 2603 neurologically normal subjects) continues for a decade or more. (From Purves, 1994; (A) after Conel, 1939–67; (B) after Dekaban and Sadowsky, 1978.)



Red- prefrntontal ctx

Green –visual ctx

from Paus, *Nature Reviews*, 2008, vol.9

Force Expiratory Volume of the L

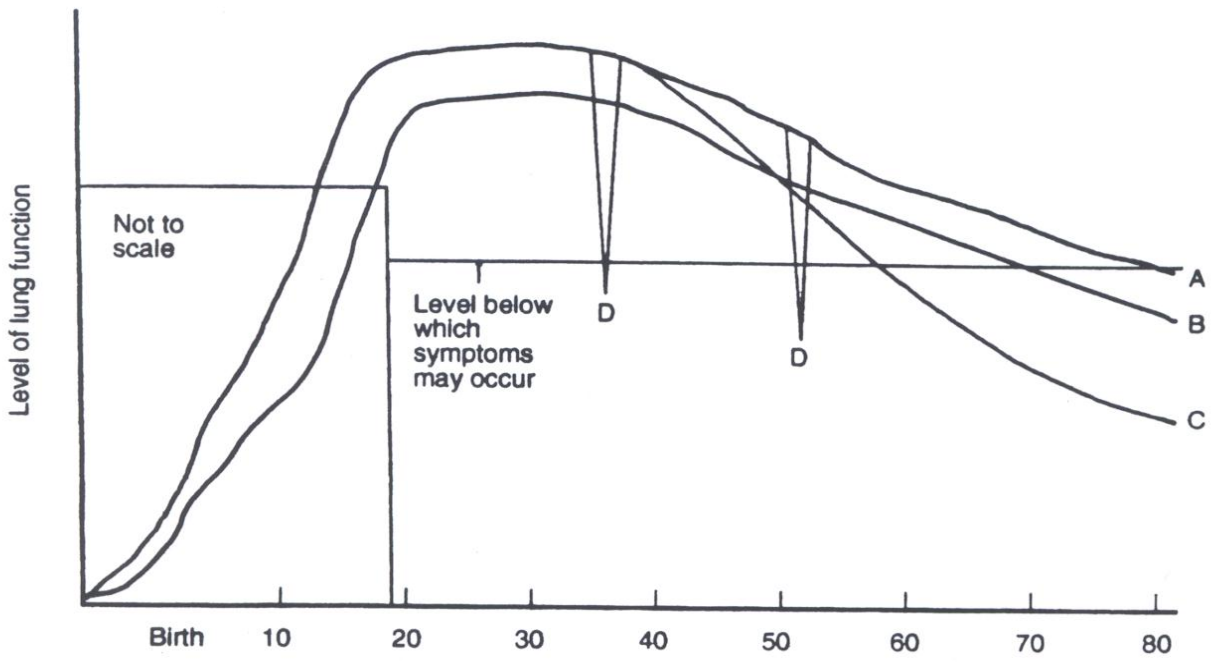


Figure Schematic representation of the life course of ventilatory function measurements such as forced expiratory volume in one second.

Footnotes:

A = normal growth and decline.

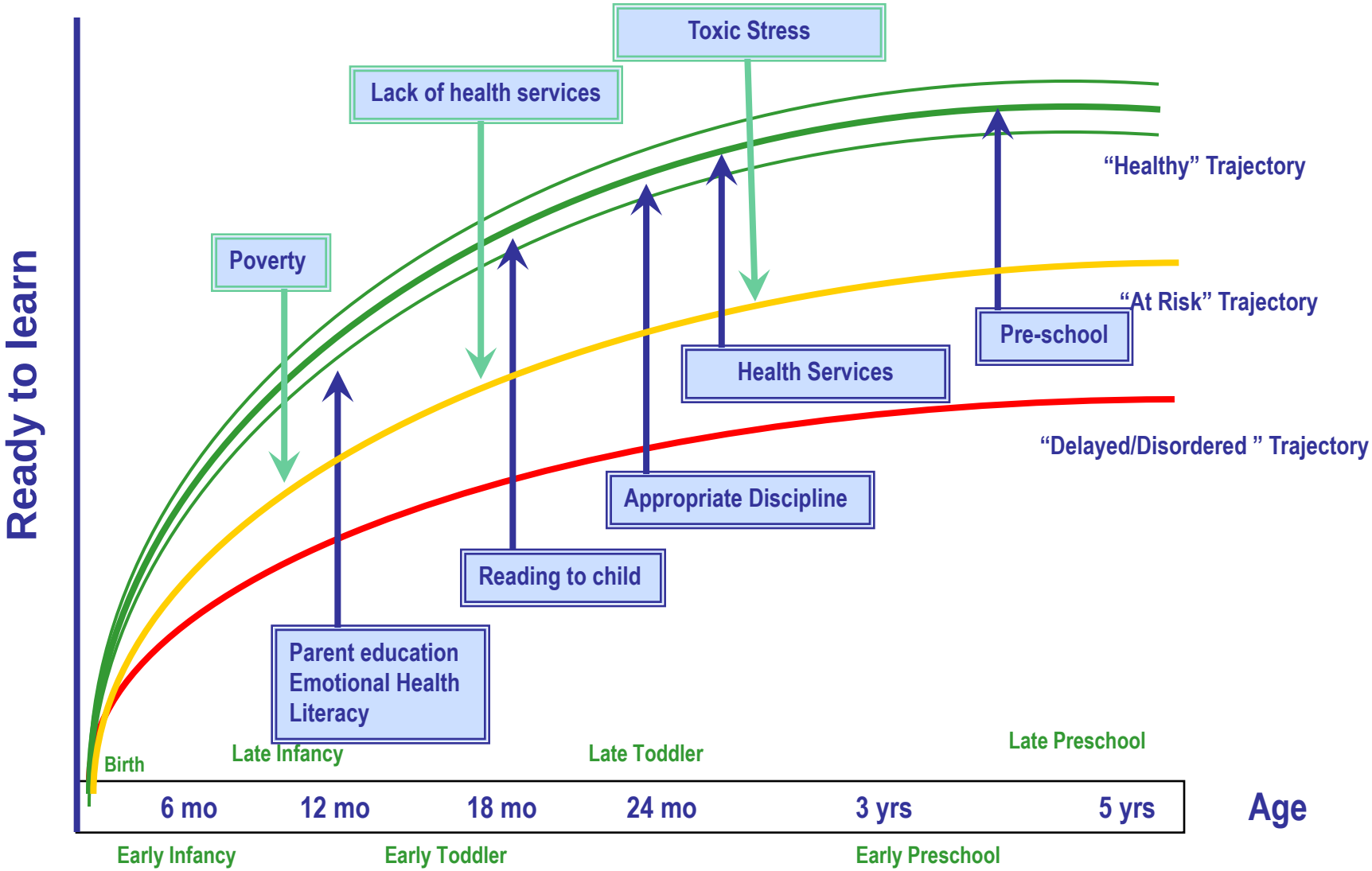
B = impaired prenatal or postnatal growth, leading to reduced maximal function and increased risk of later disability and death from chronic respiratory disease despite a normal rate of decline.

C = normal growth but accelerated decline, leading to premature disability and risk of death from chronic respiratory disease.

D = episodes of reversible airflow obstruction, which may be superimposed on any of curves A, B or C.

From: Kuh D, Ben-Shlomo Y. A life course approach to chronic disease epidemiology. New York: Oxford University Press. 1997.

LCHD : Reducing Risk &Optimizing Protective Factors at a Population level (curve shifting)



Transformation of the Health Care System

The Third Era

The Evolving Health Care System

The First Era (Yesterday)

- Focused on acute and infectious disease
- **Biomedical**
- Short time frames
- Medical Care
- Insurance-based financing
- Industrial Model
- **Reducing Deaths**

Health System 1.0

The Second Era (Today)

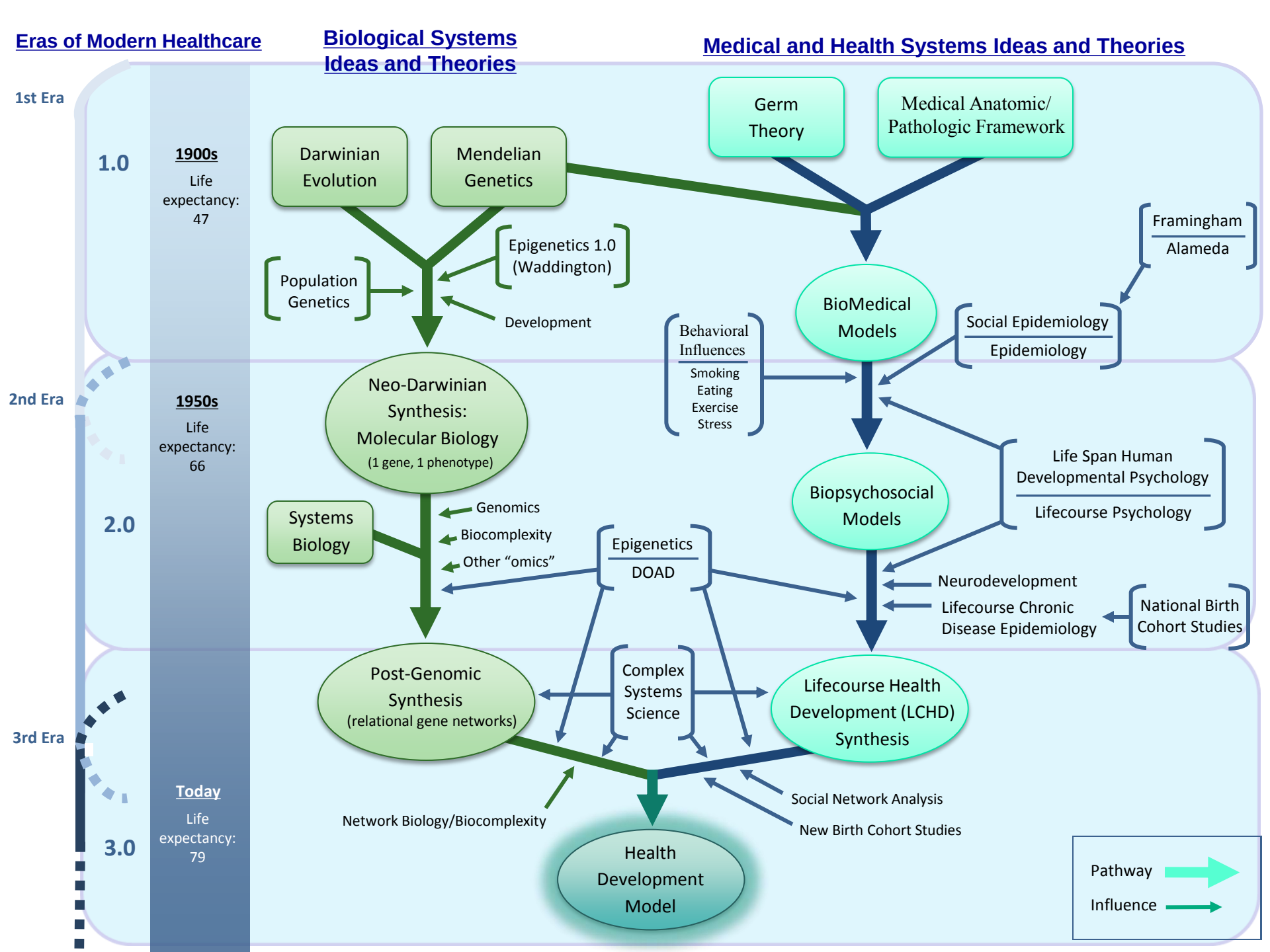
- Increasing focus on chronic disease
- **Biopsychosocial-multiple risks**
- Longer time frames
- Chronic Disease Mgmt & Prevention
- Pre-paid benefits
- Corporate Model
- **Prolonging Disability free Life**

Health System 2.0

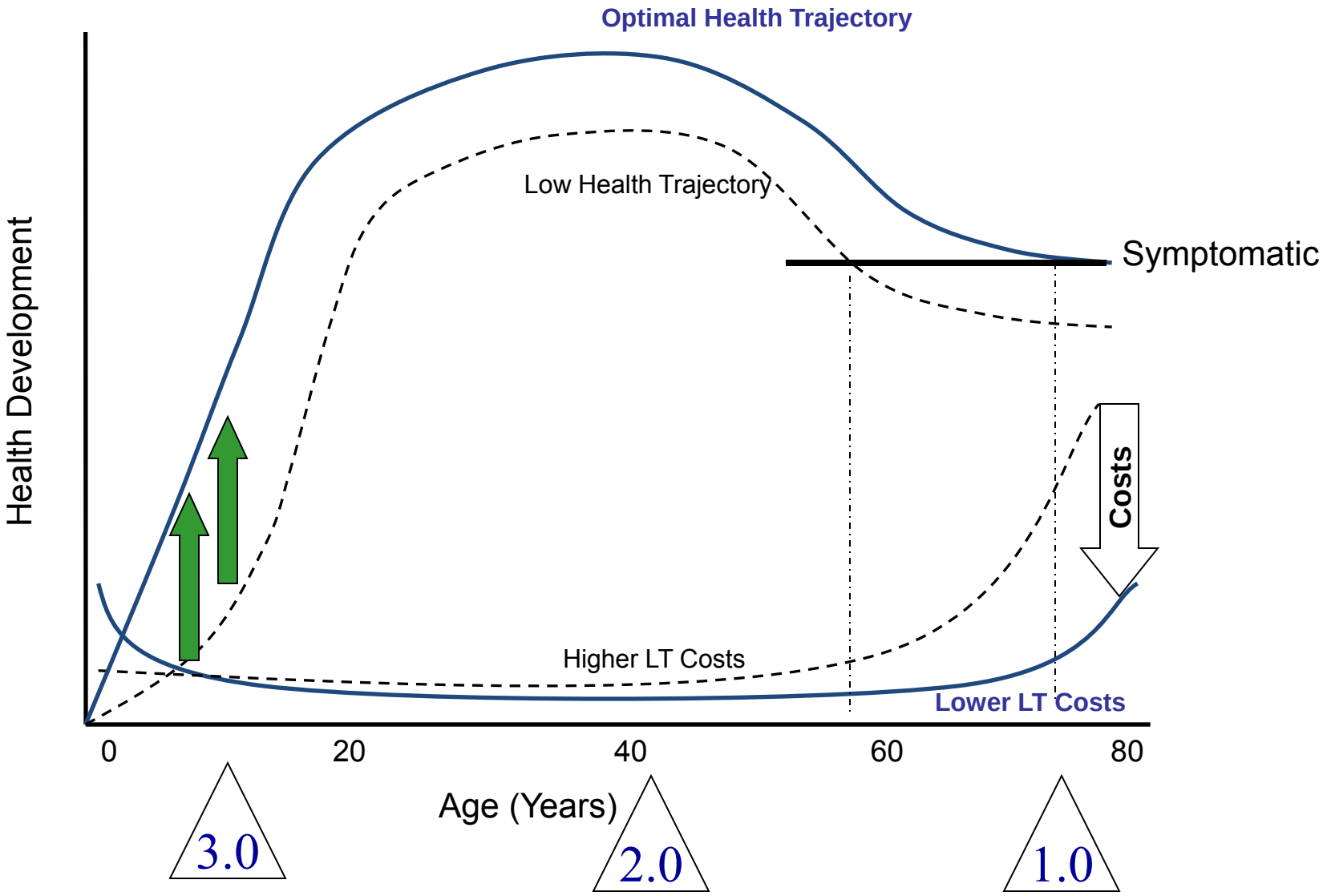
The Third Era (Tomorrow)

- Increasing focus on achieving optimal health
- **LCHD- Complex Systems**
- Lifespan/ generational
- Investing in population-based prevention
- Network Model
- **Producing Optimal Health for All**

Health System 3.0


Eras of Modern Healthcare
Biological Systems Ideas and Theories
Medical and Health Systems Ideas and Theories
1st Era
1.0
1900s
Life expectancy: 47
2nd Era
2.0
1950s
Life expectancy: 66
3rd Era
3.0
Today
Life expectancy: 79
Darwinian Evolution
Mendelian Genetics
Germ Theory
Medical Anatomic/ Pathologic Framework
Framingham
Alameda
Epigenetics 1.0 (Waddington)
Population Genetics
Development
BioMedical Models
Behavioral Influences
Smoking
Eating
Exercise
Stress
Social Epidemiology
Epidemiology
Neo-Darwinian Synthesis: Molecular Biology
(1 gene, 1 phenotype)
Life Span Human Developmental Psychology
Lifecourse Psychology
Biopsychosocial Models
Systems Biology
Genomics
Biocomplexity
Other "omics"
Epigenetics
DOAD
Neurodevelopment
Lifecourse Chronic Disease Epidemiology
National Birth Cohort Studies
Post-Genomic Synthesis
(relational gene networks)
Complex Systems Science
Lifecourse Health Development (LCHD) Synthesis
Network Biology/Biocomplexity
Social Network Analysis
New Birth Cohort Studies
Health Development Model
Pathway
Influence

Shifting the Health Development Curve to Shift the Cost Curve



3.0 Agenda of Discovery, Innovation and Advancement

- Science
  - Convergence Molecular and Population Health Pathways
  - Linking Social Epigenetics /Personalized Medicine
  - Creating Measures of Health Development over Life Course
  - New Longitudinal Cohort Data (NCS)
  - New Classification of Disease and Developmental Health
- Clinical Translation @ Individual and Population Level
  - Population health development – Curve Shifting Efforts
  - Early & Preemptive Interventions
  - Neurodevelopmental Optimization

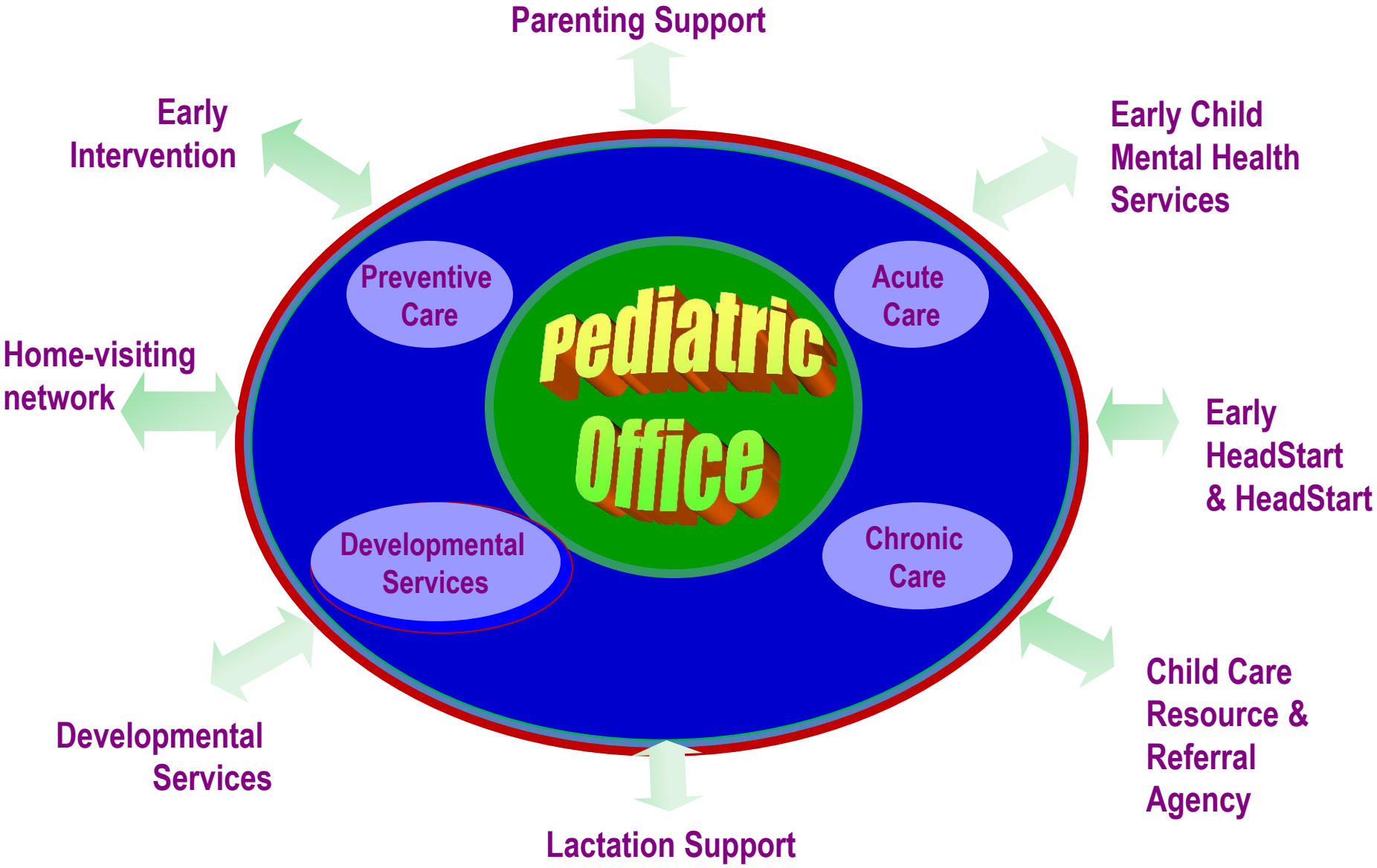
3.0 Agenda of Discovery, Innovation and Advancement

- Organization
  - 3.0 Child Health Development Systems (ACOs++)
  - Greater integration
    - Population and Individual Approaches
    - Horizontal and Longitudinal
  - R/D Investment vehicles – invest in health capital
- Transformational
  - Collaborative Innovation networks to stimulate improvement and innovation
    - All levels
    - States and Local level

Transitioning to a 3.0 Operating Logic

	Old Operating Logic	New Operating Logic
Definition of Health	**Absence of Disease**	**Development of Capacities and Realizing Potential (IOM2004)**
Goal of the Health System	**Maintain Health, Prolong Life**	**Optimize Population Health Development**
Client Model	**Individual**	**Individual, Population, Community**
Health Production Model	**Biomedical**	**Life Course Health Development**
Intervention Approach	**Diagnosis, Treatment and Rehabilitation**	**Disease prevention, Preemptive Interventions, Health Promotion, Optimization**
Time Frames	**Short/ Episodic**	**Life Long & Continuous**

Pediatric Office 2.5



Innovation Driven
US Health Care Delivery System Evolution

Acute Care System 1.0

- Episodic Health Care
  - Sick care focus
  - Uncoordinated care
  - High Use of Emergency Care
  - Multiple clinical records
  - Fragmentation of care
- Lack integrated care networks
- Lack quality & cost performance transparency
- Poorly Coordinate Chronic Care Management

Coordinated Seamless Healthcare System 2.0

Outcome Accountable Care

- Patient/Person Centered
- Transparent Cost and Quality Performance
  - Results oriented
  - Assures Access to Care
  - Improves Patient Experience
- Accountable Provider Networks Designed Around the patient
- Shared Financial Risk
- HIT integrated
- Focus on care management and preventive care
  - Primary Care Medical Homes
  - Care management/ prevention focused
  - Shared Decision Making and Patient Self Management

Community Integrated Healthcare System 3.0

Community Integrated Healthcare

Healthy Population Centered
Community Health Linked
Cost , Quality, and Population Transparency
Accessible Health Care Choices

Community Health Integrated networks capable of addressing psycho social/economic needs

Population based reimbursement

Learning Organization: capable of rapid deployment of best practices

Community Health Integrated
Healthy People Goal Oriented
Community Health Capacity Builder
Shared community health responsibility

E-health and telehealth capable
Patient remote monitoring and management
Health E-Learning resources

Putting Children First = Transformative

- New Powerful Narrative –
  - Not healthy, not investing, broken system
- New “game changing” Strategic Approach
- Transformative Tactics for Confronting
  - Challenges – Private love, public commitment
  - Barriers – structural, organization, finance
  - Constraints – old, medically oriented, adult focused
- Creating & Leveraging Opportunities
  - Affordable Care Act – emerging innovations
  - Science of health development – National Children’s Study
  - New measurement tool, social networking innovations

Big, Bold and Transformative- Change

- Child Health Community needs to commit itself to Child Health 2025 Initiative
- Adopt a 3.0 Strategic Framework for Research & Health System Transformation (children lead the way)
- Make the Unnecessary Catastrophic Loss Health Potential the unavoidable & inconvenient truth of our national destiny
- Child Health Futures Network – a national innovation network designed to
  - Develop 3.0 research, delivery, organization, payment, HIT, & other innovations that will jolt the system forward
  - Prototype new models of finance & delivery
    - Child Health Trusts,
    - Community Accountable Health Systems-Kids 3.0 ACO+

Center for Healthier Children Families and Communities

http://www.healthychild.ucla.edu/

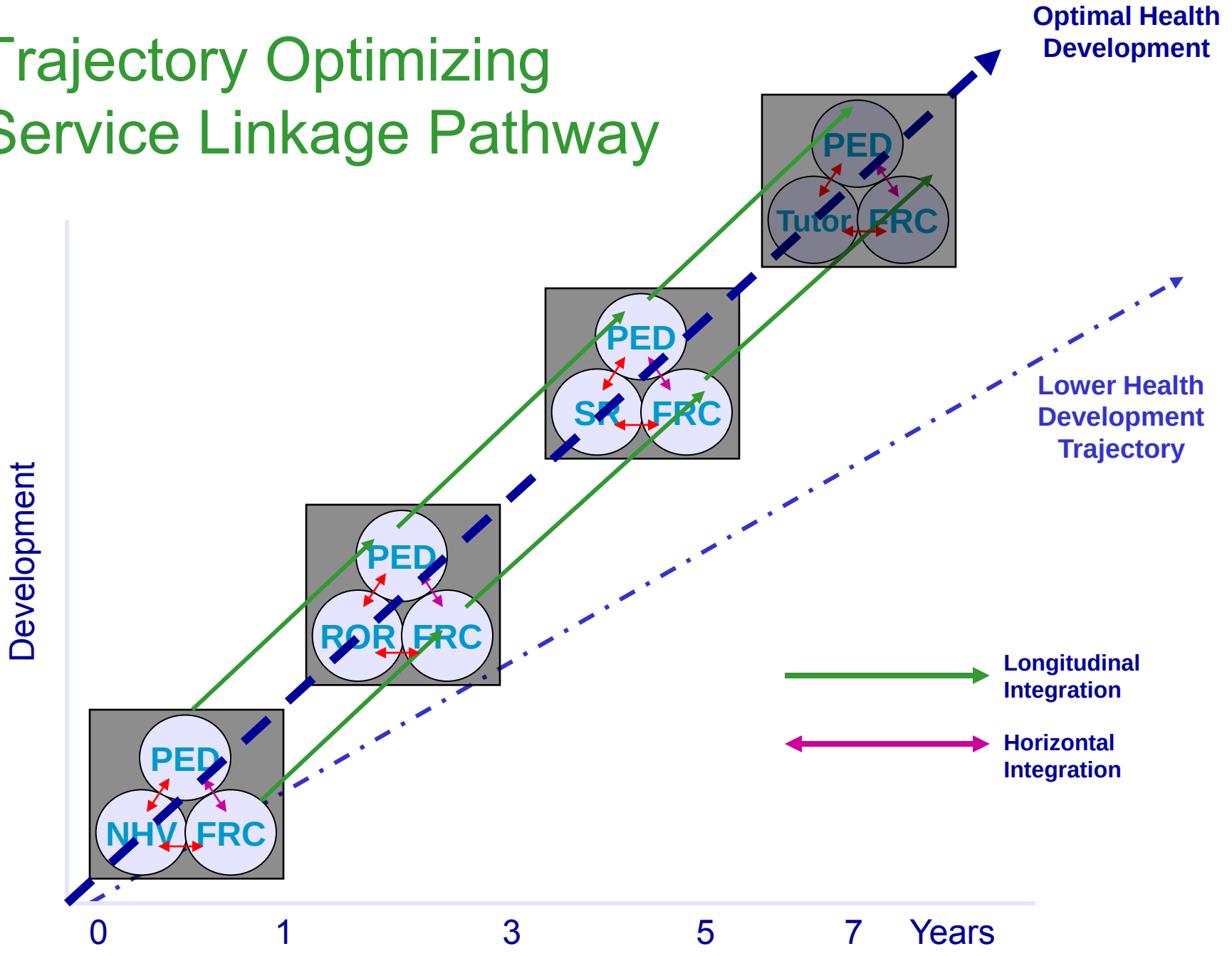
Maternal Child Health Life Course Research Network

Http://www.lcrn.net/

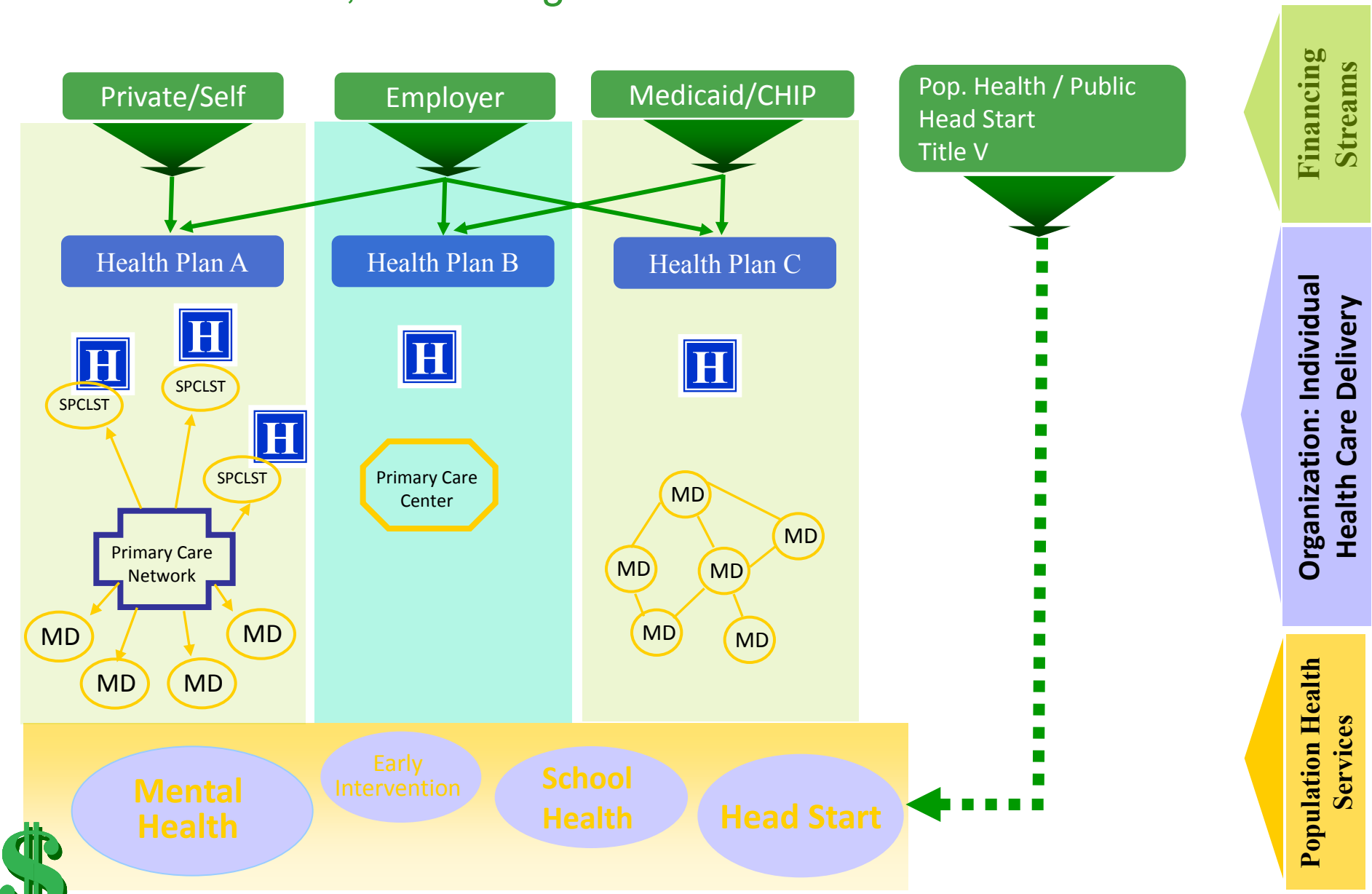
Investing in the right type of Research, Innovation,& Improvement Strategies

- Fixit – fix broken parts and pieces
- Incremental Improvement
  - Evidence based improvements in care
  - Most research (RO1s) & reforms
- Transitions
  - New way of performing; Quantum leap;
  - Breakthroughs & innovations
  - Requires nudges and jolts
  - T-R0-1s, ACOs, HIT, Prevention Trust Fund,
- Transformation: Paradigm Shift
  - New Operating System

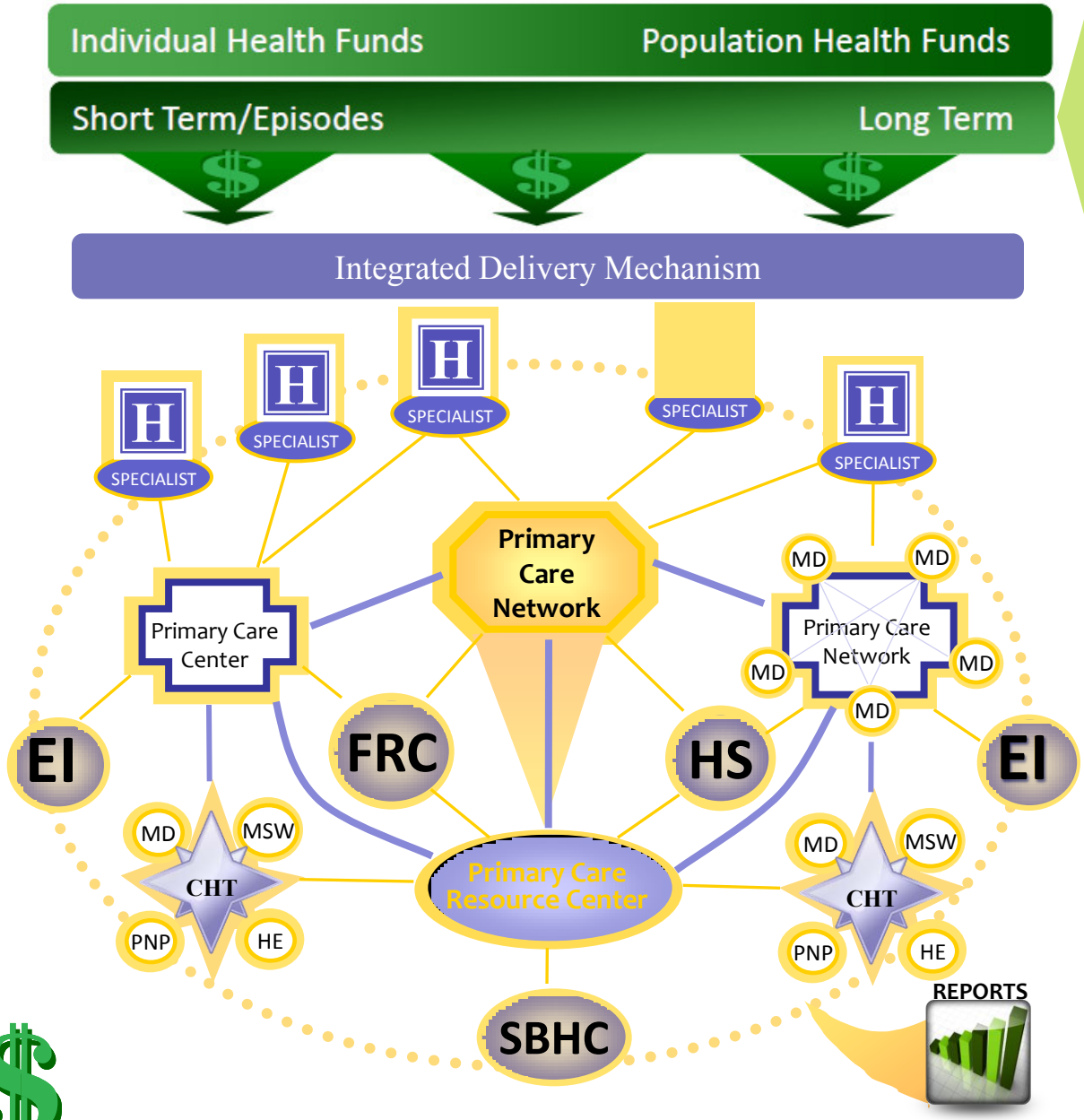
Trajectory Optimizing Service Linkage Pathway



Current Model
Vertical Silos, Little Integration



3.0 Children's ACO



Integrated Finance Mechanism

- Employer
- Medicaid CHIP
- Individual
- Prevention Trust Fund
- Other: Title V, HeadStart, Title X, CDC, etc

Measurement/IT System

- Decision Support and care mgmt
- Quality & Performance
- Clinical & Population Registries (surveillance and other analyses)
- Health information exchanges

Value Portfolio

- Population Health Trajectories
- Diagnosis-specific outcomes
- Geographic Outcomes
- Short/Long Term Costs Savings