Where are we now?
Where should we go next?
Prevention Stages

Primary Prevention
- Health promotion and addressing risk factors, social and genetic factors

Secondary Prevention or Early Intervention
- Screening of at-risk individuals, control of factors, and early intervention

Tertiary Prevention or Response
- Rehabilitation, preventing complications, and improving quality of life
Noncommunicable Diseases Targets: Public Health Focus

- **Global 2025 Target**: Tobacco use, 30% reduction.
- **Global 2025 Target**: Physical inactivity, 10% reduction.
- **Global 2025 Target**: Raised blood pressure, 25% reduction.
- **Global 2025 Target**: Diabetes/obesity, 0% increase.
- **Global 2025 Target**: Harmful use of alcohol, 10% reduction.
- **Global 2025 Target**: Salt/sodium intake, 30% reduction.
- **Global 2025 Target**: Availability of essential medicines and basic technologies to treat CVD and other NCDs, 80%.
- **Global 2025 Target**: 50% of eligible people receiving drug therapy and counselling to prevent heart attack and stroke.

*Source of icons: World Heart Federation Champion Advocates Programme*
## The Case for Early Prevention

### Preventable Cancer Causes

- **33%** of cancer diagnoses are caused by **tobacco use**.
- **20%** of cancer diagnoses are related to individuals being **obese or overweight**.
- **16%** of cancer diagnoses are related to infection with one of several cancer-causing pathogens.
- **5%** of cancer diagnoses are related to individuals getting **insufficient physical activity**.
- **5%** of cancer diagnoses are related to individuals having **poor dietary habits**.
- **2%** of cancer diagnoses are a result of exposure to ultraviolet light from the sun or tanning devices.

### Additional Information

- **~65% of cancers can be prevented!**
- **NicoDerm CQ**
- **SCREEN TO SAVE**
- **HPV Vaccines**
- **Earl Detection Saves Lives**
- **This is a Smoke Free Workplace**
How can we get there?
Translational Research Continuum

**T0**
- Basic science research
- Defining mechanisms, targets, and lead molecules

**T1**
- Translation to humans
- Proof of concept
  - Phase 1 clinical trials
- New methods of diagnosis, treatment, and prevention

**T2**
- Translation to patients
- Phase 2 clinical trials
- Controlled studies leading to effective care

**T3**
- Translation to practice
- Phase 4 clinical trials and clinical outcomes research
- Delivery of recommended and timely care to the right patient

**T4**
- Translation to community
- Population-level outcomes research
- True benefit to society

Translation from basic science to human studies
Translation of new data into the clinic and health decision making

Copyright: Nature Medicine
Holistic View of Patient Care

REACH
How do I reach the targeted population?

EFFECTIVENESS
How do I know my intervention is effective?

RE-AIM
Translating Research into Action
re-aim.org

MAINTENANCE
How do I incorporate the intervention so it is delivered over the long term?

ADOPTION
How do I develop the institutional support to deliver my intervention?

IMPLEMENTATION
How do I ensure the intervention is delivered properly?
### What Is a Scientific Research Team?

...think of it as a continuum...

<table>
<thead>
<tr>
<th>Low Level of Interaction and Integration</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigator-initiated research</td>
<td></td>
</tr>
<tr>
<td>Investigator works largely independently on a research problem with his or her laboratory.</td>
<td></td>
</tr>
<tr>
<td>Each group member brings expertise to address the research problem.</td>
<td></td>
</tr>
<tr>
<td>Each team member brings specific expertise to address the research problem.</td>
<td></td>
</tr>
<tr>
<td>Collaborating</td>
<td></td>
</tr>
<tr>
<td>Group members work on separate parts of the research problem, which are later integrated.</td>
<td></td>
</tr>
<tr>
<td>Teams meet regularly to discuss team goals, individuals' objectives, and next steps.</td>
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</tr>
<tr>
<td>Integrated research team</td>
<td></td>
</tr>
<tr>
<td>Data sharing or brainstorming among lead investigators varies from limited to frequent.</td>
<td></td>
</tr>
<tr>
<td>Team shares leadership responsibilities, decision-making authority, data, and credit.</td>
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</tr>
<tr>
<td>Frequently, new leaders emerge to take on projects from new ideas sparked by the joint work.</td>
<td></td>
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</tbody>
</table>
A Tool to Consider: Behavioral Economics

- Interdisciplinary field: psychology + economics + neuroscience + ...
- Differs from Psychology: considers the contexts and institutions under which decisions are made
- Differs from Economics: uses more realistic and more complicated model for decision making
- Science about choice architecture
- Science about how and why people behave the way they do in the real world

It is not based on “irrationality”
It is not about “controlling” behaviors
Traditional vs. Behavioral Economics

- **Traditional Economics:**
  - unlimited rationality and stable preferences
  - absolute self-control
  - effective optimization under all circumstance

- **Behavioral Economics:**
  - bounded rationality [cognitive limitations]
  - bounded willpower [self-control problems]
  - Bounded selfishness [social preferences]

The Royal Swedish Academy of Sciences has decided to award the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2017 to

Richard H. Thaler
University of Chicago, IL, USA

"for his contributions to behavioural economics"

Integrating economics with psychology

Richard H. Thaler has incorporated psychologically realistic assumptions into analyses of economic decision-making. By exploring the consequences of limited rationality, social preferences, and lack of self-control, he has shown how these human traits systematically affect individual decisions as well as market outcomes.
Overview of BE History

- 1944: expected-utility theory (von Neumann and Morgenstern)
- 1955: bounded rationality (Herbert Simon, 1978 Laureate)
- 1962: impact of bounded rationality on firm behavior (Reinhard Selten, 1994 Laureate)
- 1979: prospect theory and risky decisions (Daniel Kahneman, 2002 Laureate)
- 1980: apply prospect theory to economic issues (Thaler, 2017 Laureate)
Classic BE Readings

3. *Predictably Irrational: The Hidden Forces That Shape Our Decisions* by Dan Ariely
4. *Thinking, Fast and Slow* by Daniel Kahneman
Lost in Translation ...

- ~10-27% individuals receive scientifically validated care  
  [IOM 2006]

- >20% of care provided is unnecessary or potentially harmful! [Bouck et al. 2019]

- ~17-20 years for clinical innovations to get integrated into usual practice  
  [Balas and Boren 2000]

- ~80% of medical research dollars do not make a public health impact!  
  [Chalmers and Glasziou 2009]
How to better align clinical practice with research evidence

- Improving information access: education and guideline dissemination
- Why those do not work?

Physicians: make complex decisions daily

- With limited information
- Under time pressure

→ Vulnerable to cognitive biases
Selected Relevant BE Concept 1:
Status Quo Bias / Inertia

- Status Quo Bias / Inertia:
  - People tend to prefer things to remain the same: need compensation for change
  - Classic application: ‘opt-in’ vs. ‘opt-out’
    - Preselected option is viewed as already being endowed
    - Less effort is exerted
  - Two types of BE-informed interventions aiming to promote preventive
    - Active choice
    - No-action defaults
Active Choice Example

Using Active Choice Within the Electronic Health Record to Increase Influenza Vaccination Rates

MITESH S. PATEL, MD, MBA, MS1,2,3,4,a, KEVIN G. VAIPPA, MD, PHD1,2,3,4,b, DYLAN S. SMALL, PHD5, CRAIG WYNN, MD1, JINGSIAN ZHU, MBA1,4, LIN YANG, MS1, STEVEN HONEYWEIL, JR., BS1, and SUSAN C. DAY, MD, MPH1

Standard Practice

- Physician manually check whether a patient was due for the vaccine
- Then physician need to place an order

Intervention

- Best practice alert in EPIC: identify patients
- Physicians are prompted to actively choose to “accept” or “cancel” an order

![Graph showing the increase in % Patients Ordered for Influenza Vaccination post-intervention compared to pre-intervention years.](image)
The intervention was effective in increasing generic medications prescribing for beta-blockers and statins.
Selected Relevant BE Concept 2: Social Norms

- The power of Social Norms:
  - People tend to behave in accordance with real or perceived social norms
  - Example: pro-environmental behaviors uptake

![Diagram showing energy consumption comparison between you, efficient neighbors, and all neighbors.](image-url)

*Fig. 1. Home energy reports: social comparison module.*
Effect of Peer Comparison Letters for High-Volume Primary Care Prescribers of Quetiapine in Older and Disabled Adults: A Randomized Clinical Trial

Attachment 1 (Placebo Letter)

April 20, 2015
Pat Q. Provider MD
1234 Main St
Columbia, MD 21045
NPI: 1234567890
Specialty: General Care Practitioner

Re: Provider Enrollment Needed for Writing Prescriptions for Medicare Part D Drugs

The Centers for Medicare & Medicaid Services (CMS) recently finalized a new rule that requires physicians and other eligible professionals who write prescriptions for Part D drugs to be enrolled in an approved status or to have a valid opt-out affidavit on file for their prescriptions to be covered under Part D. The enclosed Medicare Learning Network® (MLN) Matters® article offers more information about the rule change and how it may affect you.

If you write prescriptions for covered Part D drugs and you are not enrolled in Medicare in an approved status or have a valid record of opting out, you need to submit an enrollment application or an opt out affidavit to your Medicare Administrative Contractor (MAC) by June 1, 2015, or earlier. Please consult the MLN Matters® document for guidance on how to submit and verify your enrollment.

Sincerely,

Investigations and Audit Group

Attachment 3 (Treatment Letter)

April 20, 2015
Pat Q. Provider MD
1234 Main St
Columbia, MD 21045
NPI: 1234567890 / Specialty: General Care Practitioner

Re: Your Seroquel prescribing is under review by the Center for Program Integrity.

Dear Dr. Provider,

The figure to the right displays your prescribing of Seroquel treatments (Seroquel, Seroquel XR, or generic quetiapine) compared to other general care practitioners in Maryland.

As can be seen, you prescribed far more treatments – 188% more – than similar prescribers within your state. In turn, you have been flagged as a markedly unusual prescriber, subject to review by the Center for Program Integrity.

We recognize that some flagged practitioners have appropriate reasons for this pattern. However, we have seen that other practitioners may drift into prescribing patterns that would be considered medically unjustified or abusive. Abusive prescribing can lead to extensive audits and even revocation of Medicare billing privileges.

We hope that you will use this information to see if your high prescribing level is consistent with the latest standards of care. To assist in your monitoring efforts, CMS will periodically send you letters with our most recent information about your Seroquel prescribing. We may contact you at a later date to ask what steps, if any, you have taken in response to our communications. Read on for more information about the methodology used to analyze your prescribing behavior and to learn what actions to take next.

Sincerely,

Investigations and Audit Group
Figure 2. Quarterly Average Quetiapine Prescribing in Control and Treatment Arms

A. Quetiapine prescribing by study prescribers

B. New quetiapine prescribing by study prescribers

A, Counts all days supplied by the prescribers. B, Counts only days supplied for new patient starts. Each point represents the average number of quetiapine days supplied in each quarter per prescriber relative to the intervention start date. Error bars indicate 95% CIs. Arrowheads denote when letters were sent to prescribers.
Selected Relevant BE Concept 3: Framing Effect

- Present choices in a way that highlights the positive or negative aspects of the same decision, leading to changes in their relative attractiveness
  - risky choice framing: lose 10 out of 100 vs. save 90 out of 100
  - attribute framing: 95% lean vs. 5% fat
  - goal framing: $5 reward vs. $5 penalty

Targeting less stigmatized risk factors/disorders that are associated with main treatment goal

Substance use disorder treatment

Anxiety or mood disorder treatment
Selected Relevant BE Concept 4: Incentives

- Monetary or non-monetary things that motivate an action
  - Help to break the undesirable habits
  - Upfront incentives can address present bias

- Examples of using BE to design salient physician rewards
  - Mental accounting
    - Massachusetts General Hospital mails reward checks to physician’s home
  - Timing
    - Advocate Physician Partners pays incentive payments around April 15th
  - Loss aversion
    - Massachusetts General Hospital gives everyone incentives in one year and then the next year only gives incentives to those meeting performing standards
Incentive is Complexed

DESIGNING FINANCIAL INCENTIVES TO ENHANCE PARTICIPATION OF TARGET POPULATIONS in Weight Loss Programs

Examining Ways to Improve Weight Control Programs' Population Reach and Representativeness: A Discrete Choice Experiment of Financial Incentives

Wen You1,2,3,4, Yuan Yuan2,3, Kevin J. Boyle1,2, Tze-Yu L. Michaud4, Chris Parmeter5, Richard W. Seidel6, Paul A. Estabrooks6

Accepted: 12 October 2021

Figure S.3: Average Participation Rates of Employees Identified for Inclusion in Select Wellness Program Components

HRA: 46%  Clinical: 46%  Fitness: 21%  Smoking cessation: 7%  Disease management: 10%  Disease management: 16%

Wellness program component

NOTES: The graph represents information from employers with at least 50 employees that offer the specific component as part of a wellness program.
Is Paying More Better?

![Graph showing participation probability vs reward amount for different groups: National (100%), Obese (32%), Blacks (11%), Low-income women (17%), Males (49%), Females (51%).]
A Little More Choices Help

$48 ($2/wk)

- National
- Obese
- African Americans
- Low-income women
- Males
- Females

Participation probability at $48

59%

One design
x2 program locations
x2 payment forms
x2 reward conditions
x2 payment frequencies
How to value population health focused clinical work?
Translation to Practice/Community > >

Efficacy

- Who delivers?
- What resources?
- Ease of implementation?
- How scalable?
- How sustainable?

✓ Who chooses?
✓ Who uses?
✓ Who pays?
✓ Who profits?

INCENTIVES
Which One Would ___ Choose?

$ per participant

Dollars

Clinician?

Worksite?
Which One Would ___ Choose?

Reach X Effectiveness

Clinician?
Worksite?

<table>
<thead>
<tr>
<th></th>
<th>Effectiveness</th>
<th>Reach</th>
<th>RE</th>
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<tbody>
<tr>
<td>Internet+</td>
<td></td>
<td></td>
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<tr>
<td>Small Group</td>
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<tr>
<td>Individual</td>
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</tbody>
</table>
Which One Would ___ Choose?

Reach X Effectiveness X Cost

Dollars

- Internet+
- Small Group
- Individual

Clinician?

Worksite?
A Tool to consider: Economic Evaluation (EE)

Note: Value depends on calibration of the scale – DM threshold value for outcomes should reflect opportunity cost – best alternative
EE Example:
Case for Early Intervention in Psychosis

- Need a comprehensive perspective

- Effect: reduce the duration of untreated psychosis
  - Quality of life
  - Better treatment outcomes when treatment does start

- Costs:
  - $ of psychosis care
  - $ of in-patient care, other mental health services, general healthcare
  - $ of social services, criminal justice system
  - $ of impacted employment or education
  - $ of informal caregivers
  - $ of time off work or school or productivity loss
Cost-Effectiveness Plane
Do I have to do clinical trials?
Secondary Data Analysis

- National Health Survey
  - BRFSS: behavioral risk factor surveillance system
  - MEPS: medical expenditure panel survey
  - NHIS: national health interview survey
  - NHNES: national health and nutrition examination survey
  - SEER: surveillance, epidemiology, and end results program

- Electronic Health Records
- National and local registries
- Claims data
Contemporary Tobacco Products (CTP): ENDS and HnB

- Directly marketing to active-duty personnel and veterans
- Limited evidence on risk, cost and benefit
  - Lack of longitudinal health outcome data
  - Lack of robust methods to address confounding factors
  - Limited types of products examined by national surveys
  - Potential self-report bias in survey settings

- We will utilize TRICARE claims and clinical data
- Focus on Air Force
- Active duty and retirees (supplemented with VA data)
Figure 1. Illustrations of Connections between Key Concepts

Tobacco Use Behaviors
- Initiation
- Product choices
- Single/duo/poly use
- Dynamic use patterns (harm escalation or reduction)
- Cessation
- Relapse

Risks = Probabilities of the occurrence of consequences/costs
- Direct Costs:
  - Smoking-related diseases
- Indirect Costs:
  - Second-hand smoking-related diseases
  - Absenteeism
  - Presenteeism

Expected Costs = Σ (Risks x Costs)
- Net Costs = Expected costs increment from policy A to policy B
- Net Benefits = Expected costs reduction from policy A to policy B
Existing Data Utilization

- Tobacco usage information: EHR claim data vital sign table
  - Natural Language Processing
  - Machine learning methods
  - Earlier observations of IQOS usage from Airmen stationed abroad
- Second-hand exposure costs: TRICARE data on USAF dependents
- Indirect cost of military readiness/presenteeism/absenteeism
  - Deployment availability
  - Duty status
  - Fitness test outcomes
  - Outpatient clinic visits
“Here is Edward Bear, coming downstairs now, bump, bump, bump... It is, as far as he knows, the only way of coming downstairs, but sometimes he feels that there really is another way, if only he could stop bumping for a moment and think of it...”
- A. A. Milne
Air Force Suicide Prevention Program
Appendix (11 Initiatives)

- Leadership Involvement
- Addressing Suicide Prevention in Professional Military Training
- Guidelines for Commanders on Use of Mental Health
- Community Prevention Services
- Community Education and Training
- Investigative Interview Policy
- Trauma Stress Response
- Integrated Delivery System
- IDS Consultation Assessment Tool
- Suicide Event Surveillance System
- Limited Privilege for Mental Health Clients


