Why Place Matters: Understanding the Role of Social Determinants of Health

Derek A. Chapman, PhD

September 26, 2018
The VCU Center on Society and Health is an academic research center working to connect the dots between social factors and health.

www.societyhealth.vcu.edu
Connecting the Dots

Diagram showing connections between neighborhood, income, education, policy, lifestyle, and health care.
Estimated Deaths Attributable to Social Factors in the United States

Sandro Galea, MD, DrPH, Melissa Tracy, MPH, Katherine J. Hoggatt, PhD, Charles DiMaggio, PhD, and Adam Karpati, MD, MPH

In 1993, an article provocatively titled “Actual Causes of Death in the United States” offered a new conceptualization of cause-of-death classification, one that acknowledged and quantified the contributions of behavior rather than the more typical pathological explanations recorded on death certificates. The authors, McGinnis and Foege, found that the most prominent contributor to mortality in 1990 was tobacco (400,000 deaths), followed by diet and activity patterns (300,000 deaths). A decade later, updated findings by Mokdad et al. using data from 2000 showed progress in some areas.

**Objectives.** We estimated the number of deaths attributable to social factors in the United States.

**Methods.** We conducted a MEDLINE search for all English-language articles published between 1980 and 2007 with estimates of the relation between social factors and adult all-cause mortality. We calculated summary relative risk estimates of mortality, and we obtained and used prevalence estimates for each social factor to calculate the population-attributable fraction for each factor. We then calculated the number of deaths attributable to each social factor in the United States in 2000.

**Results.** Approximately 245,000 deaths in the United States in 2000 were attributable to low education, 176,000 to racial segregation, 162,000 to low social support, 133,000 to individual-level poverty, 119,000 to income inequality, and 39,000 to area-level poverty.
Social determinants of health inhibit physicians’ ability to accomplish the historical goals of medicine.

Nguyen (2016) Redrawing the Boundaries of Medicine: The Case for Social Determinants of Health
World Health Organization Conceptual Model

Life expectancy varies by country
GLOBAL LIFE EXPECTANCY AT BIRTH:

https://www.pri.org/stories/2014-10-09/these-maps-reveal-how-long-you-probably-have-live
Life Expectancy at Birth, 1970 & 2014, OECD Countries

OECD Health Statistics 2016: [http://dx.doi.org/10.1787/9789264261488-en](http://dx.doi.org/10.1787/9789264261488-en)
Life Expectancy at Birth in 21 High-Income Countries, 1980-2006

Males

Females
Mortality from Non-Communicable Diseases (NCD), 2008

Japan: 273
Switzerland: 323
Australia: 330
France: 336
Italy: 342
Canada: 346
Spain: 351
Sweden: 358
Norway: 363
Austria: 373
Netherlands: 377
Finland: 377
Portugal: 394
Germany: 394
United Kingdom: 401
United States: 418
Denmark: 440

Age-Standardized Deaths per 100,000 People
Mortality from Communicable (Infectious) Diseases, 2008

- Finland: 11 deaths per 100,000 people
- Austria: 14 deaths per 100,000 people
- Italy: 16 deaths per 100,000 people
- Switzerland: 17 deaths per 100,000 people
- Australia: 18 deaths per 100,000 people
- Sweden: 20 deaths per 100,000 people
- Germany: 21 deaths per 100,000 people
- France: 23 deaths per 100,000 people
- Canada: 23 deaths per 100,000 people
- Spain: 24 deaths per 100,000 people
- Norway: 27 deaths per 100,000 people
- Denmark: 27 deaths per 100,000 people
- Netherlands: 28 deaths per 100,000 people
- United States: 34 deaths per 100,000 people
- United Kingdom: 36 deaths per 100,000 people
- Japan: 40 deaths per 100,000 people
- Portugal: 46 deaths per 100,000 people
Mortality from Injuries

<table>
<thead>
<tr>
<th>Country</th>
<th>Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>22</td>
</tr>
<tr>
<td>Spain</td>
<td>23</td>
</tr>
<tr>
<td>Italy</td>
<td>25</td>
</tr>
<tr>
<td>Germany</td>
<td>25</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>25</td>
</tr>
<tr>
<td>Portugal</td>
<td>28</td>
</tr>
<tr>
<td>Australia</td>
<td>30</td>
</tr>
<tr>
<td>Switzerland</td>
<td>30</td>
</tr>
<tr>
<td>Canada</td>
<td>32</td>
</tr>
<tr>
<td>Sweden</td>
<td>32</td>
</tr>
<tr>
<td>Denmark</td>
<td>33</td>
</tr>
<tr>
<td>Austria</td>
<td>34</td>
</tr>
<tr>
<td>Norway</td>
<td>36</td>
</tr>
<tr>
<td>Japan</td>
<td>36</td>
</tr>
<tr>
<td>France</td>
<td>38</td>
</tr>
<tr>
<td>United States</td>
<td>53</td>
</tr>
<tr>
<td>Finland</td>
<td>58</td>
</tr>
</tbody>
</table>

Age-Standardized Deaths per 100,000 People
Ranking of US Mortality Rates by Age Group in 17 Peer Countries, 2006-2008
Ranking of Mortality of non-Hispanic Whites by Age Group in 17 Peer Countries, 2006-2008

At no age below 55 do US non-Hispanic whites rank better than 16th out of 17 countries (for either sex).
Self-Reported “good” or “better than good” Health, 2014

OECD Health Statistics, 2016: http://dx.doi.org/10.1787/9789264261488-en
Health Expenditures and Life Expectancy, 2010

Life expectancy vs. health expenditure, 1980 to 2015

Health financing is reported as the annual per capita health expenditure and is adjusted for inflation and price level differences between countries (measured in 2010 international dollars).


https://ourworldindata.org/the-link-between-life-expectancy-and-health-spending-us-focus
Social Services Versus Health Spending Among OECD Countries, 1995-2005

Average social services expenditures as percentage of GDP, 1995-2005

Average health services expenditures as percentage of GDP, 1995-2005

Bradley et al., *BMJ Qual Saf* 2011; 20:826-31
Figure 5. Total Health & Social Services Spending Among OECD Countries as a Percentage of GDP, 2005

Adapted from Bradley EH et al, BMJ Qual Saf 2011;20:826-831
Public Social Expenditure as a Percent GDP, 1960, 1990, and 2016, OECD Nations

Table 2. Social-to-Health Spending Ratio & Health Outcomes in U.S. States

For every 20% increase in social-to-health spending ratio

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Change in Outcome</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health Metrics (among adults)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity (BMI ≥30)</td>
<td>-33%</td>
<td>0.01</td>
</tr>
<tr>
<td>Asthma</td>
<td>-11%</td>
<td>0.04</td>
</tr>
<tr>
<td>Mentally unhealthy ≥50% time</td>
<td>-43%</td>
<td>0.007</td>
</tr>
<tr>
<td>Activity limitations ≥50% time</td>
<td>-37%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Mortality Rates (per 100,000 people)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute myocardial infarction</td>
<td>-4.02 deaths</td>
<td>0.03</td>
</tr>
<tr>
<td>Lung cancer</td>
<td>-2.72 deaths</td>
<td>0.001</td>
</tr>
<tr>
<td>Type 2 diabetes</td>
<td>-0.45 deaths</td>
<td>0.004</td>
</tr>
<tr>
<td>Neonatal</td>
<td>-4.15 deaths</td>
<td>0.325</td>
</tr>
</tbody>
</table>

Adapted from Bradley EH et al, *Health Affairs* 2016;5:760-768

Nguyen (2016) Redrawing the Boundaries of Medicine: The Case for Social Determinants of Health
Life expectancy varies within the U.S.
Life expectancy, by state, 2013-14

Source: http://www.measureofamerica.org/
What Country Does Your State’s LE Resemble?

Life Expectancy at Birth by County, KY, 2002-11

Sources: Mortality data (2002-11) from CDC Wonder; Census data (interpolated population avg. of 2000 & 2010) from American Fact Finder
Short Distances to Large Gaps in Health

WASHINGTON, D.C.

Follow the discussion
#CloseHealthGaps

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CHICAGO, ILLINOIS

Short Distances to Large Gaps in Health

Life expectancy at birth (years)
- Shorter
- Longer

1 mile

Red Line
Green Line
Orange Line

Follow the discussion
#CloseHealthGaps

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CHICAGO, ILLINOIS
Short Distances to Large Gaps in Health

ATLANTA, GEORGIA

Life expectancy at birth (years)

Shorter Longer

2 miles

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MIAMI, FLORIDA

Short Distances to Large Gaps in Health

Life expectancy at birth (years)
Shorter Longer

Follow the discussion
#CloseHealthGaps

2 miles

MIAMI INTERNATIONAL AIRPORT

HIALEAH

MIAMI SHORES

MIAMI BEACH

OVERTOWN

DOWNTOWN MIAMI

MARLINS PARK STADIUM

Airport Expressway

Robert Wood Johnson Foundation

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Why the Differences?

• **Education and income** are directly linked to health: Communities with weak tax bases cannot support high-quality schools and jobs are often scarce in neighborhoods with struggling economies.

• **Unsafe or unhealthy housing** exposes residents to allergens and other hazards like overcrowding.

• **Stores and restaurants selling unhealthy food** may outnumber markets with fresh produce or restaurants with nutritious food.

• **Opportunities for residents to exercise, walk, or cycle** may be limited and some neighborhoods are unsafe for children to play outside.

• **Proximity to highways, factories, or other sources of toxic agents** expose residents to pollutants.

• **Access to primary care doctors and good hospitals** may be limited.

• **Unreliable or expensive public transit** can isolate residents from good jobs, health and child care, and social services.

• **Residential segregation and features that isolate communities** (e.g., highways) can limit social cohesion, stifle economic growth, and perpetuate cycles of poverty.
Short Distances to Large Gaps in Health
## Gilpin Court vs Westover Hills, 2009-13

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Gilpin Court (Tract 301)</th>
<th>Westover Hills (Tract 606)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median Household Income</strong></td>
<td>$10,263</td>
<td>$77,583</td>
</tr>
<tr>
<td><strong>% of Population 16+ years that are unemployed</strong></td>
<td>19.1</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>% of insured population with private health insurance</strong></td>
<td>10.7</td>
<td>84.6</td>
</tr>
<tr>
<td><strong>% of total population with no health insurance</strong></td>
<td>16.7</td>
<td>5.8</td>
</tr>
<tr>
<td><strong>% of families with income in the past 12 months below the federal poverty level</strong></td>
<td>73.2</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>% of families with female headed households</strong></td>
<td>91.6</td>
<td>11.3</td>
</tr>
<tr>
<td><strong>Racial composition</strong></td>
<td>89.8% black/African-American</td>
<td>88.2% white</td>
</tr>
</tbody>
</table>

Source: 5-year estimates from the 2009-2013 American Community Survey
Percentage of Households with Annual Income Below the Poverty Threshold, By Census Tract

Large Public Housing Sites

2010 Census Tracts

Poverty rate

- < 10%
- 10% - 19.9%
- 20% - 29.9%
- 30% - 39.9%
- 40% - 49.9%
- > 50%

Source: Housing Opportunities Made Equal of Virginia: Where You Live Makes All The Difference: An Opportunity Map of the Richmond Region

Data source: American Community Survey, 2009 - 2013 5-Year Estimates (U.S. Census Bureau)
HOLC map, 1937

Life Expectancy at Birth, 2002-11

Source: http://dsl.richmond.edu/holc/pages/home
Richmond Virginia, 2012

Map 2: City of Richmond Home Owners Loan Corporation Boundaries, 1937

Map 3: Current Concentration of Public Housing, Contrasted with the HOLC Areas (Graded A & B) That Received the Majority of Home Loans

Primary prevention

Safety net programs and secondary prevention

Medical care and tertiary prevention
Differences in quality of care
Differences in access to care
Differences in exposure and opportunities

Camara Phylis Jones, MD, MPH, PhD
Our goal: To move the conversation

Health services

Social determinants of health

Social determinants of equity

Policies that promote access to quality care for the underserved can improve population health.
Policies that strengthen access to nutritious foods, improve the built environment, and help the poor get help for smoking, alcohol, or drug dependence are critical.
Policies that discourage predatory advertising practices can promote healthier choices.
Policies that attract redevelopment and construction of healthy housing can promote the health of residents.
Policies that promote affordable and reliable public transportation can increase access to jobs and services.
Policies that strengthen schools and academic success can enhance livelihoods and promote better health.
Policies that create jobs and foster business growth can promote economic opportunity and good health.
Policies that address zoning for polluters and curb environmental emissions can improve population health.
Policies that encourage investments in early childhood can help put children on a path for success and better health.
Policies that strengthen the economy can improve wellbeing and public health.
Policies that promote economic opportunity for all Americans can close the gap.
Policies that curb crime and address the root causes of violence can save lives.
Policies that encourage economic development and empowerment can improve the wellbeing of communities.
Three levels of engagement

**LEVEL 1: Assessing social determinants systematically**

- systematic collection of race/ethnicity, health literacy, income, etc.
- @ Systems level: characterize patient population; identify populations at risk or geographic “hot spots”
- @ Individual level: screen/asses; customize care plans
Figure 7. Hospitalizations for Hypoglycemia by Income, 2000-2008

Admissions attributable to hypoglycemia, per 100,000

Day of the month

Admissions attributable to appendicitis, per 10,000

* Hypoglycemia
Red = lowest income decile

* Appendicitis

Adapted from Seligman HK et al, Health Aff, 2014

Nguyen (2016) Redrawing the Boundaries of Medicine: The Case for Social Determinants of Health
Three levels of engagement

**LEVEL 1:** Assessing social determinants systematically
   - systematic collection of race/ethnicity, health literacy, income, etc.

**LEVEL 2:** Helping connect patients with assistance
   - e.g., referring patients to social service agencies
Three levels of engagement

**LEVEL 1:** Assessing social determinants systematically
- systematic collection of race/ethnicity, health literacy, income, etc.

**LEVEL 2:** Helping connect patients with assistance
-- e.g., referring patients to social service agencies

**LEVEL 3:** Supporting community initiatives
-- e.g., joining community collective-impact initiatives
Integrated Models of Health Care and Social Services Can Work!

Table 1. Summary of findings in the literature (N = 39).

<table>
<thead>
<tr>
<th>Findings</th>
<th>Housing Support N (%)</th>
<th>Nutrition Support N (%)</th>
<th>Income Support N (%)</th>
<th>Care coordination and community outreach N (%)</th>
<th>Other* N (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive health outcomes</td>
<td>5 (42%)</td>
<td>7 (64%)</td>
<td>3 (75%)</td>
<td>2 (22%)</td>
<td>3 (100%)</td>
<td>20 (51%)</td>
</tr>
<tr>
<td>Reduced costs</td>
<td>1 (8%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>4 (44%)</td>
<td>0 (0%)</td>
<td>5 (13%)</td>
</tr>
<tr>
<td>Both health outcomes and reduced costs</td>
<td>4 (33%)</td>
<td>0 (0%)</td>
<td>1 (25%)</td>
<td>2 (22%)</td>
<td>0 (0%)</td>
<td>7 (18%)</td>
</tr>
<tr>
<td>Mixed results</td>
<td>0 (0%)</td>
<td>1 (9%)</td>
<td>0 (0%)</td>
<td>1 (9%)</td>
<td>0 (0%)</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>Non-significant effects</td>
<td>1 (8%)</td>
<td>2 (18%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>3 (8%)</td>
</tr>
<tr>
<td>Negative health outcomes</td>
<td>1 (8%)</td>
<td>1 (9%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>2 (5%)</td>
</tr>
<tr>
<td>Total</td>
<td>12 (100%)</td>
<td>11 (100%)</td>
<td>4 (100%)</td>
<td>9 (100%)</td>
<td>3 (100%)</td>
<td>39 (100%)</td>
</tr>
</tbody>
</table>

*Other studies contained interventions that had major educational components that were associated with improved health outcomes, especially among children.

doi:10.1371/journal.pone.0160217.t001

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Relative Risk Reduction, % (95% CI)</th>
<th>p-value</th>
<th>Estimated Magnitude of Benefit **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalizations</td>
<td>29 (10-44)</td>
<td>0.005</td>
<td>49 fewer hospitalizations</td>
</tr>
<tr>
<td>Hospital days</td>
<td>29 (8-45)</td>
<td>0.01</td>
<td>270 fewer hospital days</td>
</tr>
<tr>
<td>ED visits</td>
<td>24 (3-40)</td>
<td>0.03</td>
<td>116 fewer ED visits</td>
</tr>
</tbody>
</table>

*Adjusted for sex, race, age, education, insurance, veteran, prior hospital or ED visit, HIV status, hospital site, current alcohol or other drug use, physical function quality of life, mental health quality of life, and mental health disorders

**For every 100 persons offered the intervention over 1 year

Adapted from Sadowski LS et al, JAMA 2009
Community Engagement (Residents)
### Resident Opinions on Health and Wellness in the East End of Richmond, VA: 2014

<table>
<thead>
<tr>
<th>Option</th>
<th>N of 1076</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>More job training</td>
<td>810</td>
<td>75.3</td>
</tr>
<tr>
<td>Less violence</td>
<td>806</td>
<td>74.9</td>
</tr>
<tr>
<td>Better housing</td>
<td>790</td>
<td>73.4</td>
</tr>
<tr>
<td>Safer places to play</td>
<td>786</td>
<td>73</td>
</tr>
<tr>
<td>Less drug selling</td>
<td>779</td>
<td>72.4</td>
</tr>
<tr>
<td>More GED classes</td>
<td>759</td>
<td>70.5</td>
</tr>
<tr>
<td>More recreation activities</td>
<td>741</td>
<td>68.9</td>
</tr>
<tr>
<td>Playgrounds</td>
<td>718</td>
<td>66.7</td>
</tr>
<tr>
<td>Better transportation</td>
<td>717</td>
<td>66.6</td>
</tr>
<tr>
<td>Closer places to buy healthy foods</td>
<td>697</td>
<td>64.8</td>
</tr>
<tr>
<td>Health center located close by</td>
<td>664</td>
<td>61.7</td>
</tr>
<tr>
<td>Less expensive healthy food</td>
<td>610</td>
<td>56.7</td>
</tr>
<tr>
<td>More interaction with neighbors</td>
<td>609</td>
<td>56.6</td>
</tr>
<tr>
<td>More police</td>
<td>594</td>
<td>55.2</td>
</tr>
<tr>
<td>Community garden</td>
<td>580</td>
<td>53.9</td>
</tr>
<tr>
<td>More grass and trees</td>
<td>533</td>
<td>49.5</td>
</tr>
</tbody>
</table>
Community Engaged Approach to Study of Pediatric Asthma

• NIH planning grant to design a multi-level culturally tailored intervention for low income minority children in Richmond City, VA

• Needs assessment
  – Caregivers of children with asthma survey
  – Caregiver and child focus groups
  – Identify barriers to effective management of asthma, concerns and needs related to asthma care

• Met monthly with Community Advisory Board
  – Assessed cultural appropriateness of potential interventions

• Newsletters and educational materials for community

• Awarded 6 yr $5.8 million NIH grant in Summer 2018
  – Family-based asthma self management education delivered by community health workers w/ a school nurse component
Data Tools/Examples
How “Hot Spotting” Cut Health Care Costs by 50%

One doctor in Camden, New Jersey, Jeffrey Brenner, used data to map “hot spots” of health care high-utilizers—one patient had gone to the hospital 113 times in a year—and found a better, cheaper way to treat these costly patients through collaborative care. Brenner’s team was able to reduce hospital visits and costs by 40 to 50 percent.
### CA Healthy Places Index Domain Weights

<table>
<thead>
<tr>
<th>Domain</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>32.0%</td>
</tr>
<tr>
<td>Transportation</td>
<td>16.0%</td>
</tr>
<tr>
<td>Education</td>
<td>19.0%</td>
</tr>
<tr>
<td>Social</td>
<td>10.0%</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>8.0%</td>
</tr>
<tr>
<td>Pollution</td>
<td>5.0%</td>
</tr>
<tr>
<td>Healthcare Access</td>
<td>5.0%</td>
</tr>
<tr>
<td>Housing</td>
<td>5.0%</td>
</tr>
</tbody>
</table>
CA Healthy Places Index Website

http://map.healthyplacesindex.org/
Discussion
Contact information

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