Five Generations of Research on Health Disparities

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Articles with key term “health disparity,” “health inequality,” or “health inequity”

<table>
<thead>
<tr>
<th>Years</th>
<th>Health Disparity</th>
<th>Health Inequality</th>
<th>Health Inequity</th>
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<tbody>
<tr>
<td>‘83-’92</td>
<td>6</td>
<td>1</td>
<td>0</td>
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<tr>
<td>’93-’02</td>
<td>205</td>
<td>18</td>
<td>0</td>
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<tr>
<td>‘03-’12</td>
<td>4,019</td>
<td>82</td>
<td>30</td>
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</tbody>
</table>
Health Disparities Research
Generations

Each generation:

– Asked more complex, nuanced questions
– Left unresolved issues
1st generation –
Poverty and Race
Threshold Effect of Poverty

Health

Income

Poverty Line
Figure 1.4 GDP per capita and life expectancy at birth in 169 countries\textsuperscript{a}, 1975 and 2005

Life expectancy at birth (years)

GDP per capita, constant 2000 international $\text{\$}

\textsuperscript{a} Only outlier countries are named.
Unresolved issues:

• Nature of association
• Intersection of race and poverty
• Other bases of social stratification
Second Generation:

SES – health gradients
Adjusted odds ratio for death from all causes according to annual household income, 1972-1989

The group with an annual household income of more than $70,000 (in 1993 dollars) is the reference group. Data are from McDonough et al. Am. J Pub Hlth, 1997.

Prevalence of Health Problems in Children

<table>
<thead>
<tr>
<th>Percentage</th>
<th>SES (lowest to highest)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

- **Any limiting chronic condition**
- **Asthma prevalence**
- **Ear disease**
- **Injury**
- **Physical inactivity**
Unresolved issues

Diseases:
Reversals for some diseases

Populations:
Reversals in some countries
Diseases

- Gradient for CVD, stroke, diabetes, mood disorders, lung cancer (now)
- Reverse gradient: Breast cancer, skin cancer
Populations

Reverse gradient in lower income nations
In developing countries, higher socio-economic status (SES) is associated with:

- ↓ Blood pressure (Chile, Brazil, Colombia)
- ↑ Blood pressure (Nigeria)
- ↑ Hypertension (India)
- ↑ & ↓ Hypertension (Jamaica)
Why the inconsistencies?

—Methodologic concerns (i.e. definitions of SES)

—Sample sizes

—Truly different patterns in developing countries?
Oportunidades: SES & blood pressure

• Lowest income women in a middle income country

• Blood pressure in relation to:
  – Education
  – Income
  – Housing/Assets
  – Subjective Social Status (community)
Subjective social status
Systolic blood pressure

Anomalous finding?
## Systolic blood pressure

<table>
<thead>
<tr>
<th></th>
<th>$\beta$ (95% C.I.)</th>
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<tbody>
<tr>
<td><strong>Household income per capita</strong></td>
<td></td>
</tr>
<tr>
<td>Second tertile</td>
<td>+1.01 (0.30, 1.73)*****</td>
</tr>
<tr>
<td>Third tertile</td>
<td>+1.95 (1.21, 2.69)*****</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>-0.86 (-1.75, 0.03)*</td>
</tr>
<tr>
<td>Secondary school</td>
<td>-2.03 (-3.13, -0.94)*****</td>
</tr>
<tr>
<td><strong>Body mass index</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.57 (0.51, 0.64)*****</td>
</tr>
<tr>
<td><strong>Subjective social status</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+0.23 (0.10, 0.36)*****</td>
</tr>
</tbody>
</table>

N=8840, *Significant at 10%, *** Significant at 1%
Model adjusted for age
Results are from multiple linear regression, adjusted for clustering at household level
R-squared for model is 0.18

Fernald & Adler *J Epidemiol Comm Health* (2008)
Income is a risk factor for high BP

Systolic blood pressure (mmHg)

Income per capita (log-transformed)

No education

Some primary

Some secondary

Fernald & Adler  J Epidemiol Comm Health (2008)
Third Generation:

Mechanisms
How does socioeconomic status get under the skin?
Life Course

MaArthur Foundation Research Network model
Determinants of Health

- Genetic predisposition
- Behavioral patterns
- Environmental exposures
- Social circumstances
- Health care

Proportions (Premature Mortality)

- Genetic: 30%
- Behavior: 40%
- Health care: 10%
- Social: 15%
- Environment: 5%

Life Course

MaArthur Foundation Research Network model
Life Course

MacArthur Foundation Research Network model
Health Behaviors by Education – U.S. Adults

Bar chart showing the percentage of Cigarette smoking and Recommended activity level by education level:

- No HS diploma
- HS diploma
- Some college
- BA degree or more

- Cigarette smoking
- Recommended activity level

Percentage vs. Education

27
The diagram illustrates the MacArthur Foundation Research Network model, which is a comprehensive framework for understanding how various factors influence health outcomes across the life course.

**SES** (Socioeconomic Status)
- Education
- Occupation
- Income
- Subjective SES
- SES Inequality

**Environmental Resources & Constraints**
- Neighborhood Factors
- Social Capital
- Work Situation
- Family Environment
- Social Support
- Discrimination

**Psychological Influences**
- Resilience/Reserve Capacity
- Negative Affect (anxiety, depression, hostility)
- Lack of Control
- Negative Expectations
- Perceived Discrimination
- Reactive Responding

**Access to Medical Care**

**Exposure to Carcinogens & Pathogens**

**Health Related Behaviors**

**CNS & Endocrine Response**

**Allostatic Load**

**Health Outcomes**

**Health**
- Cognitive fx
- Physical fx

**Disease**

**Disease Trajectories**
- Recovery
- Relapse
- Secondary Events

**Mortality**

**Life Course**

MacArthur Foundation Research Network model
You call this a stress test? Where’s the office, phones, clients canceling contracts, boss raising sales quotas, rumors of downsizing, shrinking paycheck, kids needing braces, car needing tires...
Telomeres cap ends of chromosomes (Blackburn, 1978)
Telomere Length and Survival

Cawthon et al., 361, Lancet, 2003
Scatter plots of chronicity of stress by telomere length in caregivers and perceived stress scores by telomere length
Figs. 1 and 2. Mean age-adjusted telomere length and standard error by social class grouping (for trend = 0.0024).

**Fig. 1** Mean age-adjusted telomere length and standard error by social class grouping (P for trend = 0.0024).

- **Nonmanual**
- **Manual**

**Fig. 2** Mean telomere length and standard error by manual vs. nonmanual social class groupings.

*P = 0.01

# P = 0.04
Life Course

MacArthur Foundation Research Network model
SES & Interpretations

A: \( t (28) = 2.99, p < .01 \)
N: \( t (28) = 0.25, ns \)
Adolescents who make negative interpretations have higher mean night time heart rate

Quartile of Negative Interpretation Scores

Unresolved issues: Third generation

Why do health behaviors vary by SES?

Do psychosocial resources mediate or moderate SES effects?

What is the time lag between exposure and health problem?
Fourth Generation:

Multiple-levels
Neighborhood as *proxy* for individual

Neighborhood *independent* of individual
Significant, independent impact of neighborhood (but small effect)
Built environment:
Supermarkets
Recreational facilities
Parks
Individual vs. social determinants of obesity
Behavioral Justice
Unresolved issues:
Fourth generation

Interactive effects of different basis of disadvantage

Relationship of individual and social levels
Fifth Generation

Interactions and Systems
Example One

Interaction of individual and neighborhood SES
Death per Neighborhood SES

Winkleby, Cubbin & Ahn. (2006). AJPH.
Example Two

Interaction of SES and race / ethnicity
Note. The education line was significant among White and Black children (P's were < .001) but not for Hispanic and Asian children.

**FIGURE 1**—Parental education × race interaction for activity limitations.
Correlations of income and education with telomere length (year 15) and change in telomere length (year 10-15) for white (n = 78) and black (n = 52) men

<table>
<thead>
<tr>
<th></th>
<th>White</th>
<th></th>
<th>Black</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Education</td>
<td>Income</td>
<td>Education</td>
<td>Income</td>
</tr>
<tr>
<td>TL Year 15</td>
<td>-.27*</td>
<td>-.33*</td>
<td>.08</td>
<td>.12</td>
</tr>
<tr>
<td>Change Year 10-15</td>
<td>-.27*</td>
<td>-.35*</td>
<td>.01</td>
<td>.02</td>
</tr>
</tbody>
</table>

* All p’s ≤ .01
TL x Education x Race – Full Sample

Full Sample

Telomere Length

Black  White

<= HS  >HS
Cross-cutting unresolved issues:

- Causal direction
- Rigor vs. vigor
Causal direction

SES → health

Health → SES

SES → Health

SES

X

Health
Single cause – single effect

Parental home ownership (age 0-5) → Probability of cold

Source: Cohen et al., 2004
“Actually, Lou, I think it was more than just my being in the right place at the right time. I think it was my being the right race, the right religion, the right sex, the right socioeconomic group, having the right accent, the right clothes, going to the right schools...”
“Poverty is associated with other experiences of disadvantage (such as poor schools or being raised by a single parent), making it difficult to be certain whether it is poverty per se that really matters or other related experience.”

Duncan and Magnuson (2010), *The Long Reach of Early Childhood Poverty*
Overestimation & Underestimation

• Any one risk may be *overestimated* if looked at in isolation

• Overall impact of social disadvantage may be *underestimated* if not taken as totality
Cumulative Effects
Isle of Wight Study

- Low parental SES
- Large family size
- Marital discord
- Paternal criminality
- Maternal mental illness
- Foster placement

Source: Rutter, 1979
Findings

No single risk significantly raised rates of childhood psychiatric disorder, but

Two risk factors → Four-fold increase

Four risk factors → Ten-fold increase

Source: Rutter, 1979
Issues in use of risk scores

• Assumption that each risk is equally weighted

• Independent effects
## Odds of Children Having Poor Health by Individual and Cumulative Risk Factors (0-18)

<table>
<thead>
<tr>
<th>Risks</th>
<th>Model 1 (separate)</th>
<th>Model 2 (together)</th>
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<tbody>
<tr>
<td>Non-white</td>
<td>1.8***</td>
<td>2.5***</td>
</tr>
<tr>
<td>Mom poor mental health</td>
<td>3.5***</td>
<td>4.5***</td>
</tr>
<tr>
<td>Dad poor mental health</td>
<td>1.5</td>
<td>2.1**</td>
</tr>
<tr>
<td>Mom &lt; HS education</td>
<td>1.6*</td>
<td>2.6***</td>
</tr>
<tr>
<td>Dad &lt; HS education</td>
<td>1.9**</td>
<td>2.9***</td>
</tr>
<tr>
<td>Low income family</td>
<td>2.1***</td>
<td>3.3***</td>
</tr>
<tr>
<td>Highly mobile family</td>
<td>1.3</td>
<td>1.9**</td>
</tr>
<tr>
<td>Resource poor neighborhood</td>
<td>1.8**</td>
<td>2.4***</td>
</tr>
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### Cumulative Risks

<table>
<thead>
<tr>
<th>Cumulative Risks</th>
<th>Model 1 (separate)</th>
<th>Model 2 (together)</th>
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<tbody>
<tr>
<td>0</td>
<td>Ref</td>
<td>Ref</td>
</tr>
<tr>
<td>1</td>
<td>2.7***</td>
<td>----</td>
</tr>
<tr>
<td>2</td>
<td>3.6***</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>9.5***</td>
<td>0.5</td>
</tr>
<tr>
<td>4+</td>
<td>19.7***</td>
<td>0.2**</td>
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