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HIV Prevention through the Lens of Behavioral Economics (Draft)

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A number of biomedical tools to prevent the transmission of HIV are currently available including male and female condoms, pre-exposure prophylaxis (PrEP), microbicides, treatment as prevention (following the encouraging results of the HPTN 052 trial), and male circumcision.¹ Despite the availability of these effective strategies to prevent HIV, low uptake of and adherence to these prevention approaches have led to continued high HIV incidence rates in many countries² and contributed to limited results in some efficacy trials.^{3,4} Behavioral economics (BE) provides a readily available framework to better understand individual decision-making and behaviors related to HIV prevention and can help in the design of innovative interventions. This growing discipline is based on traditional economics but complemented by insights from psychology and studies how people make decisions about their behaviors. Further, BE aims to identify the conditions under which individuals are likely to make systematic decision-making errors or ‘biases’ that in turn provide entry points for interventions. BE has shed new light on a range of health behaviors,⁵ but to date few published studies exist for HIV-related behaviors, and most involve conditional cash transfers (payments in exchange for a certain behavior). These transfers are to a significant extent inspired by traditional (neoclassical) economics and have been described elsewhere.⁶ This Letter to the Editor instead discusses three BE biases that likely contribute to suboptimal prevention behaviors and suggests potential interventions to address them.

A key BE bias is salience, i.e., the tendency for people to act on information that first comes to mind rather than making use of all available knowledge. This bias helps explain why many people do not prioritize HIV- prevention: HIV is a largely invisible disease and – for the most part – cannot be inferred from a person’s appearance. Therefore at the moment when an individual may be most at risk for HIV infection, the perceived threat of the disease (and therefore the perceived benefits of prevention) is likely lower compared to diseases with more noticeable symptoms such as smallpox or Ebola. Furthermore, different from episodic diseases such as Ebola that capture substantial attention during a time of outbreak, HIV infection is increasingly viewed as a chronic, manageable disease therefore over time the salience of HIV likely diminishes. Even if a person is initially concerned about acquiring HIV, over time this perceived, constant threat is likely superseded by other, more pressing requirements of daily life (such as financial instability), leading to lower salience of HIV risk, reduced likelihood of practicing behaviors that minimize the risk for HIV, and resulting

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increased risk of HIV infection. Salience points to the need to periodically remind people at risk of HIV infection regarding the benefits of prevention; it indicates that providing information once is not sufficient to permanently fix the importance of continued prevention in a person's mind. A potential BE intervention to increase HIV salience could be to send phone text messages reminding the individual of the importance of HIV prevention at times when s/he may be at increased risk for HIV, such as on a weekend night when individuals are more likely to engage in excessive drinking and drug use.

A related BE bias is present bias, or the tendency of many people to give in to short-term temptations at the cost of long-term outcomes. This decision-making error is a major barrier for patients trying to adhere to regimens for chronic diseases where the costs of adherence (e.g., stigma, side-effects, financial costs) are very noticeable and immediate, but the benefits of increased life expectancy and improved life quality occur in the distant future. To test the impact of this bias on adherence to antiretroviral therapy (ART), participants in an ongoing study by the author were asked to make a choice between hypothetical rewards that varied in size depending on the delay of payment, a common method to measure present bias. Among this sample of clients in HIV care in Uganda, about one-third of participants exhibited present bias (they preferred smaller, earlier pay-outs to larger, more remote ones), and this bias was associated with subsequently lower ART adherence.⁷ The same study is currently testing small prizes distributed by a lottery to reward those with high observed adherence. Preliminary results indicate that these low-cost rewards are able to overcome present bias and lead to increased adherence. While comparable studies have not yet measured the role of present bias in HIV prevention, its impact may be even more pronounced for prevention compared to ART adherence due to the high cost of prevention activities (such as foregone pleasure of unprotected sex) and far-off, uncertain benefits (as not every unprotected sex act would result in HIV infection). Such incentives have been used for other health behaviors as a way to increase their current benefits such as smoking or overeating; the challenge for HIV prevention is to do so in a manner that takes into account the long time period during which infection can occur at a number of time points, and also to not counter ('crowd-out') existing, intrinsic motivation to stay healthy. Some recent studies have rewarded people with relatively large monetary payments for remaining HIV-negative for a given time period,⁶ but given limited resources it is challenging to continue such studies over longer time horizons. Present bias highlights the need to reduce the current costs of prevention, as even small costs (barriers) could outweigh any perceived future benefits.

Another key insight from BE is that human decision-making is influenced by affect, i.e. that the decisions people make are impacted by their emotional state. This insight implies that the biases described above can be compounded by affect in moments when the person is emotionally activated, or – in the words of behavioral economist George Loewenstein – is in a 'hot' state.⁸ This problem is particularly acute for *pericoital* prevention tools such as condoms, i.e., those that have to be taken at or around the time of sexual intercourse when a person is likely in such a 'hot' state. In the moments preceding sexual intercourse, due to increased arousal and sensations of pleasure, an individual may be more likely to forget – or simply be unwilling – to use condoms or insert microbicides in order to practice safer sex.

This dual-process theory of a person's cold and hot states suggests the importance of commitment devices that allow a person in a 'cold' or rational state to pre-commit to a certain course of action to avoid giving in to such short-term temptations such as not using a condom. PrEP can be viewed as an example of such a commitment device: it shifts the decision-making power to a time point that is not actively influenced by sexual arousal and instead is grounded by more rational considerations such as a person's desire to remain HIV-negative. Commitment devices involving financial commitments by the participant that are only returned when a certain health goal is achieved have been successfully applied to smoking cessation, for example.⁹ Potential drawbacks of this approach have to be taken into account when deciding on their use, such as the possibility that in resource-restricted settings, potential participants may be deterred from accessing health services for fear of losing money.

While the three biases discussed – salience, present bias, and affect – have been shown to have a negative impact on many types of health behaviors, the extent to which they influence HIV prevention has not yet been empirically tested. Doing so will contribute to our understanding of the barriers to HIV prevention, and will assist the research community in identifying novel interventions to improve HIV-prevention decision-making and behavior. Indeed, a hallmark of BE is that it not only identifies decision-making errors, but uses them as entry points for interventions targeting the very same biases. Interventions such as reminder messages, incentives, and commitment devices should be systematically tested to improve HIV prevention. It is important, however, to appropriately field-test and adapt these approaches to avoid negative consequences, so that, for example, incentives do not crowd out intrinsic motivation or contradict religious interpretations that may view lottery-type incentives as gambling. Also, the broad-stroke discussion in this letter cannot describe the intricacies of the biases discussed nor the possibility that several biases act at the same time and may compound or weaken each other, but aims to spark interest regarding the ways in which these biases could inform future interventions.

In sum, BE offers a comprehensive and readily available framework for understanding people's failure to effectively use all available tools to prevent HIV transmission. We encourage HIV researchers to make use of BE insights, to test the innovative intervention types suggested by them, and to build up an evidence base around this potentially important and much-needed tool in the fight against HIV.

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