Beyond Magical Thinking

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Chair, Steinberg Institute
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Disclosures

Equity in Alphabet, Apple, Compass Pathways, Mindstrong Health, Sage Therapeutics, Karuna Therapeutics

Board Service: Alto Neurosciences, NeuraWell, Compass Pathways, Mindstrong Health

Non-profit Board Service: Autism Science Foundation, International Neuroethics Society, Steinberg Institute
Diseases of Despair

- Suicide
- Drug overdose
- Alcoholic liver disease

Mortality rate

Deaths per 100,000

- Germany
- United States, WNHs
- France
- Canada
- Australia
- United Kingdom
- Sweden

Year

- 1995
- 2000
- 2005
- 2010

Case & Deaton, Brookings, 2017

Norman Rockwell, Stockbridge, 1894 - 1978
What is the crisis in mental health?

No reduction in morbidity or mortality

1. Neuropsychiatric Disorders: 18.7%
2. Cardiovascular and Circulatory Diseases: 16.8%
3. Neoplasms: 15.1%
4. Musculoskeletal Disorders: 11.8%
5. Diabetes, Urogenital, Blood, and Endocrine Diseases: 8.0%
6. Chronic Respiratory Diseases: 6.5%
7. Other Non-communicable Diseases: 5.1%

Percent change in mortality:
- Peak (1965 - 1995)
- Current (2010 - 2018)
Why do we have this crisis in care?

Lack of Engagement: 60% not receiving care

Lack of Quality: Fragmented, episodic, reactive

Lack of Measurement: We don’t manage what we don’t measure
~44 million people in the U.S. with any disorder; ~10 million “serious”

Underserved

The 40-40-30 Rule

Sources: NSDUH (2013); Kessler, Chiu, Demler, & Walters (2005); Wang, Lane, Olfson, Pincus, Wells, Kessler (2005); Merikangas, He, Burstein, Swendsen, Avenevoli, Case, Georgiades, Heaton, Swanson, Olfson (2011), SSA Publication 13-11827 (2014)
Figure 4.1 (A) The number of practitioners for social work, psychology, and psychiatry in the US. In (B) the percentage of programs for these practitioners lacking training in psychotherapies considered evidence-based treatments (EBT). Data adapted from Weissman et al, Arch Gen Psych 2006.
Figures 4-1: Mental health vs cardiovascular quality scores 2005–2016. Data show percentage of population meeting quality standard for a mental health measure (outpatient follow-up within 7 days of hospital discharge) compared to a cardiovascular measure (persistence of beta-blocker treatment for 6 months after hospitalization for a heart attack) in patients with private insurance, Medicaid, or Medicare. Improvements across time are evident in cardiovascular care but not psychiatric care.
Lack of Measurement

### Measuring Mood, Cognition, and Behavior

<table>
<thead>
<tr>
<th>What We Do Today</th>
<th>What We Need</th>
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<tbody>
<tr>
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If you don’t get feedback, your confidence grows much faster than your accuracy.

Philip Tetlock, Superforecasting
## Will Digital Tools Disrupt Healthcare?

<table>
<thead>
<tr>
<th>Services - Digital Age</th>
<th>Healthcare - 2019</th>
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<tbody>
<tr>
<td>Consumer-focused</td>
<td>Provider-focused</td>
</tr>
<tr>
<td>Virtual</td>
<td>Brick and mortar</td>
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<tr>
<td>On demand</td>
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<tr>
<td>Transparent</td>
<td>Opaque</td>
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<tr>
<td>Information rich</td>
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<td>Proactive</td>
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The Changing Ecosystem of Health Research

**Start-ups:**
$22B invested in Health Tech since 2011
> 1,000 new companies
(Rock Health, 2018)

**Tech Giants with health/biomedical initiatives:**
Alibaba, Alphabet, Amazon, Apple, Facebook, Fitbit, GE, IBM, Intel, Microsoft

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**DIGITAL HEALTH FUNDING**
2011–2017

**TOTAL VENTURE FUNDING**

2011: $1.1B
2012: $1.5B
2013: $2.1B
2014: $4.3B
2015: $4.6B
2016: $4.4B
2017: $5.8B

**# OF DEALS**

2011: 89
2012: 140
2013: 193
2014: 272
2015: 308
2016: 324
2017: 345

**AVERAGE DEAL Size**

2011: $12.9M
2012: $10.6M
2013: $10.8M
2014: $14.8M
2015: $14.3M
2016: $13.7M
2017: $16.7M

*Source: Rock Health Funding Database*

*Note: Only includes U.S. deals >$1M; data through December 31, 2017*
DIGITAL PHENOTYPING
A New Kind of Biomarker

Digital phenotype can also include “digital exhaust” (social media posts, search terms, AI personal assistants etc.)

Digital Phenotype = Cognition, Mood, Behavior

Feature Extraction
Pattern Recognition
Machine Learning
I'm doing a lot better. I was experiencing a lot of auditory hallucinations. They made it difficult to sleep which made things progressively worse.

I checked myself into the hospital. They adjusted my medications, gave group therapy, and monitored me. I believe I slept for 12 hours each night 3 days in a row. What a relief! The hallucinations finally subsided.
## Measuring Mood, Cognition, and Behaviour

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The Digital Health Landscape

- Mobile Interventions
  - CBT, DBT, IPT; Coaching; Peer Support; Crisis Intervention

- Learning Engine
  - Sensors
  - HCI
  - Voice
  - Sociality

- Care Management

- Digital Phenotyping

- Coordination
  - Data Capture
  - Quality Metrics
  - Feedback
Digital Phenotyping

AI Nurse

Connected Care

Manager Dashboard
The Digital Future for Psychiatry?

Lack of Engagement → Anonymous, person-centered online care

Lack of Quality → Coordinated, connected care with quality metrics

Lack of Measurement → Digital smoke alarms for early detection of recovery and relapse
Magical Thinking: The belief that a simple cause will explain a complex result or that a simple solution will fix a complex problem.


Beyond Magical Thinking

The Four P’s:
A Medical Approach to Bending the Curve

Predictive – identify risk profile
Preemptive – move upstream
Personalized – individualize interventions
Participatory – shared decision making
Beyond Magical Thinking

The mental health crisis can be defined as medical…

But

The solutions are complex combinations of medical (neuromodulatory), cognitive (skills), social (connections), commitment (purposes), and spiritual (compassion) interventions.
Coordinated Specialty Care for FEP

- Medication/Primary Care
- Cognitive & Behavioral Therapies
- Service User
- Case Management
- Family Education and Support
- Supported Employment & Education

Focusing on recovery:
- Shared decision making
- Personalized medical care
- Skill building
- Social inclusion
- Academic/work support

Technology for scale
Whole Person Care for SPMI

Service User

Primary Care

Supportive Housing

Supported Employment

Criminal Justice Diversion

Case Management / ACT teams

Closing the longevity gap:
- Medical care
- SUD Treatment
- Social inclusion
- Housing & Work
- No wrong door

Technology for scale
Moving Upstream

Building resilience:
- Nurse visitation
- Mental fitness
- Emotional regulation
- Mindfulness
- Education

Technology for scale
Diseases of Despair
Suicide
Drug overdose
Alcoholic liver disease

Mortality rate
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Case & Deaton, Brookings, 2017

Norman Rockwell, Stockbridge, 1894 - 1978
Camelot for Mental Healthcare

Predictive  Preemptive  Personalized  Participatory

Integration with SUD, Primary Care

Cognition  Compassion  Connection  Commitment

Engagement of schools, families, communities

Reimbursement that Recruits and Retains Providers
Conclusion

- Our mental health crisis is a crisis of care.
- We know what to do to resolve this crisis but we are failing to act. **[WE ARE THE PROBLEM.]**
- The cause is a set of medical brain disorders but the solutions will require a comprehensive set of interventions. **[COGNITION, CONNECTION, COMPASSION, COMMITMENT]**
- **WE CAN FIX THIS. [BUT NOT THROUGH MAGICAL THINKING]**
Thank You!

Transforming Brain Health

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