Insights from behavioral economics for HIV Research

Sebastian Linnemayr, PhD
RAND, Santa Monica

IAPAC June 4, 2013
\[ \cosh x - \sinh x = 1. \quad \cosh x = \frac{1}{1 - \tanh^2 x}. \]
\[ \cosh (x + y) = \cosh x \cosh y + \sinh x \sinh y. \]
\[ \sinh (x + y) = \sinh x \cosh y + \cosh x \sinh y. \]
\[ \cosh^2 x = \frac{1}{2} (\cosh 2x + 1), \quad \sinh^2 x = \frac{1}{2} (\cosh 2x - 1). \]
\[ \text{ar sinh} x = \log \left( x + \sqrt{x^2 + 1} \right). \]
\[ \text{ar cosh} x = \log \left( x + \sqrt{x^2 - 1} \right) (x \geq 1). \]
...just kidding!

The only equation needed today:
Behavioral Economics ≠ Economics as you may know it...

- ‘Traditional’ economics has its place (cost-effectiveness analysis, price setting),
- Behavioral economics focuses on decision making and may offer new insights to HIV research
Motivating example – organ donations

Fraction of drivers who are organ donors:

Germany: 12%
Austria: 99%

What is the difference?
Expensive information campaigns?
Drivers getting paid for donations in Austria?
No, the difference is this:

Whether people have to check the box

Opt in versus opt out of donating organs

Thaler and Sunstein (2009): Nudge
Motivating example 2

Save tomorrow
Saving = adherence to a thrifty lifestyle

Most people do not save enough

But many want to, yet they would rather save tomorrow and spend today

Behavioral economics idea: sign people up for automatic deductions from future pay raises

Huge impact: savings rates rose from 3 to 13%; program rolled out at many large companies now

Thaler and Benartzi (2004)
For those who “need” to leave early, I will argue that...

1. Behavioral economics offers a systematic way to think about incentivizing behavior

2. Barely used in HIV research: wide open field for novel interventions

3. Example given: a currently ongoing NIMH-funded intervention in Uganda using behavioral economics to improve ARV adherence
My argument:

1. People often know what is good for them
My argument:

1. People often know what is good for them

2. But they often have difficulty sticking to this decision
Medication adherence
Overeating
Alcohol abuse
Smoking
Saving
Å Conference attendance
My argument:

1. People often know what is good for them
2. But they often have difficulty sticking to this decision
3. Behavioral economics can help us think why motivation often does not translate into action
Behavioral change is key

Many health problems neither medical nor scientific but behavioral (Rice, 2013)

Unhealthy behaviors responsible for 40% of premature deaths in U.S. annually (Schroeder, 2007)

Compliance for chronic diseases ~50% (WHO, 2003)
What is behavioral economics?

Different from traditional economics that assumes that people can think like Albert Einstein, store as much memory as IBM’s Big Blue, and exercise the willpower of Mahatma Gandhi” (Thaler and Sunstein, 2008)

The insight that people do not always behave rationally (i.e. in their best interest)

Studies systematic mistakes in decision-making
Key behavioral biases

1. In forming decisions:

**Bounded rationality**

Salience: Information most readily available is typically used

Anchoring: seemingly irrelevant information matters; defaults!

Framing: how questions are posed matters in surveys

Optimism and overconfidence: 90% of the population think they are above-average drivers; can lead to not enough precaution being taken and hence risky behaviors
Key behavioral biases

2. In sticking to these decisions:

**Bounded willpower**

Loss Aversion: people hang on to things at a loss, can lead to inertia: **Defaults!**

Status quo bias: researchers tend to sit in the same seats at conferences 😊 people tend to stick with TV programs as they don’t want to change channel

Overconfidence: people do not take precautions to guard them against their own behavior

Myopia: people give in to temptations at the expense of long-term goals

Herding behavior: people follow others in their decisions
Important for many health behaviors: Myopia (the role of temptation)

People have problems with self-control

Oldest documented example: Ulysses tying himself to the mast to avoid the Sirens
Important for many health behaviors: Myopia (the role of temptation)

People have problems with self-control

Oldest documented example: Ulysses tying himself to the mast to avoid the Sirens

In econ lingo: people are *dynamically inconsistent*

i.e. people make choices that they later regret, but lack the will to resist a current benefit (i.e. ice cream) at the cost of long-term benefit (obesity)

Planners vs. Doers / Hot-Cold Empathy Gap, mindlessness
Important for many health behaviors: Overconfidence

Asking patients **with adherence problems** in Uganda:

How likely is it that **you** will forget at least one dose of ARV over the next week:

How likely is it that **other clients** will forget at least one dose of ARV over the next week:
Important for many health behaviors: Overconfidence

Asking patients with adherence problems in Uganda:

How likely is it that you will forget at least one dose of ARV over the next week:

71%: Very unlikely

How likely is it that other clients will forget at least one dose of ARV over the next week:

18%: Very unlikely
These insights have been used in many fields...

Estimates
1. Anchoring
   Anchoring estimates to an inappropriate baseline such as guidance or consensus.
2. Confirmation bias
   Cherry picking data to support a thesis, rather than objectively analysing.
3. Framing
   Interpreting positively-crafted statements positively.
4. More is more fallacy
   Adding greater detail makes thesis more persuasive but less likely.
5. Overconfidence
   Overriding models and data because we convince ourselves we know better.
6. Availability bias
   Judging probability of events by how easy it is to think of examples.
7. Substitution
   Substituting the question ‘Is this stock fairly valued’ with ‘Do I like this stock?’
8. Halo effect
   Assuming all aspects of company positive just because a few stand out.

Investment decision
1. Herding
   Buying when everyone else buys (and/or when share price is rising).
2. Loss aversion
   Reluctance to sell losers but willingness to sell winners.
3. Mental accounts
   Unwillingness to invest in a good opportunity because you ‘missed out already’
4. Status quo bias
   Reluctance to change a portfolio despite evidence supporting that change.
5. Overoptimism
   Underestimating the risks around a stock you own or recommend.
6. Recency bias
   Focusing on recent/coming catalysts rather than the long-run thesis.
7. Hindsight bias
   Assuming you always knew a certain outcome would happen.
8. Causal thinking
   Assuming a link between a news story and the share price performance that day.

Source: Goldman Sachs Research, Kahneman 'Thinking, fast and slow', Montier 'Behavioural investing: a practitioners guide to applying behavioural finance'.
These insights have been used in many fields...

<table>
<thead>
<tr>
<th>Estimates</th>
<th>Investment decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anchoring</td>
<td>1. Herding</td>
</tr>
<tr>
<td>Anchoring estimates to an inappropriate baseline such as guidance or consensus.</td>
<td>Buying when everyone else buys (and/or when share price is rising).</td>
</tr>
<tr>
<td>2. Confirmation bias</td>
<td>2. Loss aversion</td>
</tr>
<tr>
<td>Cherry picking data to support a thesis, rather than objectively analysing.</td>
<td>Reluctance to sell losers but willingness to sell winners.</td>
</tr>
<tr>
<td>3. Framing</td>
<td>3. Mental accounts</td>
</tr>
<tr>
<td>Interpreting positively-crafted statements positively.</td>
<td>Unwillingness to invest in a good opportunity because you ‘missed out already’.</td>
</tr>
<tr>
<td>4. More is more fallacy</td>
<td>4. Status quo bias</td>
</tr>
<tr>
<td>Adding greater detail makes thesis more persuasive but less likely.</td>
<td>Reluctance to change a portfolio despite evidence supporting that change.</td>
</tr>
<tr>
<td>5. Overconfidence</td>
<td>5. Overoptimism</td>
</tr>
<tr>
<td>Overriding models and data because we convince ourselves we know better.</td>
<td>Underestimating the risks around a stock you own or recommend.</td>
</tr>
<tr>
<td>6. Availability bias</td>
<td>6. Recency bias</td>
</tr>
<tr>
<td>Judging probability of events by how easy it is to think of examples.</td>
<td>Focusing on recent/upcoming catalysts rather than the long-run thesis.</td>
</tr>
<tr>
<td>7. Substitution</td>
<td>7. Hindsight bias</td>
</tr>
<tr>
<td>Substituting the question ‘Is this stock fairly valued’ with ‘Do I like this stock.’</td>
<td>Assuming you always knew a certain outcome would happen.</td>
</tr>
<tr>
<td>Assuming all aspects of company positive just because a few stand out.</td>
<td>Assuming a link between a news story and the share price performance that day.</td>
</tr>
</tbody>
</table>

Why behavioral economics in HIV research?

We know that people make best decisions when:
- Decision is easy to make (simple decisions)
- Good feedback about results of healthy behavior
- Benefits of an action easy to observe

Aspirin-example

Unfortunately, HIV does not fit these criteria

These criteria can serve as entry points for behavioral economics interventions
Characteristics of ARV adherence that make it difficult to adhere

HIV is a **chronic** disease with daily costs yet and a long-term benefit (survival)

Behavioral economics: people weigh net present value of costs and benefits but don’t stick to their decisions (myopia) or don’t take enough precautions to adhere (overconfidence)

Potential interventions to overcome this bias: nudge people to prepare the environment for good adherence (habit formation), make current benefits more salient, ...
Characteristics of ARV adherence that make it difficult to adhere

The benefits of ART are largely **invisible** (absence of disease).

Behavioral economics: people fail to observe the positive effects of ART but they do experience the (current) negative side effects etc. (salience).

Potential intervention: make benefits visible (fitbit)
Characteristics of ARV adherence that make it difficult to adhere

**little (and often wrong) learning** about the effectiveness of ARV

- Side effects send signal that drugs may be bad for you
- See other people on ARV fall sick or die [not knowing about their likely lack of adherence]
- ARV causes an *absence* of disease; drug holidays often no observable negative effect
Which (behavioral economics) interventions have been used in HIV research?

- Conditional cash transfers for recent prevention efforts in sub-Saharan Africa  
  (Baird et al., 2012, deWalque et al., 2012; Kohler and Thornton, 2012)

- Contingency management and voucher reinforcement interventions, mainly in substance abuse populations in the US

- Most of these focus on financial incentives, but there is little work on underlying biases and how to address them
Rewarding Adherence Program (RAP) – the Basics

- NIMH-funded 3-year R34 at one clinic in Uganda’s capital Kampala

- Clients in previous studies complained of treatment fatigue

- Research question: how can we design a program to offer some fun to participants and get some more tangible benefit?

- Constraint: severely resource-constrained environment
Starting point: Ugandans like to play the lottery (and more importantly, winning something)

How can we use the desire to win for designing a study to improve ARV adherence?

“Adherence lottery”: win if you show healthy behavior
Predecessor U.S. study

- Small sample: incentivizing warfarin adherence among ten volunteers

- Higher stakes: daily chance to win 3-5 USD

- Hi-tech: MEMS caps electronically transmitted information, immediate feedback by SMS message

- U.S. setting

  Volpp et al. (2008)
**RAP implementation**

Â **Low-tech measurement:** clients eligible for the prize drawing if come in on their scheduled clinic day

Â **Low-tech prize drawing:** drawing cards out of a bag, win when "6"

Â **Small payouts:** expected value of prize over the six drawings in one year: 2-3 USD.
RAP – drawing a prize
Insights from psychology and behavioral economics:

- Myopia: providing immediate benefits of a healthy behavior
  Operant conditioning / Contingency management; Conditional Cash transfers); variable rewards found more effective

- Loss aversion (people know if they are not allowed to enter the prize drawing)

- Optimism: leads to enrolment in the program

- Mood: adding a fun element associated with adherence
2 intervention groups (n=50 each), 1 control group (n=50)
- one group eligible if come on the day they are scheduled
- one group eligible based on 95% MEMS-measured adherence
- control group: usual care, will participate in RAP after year 1

Expected value of prize: ~2 USD per year, six drawings per year
Some quotes from focus groups

“...having to take [the drugs] till death...may start to skip doses.” (young male client)

“[Giving prizes] is fun and helps to boost one’s morale.” (community leader group)

“[The program] is important. Its good.” (young female client)

“It’s a good motivator. It’s an incentive, this time we will take the medication.” [young male client]
Preliminary evidence on behavioral biases in the sample

- Tying to the mast: 97% use some aid to remember their medication

- Information: 18% know the name of their ARV

- Only 6% remember more than 3 numbers out of 5 being read out to them
Preliminary evidence on behavioral biases in the sample

- 53% are impatient (prefer current reward to higher reward in the future)
- 21% are risk-seeking
- 45% can calculate the percentage of adherence over 1 month if forgetting 7 pills on a 2-pill regimen
Conclusion

Â Tried to convince you that behavioral economics may be a valuable tool to think about adherence issues

Â Pointed out main behavioral biases that are in the way of better adherence

Â Indicated some potential projects that could be implemented and tested (is anyone game?)

Â Presented preliminary results from an ongoing project in Uganda based on some of these insights
Acknowledgments

Â Funding provided by NIMH through 1R34MH096609

Â Colleagues, in particular Glenn Wagner at RAND

Â Study participants and study team at Mildmay Uganda

Â Thanks to Chris Gordon and Mike Stirratt for a fantastic conference
Thank you!

sli.nnema@rand.org
Priorities for future research

How to sustain behavioral change: DeFulio and Silverman (2012) review 5 studies with post-intervention data; all fail to keep up effects

Research on use of incentives in HIV populations has focused on U.S., projects in low and middle-income countries needed (Galarraga et al., 2013); also, most of these studies are on populations with substance abuse problems (DeFulio and Silverman, 2012).

Related: cost-effectiveness