Socioeconomic Disparities in Cognitive Reserve (Resilience)

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Alzheimer’s Disease (AD) and other dementias affect a substantial proportion of the U.S. and worldwide populations

- New case ~ every 65 seconds in U.S.
- Although incidence rate is not expected to dramatically increase, the aging of the population will lead to doubling in number of cases over the coming decades.

\(^1\)Data from Hebert et al. (2013) from the Chicago Health & Aging Project (CHAP)
SES Disparities in Cognitive Health

SES: education, occupational status, income, wealth, financial strain

Meta-analyses of AD/dementia:

• RRs of 1.59 – 1.99 for lower vs. higher levels of education
  ➢ Methodological challenge: varying criteria for “low” education
• ~7% reduction in AD risk per each year of additional education

Beydoun et al. (2014); Caamano-Isorna et al. (2006); Xu et al. (2016)

Worldwide, low education is estimated to be the risk factor with the single largest population attributable risk for AD (19.1%; Evans et al., 2014)
SES Disparities in Cognitive Health

Meta-Analytic Association (r)* of SES Indicators and Cognitive Performance Domains

Future Goal: Assessment of multiple SES indicators in relation to cognitive health

*data from Opdebeeck et al. (2016)

109 studies for education, 19 studies for occupational status
Lower midlife occupational status (but not childhood/parental or adult education) associated with smaller hippocampal volume and greater 4-year hippocampal atrophy in French older adults

(Three City Study; Elbejanni et al., 2017)

Lower parental education linked to smaller hippocampal volumes in children; parental income and education linked to total brain surface area and surface area mediated income variations in executive function

(Pediatric Imaging, Neurocognition and Genetics (PING) Study; Noble et al., 2015)
Intervening Mechanisms?
Modifiable Risk Factor Targets for AD/dementia:

- Increase physical activity
- Healthy/Mediterranean diet
- Reduce heavy alcohol consumption
- Stop smoking
- Foster social integration and engagement
- Foster a cognitively active lifestyle and work environment

Alzheimer’s Association (2018); Bellou et al. (2017); Gaugler et al., 2019; Hussenoeder & Riedel-Heller (2018); Kulmala et al. (2018)
Biological Mechanisms?

Gruenewald et al. (2012)
**Future Goal:**
Identification of the environmental, psychosocial, behavioral, and biological pathways that underlie SES variations in cognitive health

**English Longitudinal Study of Aging (ELSA):** Lifestyle for Brain Health (LIBRA) index accounted for 52% of the greater risk of incident AD for those with lower household income. (Deckers et al. (2019))

**Biological Regulatory Systems**
- **Primary:** Nervous system (CNS, ANS) & Neuroendocrine (e.g., HPA)
- **Secondary:** Cardiovascular/circulatory, Metabolic, Immune

**Neuropathology**
**Cognitive Decline**
MCI/AD/dementia

**Psychosocial Pathways**
- Stress exposure
- Social integration & engagement
- Cognitive and emotional processes
- Psychosocial resources

**Environmental Pathways**
- Pollution, toxins, carcinogens
- Neighborhood/community characteristics

**Behavioral Pathways**
- Smoking, diet
- Physical activity level
- Drug/alcohol use

**Socioeconomic Status**
- Education
- Occupational status
- Income
- Wealth
SES as a Resilience Factor?
Cognitive Reserve (Resilience)

Build Reserve
- Education, occupational complexity, socioeconomic resources
- Activity (physical, cognitive, social)
- Healthy Diet
- Sleep

Decrease Reserve
- Morbid conditions
- Stress
- Substance use/misuse

Cognitive reserve

neuropathology

Cognitive decline (functional)
- AD
- Other dementias

Pettigrew & Soldan (2019); Stern (2002, 2009); Stern et al. (1999)
SES as a Cognitive Resilience Factor?

Those with higher levels of education:

Less likely to show progression to mild cognitive impairment/dementia even in presence of cortical thinning in AD-vulnerable brain regions (Pettigrew et al., 2017; BIOCARD Study)

Less likely to show declines in cognitive function or to progress to mild cognitive impairment or dementia in presence of cerebrovascular damage (white matter intensities) (Jokinen et al., 2016; Mortamais et al., 2014)

Future Goal: Identification of direct and moderating (resilience) role of SES in cognitive health
Future Directions

What aspects of SES best confer protection and resilience?

Focused attention on delineating direct vs. moderating roles in SES-cognition relationships

Identification of psychosocial, behavioral, and biological mechanisms

Life course mechanisms
Alternative Causal Hypothesis: A key alternative causal hypothesis is that cognitive ability or physical health stock selects individuals into adverse SES environments and promotes poor later-life cognitive health.
1960 – Project Talent
2-day assessment
(>375,000 students
across U.S.)

Cognitive abilities, individual,
family, and school
characteristics

1-, 5-, and 11-year post high-
school follow-ups

2018-2019 – Project
Talent Aging Study –
Late-life mail survey,
telephone and
computerized
cognitive assessments

Target >22,000 of original
cohort; ~23% deceased,
6,644 responders

Repeat of some high school
cognitive assessments;
addition of others

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