What matters most to improve the mental health of populations

Sandro Galea

Boston University School of Public Health
1. We are centrally motivated to improve the health of populations
FIGURE 1-1 Mortality from noncommunicable diseases in 17 peer countries, 2008. SOURCE: Data from World Health Organization (2011a, Table 3).
2. What are we doing to improve (population) mental health?
Ten medical conditions with the highest estimated spending in 2013

- Mental disorders
- Heart conditions
- Trauma
- Cancer
- Pulmonary conditions
- Osteoarthritis
- Normal birth
- Diabetes
- Kidney disease
- Hypertension

**Source:** Author’s analysis of study data. **Notes:** Institutionalized populations include nursing home residents, long-term patients in psychiatric hospitals, and prisoners. Trauma is fractures and wounds. Pulmonary conditions include chronic obstructive pulmonary disease, asthma, and other pulmonary diseases.
BRAIN Initiative

President Obama is making new investments in the "BRAIN" Initiative — a bold new research effort to revolutionize our understanding of the human mind and uncover new ways to treat, prevent, and cure brain disorders like Alzheimer's, schizophrenia, autism, epilepsy, and traumatic brain injury.

THE WHITE HOUSE IS ANNOUNCING
OVER $300 MILLION IN PUBLIC AND PRIVATE INVESTMENTS
IN SUPPORT OF THE BRAIN INITIATIVE

Since President Obama announced the BRAIN Initiative in April 2013, dozens of leading technology firms, academic institutions, scientists and...
Among NIH funding for the current fiscal year, only 0.4% was awarded to projects with the terms “population” or “public” in the title.
Proportion of NIH funding awarded to projects with the terms “genetic” or “genetics” in the title, abstract or terms
Proportion of NIH funding awarded to projects with the terms "population" or "public" in the title, abstract, or terms

3. Is this getting us where we want to get to?
Figure 3. Percentage of persons aged 12 and over with depression, by poverty status and race and Hispanic origin: United States, 2009–2012

<table>
<thead>
<tr>
<th></th>
<th>Below poverty level</th>
<th>At or above poverty level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>15.4^1</td>
<td>6.2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>13.4^1</td>
<td>7.6</td>
</tr>
<tr>
<td>Non-Hispanic Black</td>
<td>16.4^1</td>
<td>7.3</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>16.5^1</td>
<td>5.9</td>
</tr>
</tbody>
</table>

^1Significantly higher than "at or above poverty level."

NOTES: Depression is defined as moderate to severe depressive symptoms. The poverty level is set by the U.S. Department of Health and Human Services and is based on family income and family size. Access data table for Figure 3 at: http://www.cdc.gov/nchs/data/databriefs/db172iaric.pdf.

Figure 5. Percentage of those aged 12 and over who contacted a mental health professional in past 12 months, by depressive symptom severity and race and Hispanic origin: United States, 2009-2012

<table>
<thead>
<tr>
<th></th>
<th>No symptoms</th>
<th>Mid</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>5.2</td>
<td>13.0</td>
<td>19.6</td>
<td>35.3</td>
</tr>
<tr>
<td>Hispanic</td>
<td>3.3²</td>
<td>9.1³</td>
<td>17.1</td>
<td>27.8⁴</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>4.6</td>
<td>11.6</td>
<td>19.2</td>
<td>33.6⁵</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>6.0</td>
<td>13.9</td>
<td>20.9</td>
<td>37.0⁶</td>
</tr>
</tbody>
</table>

¹Significantly linear trend
²Significantly less than non-Hispanic black and non-Hispanic white.
³Significantly less than non-Hispanic white.
⁴Includes race and ethnicity groups not shown separately.
⁵Includes Hispanic white.
⁶Includes Hispanic black.

NOTES: Access data used for figure 5 at: http://www.cdc.gov/nchs/data/databriefs/DB172_table_00.pdf
A Bigger Bite
Middle-class families’ spending on health care has increased 25% since 2007. Other basic needs, such as clothing and food, have decreased.

Percent change in middle-income households’ spending on basic needs (2007 to 2014)

Sources: Brookings Institution analysis of Consumer Expenditure Survey, Labor Department

The Wall Street Journal. “Burden of Health-Care Costs Moves to the Middle Class.”
4. What *should* we be doing? A what matters most illustration
How much is risk of depression determined by our genes?
Scenario 1

= GE+  = DEP+  = ENV+
Scenario 1

= GE+  = DEP+  = ENV+
Scenario 1

= GE+  = DEP+  = ENV+
Scenario 1

RR (DEP+|GE+) = 334
PARP (DEP+|GE+) = 1

= GE+   = DEP+   = ENV+
Therefore *all* our risk of depression is determined by our genes.

*GE*+ = [Green person]  
*DEP*+ = [Red person]  
*ENV*+ = [Light green person]
A mega-analysis of genome-wide association studies for major depressive disorder

Major Depressive Disorder Working Group of the Psychiatric GWAS Consortium

Prior genome-wide association studies (GWAS) of major depressive disorder (MDD) have met with limited success. We sought to increase statistical power to detect disease loci by conducting a GWAS mega-analysis for MDD. In the MDD discovery phase, we analyzed more than 1.2 million autosomal and X chromosome single-nucleotide polymorphisms (SNPs) in 18,759 independent and unrelated subjects of recent European ancestry (8,240 MDD cases and 9,519 controls). In the MDD replication phase, we evaluated 554 SNPs in independent samples (6,783 MDD cases and 50,686 controls). We also conducted a cross-disorder meta-analysis using 819 autosomal SNPs with $P < 0.0001$ for either MDD or the Psychiatric GWAS Consortium.
Although this is the largest genome-wide analysis of MDD yet conducted...we were unable to identify robust and replicable findings.
Scenario 2

= GE+  = DEP+  = ENV+
Scenario 2

= GE+  
= DEP+  
= ENV+
Scenario 2

RR (DEP+ | GE+) = 1.7
PARP (DEP+ | GE+) = 0.4

= GE+    = DEP+    = ENV+
Scenario 2

Therefore only about 40% of our risk of depression is determined by our genes

= GE+  = DEP+  = ENV+
What is going on?
Interaction Between the Serotonin Transporter Gene (5-HTTLPR), Stressful Life Events, and Risk of Depression
A Meta-analysis

Figure 2. Logistic Regression Analyses of Risk of Depression for 14 Studies

The boxes and lines indicate the odds ratios (ORs) and their 95% confidence intervals (CIs) on a log scale for each study. The size of the box indicates the relative weight of each estimate.

Risch et al., JAMA (2009) 301: 2462-71
5. So what *should* we be doing?
1. Investment in early childhood education
2. Increase Earned Income Tax Credits
3. Expand safe affordable public transportation
4. Financial support for low-income homeowners
5. School-based obesity prevention
6. …
But isn’t this outside our remit?
6. We cannot afford not to.
FIGURE 1-6 U.S. female life expectancy at birth relative to 21 other high-income countries, 1980-2006.

NOTES: Red circles depict newborn life expectancy in the United States. Grey circles depict life expectancy values for Australia, Austria, Belgium, Canada, Denmark, Finland, France, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and West Germany.

SOURCE: National Research Council (2011, Figure 1-4).
SURPASSING THE US IN LIFE EXPECTANCY

The US saw limited gains in average life expectancy at birth over the past 60 years.

In the same time period Japan, Singapore, Costa Rica and Chile experienced tremendous gains, so much so that all of them surpassed the US by 2000.

Author: GRAPH Team  Published: December 11th, 2013  Tagged: life expectancy, high-income countries, oecd

Gun deaths and motor vehicle deaths converge

Deaths per 100,000 population for gun violence and motor vehicle traffic events, 1950 – 2014

Source: CDC/Garen Wintemute

Lifetime prevalence of psychiatric disorders are comparable in Canada and the U.S.

Firearm homicide rate per 100,000 in 2009

Rate per 100,000 population

Canada: 0.53
United States: 3.42

Proportion of households owning firearms

Canada: 15.5%
United States: 42.8%

America has 4.4 percent of the world’s population, but almost half of the civilian-owned guns around the world.

Americans own a ridiculous number of guns

Population of the world: 7.13 billion
Civilian-owned guns in the world: 644 million

Population of US: 4.43%
Civilian-owned guns in US: 42%


Image credit: Javier Zarracina/Vox
House Approves Modest Funding Boost For Gun Background Checks

Sandy Hook Panel Focusing On Guns, School Safety, Mental Health

Mental Illness and New Gun Law Reforms
The Promise and Peril of Crisis-Driven Policy

Federal Firearms Prohibition under 18 U.S.C. § 922(g)(4)
Persons Adjudicated as a Mental Defective or Committed to a Mental Institution

What We Actually Know About the Connections Between Mental Illness, Mass Shootings, and Gun Violence

By Lois Beckett - June 10, 2014 - 3:40 PM
High-profile mass shootings and the accumulation of mental health records in National Instant Check System

To date, 99% of mental health records in NICS have **not** resulted in a federal gun denial.

Mental health records accounted for 7% of federal gun-disqualifying records in 2007.

Mental health records accounted for 28% of federal gun-disqualifying records in 2007.

---

7. Rethinking our overall approach
Some people are ‘exposed’
Both exposed and unexposed have disease
Identify those who are high risk

Then decrease their risk

This strategy sees this
But misses all of this.
An alternate, population health, strategy
Shifts the entire risk distribution

The population health strategy

Unexposed  Exposed
The population health strategy

Unexposed

Exposed
The population health strategy

Unexposed
Exposed
8. Would that even work?
Yes
Data from *The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment*, by Raj Chetty, Nathaniel Hendren, and Lawrence Katz
Math scores for students in public housing

Scores normalized for various tests across grades

Data from Housing Policy Is School Policy: Economically Integrative Housing Promotes Academic Success in Montgomery County, Maryland, by Heather Schwartz

Black Body Mass Index change by policy

Orr MG, Galea S, Kaplan GA. Neighborhood food, physical activity, and educational environments and black/white disparities in obesity: A complex systems simulation analysis. Under review.
9. Looking back, the bigger picture
The spending mismatch: Health determinants vs. health expenditures

Access to care: 6%
Genetics: 20%
Socioeconomic and physical environments: 22%
Healthy behaviors: 37%
Interactions among determinants: 15%

Medical services: 99%
Healthy behaviors: 9%
Other: 1%

National health expenditures: $2.6 trillion

Health care spending crowds out investments in key determinants of health: Change in Massachusetts State Government spending, FY01-FY14, adjusted for inflation

* Health care expenditure is Group Insurance Commission spending plus MassHealth (Medicaid)
