Institute *for* Healthcare Improvement

March 29, 2019
Glasgow, Scotland

I Have Changed My Mind

International Forum on Quality and Safety in Healthcare

Don Berwick
President Emeritus and Senior Fellow, IHI

Maureen Bisognano
President Emerita and Senior Fellow, IHI

Dr Tom Nolan

Changing My Mind…

MEASUREMENT: It is said: “If you can’t measure it, you can’t manage it.” That is wrong – very wrong.

A Major Change:

- “Plan-Do-Check-Act”

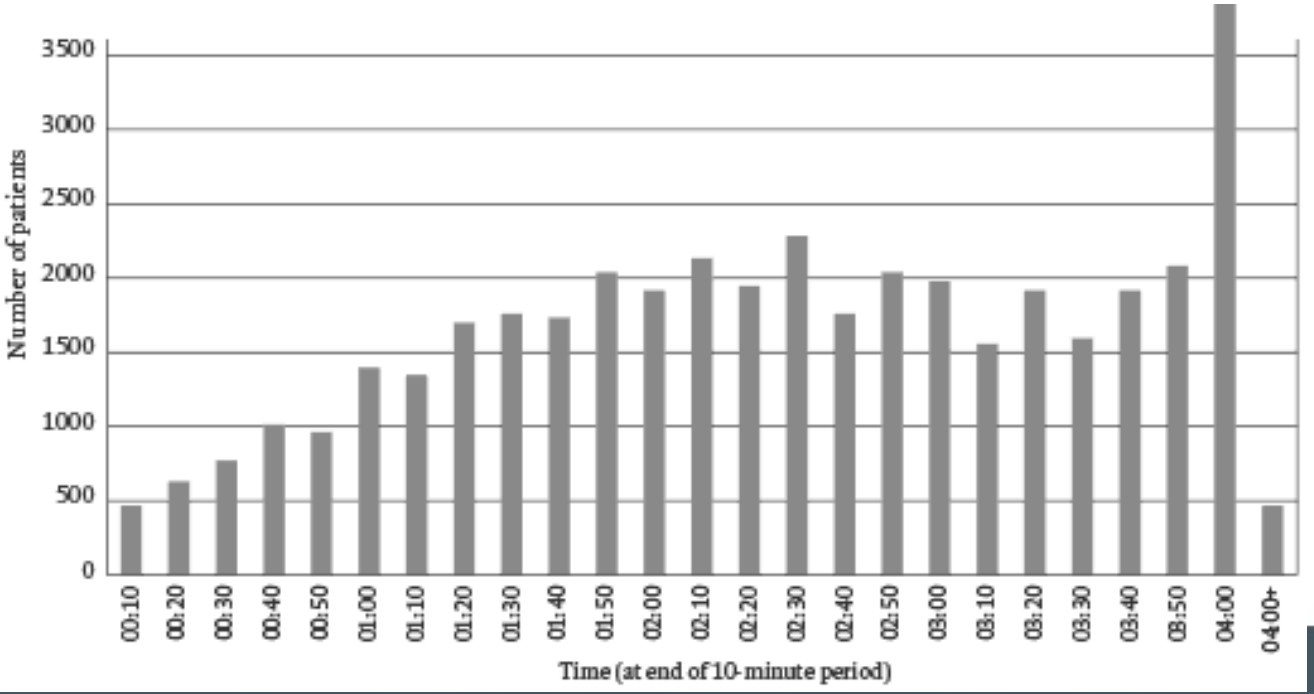
becomes

- “Plan-Do-Study-Act”

Beware Measurement!

- Measurement is always wrong, though sometimes useful:
  - Error in Metrics
  - Loss of Meaning - Reductionist
  - A “Shadow of a Shadow”

Distribution of Waiting Times for Patients Admitted to Stafford Hospital A&E



Two Uses of Measurement:

Berwick DM, James B, Coye MJ. Connections between quality measurement and improvement. Med Care 2003; Supplement I-30-I-38.

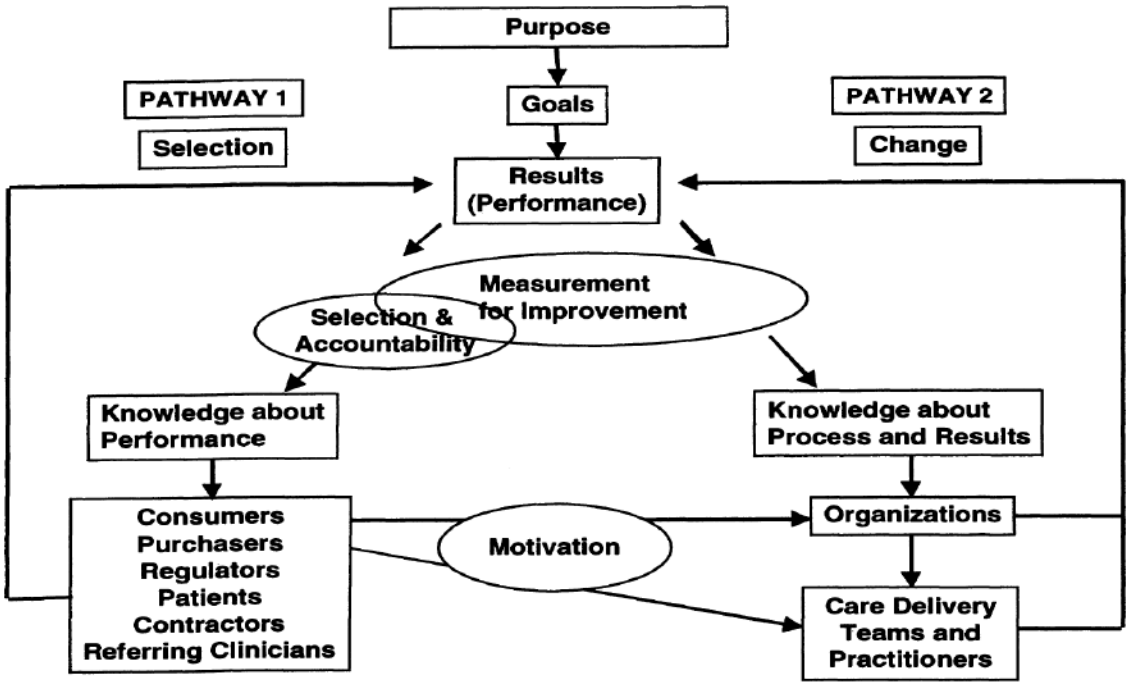


FIG. 1. Two pathways to quality improvement.

Guidance

- Never confuse a metric for what is important.
- Avoid suboptimization.
- Use conversation if you possibly can.
- Learn and master control charts – not red/yellow/green stoplights.
- Remember that graphs tell stories that tables do not.
- Put measuring on a diet.

Changing My Mind…

MENTAL HEALTH. I used to think that physical and mental illness were different worlds. They are not.

In the US

- Nearly 45 million people are affected by mental illness
- More than 20 million endure a substance use disorder
- More than 8 million experience both
- Nearly one in five kids and teens have had a debilitating mental condition

A Worldwide Problem

- 1.8 billion people worldwide have a mental health issue
- 80% of all mental illness goes untreated
- Mental health receives less than 1% of global aid and costs the global economy $2.6 trillion in lost productivity each year

Drug overdose is a leading cause of death in America.

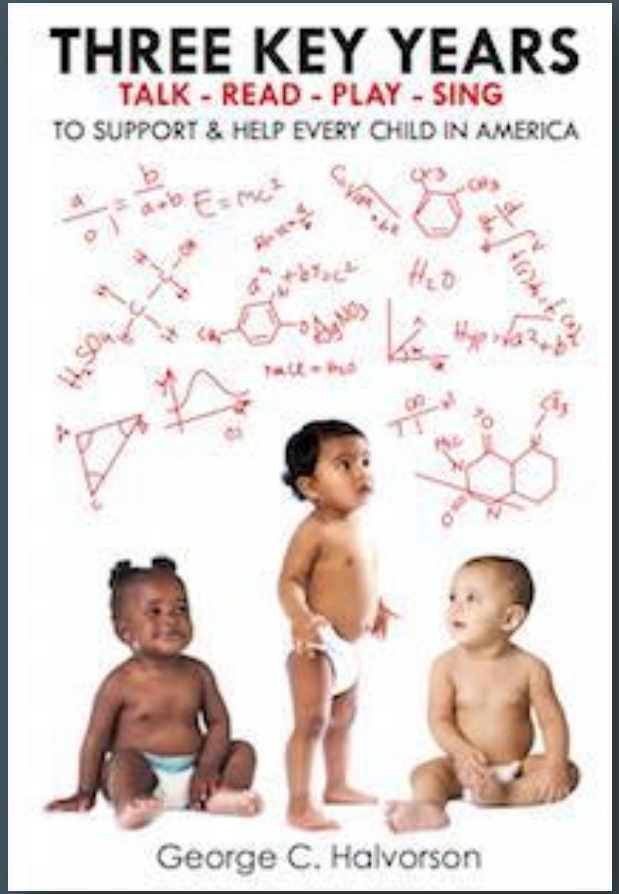
Every 11 minutes another life is lost.

Some Causes

- Social isolation
  - Teens who Facetime with friends are the loneliest of all
  - The percent of high school seniors who feel lonely increased from 26% in 2012 to 39% this year
- Social isolation weighs heavily on the elderly as well

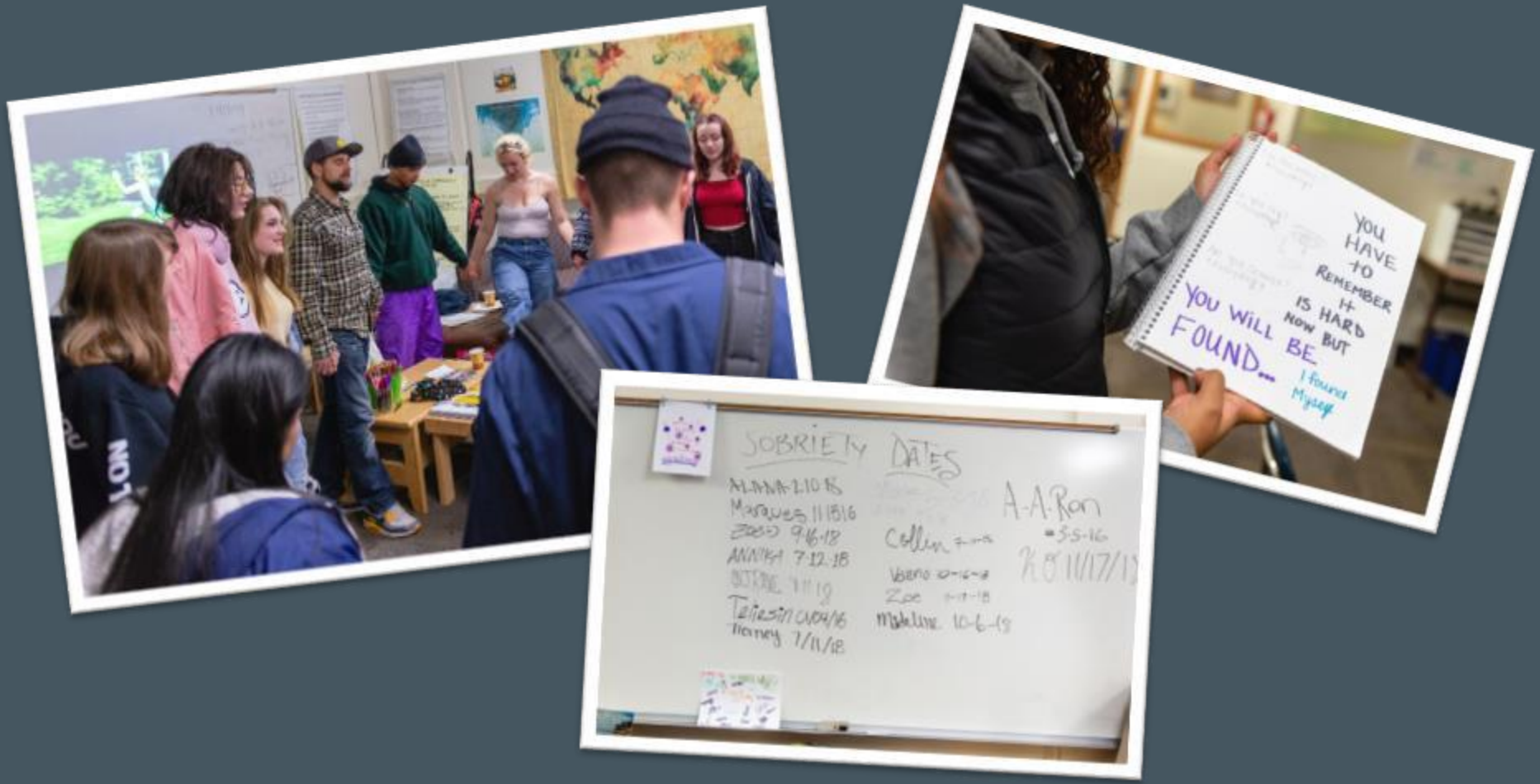
We aim to significantly reduce the personal, familial, social and economic costs of mental illness and substance misuse. To accomplish this, Well Being Trust is establishing and advancing a comprehensive agenda for policies, programs, investment, multisector engagement and other solutions to address the underlying drivers of disease and pain, so everyone can achieve their fullest potential for their lives.

Mental Health Improvement Network


THREE KEY YEARS
TALK - READ - PLAY - SING
TO SUPPORT & HELP EVERY CHILD IN AMERICA
George C. Halvorson

Royal Free Hospital, London

East London Foundation Trust



Source: https://khn.org/news/students-with-addictions-immersed-in-the-sober-life-at-recovery-high-schools/

Be well, be heard, and be there.

Socialance Program

- *“It takes a system to save a life.”* – Thomas, Paramedic
- 3,200 homeless in Copenhagen who may be mentally ill and socially vulnerable
- Psychiatrists on call at night
- General practitioners on call during the day

Moai: Social Network

- Began in Okinawa, Japan, where life expectancy for women is around 90
- Groups of 5 friends who offer social, logistic, emotional, or even financial support for a lifetime
- Traditionally, parents put their children into moai's when they are born
- Now, moai's are spreading to two dozen cities around the US

Source: Parker-Pope, Tara. "The Power of Positive People." The New York Times, The New York Times, 10 July 2018, www.nytimes.com/2018/07/10/well/the-power-of-positive-people.html.

Guidance…

- Put prevention first
- Focus on early childhood
- Strengthen school-community efforts to support teens and tweens
- Assure timely access and a skilled, integrated workforce
- Improve pain management and treatment
- Work on social isolation
- Integrate behavioral services for whole health… and us!

“Love is the oldest medicine.”

- Dr. Vivek Murthy, Former Surgeon General of the US

Changing My Mind…

THE DIGITAL AGE: I used to think the digital revolution was a marginal change. Now, I think it is the most significant transformation in health care of our time.

St. Peter’s Square

ARTICLE

doi:10.1038/nature16961

Mastering the game of Go with deep neural networks and tree search

David Silver[1]*, Aja Huang[1]*, Chris J. Maddison[1], Arthur Guez[1], Laurent Sifre[1], George van den Driessche[1], Julian Schrittwieser[1], Ioannis Antonoglou[1], Veda Panneershelvam[1], Marc Lanctot[1], Sander Dieleman[1], Dominik Grewe[1], John Nham[2], Nal Kalchbrenner[1], Ilya Sutskever[2], Timothy Lillicrap[1], Madeleine Leach[1], Koray Kavukcuoglu[1], Thore Graepel[1] & Demis Hassabis[1]

The game of Go has long been viewed as the most challenging of classic games for artificial intelligence owing to its enormous search space and the difficulty of evaluating board positions and moves. Here we introduce a new approach to computer Go that uses 'value networks' to evaluate board positions and 'policy networks' to select moves. These deep neural networks are trained by a novel combination of supervised learning from human expert games, and reinforcement learning from games of self-play. Without any lookahead search, the neural networks play Go at the level of state-of-the-art Monte Carlo tree search programs that simulate thousands of random games of self-play. We also introduce a new search algorithm that combines Monte Carlo simulation with value and policy networks. Using this search algorithm, our program AlphaGo achieved a 99.8% winning rate against other Go programs, and defeated the human European Go champion by 5 games to 0. This is the first time that a computer program has defeated a human professional player in the full-sized game of Go, a feat previously thought to be at least a decade away.

All games of perfect information have an optimal value function, $v^*(s)$, which determines the outcome of the game, from every board position or state s, under perfect play by all players. These games may be solved by recursively computing the optimal value function in a search tree containing approximately b^d possible sequences of moves, where b is the game's breadth (number of legal moves per position) and d is its depth (game length). In large games, such as chess ($b \approx 35$, $d \approx 80$)[1] and especially Go ($b \approx 250$, $d \approx 150$)[1], exhaustive search is infeasible[2–4], but the effective search space can be reduced by two general principles. First, the depth of the search may be reduced by position evaluation: truncating the search tree at state s and replacing the subtree below s by an approximate value function $v(s) \approx v^*(s)$ that predicts the outcome from state s. This approach has led to superhuman performance in chess[4], checkers[5] and othello[6], but it was believed to be intractable in Go due to the complexity of the game[7]. Second, the breadth of the search may be reduced by sampling actions from a policy $p(a|s)$ that is a probability distribution over possible moves a in position s. For example, Monte Carlo rollouts[8] search to maximum depth without branching at all, by sampling long sequences of actions for both players from a policy p. Averaging over such rollouts can provide an effective position evaluation, achieving superhuman performance in backgammon[8] and Scrabble[9], and weak amateur level play in Go[10].

Monte Carlo tree search (MCTS)[11,12] uses Monte Carlo rollouts to estimate the value of each state in a search tree. As more simulations are executed, the search tree grows larger and the relevant values become more accurate. The policy used to select actions during search is also improved over time, by selecting children with higher values. Asymptotically, this policy converges to optimal play, and the evaluations converge to the optimal value function[12]. The strongest current Go programs are based on MCTS, enhanced by policies that are trained to predict human expert moves[13]. These policies are used to narrow the search to a beam of high-probability actions, and to sample actions during rollouts. This approach has achieved strong amateur play[13–15]. However, prior work has been limited to shallow policies[13–15] or value functions[16] based on a linear combination of input features.

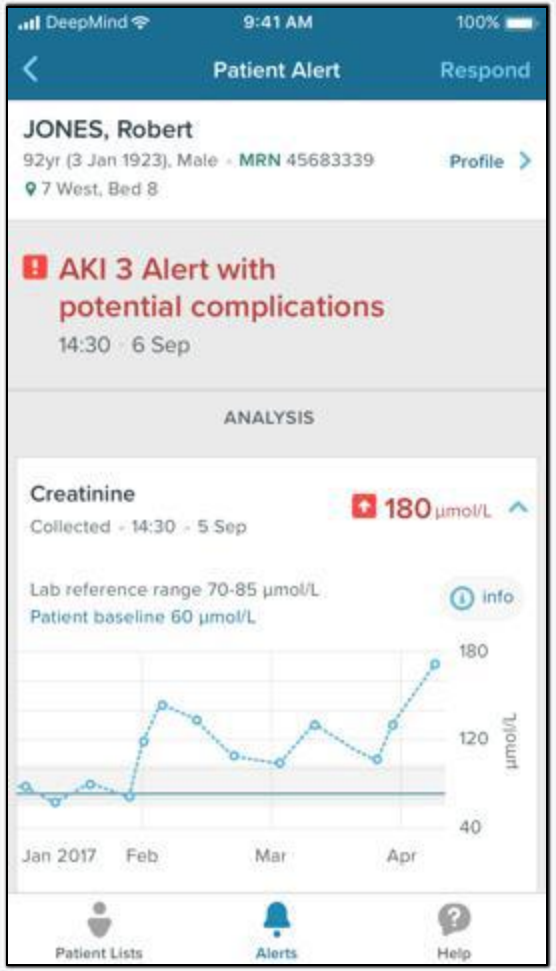
Recently, deep convolutional neural networks have achieved unprecedented performance in visual domains: for example, image classification[17], face recognition[18], and playing Atari games[19]. They use many layers of neurons, each arranged in overlapping tiles, to construct increasingly abstract, localized representations of an image[20]. We employ a similar architecture for the game of Go. We pass in the board position as a 19×19 image and use convolutional layers to construct a representation of the position. We use these neural networks to reduce the effective depth and breadth of the search tree: evaluating positions using a value network, and sampling actions using a policy network.

We train the neural networks using a pipeline consisting of several stages of machine learning (Fig. 1). We begin by training a supervised learning (SL) policy network p_σ directly from expert human moves. This provides fast, efficient learning updates with immediate feedback and high-quality gradients. Similar to prior work[13,15], we also train a fast policy p_π that can rapidly sample actions during rollouts. Next, we train a reinforcement learning (RL) policy network p_ρ that improves the SL policy network by optimizing the final outcome of games of self-play. This adjusts the policy towards the correct goal of winning games, rather than maximizing predictive accuracy. Finally, we train a value network v_θ that predicts the winner of games played by the RL policy network against itself. Our program AlphaGo efficiently combines the policy and value networks with MCTS.

Supervised learning of policy networks

For the first stage of the training pipeline, we build on prior work on predicting expert moves in the game of Go using supervised learning[13,21–23]. The SL policy network $p_\sigma(a|s)$ alternates between convolutional layers with weights σ, and rectifier nonlinearities. A final softmax layer outputs a probability distribution over all legal moves a. The input s to the policy network is a simple representation of the board state (see Extended Data Table 2). The policy network is trained on randomly

[1]Google DeepMind, 5 New Street Square, London EC4A 3TW, UK. [2]Google, 1600 Amphitheatre Parkway, Mountain View, California 94043, USA.
*These authors contributed equally to this work.



Streams is live today

NHS
Royal Free London
NHS Foundation Trust

NHS
Imperial College Healthcare
NHS Trust

For our first insight, we made a strategic decision 3 years ago to focus AKI

40,000

Deaths per year in the UK

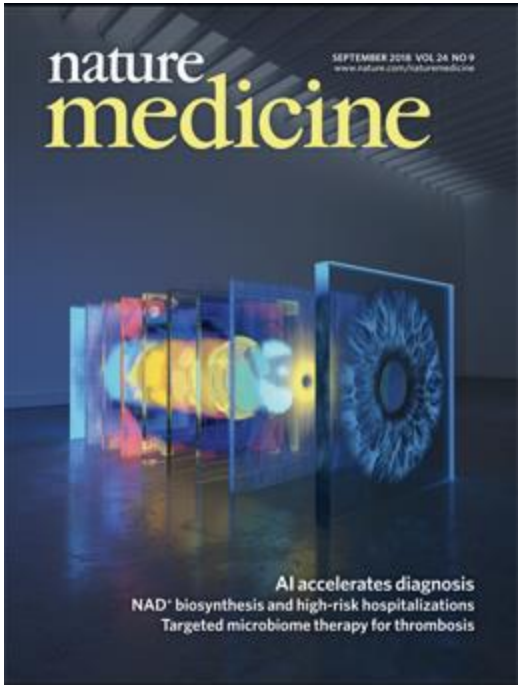
£1.2 billion

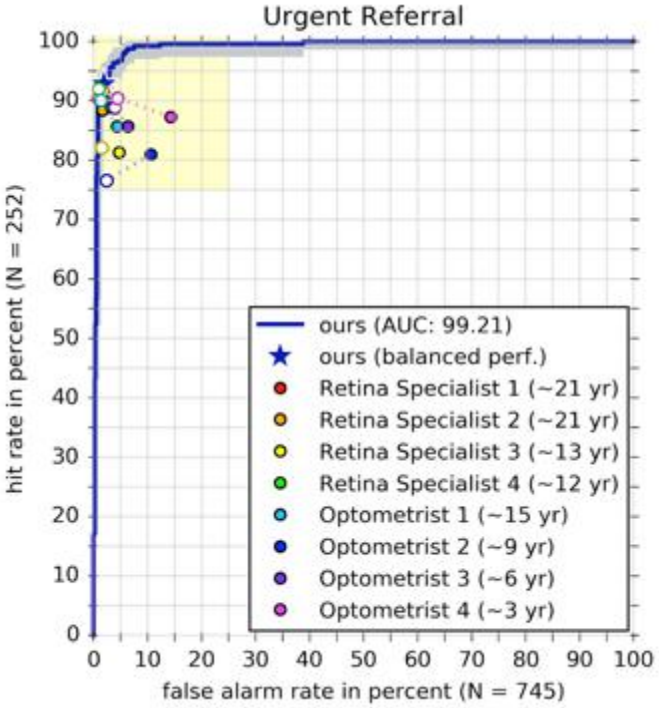
Cost to the UK

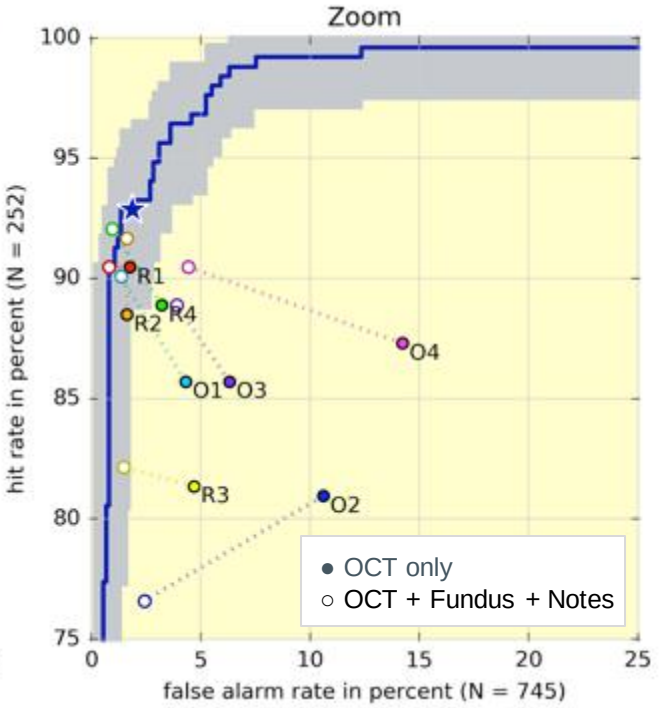
25%

Contributes to a quarter of all hospital admissions

The algorithm matches accuracy of ophthalmologists with 20+ years' experience







New Sites of Care

- *"For the first time, last year, we had over 110 million interactions between our physicians and our members."* - Bernard Tyson, CEO, Kaiser Permanente
- 52% of interactions were done via:
  - Smartphone
  - Videoconferencing
  - Kiosks
  - Other technology tools

Source: Kokalitcheva, Kia. "More Than Half of Kaiser Permanente's Patient Visits Are Done Virtually," Fortune. 6 Oct 2016.

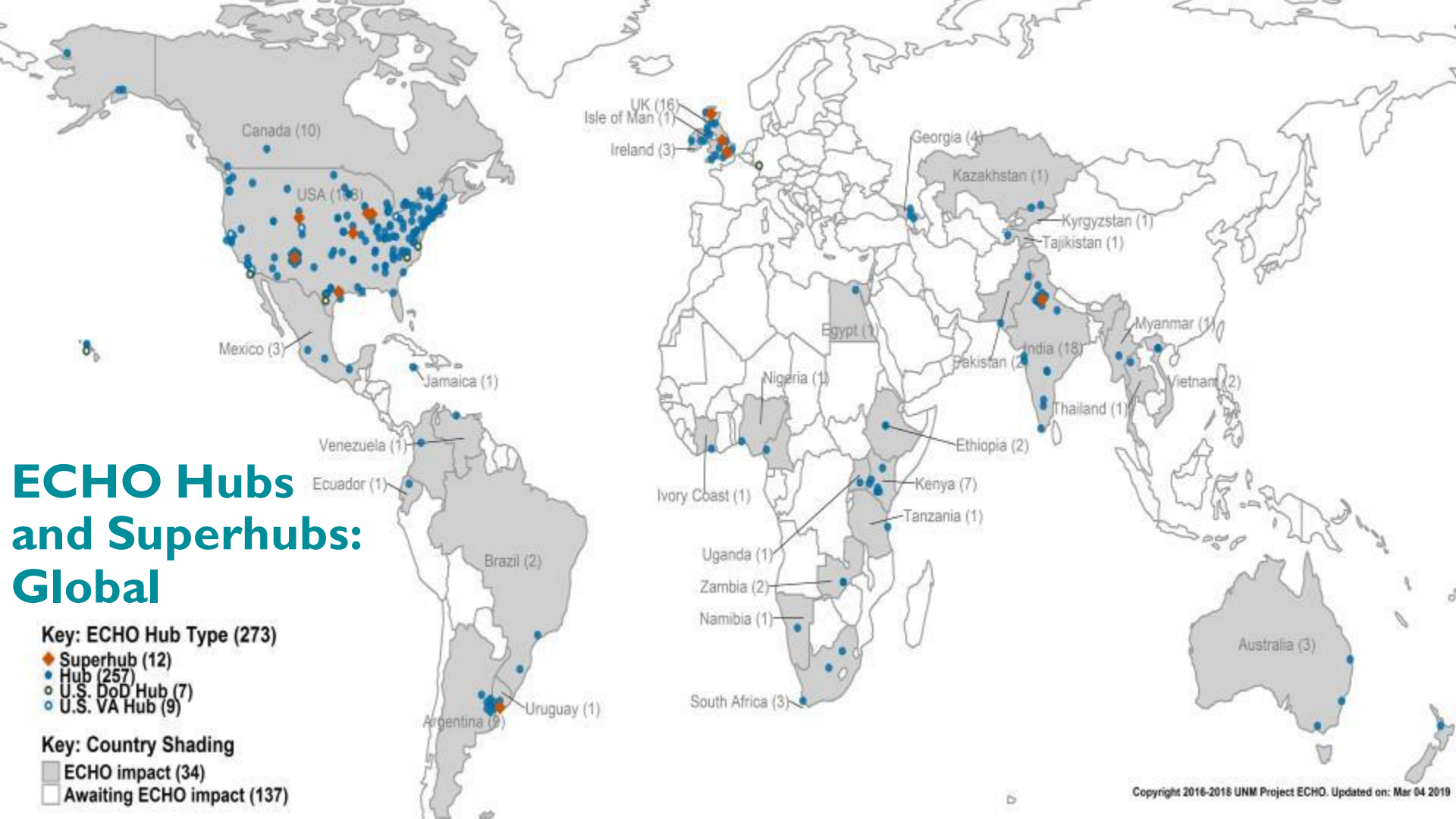
Moving Knowledge Instead of Patients and Providers

Arora S., Thornton K., Murata G., et al. *N Eng J Med*. 2011;364(23):2199-207.

ECHO now reaching a breadth of areas

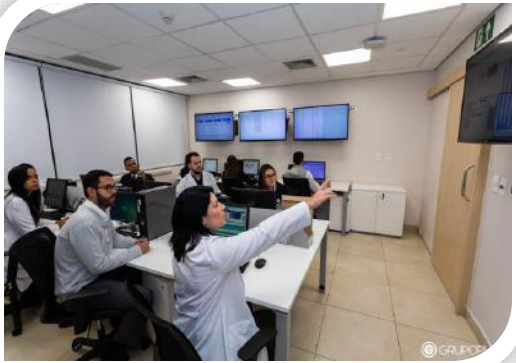
- Antimicrobial Stewardship
- Autism
- Behavioral Health
- Bone Health
- Cancer
- Cardiology
- Chronic Lung Disease
- Chronic Pain
- Crisis Intervention
- Diabetes and Endocrinology
- Education
- Geriatrics
- Good Health and Wellness in Indian Country
- Hepatitis
- High-Risk Pregnancy
- HIV/AIDS
- Infectious Disease
- Integrated Addictions & Psychiatry
- Laboratory Medicine
- LGBT Health
- Opioid Use Disorder
- Palliative Care
- Pediatrics
- Prison Peer Education
- Quality Improvement
- Rheumatology
- Sexually Transmitted Diseases
- Trauma-Informed Care
- Tuberculosis

ECHO Hubs and Superhubs: Global




Recording

Patient Flow| Operational Control Center



Central Care Monitoring

Centralized command for bedside team. The staff of CMOA act directing frontline professionals to increase patient care security.

The team of CMOA is formed by non-clinical professionals that are trained and have drivers for interventions according to predefined triggers;

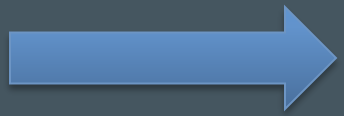
The CMOA provides real-time information that makes it possible to prioritize delayed activities, fundamental care; and optimize caregivers' time;

It was developed to guide and doesnt have a punitive function

Monitoring real-time care indicators 24 hours per day

Changing My Mind…

COMPASSION: I used to think that empathy was a key element for caring. Empathy is not enough.

“EQ”  **“CoQ”**

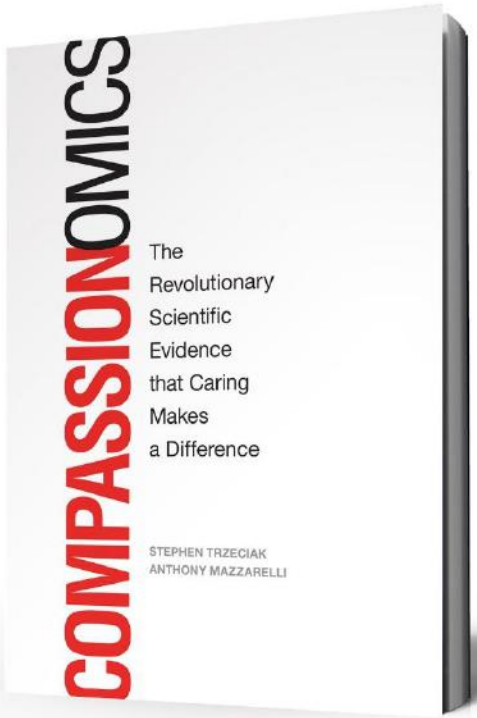
The Importance of Curiosity

- IQ – Intelligence Quotient
  - processing complex data sets and having the mental capacity to problem solve at speed
- EQ – Emotional Quotient
  - the ability to perceive, control and explain emotions; risk-taking, creating resilience and empathy
- CQ – Curiosity Quotient
  - inquisitive, open to new experiences, finding novelty exciting

Source: Chamorro-Premuzic T. “Curiosity Is as Important as Intelligence.” *Harvard Business Review.* Aug 27, 2014.

“What Matters to You?”

COMPASSIONOMICS
Stephen Trzeciak
Anthony Mazzarelli



Sources: Inside Edition and Shriner's Hospital for Children

Average Time to Physician Interruption

- 15 years ago: 17 seconds
- Now: **11 seconds**

Kindness Bundle

- Opening and closing interactions with patients in a structured way
- Warm personal introduction
  - “What would you like me to call you?”
- Shared decision making
  - “What matters to you?”
  - “What about today? What would make today a good day?”
- Warm close-out
  - “Is there anything we can do to make you more comfortable?”

Source: Galina Gheihman, MD and Cynthia Cooper, MD

Basic Acts of Kindness Can Lead to…

- Faster wound healing
- Reduced pain, anxiety and blood pressure
- Shorter hospital stays

Source: Berry, L. (2018, April 8). Some basic acts of kindness found to help patients dealing with cancer. *The Washington Post*.

Basic Acts of Kindness

- Deep listening
  - "What's the matter?" → "What matters to you?"
- Empathy
  - Anticipatory kindness based on patient's situation and stressors
- Generous acts
  - Can offer a renewing buffer to emotional fatigue and stress
- Timely care
  - Institutional commitment to being on time
- Gentle honesty
  - Guide patients to intrinsic hope
- Support for family caregivers
  - Prepare, empower, and assist a patient's family

Source: Berry, L. (2018, April 8). Some basic acts of kindness found to help patients dealing with cancer. *The Washington Post*. Retrieved from https://www.washingtonpost.com/

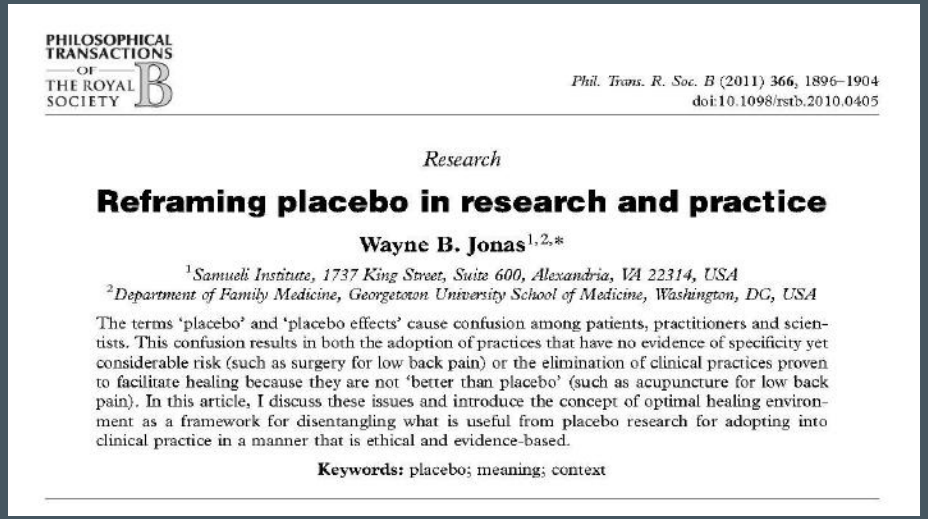
Changing My Mind…

COMPASSION: I thought compassion was an amenity. It is not. It is the source of healing.

Wayne Jonas

SAMUELI INSTITUTE
EXPLORING THE SCIENCE OF HEALING

Placebo Effect



PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B

Phil. Trans. R. Soc. B (2011) **366**, 1896–1904
doi:10.1098/rstb.2010.0405

Research

Reframing placebo in research and practice

Wayne B. Jonas[1,2,*]

[1]*Samueli Institute, 1737 King Street, Suite 600, Alexandria, VA 22314, USA*
[2]*Department of Family Medicine, Georgetown University School of Medicine, Washington, DC, USA*

The terms 'placebo' and 'placebo effects' cause confusion among patients, practitioners and scientists. This confusion results in both the adoption of practices that have no evidence of specificity yet considerable risk (such as surgery for low back pain) or the elimination of clinical practices proven to facilitate healing because they are not 'better than placebo' (such as acupuncture for low back pain). In this article, I discuss these issues and introduce the concept of optimal healing environment as a framework for disentangling what is useful from placebo research for adopting into clinical practice in a manner that is ethical and evidence-based.

Keywords: placebo; meaning; context

- Real surgery vs. sham surgery for angina
- No difference in outcomes
- Pain relief in 70% - 80% of patients in both groups

The Boston Globe | Metro

THOMAS FARRAGHER

When a Newton family welcomed a baby who is deaf, 20 neighbors learned sign language

CRAIG F. WALKER/GLOBE STAFF

Glenda Savitz held her 2-year-old daughter, Samantha, while signing the word "love" during a sign language class at a neighbor's home.

By Thomas Farragher | GLOBE COLUMNIST FEBRUARY 07, 2019

NEWTON — Something small and profound is happening here along the banks of the Charles River. It's a love story.

It's a story of a little girl who's deaf.

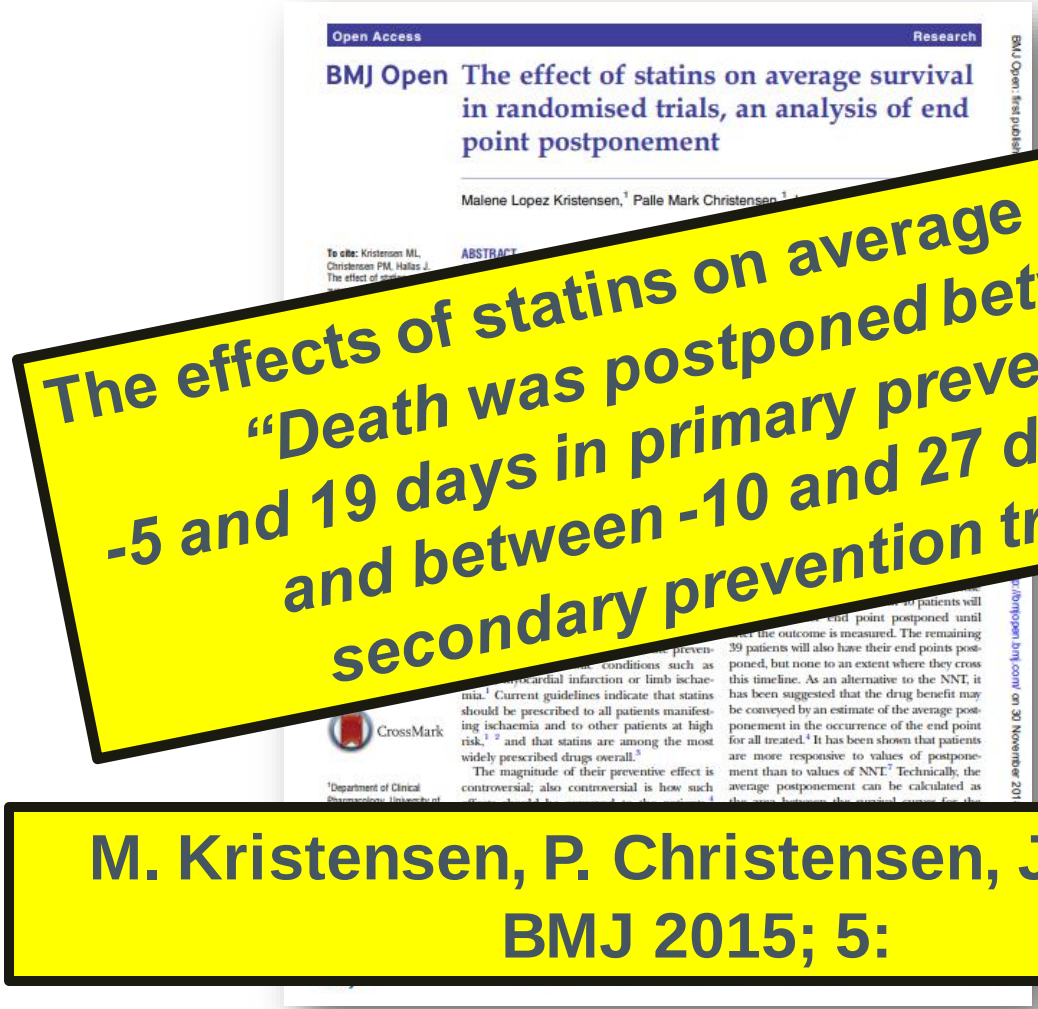
Guidance…

- Ask “What Matters to You?” to patients, families, and your team.
- Test the “Kind Care Bundle” and invent new bundles to align your work with what matters most.
- Time and touch will speed healing, reduce pain, and save money.
- Elevate the importance of PDSA tests on compassion.
- Eliminate stupid rules. What wastes spirit?
- Become a student of “Joy in Work.” Check out Steve Swensen’s framework.
- Take care of yourself.

Changing My Mind…

SOCIAL DETERMINANTS OF HEALTH: I had no idea how powerful they are. Their effects dwarf those of health care.

Life Expectancy and the London Tube



The effects of statins on average survival….
"Death was postponed between -5 and 19 days in primary prevention trials and between -10 and 27 days in secondary prevention trials."

M. Kristensen, P. Christensen, J. Hallas; BMJ 2015; 5:

20 Days of Your Lifespan Equals:

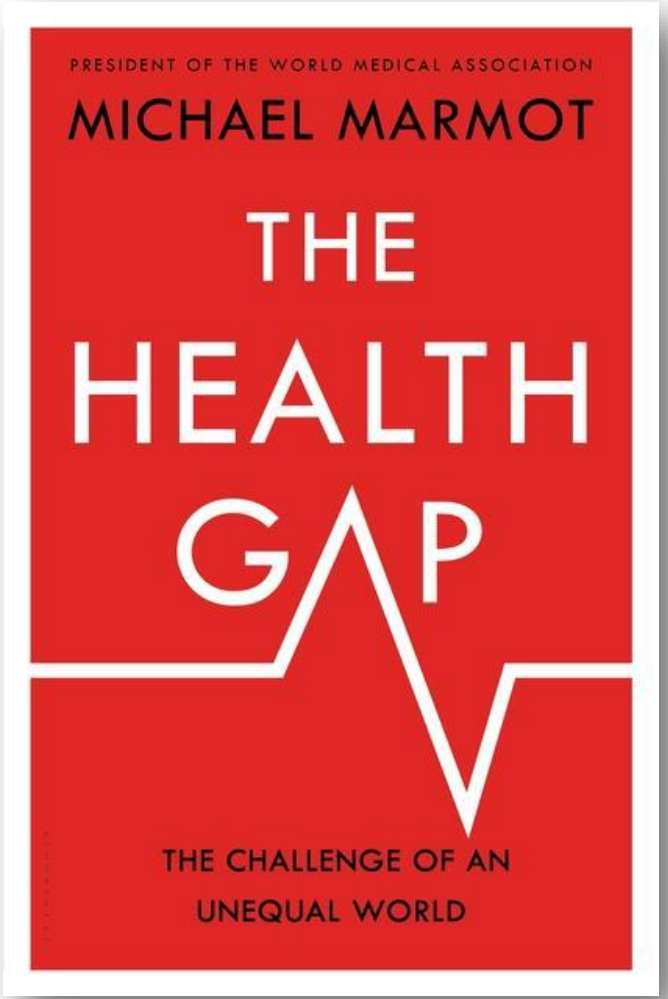
Taking Statins for 20 Years

Riding the D Train for 7 Seconds

Riding the Glasgow Bus for 43 Feet

Image Source: AARP, B.C. Lorio via Flickr, Raymond Okonski via geograph.org/uk

Sir Michael Marmot



“Inequities in power, money, and resources give rise to inequities in the conditions of daily life, which in turn lead to inequities in health.”

-Sir Michael Marmot

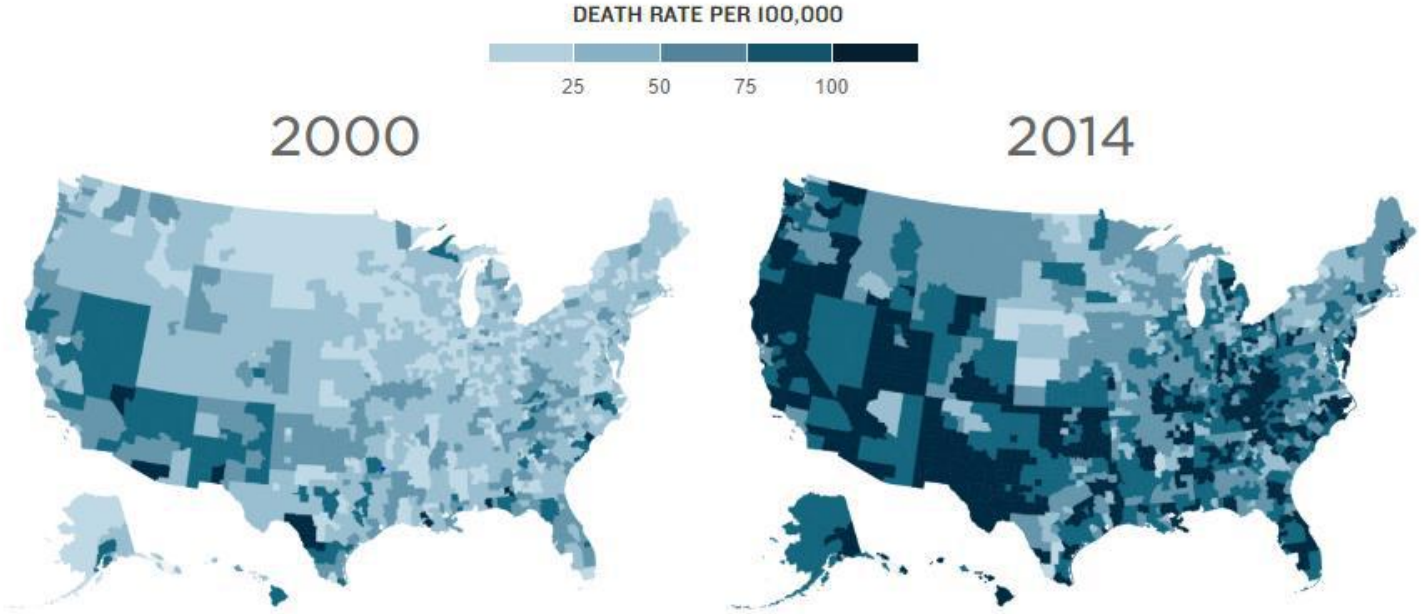
Conditions of Daily Life That Matter

1. Early Childhood
2. Education
3. The Conditions of Work
4. Aging
5. Resilience of Communities
6. Fairness

Sir Harry Burns

Midlife 'Deaths Of Despair' In The U.S., 2000 and 2014

Deaths by drugs, alcohol and suicide among non-Hispanic whites, ages 45-54



Notes

The geographic units represented are a blend of county boundaries and Public Use Microdata Areas.

Source: Anne Case and Angus Deaton, Brookings Papers on Economic Activity

Credit: Brookings, adapted by NPR

Treasure Seekers

Helping people become 'the best version of themselves'

- Drop-in center for 700 people
- Open 365 evenings a year
- Hospital admissions and ED use have dropped

Treasure Seekers

Source: https://www.kftseekers.org.uk/the-cavern-coffee-shop

The NHS Long Term Plan – January 2019

The NHS 10-year plan: transformation holds the key to sustainability

kingsfund.org.uk/blog

“We need a master plan for the community.”

- Tom Nolan

3-4-50 in San Diego County

- Highlights how just three unhealthy behaviors can cause a majority of death and disability
- Focus on physical inactivity complements the Surgeon General's call to "Step It Up!"

Elementary School

- 650 kids in this elementary school
- Emphasis on whole person health:
  - Posture
  - Exercise
  - Healthy eating and cooking
  - Smoking and drugs
  - Talking with family
  - Managing stress
  - Birthing and breastfeeding
  - Dental care

How to Keep an Open Mind

- Ask *“what matters to you?”*
- Build on your curiosity
- Learn to see
- Harvest
  - In your backyard
  - In other sites like yours
  - In completely surprising places
- Look at intersections
- Find new ideas out of channel
- Have deep humility – you have to believe you don’t know

A Hint: Go to the Gemba

- Sit with a patient and learn as you listen
- Watch a visit in a hospital setting and at an outpatient encounter
- Follow a nurse for an hour and see what caring really looks like
- Ask a child
- Introduce yourself as a Native American would

Thank You!

Donald M. Berwick, MD

President Emeritus and Senior Fellow

Institute for Healthcare Improvement

53 State Street, 19th Floor

Boston, MA 02109

dberwick@ihi.org

Maureen Bisognano

President Emerita and Senior Fellow

Institute for Healthcare Improvement

53 State Street, 19th Floor

Boston, MA 02109

mbisognano@ihi.org