A COMPREHENSIVE APPROACH TO CHANGING HEALTH BEHAVIORS:

CARE
PREVENTION
FINANCE
About this report

This report summarizes research on health behavior by researchers on the Health team of the Center for Advanced Hindsight (CAH Health) at Duke University and collaborators. The researchers are listed at the end of the report (“Our team”). The report was edited by Jonathan Cloughesy, Jonathan Corbin, and Jan Willem Lindemans. Please cite the report as follows:


If you want to know more about CAH Health, you can visit our website: advanced-hindsight.com/health-research.

If you want to know more about specific projects or are interested to get involved, contact Jan Willem Lindemans, Principal of CAH Health, at jan.lindemans@duke.edu.
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**Centene Corporation**: As a leading multi-national healthcare enterprise, Centene works with local communities and health plans to help their members receive the best care possible. One of the ways Centene demonstrates its commitment to health is by conducting innovative research in behavioral science through the Centene Center for Health Transformation. The Centene Center is a community-industry-academic healthcare partnership between Centene, the Center for Advanced Hindsight, and Washington University in St. Louis. Its mission is to improve the health of vulnerable populations by creating, testing, implementing, and advancing effective behavior-based innovations that remove barriers to healthy habits and facilitate pathways for healthier living. Our research with Centene touches on all aspects of health, from preventative care (see section Lay beliefs: The social vs. personal motivators of vaccination) to lifestyle behaviors (see section Better understanding breaking points in diabetes patients) to disease management (see section Purpose in life and medication adherence). We look forward to exploring these topics and more in 2020 and beyond. At CAH Health, **Jenna Clark** leads the Centene collaboration.

**GlaxoSmithKline Vaccines (GSK Vaccines)**: In 2017–2019, CAH initiated an academic and applied program of research to apply a novel behavioral science perspective to vaccination uptake. An academic research grant from GlaxoSmithKline Vaccines has supported this program of research. GSK Vaccines researches, develops, and manufactures vaccines for people across the life-course. At CAH Health, **Catherine Berman** led our team’s vaccination research.

**Zilveren Kruis**: With 5 million insured persons in The Netherlands, Zilveren Kruis is not only the largest health insurance company in The Netherlands, but also of Europe as a whole. Since 2017, CAH has partnered with Actify, a health app started by Zilveren Kruis, working on a variety of lifestyle topics. Our projects combine mobile health and behavioral science to encourage healthy eating, to practice mindfulness, and to increase exercise behavior through hidden gyms—little opportunities that make a big difference. In 2019, we expanded our partnership to include more projects with Zilveren Kruis beyond the Actify app. Together, we leverage behavioral science to improve health and vitality in the workplace within the following three focus areas: healthy food choices, exercise, and mental well-being. At CAH Health, **Nina Bartmann** leads the Zilveren Kruis collaboration.
The Joep Lange Institute (JLI): The Joep Lange Institute is an activist global health and development institute, inspired by the life and work of Dr. Joep Lange. The Institute combines science, activism, and pragmatism to reach its goal of making health markets work for the poor in countries where the system fails the people, often working to utilize technology to increase health access. Since 2016, JLI has funded CAH’s research on health access research in Kenya. Our main partner was the PharmAccess Foundation (PAF), an entrepreneurial organization dedicated to connecting more people to better healthcare in Africa using technological innovations. PAF has helped create a digital platform that connects all players in the health market, including funders, providers, and patients. In addition, PAF mobilizes public and private resources to increase access to care through health insurance and new, digital forms of health financing like mobile health contracts. At CAH Health, Judson Bonick led the JLI-PAF collaboration. In addition to JLI and PAF, we collaborated with a number of other organizations active in Kenya:

CarePay is an organization that believes the intersection of mobile technology and mobile money has the potential to transform healthcare by facilitating universal access to good quality care at lower costs. It utilizes the potential of technology to increase health access for those who need it most. CAH has partnered with JLI, PAF, and CarePay since 2016, working hand-in-hand with these organizations on health access research in Kenya through the M-TIBA, i-PUSH, and Afya Pap projects. These projects use digital platforms and behavioral science to increase health savings and coverage of health insurance, as well as non-communicable disease management, for the most vulnerable populations in Nairobi and beyond.

Carolina for Kibera (CFK) develops local leaders, catalyzes positive change, and alleviates poverty in the informal settlement of Kibera in Nairobi, Kenya. It combines service with responsible research to inform and assist participatory development in Kibera and other informal settlements globally.

Access Afya is a social enterprise that runs high-quality, affordable primary healthcare in Nairobi’s informal settlements through a chain of quality assured, low-cost micro-clinics. It delves deeper into its communities through field health programs, which use subscription models to deliver proactive and preventative care in natural community gathering places. CFK and Access Afya have been field implementation partners with CAH since 2018. Their local expertise and guidance via their on-the-ground staff and community health volunteers have proven invaluable to CAH’s work.

The Robert Wood Johnson Foundation (RWJF): RWJF is a philanthropic foundation focused on promoting a Culture of Health throughout the United States. Their goal is to ensure that all Americans can enjoy the same level of health and well-being. Their Pioneering Ideas program, focusing on bold new approaches to health challenges and disparities, has provided funding and support to CAH’s work on paternalism and influence. At CAH Health, Jenna Clark and Judson Bonick lead the RWJF collaboration.
**Pattern Health**: Pattern Health has been a research partner of the CAH since 2016. It has a digital health platform that enables researchers and clinicians to translate ideas into real-world applications faster and easier than custom development. These programs help people manage a wide range of conditions, from diseases like hypertension, obesity, and mental illness, to helping people prepare and recover from procedures like heart cancer surgery, cardiac rehab and even heart transplants. Pattern Health has developed and tested a variety of behavioral strategies to increase user engagement and adherence to these programs in collaboration with the Center for Advanced Hindsight, including a commitment device feature based on loss aversion that penalizes users for failing to complete a health task (Lose your apps if you don’t take your medication), a feature based on implementation intentions that helps users remember to complete a task by associating it with typical daily activities like eating dinner (Implementation intentions for weight tracking among congestive heart failure patients), and a points-based system for incentivizing healthy behaviors (How to best incentivize exercise: Gaining points, losing points, or both?). Aline Holzwarth, Principal at CAH, leads the Pattern Health collaboration.
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**Conclusion: A Comprehensive Approach to Changing Health Behaviors**

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Get your toast out with a fork
Do your own electrical work
Teach yourself how to fly
Eat a two-week-old unrefrigerated pie

Dumb ways to die
So many dumb ways to die

This song, which goes on and on enumerating dumb ways to die, was part of an extremely popular Australian public health campaign. If you are not among the 200 million people who have seen the video on YouTube, consider catching up. At least if you don’t mind humming “So many dumb ways to die!” for the rest of the day. As a depiction of public health in today’s world, “Dumb Ways to Die” is at the same time very insightful and very deceiving. The great insight is that in today’s world death is often our own “dumb” fault. We die because we do things we shouldn’t do. But the song is also deceiving because it zooms in on the more spectacular ways to die: getting electrocuted by the toaster, tripping on the train platform to get run over by a train, crashing a homemade airplane, inviting a psychopath into the house, the list goes on. But these days, we probably won’t die because of a spectacular accident or murder. Of all deaths in the United States in 2017, 6% were due to some kind of accident or involuntary injury, and 0.006% were homocides. In comparison, 23% of deaths were due to heart diseases, 21% due to cancer, and lumping together a few other leading causes, another 16% of deaths were due to chronic lower respiratory diseases, cerebrovascular diseases (strokes), diabetes, the flu and pneumonia. If you do the math, mortality for this list of diseases is 10 times higher than mortality for any kind of accident.

Still, “Dumb Ways to Die” is right: Many of these early deaths are preventable. If only people lived their lives differently, mortality statistics would look very different. We eat too much, and we eat unhealthy things, we smoke and drink, we don’t exercise enough, we don’t sleep enough, and we work too hard. We don’t wash our hands properly, we don’t listen to our doctor, we don’t get vaccinated, and we don’t take our medicines. So we die too early. Why do we do all these dumb things? Because the world we live in is not designed to get the best out of us: Very often it is designed to get the worst out of us. Most companies want us to crave their products and services so we will continuously consume them, whether this is in our long term interest or not. So they design the world around us, the physical world as
well as the digital world, for maximal temptation and immediate gratification. The problem is not limited
to the world outside. Companies make sure we take the temptations into our homes, with full fridges,
transparent cookie jars, and very comfortable sofas. Unfortunately, the solution is not so simple. We
could try to give people more information about the health consequences of their behaviors. But the
problem people face in today’s world is not a lack of information. Everybody knows that eating cookies
is unhealthy. We just lack the self-control to walk past the cookie jar and ignore it. The anticipation of
the immediate pleasure from devouring a freshly baked cookie has a much stronger effect on us than
the rational consideration of its uncertain consequences to our future health. That is why we need
behavioral scientists to develop solutions together with health experts and medical scientists.

Some people are reluctant to use psychology and behavioral science to change people’s minds and
“trick” them into behaving the right way. Shouldn’t we respect people’s free will? If people know cookies
are bad for them, but still want to eat them, shouldn’t we respect their decision? Well, think about this:
Isn’t it interesting that we accept a lot of paternalism in the domains of accidents and crime, while
we are so much less tolerant in the domain of diseases and disease prevention, where the mortality
at stake is much higher? (In the last chapter of this report, we discuss some of our research on the
psychology of paternalism.) We are fine with compulsory seatbelts and locking up dangerous people,
but we wish to leave things like lifestyle and vaccination up to people’s free volition. If eating is a
bigger killer than car accidents, why do we accept speed limits but not eat limits? The reason may be a
psychological one: The harm of accidents and crime is much more clear, vivid, certain, and immediate
than the harm of behaviors that cause diseases, or the benefits of behaviors that prevent diseases.
But if we reflect carefully we must conclude that influencing behaviors for disease prevention and
for disease management is much more justifiable than influencing behaviors for the prevention of
accidents and crime.

In this report, we discuss some of our research on influencing behaviors related to disease prevention
and disease management. There are many dumb ways to die, but fortunately there are many smart
ways to live. We discuss four domains: (1) self-care and chronic disease management, (2) vaccination
uptake, (3) lifestyle behaviors, and (4) health-related financial decisions. In all these domains, we
show how powerful behavioral science and the experimental method can be in helping to understand
and change behavior. I’m very grateful to all the people we have collaborated with who made this
research possible, and who contributed with their energy and creativity. I’m also very grateful to all
our researchers in the Health team at the Center for Advanced Hindsight. We have two main focus
areas in our center: financial decisions and health behaviors. It’s exciting to collect some of our health
research into this report. (If you’re also interested in financial behaviors, you can find these reports
on our center’s website.) Finally, I hope you will enjoy reading about the results of our research, learn
something about preventing dumb ways to die, and go out and prevent some deaths while you are at it.
EXECUTIVE SUMMARY

In this report, we (Health team researchers at the Center for Advanced Hindsight at Duke University and collaborators) discuss some of our research on health behavior. We show the power of behavioral science in helping individuals at every stage of their healthcare journey. Taking care of our health does not just mean going to the doctor when we are ill or taking our medication. It also means doing the things that will prevent us from getting ill and taking care of our health finances. In other words, health is about curative care, prevention, and finance, which together forms a comprehensive approach to health behavior. We think of health as a tree, where the roots symbolize stable finances, the trunk stands for adequate prevention, and the branches and leaves, which grow back when they fall off, symbolize curative care.

In **Chapter 1**, we discuss our research on helping patients with self-care behaviors: taking one’s medicines, refilling them on time, monitoring one’s illness, taking measurements, and making the required lifestyle changes to manage one’s illness. We discuss correlational studies we conducted on the drivers of self-care behaviors, interventions we designed to boost self-care behaviors, and experiments we ran on the efficacy of interventions. In all this, we show the power of behavioral science in understanding and improving self-care behaviors: through commitment devices, reminders, goal-setting, and implementation intentions.

With **Chapter 2**, we move from curative care to prevention, starting with vaccination uptake. We discuss some of our research aimed at uncovering the psychological and contextual factors that lead to underutilization of vaccination and developing effective, scalable behavioral interventions that address vaccination barriers. We look at three ways to boost vaccination uptake: emotions, social processes, and persuasion.

In **Chapter 3**, we continue our focus on prevention by discussing our work on adherence to a healthy lifestyle: not only exercising and eating healthy foods, but also meditating, being mindful, and living a meaningful life. We discuss four ways to get people to live a healthier lifestyle: rewards, social forces, dealing with negative feelings, and positive psychology.
With **Chapter 4**, we move from prevention to finance. We discuss some of our work on *saving for health care and health insurance* in Kenya. We introduce a new digital wallet developed by our partner to help low-income Kenyans save for health care and for health insurance. Barriers to savings are identified, and we offer solutions based on several behavioral principles: *the placebo effect, procedural knowledge, gamification, implementation intentions, social norms, and loss aversion.*

In **Chapter 5**, we reflect on our *methods* as behavioral scientists and as designers of behavioral solutions. We discuss our empirical research on an old philosophical question, namely, to what extent *paternalism is morally justifiable*. Campaigns based on behavioral science are paternalistic to a certain extent, so it’s important to understand whether (and under what circumstances) people find them acceptable. In this last chapter we also discuss our own method of diagnosing behavioral problems: *behavior mapping*. Behavior mapping is a collaborative approach that diagnoses specific barriers that prevent desirable behaviors (or structures that promote undesirable ones) and generates potential (behaviorally-focused) solutions to test.

Most of the research we report on was conducted in 2019 or started earlier but was still ongoing in 2019. The research was funded by and/or conducted in collaboration with the following organizations: Centene Corporation (a leading multi-national healthcare enterprise), an academic research grant from GlaxoSmithKline Vaccines (GSK Vaccines researches, develops, and manufactures vaccines for people across the life-course span), Zilveren Kruis (a Dutch health insurance company), the Joep Lange Institute (an Amsterdam-based activist global health and development institute), and the Robert Wood Johnson Foundation (a US philanthropy focused on health).
INTRODUCTION
INTRODUCTION

Jan Willem Lindemans, Jonathan Cloughesy, Jonathan Corbin

Care, prevention, and finance: The T(h)ree of Healthy Life

Taking care of your health does not just mean going to the doctor when you are ill, and taking your medicines. It also means engaging in behaviors like exercise and healthy eating that will prevent you from getting ill in the first place (and will mitigate the severity when you do get sick). Additionally, you must take care of your finances, because health carries a financial cost. In this report, we show the importance of health behaviors in each of these stages: curative care, prevention, and finance. Each of these stages are equally important and should be part of a comprehensive approach to health behavior.

We believe health is like a tree: the roots represent health finances, the trunk represents prevention, and the branches represent care. Just as the roots allow the tree to absorb nutrients from the soil, so do our finances allow us to obtain the necessary care for our health. Then, the absorbed nutrients get converted into a strong trunk, strong enough to support the whole tree. The trunk is like prevention—it makes sure we are strong enough to withstand health shocks. Finally, a strong trunk supports branches and leaves. They wave in the wind, and some may break off, but with a solid trunk, and good roots that absorb the proper nutrients, the broken branches can heal and the leaves can grow again. The branches and leaves are a metaphor for care.
In this report we will take you down the Tree of Healthy Life.

We will start at the top with the leaves and branches (care: we’ll focus on self-care rather than physician interactions), then go down the trunk (prevention: first lifestyle, then vaccination), and end at the roots (finance). Our strategy is like that of the English explorer John Hanning Speke. To find the source of the Nile, Speke simply travelled upstream, until he bumped into Lake Victoria. We will do the same for health behaviors.
The report is organized as follows.

In **Chapter 1**, “Self-Care: Medicines and Measurements” we discuss our research on helping patients with self-care behaviors. Helping patients do the right thing is crucial because we cannot always rely on physicians. Our research is designed to help patients do the things they need to, such as taking and refilling medication, monitoring illness, taking measurements, and making the required lifestyle changes to improve health. Taking and refilling medication, for example, is no small matter. An estimated 50% of medications for chronic diseases are not taken as prescribed and up to 30% are never filled.\(^1\) Every year non-adherence to medication is implicated in up to 125,000 deaths in the United States.\(^4\) We discuss correlational studies we conducted on the drivers of self-care behaviors, interventions we designed to boost self-care behaviors, and experiments we ran on the efficacy of interventions. In all this, we show the power of behavioral science in understanding and impacting self-care behaviors: whether it is through commitment devices, reminders, goal-setting, implementation intentions, or other techniques.

With **Chapters 2 and 3**, we move our focus from curative care to prevention. On the Tree of Healthy Life, we are descending from the branches and leaves to the trunk. Our research investigates how we can help people build a solid trunk that will withstand wind and rain. In Chapter 2, “Vaccination: Beliefs and Behaviors”, we zoom in on vaccination. Vaccination is obviously a crucial ingredient to a preventative approach to health. Experts estimate that, during 2017–2018, flu vaccination prevented 91,000 influenza-associated hospitalizations, and 5,700 influenza-associated deaths.\(^5\) However, uptake is much lower than what it should be. In the 2018–2019 season, only 45% of adults received their flu shot.\(^6\) Psychological and contextual factors contribute to people’s attitudes, intentions, and behaviors surrounding vaccination.

In **Chapter 2**, we discuss some of our research aimed at uncovering the psychological and contextual factors that lead to underutilization of vaccination and developing effective, scalable behavioral interventions that address vaccination barriers. We look at three ways to boost vaccination uptake: emotions, social processes and persuasion. First, people are not fully rational: their behavior is guided by emotions, like disgust, fear, and pain. By understanding the emotions behind the reluctance to get vaccinated and designing interventions that defuse unhelpful emotions and leverage useful emotions we can boost vaccination uptake. Second, people are social beings guided by social processes. People care about others and about what others think is the right thing to do. By manipulating social processes we can thus influence vaccination behaviors. Third, people are susceptible to persuasion. If we remind people of their values and frame vaccination in the context of those values, people’s intentions to get vaccinated increases.
In Chapter 3, “Lifestyle: A Healthy Home and Workplace”, we discuss a second pillar of prevention: living a healthy lifestyle. With lifestyle we are descending even farther down the Tree of Healthy Life, as we move from medicine to everyday life. Because ultimately our daily behaviors play the largest role in determining health outcomes. Based on data between 2013 and 2018, on any given day, about 37% of adults consume fast food and only about 23% of adults meet the Physical Activity Guidelines for both aerobic and muscle-strengthening activity. The result is that about 72% of adults age 20 and over are overweight, and about 15% have diabetes. In addition to physical health, mental well-being is another major facet of living a healthy lifestyle. Life satisfaction and happiness are goals in and of themselves, but they are also positively associated with better overall health outcomes.\(^2\)

Our research shows that progress toward a healthy lifestyle can be made via a nuanced use of material and immaterial rewards, of personal and social approaches, and positive and negative forces at home and in the workplace. In the third chapter, we discuss several solutions we designed based on principles of behavioral science. We offer four broad categories of solutions: rewards, social forces, dealing with negative feelings, and positive psychology. In the category of rewards, we will discuss several solutions: monetary incentives, taking away rather than giving (leveraging “loss aversion”), paying people not only to exercise, but also to meditate, creating a feeling of progress (leveraging the “goal gradient” effect), gamification, points, discounts, and health feedback framed as “Real Age”. In the category of social forces, we investigate two solutions: digital coaching, and a novel social-coordination device we developed. The third category of solutions deal with negative feelings. We present two solutions: the idea of reappraising pain as something good, and the strategy of focusing on the immediate mechanisms rather than on the future harms (leveraging “present bias”). Finally, the fourth category is solutions based on positive psychology, that is, the branch of psychology that focuses on positive experiences, flourishing, the good life, and happiness. We discuss two solutions: reflection on purpose in life, and happiness challenges.

With Chapter 4, “Finance: Saving for Health Care and Health Insurance”, we move from the domain of prevention to that of finance. In our metaphor of the Tree of Healthy Life, we have now descended to the roots of the tree: where it should all start. Because without proper finances we cannot plan for a healthy life. In the chapter, we discuss some of our work on saving for health care and health insurance in Kenya. In 2015–2016, a bit more than one in three Kenyans lived on less than the international poverty line (US$1.90 per day in 2011 PPP). Poverty obviously has dire consequences for health. It’s estimated that 150,000 Kenyan children died from preventable causes in 2011 alone. Low-income Kenyans cannot afford to get treatment for themselves or their children, particularly those living in informal settlements and rural areas. Saving for health care and health insurance can be difficult, but life-saving. Unfortunately, health insurance coverage in Kenya is very low (about 19% nationally).
In the fourth chapter, we discuss some of our work with M-TIBA, a new digital wallet to help low-income Kenyans save for health care and for health insurance. We discuss barriers and catalysts for users saving money into the wallet. We propose several solutions: placebo insurance cards to increase trust, a savings game to get the mechanics of saving into one's fingers, that is, to improve procedural knowledge, a calendar to plan and track savings, and messaging that leverage social norms. We also discuss the promise of (and difficulty with) leveraging remittances from family or friends to fund health insurance in a context with weak social norms on saving and insurance. Finally, we briefly discuss how to nudge people to sign up for insurance with loss aversion vouchers.

In Chapter 5, "Reflection: Good Methods for Behavior Change", we reflect on our methods as behavioral scientists and as designers of behavioral solutions. In a first section we focus on the moral question of which methods of behavior change are morally justifiable. The problem is that behavioral science interventions are in a sense paternalistic. They involve attempting to change someone's behavior for their own good, but without solely relying on this persons' own free will and choice. The question about the justifiability of paternalism is an old philosophical problem. Rather than adding yet more arguments to this debate, the last chapter discusses some results of empirical studies we ran to understand what people care about when deciding if different behavioral interventions are justifiable. In the second section, we leave the moral question of justifiable methods aside and discuss our own method of diagnosing behavioral problems: behavior mapping. Behavior mapping is a collaborative way to narrow down a list of possible behavioral problems and solutions to focus on. It is often one of the first things we will do together with a partner at the start of a sponsorship or collaboration.

References
1. https://www.dumbwaystodie.com/song
**How to read figures in this report**

Here is a brief primer on how to read most of our figures. Below, you can see the prototypical figure that will be sprinkled throughout this report. We will typically report two statistics for most figures:

**Mean:** This is the average of all the measurements in the sample (the sum divided by the count.)

± 1 Standard Error of the Mean: The bars above and below the mean reflect our level of confidence in the accuracy of our reported mean. The wider the bars, the less confident we are in the mean.

If a figure in this report does not conform to the above format (i.e., if we are reporting other statistics, such as correlations, medians, or confidence intervals) we will include a more detailed description of the figure in a caption placed below the figure.
SELF-CARE: MEDICATIONS AND MEASUREMENTS
SELF-CARE: MEDICATIONS AND MEASUREMENTS

Jenna Clark, Jonathan Cloughesy, Shanta Ricks, Julia O’Brien, Rachel Kahn, Aline Holzwarth, Julie Miller, Rebecca Rayburn-Reeves, Judson Bonick, Jan Willem Lindemans

Introduction

When we are ill, we go see a doctor. But the doctor can’t do everything for us. We still need to take our medication, monitor our illness, and measure our weight, cholesterol, blood sugar, and so much more in order to maintain our health. With so much to do, it’s no wonder we struggle to care for ourselves.

Medication adherence is one example of where we struggle. Prescription medications are a part of life for nearly 70% of Americans, and a full 20% take at least five medications. Medications rely on proper usage in order to be effective, however, an estimated 50% of medications for chronic diseases are not taken as prescribed and up to 30% are never filled.\(^\text{1}\) Non-adherence to medication is implicated in up to 50% of failed treatments, 125,000 deaths, and about 25% of hospitalizations in the United States every year.\(^\text{2}\) Medication non-adherence costs the US healthcare system hundreds of billions of dollars a year, resulting in unnecessary hospitalizations, drug resistance, and even death.

In this chapter, we discuss our research on self-care: we describe experimental interventions that can make us better at caring for our own health as well as correlational studies that hint at the drivers and barriers to self-care. In our metaphor of the Tree of Healthy Life, care is the branches and leaves (see image below). In later chapters we will discuss prevention and finance, the trunks and roots upon which care should be built.
Lose your apps if you don’t take your medication

Most people intend to take their medications on time, but good intentions often don’t translate into action. We wondered whether we could use a novel commitment device to help people commit to taking their medication by setting up future consequences if their actions failed to align with their intentions.

A commitment device is a decision a person makes in the present that is intended to limit their behavior in the future, usually in order to avoid a negative consequence or achieve long-term goals. The most famous commitment device comes from Homer in the tale of Odysseus. Knowing that his ship would soon sail past the irresistible song of the Sirens, Odysseus ordered his men to cover their ears and strap him to the mast of the ship. By doing so, Odysseus used a commitment device: he made a decision in the present to limit his behavior in the future, avoiding his crews’ death at the hands of the Sirens.

We hypothesized that participants who set a commitment device with consequences for failure would be more adherent to their medication regimen than those who did not. The specific commitment device that we tested was a daily consequence for missing a medication dose: if participants missed a dose of their “medication” (which, in this case was the foul-tasting multivitamin Poly-vi-sol with Iron), they would lose access to the apps on their smartphone for the remainder of the day.

Participants with Android smartphones were randomized to use the App Inturrrupts commitment device program or to a no-intervention control in the Pattern Health mobile application. Those assigned to the App Interrupts condition were given a choice: they could only block their “fun” apps (such as games, video, social networking apps and music), or could opt in to raise the stakes to also include their “functional” apps (such as maps, browsers and email). All participants downloaded the Pattern Health mobile application and were asked to track each time they took their medication through the app.

We found that the group of participants assigned to use the App Interrupts program were more adherent to their medication regimen over the course of the study than participants who did not use the App Interrupts program.

This effect on adherence was even more pronounced among participants who opted in to additionally block their “functional” apps.
The App Interrupts condition was 8% more adherent on average to their medication regimen (and as much as 11%) than the control group. But the implications of this research extend beyond medication adherence. If we can use commitment devices to help people stick to their health goals, we can impact a wide variety of health behaviors, from exercise to disease management.

Read more about this study on the Pattern Health website.

Calendar reminders for medication refill requests

Life is busy and it is easy to forget small tasks, like picking up milk at the grocery store or refilling a prescription at the pharmacy. To combat this tendency, we designed a simple but effective intervention to increase prescription refills.

We partnered with a large national pharmacy to deploy our intervention. Just over 170,000 pharmacy customers were randomly assigned to a control, who received traditional SMS refill reminders, or an experimental condition, who received a link that created a digital calendar reminder to refill their prescription a few days before the refill was due.

Sending patients a calendar reminder to refill their prescription resulted in more medication refill requests than the traditional reminder. Receiving calendar reminders increased prescription refill requests by 1.5% compared to those who received a traditional reminder. Importantly, these findings are only for customers with refills remaining on their prescriptions. Participants without remaining refills would need to complete additional steps before a subsequent refill could be called in. Therefore, the calendar reminder was not relevant at the time that they received it.
Reminders serve to help us remember to do important tasks that we may otherwise forget. Forgetting to incorporate a healthy behavior into one’s schedule, such as taking prescribed medication at a specified time, is one of the main barriers to treatment adherence. Utilizing electronic reminders has been shown to improve patient adherence to treatment, and provides a low-cost solution to the forgetting barrier.


If scaled up across the national pharmacy, our intervention could translate into more prescriptions being refilled, improving medication adherence, overall health, and cost savings for pharmacies.

**Purpose in life and medication adherence**

As we’ve learned, medication non-adherence is a preventable problem. It’s imperative that we understand what factors are associated with medication adherence to help people take their medication as prescribed. To do so, we conducted a correlational study that explored relationships between medication adherence, blood sugar levels (HbA1c), and psychosocial factors among 612 participants.

We found an interesting connection between psychological well-being and behavior. Specifically, we found that those who have a higher sense of purpose in life tend to achieve greater adherence to their hypertension medication. This relationship can be further explored by designing experimental studies to examine the potential for a causal relationship between purpose in life and medical decision making.

At CAH Health, we are developing an empirically validated purpose in life intervention to increase positive health behaviors, such as medication adherence. We are creating the intervention in two stages. First, our goal is to explore the best way(s) of manipulating purpose in life through empirical evidence. Second, we will aim to see if there is a causal relationship between purpose in life and health behaviors, as well as to understand the mediators that underlies the relationship between purpose in life and health behavior based on previous research and testing of proposed mechanisms.
Reaching the breaking point: The challenge of diabetes self-management

Preventing and managing type II diabetes is a public health priority for the United States. Although substantial scientific progress has been made toward improving diabetes care, self-management of diabetes remains a challenging task. Critically, many individuals living with diabetes struggle to control their glycated hemoglobin (HbA1c), a measure used to indicate average blood sugar level over the past two to three months. As blood sugar levels increase, so does the risk of experiencing health complications from the disease.

To evaluate which factors influence effective diabetes self-management, we surveyed over 1000 individuals diagnosed with type II diabetes. The survey was designed to uncover how knowledge about diabetes self-management relates to HbA1c.

Our research showed that knowledge about self-management has a negligible impact on HbA1c. However, higher HbA1c levels were associated with a specific type of self-regulatory failure that we call breaking points.

Breaking points occur when one seeks emotional relief by overindulging in unhealthy food or engaging in other unhealthy behaviors, such as smoking, drinking, or drugs. Our research suggests that 46% of people with diabetes experience breaking points more than once per week.

For patients with diabetes, effective management often involves intensive and comprehensive lifestyle changes. People with diabetes must resist pleasurable but unhealthy behaviors and engage in unpleasant but salutary behaviors. This continuous need to monitor one’s behavior may contribute to the fatigue and poor mood often experienced by diabetes patients. In a vicious cycle, poor mood can then reduce individuals’ ability to regulate their behavior. Indeed, our research shows that people who have lower energy and feel less happy experience more breaking points.
People with higher HbA1c levels are more likely to experience breaking points.”

Future research might focus on the emotional and psychological health of individuals with diabetes as a key pathway to improving diabetes self-management. Preventing and managing breaking points is a critical area of focus for researchers, educators, and healthcare professionals to help people with diabetes live healthy lives.

Better understanding breaking points in diabetes patients

Our initial research suggested that breaking points are linked to diabetics’ health, but many questions remain about how and why. To investigate the specific effects of breaking points, we divided them into two types: **controlled** breaking points, where people choose to give in to temptation, versus **uncontrolled** breaking points, where people feel unable to resist temptation any longer.

We conducted a second study looking at breaking points in a sample of 205 people with type II diabetes. We wanted to see if the link between breaking points and health outcomes was better explained by health behaviors like diet and exercise or by psychological factors like diabetes self-efficacy and agency.

![Graph showing relationship with HbA1c](image)

**Taller positive bars indicate a stronger positive relationship—for example, the more uncontrolled breaking points a person had, the higher their blood sugar. Taller negative bars indicate a stronger negative relationship—for example, the more a person had diabetes self-efficacy, the lower their blood sugar.**
Our second study replicated the finding that breaking points are linked to blood sugar levels (HbA1c). However, this study was able to determine that it wasn’t just about the indulgences breaking points represent. Only uncontrolled breaking points were linked to higher HbA1c, even though controlled breaking points represent the same basic behaviors.
We also found that breaking points don’t seem to be linked to many of the conventional explanations for poor health. People with more breaking points don’t have worse overall diet, exercise, or diabetes self-care behaviors.

What sets people with breaking points apart is their psychological state. People who have more breaking points have lower self-efficacy. They also report feeling more helplessness. In other words, people with more breaking points report feeling less capable of managing their temptations, and more likely to believe that their tendency to give in to temptation is an innate thing about themselves that they can’t change.

Although this work is still preliminary, it tells an interesting story. People with chronic illnesses struggle to meet an incredible number of challenges in their day-to-day life. Experiencing breaking points can teach people that they lack control over their lives, which can lead to more breaking points in the future—a vicious cycle of negativity. Interventions that help people regulate their emotions and avoid temptation have real promise for interrupting this cycle.

**Reminders for diabetes and hypertension patients**

Successfully managing a chronic disease, such as hypertension or diabetes, requires patients to monitor biomarkers (such as blood pressure or blood glucose levels) that predict disease progression. If left unchecked, chronic diseases typically follow a pattern of progression over time, resulting
in rising medical costs, as well as higher morbidity and mortality rates. Although consistent and frequent monitoring helps reduce disease-related illnesses, many people struggle to incorporate regular measurements into their daily lives. Part of this challenge can be attributed to the discomfort that comes from receiving bad news such as a high blood pressure reading, the negative stigma associated with having a chronic disease, and the difficulty assimilating new behaviors into one's existing daily routines.

Sometimes we need external tools to help us succeed in changing our behavioral patterns. Setting reminders, for example, help us engage in the right behavior at the right time while reducing the cognitive load of having to constantly keep information readily at the top of mind.

In working with our partners from PharmAccess and the Joep Lange Institute, we’ve examined the effect of a mobile health platform called Afya Pap, designed for Kenyans who’ve been diagnosed with hypertension and/or diabetes, on the management of their disease over time. Given the poor measurement adherence in this population using the Afya Pap platform, we examined the effectiveness of different reminder messages on measurement adherence, as well as on general engagement with the Afya Pap program, such as attendance at monthly patient group meetings.

In Study 1, we sent reminders coming from either the patient’s Preferred Clinic (as specified in their onboarding survey) or their mobile health wallet platform, which was the default source. We found that when the reminder message came from the patient’s Preferred Clinic, measurement adherence was slightly higher than if the reminder came from the general messaging source; however there were not
enough measurements overall to detect meaningful differences across groups. Additionally, we found an almost three-fold increase in attendance at the monthly patient group meeting when comparing attendance before and during the reminder intervention. These results suggest that receiving a reminder message, regardless of whether the message came from the patient’s mobile health wallet or their Preferred Clinic, motivated these patients to increase their engagement with the Afya Pap program. Overall, it appears that sending personalized reminders increases patient engagement with their chronic disease and may represent one low-cost intervention that can positively impact eHealth management.

We’ve also done consulting work with our partners and the makers of the Afya Pap app, where we’ve provided suggestions on how to improve the app’s overall quality. One issue found early in development was that Afya Pap users were seldom entering their measurements into the app. In order to reduce the friction involved in inputting measurements, we suggested simplifying the steps needed to successfully complete this task, and we also suggested adding a positive feedback screen after the measurement was entered to reinforce the behavior of inputting the blood pressure or blood glucose reading. These changes have resulted in a more user-friendly interface that provides immediate feedback for the desired behavior.

**Implementation intentions for weight tracking among congestive heart failure patients**

Weight tracking is an important component of disease management for heart failure patients, as sudden weight gain (in the form of fluid retention) can be a symptom of a bigger problem that can lead to rehospitalization. Weight tracking can generate important life and cost savings by preventing heart failure patients from having an emergency.

We investigated whether implementation intentions could be a useful tool to help patients step on the scale on demand. Although behavioral interventions utilizing implementation intentions often target one-time behaviors, our intervention used the strategy repeatedly over the course of six months to test whether their impact would hold over an extended duration.

In a six month study with 26 congestive heart failure patients,
we gave participants a smart scale and sent two notifications each week to set an implementation intention through the Pattern Health mobile app. These notifications served as an on-demand prompt to take a weight measurement that evening. In the app, participants chose an evening activity (e.g. “after I brush my teeth”) that would serve as a cue for participants to weigh themselves. All participants were also asked to take a weight measurement every morning.

An implementation intention refers to an “if-then” plan, stating that if a certain situation occurs (e.g., if I arrive home from work), then I will respond in a certain way (e.g., then I will go change into my exercise clothes). This specific type of plan has been shown to impact behavior across many domains, including exercise, vaccination, and fruit and vegetable consumption.


We found that when patients set an implementation intention to specify when they would step on the scale later that day, they weighed themselves an average of 71% of the time across the six month intervention. When they failed to set their implementation intention, that number dropped to 36%.
In addition, consistent weight tracking in the baseline period (before the patients were prompted to set implementation intentions) was not associated with more consistent weight tracking in the intervention period. This suggests that the results cannot simply be explained by individual differences, such as more adherent people setting implementation intentions.

Weight fluctuations can be a dangerous indicator for patients with heart failure. Increases in weight need to be caught early to provide the appropriate care (such as adjusting medication dosage), reducing the likelihood of hospitalization. The implementation intention intervention used in this study was simple to implement, low cost, and highly effective at increasing weight tracking. Given the practical benefits and documented efficacy, implementation intentions should be considered wherever possible as a low-cost, high-impact intervention.

Read more about this study on the Pattern Health website.

**Conclusion**

Self-care is indispensable for maintaining good health. Yet more often than we’d like to admit, we struggle to do the things that will keep us healthy. We forget to take and refill our medication, buffer our stress with an unhealthy snack, deprioritize our appointments, and skip our measurements. However, the tools of behavioral science can help us combat the challenge of self-care. In the sections above, we describe our research testing three different behavioral science strategies—commitment devices, digital reminders, and implementation intentions—all of which successfully improved our ability to take our medication, check our blood sugar, and track our weight. In addition, we uncovered
the role that purpose in life and breaking points can play in helping or harming our health, opening up two new exciting avenues for future research.

References
VACCINATION: BELIEFS AND BEHAVIORS
VACCINATION: BELIEFS AND BEHAVIORS

Catherine Berman, Jenna Clark, Jonathan Cloughesy, Julie O’Brien, Lindsay Juarez, Ruth Appel, Jan Willem Lindemans

Introduction

In this chapter, we change our focus from care to prevention. Vaccination is one of the most effective disease-prevention interventions of our time. Experts estimate that during 2017–2018 alone, flu vaccination prevented 91,000 influenza-associated hospitalizations and 5,700 influenza-associated deaths in the U.S.¹ Yet, even when vaccines are widely available, vaccination rates are lower than they should be. As an example, in the 2018–2019 flu season, only 45% of adults received their flu shot.²

Our research aims to uncover the psychological and contextual factors that lead to underutilization of vaccination and develop effective, scalable behavioral interventions that address vaccination barriers.

We have prioritized three psychological areas for our research to take the most comprehensive approach possible to the problem of vaccination uptake. This chapter summarizes a selection of studies from these areas:

1. **Emotion**: What interventions can reduce the aversive qualities of vaccination and make vaccination more pleasurable? Which emotions (such as disgust, fear, and responses to pain) act as barriers or promoters of vaccination?
2. **Social Processes:** To what extent can social norms, social pressure, and identity be used to increase vaccination?

3. **Persuasion:** What interventions shift strong negative attitudes toward vaccination?

We have now completed twelve lab studies and five field interventions, and this report summarizes a small selection of these studies. To learn more about our overall approach and research hypotheses, download our 2018 white paper *Increasing Vaccination: A Behavioral Science Approach.*

Our vaccination research is funded by an academic grant from GSK Vaccines. Our field interventions delivered with Centene are implemented and funded through the Centene Center for Health Transformation.

**Cognitive dissonance and maternal vaccination**

Eighty percent of people agree that adult vaccination is an important priority for the public—but only 45% of adults received their flu shot in the 2018–2019 season.\(^2\)\(^3\) Flu shots are one of many areas in life where people’s behaviors do not match their attitudes. This kind of discrepancy can produce cognitive dissonance, an uncomfortable state of negative emotion that motivates people to bring their beliefs and actions into agreement. In a series of three experiments, we investigated how cognitive dissonance could be used to make people who support vaccination in the abstract more likely to receive their flu shots.
Cognitive dissonance is an uncomfortable sense of tension between one’s beliefs and actions. The unpleasant feeling of dissonance motivates people to change either their beliefs or their behavior so they can feel internally consistent again.


In our first study, we recruited 790 mothers with a second child on the way and asked them to read either an ordinary passage advising them to receive the flu shot or a particularly frightening passage about the risks of the flu while pregnant. We then asked them whether or not they’d received the flu shot in their last pregnancy and asked them to explain why.

Reading the frightening passage had a strong effect on women who had not received the flu shot in their last pregnancy. The percentage reporting strong intentions to get vaccinated among women who did not receive the flu shot in their last pregnancy jumped from 6.61% in the ordinary passage to 9.38% in the fear group. An equal increase in behavior would translate to 106,797 more vaccinated mothers a year across the U.S.

**Reading a fear-inducing passage about the risks of the flu when pregnant boosted strong intentions to get vaccinated from 6.6% to 9.4%, potentially translating into 106,797 more vaccinated mothers each year across the U.S.**

The findings of this study suggest that cognitive dissonance has an interesting role to play in vaccination decisions, but our design wasn’t fully experimental. It makes sense that fear-based messaging only affects women who didn’t receive the flu shot in their last pregnancy, but we can’t rule out other explanations. Instead of using a randomized controlled trial, we looked at differences between women who got the flu shot in their last pregnancy and those who didn’t. For example, maybe women who got the flu shot in their last pregnancy were more conscientious, and this explained the difference in their reactions. To move further with cognitive dissonance, we had to create it in the lab.
Creating cognitive dissonance to encourage flu shots

In our second study on cognitive dissonance, we took 503 people who had not always received the flu shot and asked them about their attitude toward the flu shot in order to make them feel dissonance. We then asked half of those people to write about why it is important to get their flu shot every year, and to share their writing as part of a public sharing campaign. This would make for a very strong intervention: not only would people have to face up that they hadn’t lived up to their attitudes, they’d also have to put those attitudes out there publicly.

We expected that people who had been asked to think about their attitudes toward the flu shot would feel dissonance. Moreover, we expected that the dissonance would be even stronger for those who’d also written about their attitudes and shared them publicly.

We found that just thinking about one’s own attitude toward the flu shot did not change intentions, but having to write for a public sharing campaign resulted in 11% higher intentions to receive the flu shot.

Two interesting things appear to happen in the writing task. People are articulating their beliefs, which might serve as a sort of self-persuasion, and people are pledging to publicize their beliefs, which might make them feel required to live up to them. This experiment can’t tell the full story about why dissonance works: is it writing, or sharing?

The mechanisms of cognitive dissonance and vaccination

915 people who didn’t receive the flu shot every year participated in our third study to get at the heart of this question. We used a more complicated design to tease apart the effects of just writing about vaccination versus sharing your writing with the public.
A third of our participants didn’t write anything, another third wrote about how important yearly flu vaccination is, and the final third wrote about the importance of yearly flu vaccination after thinking about their own vaccination beliefs. Our participants were also asked to sign a pledge to share their thoughts about vaccination publicly or not.

This design lets us vary the level of dissonance with the writing task, and then vary the level of public accountability with the pledge. It also lets us look at different mechanisms, like emotions or beliefs, that might explain our results.

We expected to find that both dissonance and public accountability would increase intentions to vaccinate, and that the combination of the two would be the most successful. In our data, both the writing task and the public pledge increased intentions to vaccinate, and combining them increased vaccination intentions by a full 41%.

<table>
<thead>
<tr>
<th>Behavioral task</th>
<th>Flu shot intentions (1 = Not at all to 5 = Extremely)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO WRITING</td>
<td>2.10</td>
</tr>
<tr>
<td>WRITING</td>
<td>2.32</td>
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</tbody>
</table>

Why did both dissonance and public accountability matter? Further analysis suggested that the writing task increased vaccination intentions by making people feel happier, while pledging to share the writing publicly increased vaccination intentions by making people feel like they were more likely to get the flu. In other words, both emotional and logical factors combined in our experiment to increase vaccination rates.

This work represents some of the first research on how cognitive dissonance can be applied constructively to motivate health behavior. Our simple writing prompt and public sharing pledge had a powerful impact on people’s intention to receive their flu shot, suggesting that desire for consistency can motivate people on both an emotional and a logical level.
Reappraising flu shot pain to influence future vaccine intentions

Remembered discomfort has been shown to influence intentions for future health behaviors like exercise and may also influence vaccination. In this intervention, we asked participants to reappraise (reinterpret) pain from a recent flu shot, and we measured whether their remembered pain influenced their intentions to get a flu shot the following year. We also asked about intentions to get the human papillomavirus (HPV) vaccine for those who are of age and who are not yet immunized.
A total sample of 1,478 students, faculty, and staff at Duke University received a flu shot at a pop-up flu vaccine clinic before participating in our experiment. Participants received one of three different flu flyers and temporary tattoos with different messages about the pain associated with getting a flu shot. We measured participants’ intentions to get a future flu vaccination and HPV vaccination.

The three flyers included the following messages:

### THE FLU SHOT HURTS SO GOOD!

Think about lifting weights or going for a run. Your muscles might feel sore, but that means you’re getting stronger. Vaccination pain is similar. When you feel the pain in your arm, that’s a sign of your body:

- **Getting stronger**
- **Staying protected**

A tattoo for you!

### IT’S FLU SHOT SEASON. YOU’RE IN THE RIGHT PLACE.

Flu shots are a good way to stay healthy. They keep you from getting sick.

A tattoo for you!

### THE FLU SHOT IS SOMETIMES PAINFUL — HERE ARE SOME REMEDIES.

The flu shot keeps you protected. If your arm feels sore from the vaccination, you can:

- Use a cold compress
- Use typical pain remedies
- Do gentle stretches

A tattoo for you!
Since cognitive reappraisal has been shown to help individuals manage pain and negative emotions, we hypothesized that individuals in the reappraisal condition would rate their enjoyment of vaccination pain more highly and show stronger intentions to get a future flu and HPV vaccine compared to the baseline control and pain control conditions.

Participants across conditions experienced very low pain (an average rating of 2.5 on a scale of 1–10) from the flu shot. Participants across conditions also reported similarly high intentions to receive a future flu vaccine and an HPV vaccine (among those who hadn’t yet been vaccinated). It is possible that we found no differences between conditions because pain perceptions were already very low and intentions were already very high for most people. Therefore, we are following up with studies that examine reappraisal for vaccinations that may have higher pain (e.g., multi-dose vaccines with adjuvants) to examine the impact of reframing pain on repeat vaccinations.

**Lay beliefs: The social vs. personal motivators of vaccination**

The personal benefits of the flu shot are frequently emphasized in vaccination campaigns above benefits to protecting others. Human behavior, however, is not only driven by egocentric motives; relationships also play an important motivational role. Emphasizing relationships moves our discussion of vaccination behaviors from the domain of emotions, which we considered in the previous sections, to the domain of social processes.

In a first study, we aimed to understand whether the flu shot is primarily perceived as a strategy to protect the self in order to inform subsequent studies. We hypothesized that: 1) people generally view the flu vaccine as a strategy for protecting the self more than for protecting others, and 2) the more individuals endorse that the purpose of the flu shot is to protect others, the more likely they are to get it.

A sample of 506 MTurk participants completed an online survey and answered questions about their motivations for receiving a flu vaccine, past vaccination behavior, vaccination intentions, and attitudes toward vaccination. We measured the perceived benefits of the flu shot to the self and other groups as well as participants’ level of agreement with reasons for getting the flu shot, such as to protect the self and others.

First, we sought to understand whether people view the flu vaccine as a strategy to protect the self more than as a strategy to protect others. Across different measures of self- vs. other-oriented motivators for a flu shot, protecting the self received higher average levels of agreement than protecting others. The flu shot seems to be perceived as a strategy to protect the self more than to protect others. We also observed that statements about protecting groups closer to the individual (e.g., family) and those more vulnerable to illness receiving higher average agreement ratings.
Second, we sought to determine whether a greater motivation to protect others translates into a greater likelihood of receiving the flu vaccine. We found that viewing the purpose of the flu shot as a way to protect the self and protect others were both important motivators for vaccination intentions: the higher participants’ ratings of the benefit to the self and benefit to others, the stronger their vaccination intentions.

To extend this research, we are fielding a randomized controlled trial that tests flu vaccination reminders emphasizing the risks of infecting the self versus others with the flu.
Using social norms to boost maternal vaccination

Getting a flu shot is even more important when you're pregnant. Pregnant people are both more likely to get the flu and have a much higher risk of serious respiratory complications. However, only 54% of pregnant people were vaccinated during the 2016–2017 flu season.

People often view vaccination as a personal decision with the argument that it touches mostly one's own health. However, flu shots received in pregnancy also provide an unborn child with antibodies and protect them from serious life-long consequences of maternal flu, such as birth defects. Behaviors that affect other people, like maternal immunization, are often subject to injunctive norms.

Injunctive norms are perceptions of how most others would approve or disapprove of our conduct—not what we actually do, but what we "should" do. People abide by injunctive norms in order to avoid disapproval from others. Smoking is a valuable example: the decline in smoking rates across the US can be directly traced to the discovery of secondhand smoke. As soon as smoking became linked to harming others, a strong injunctive norm against smoking in public places encouraged people to smoke less.


We harnessed the power of injunctive norms for maternal vaccination in an experiment with 1,358 pregnant or recently postpartum mothers who signed up for a multi-week series of text messages with helpful tips about pregnancy. The text messages informed participants that they needed to receive the flu shot by November 1st and that their insurance company would be checking up on them to make sure they'd met their deadline. To invoke an injunctive norm, one group of participants were also told that society expected them to get their flu shots to protect their children. We expect to see that feeling accountable would increase vaccination, but especially for those who'd been reminded of the injunctive norm of getting vaccinated for your child.

Data collection was completed on December 10th, 2019. Participants’ flu shot claims will be tracked through the end of flu season, with final analysis upcoming when the data is complete. We look forward to sharing our results in next year’s annual report.
Using dyad-linked lottery incentives to promote flu shot uptake

Lottery incentives are widely used to promote health behavior change. When used to change behavior, traditional lottery incentive structures offer individuals the ability to enter a lottery to win money or another valued reward if they achieve a goal. However, we believe lottery incentives can be made more effective at changing behavior by incorporating social pressure.

The present research compares a novel lottery incentives structure, dyad-linked lottery incentives, with a traditional lottery incentive structure in promoting flu shot uptake. Dyad-linked lottery incentives differ from traditional lottery incentives in that individuals gain eligibility for the lottery if and only if two paired individuals (i.e., a dyad) achieve a specified goal. However, if one of the partners in the dyad does not achieve the goal, neither individual will gain eligibility to enter the lottery, regardless of whether the goal was achieved by the second partner. In a dyad-linked lottery incentive, the two individuals are inextricably linked. They are either both eligible to win, or both not.

Our research evaluated the effect of dyad-linked lottery incentives on flu shot uptake in an experiment conducted on a college campus. In the present study, 13 first-year college dormitories (N = 1,588) were randomly assigned to either a dyad-linked (n = 794) or traditional (n = 794) lottery incentive condition. All students in the experiment were provided with a flu card that offered them the opportunity to enter a lottery for a $20 gift card as a reward for getting the flu shot at an on-campus flu vaccine clinic.

Here's how it works:

If you both get the flu shot, you can win $20 each.

You and your roommate are on a team.

But if you skip it, you're both out of luck.

Students receiving the traditional incentive card were told they would be eligible to enter the lottery if they went to the flu vaccine clinic to receive their flu shot. In contrast, students receiving the dyad-linked incentive card were told they would be eligible to enter the lottery if they and their roommate both went to the flu vaccine clinic to receive their flu shot. The flu vaccine clinic offered free flu shots to all students over the following seven weeks.
Our results show that the rate of flu shot uptake did not statistically differ between the dyad-linked and traditional lottery incentive conditions. These results suggest that the dyad-linked lottery incentive mechanism may be equally effective to a traditional lottery incentive condition. However, our intervention faced numerous challenges in implementation. For example, less than 40% of the participants that received the flu shot reported actually receiving the flu cards. Among participants who both received the flu card and the flu shot, more participants received the dyad-linked card than the individual card. However, we observed the same number of participants in each condition that received the flu shot but did not receive the flu card. This result suggests that the dyad-linked condition may have increased flu shot uptake. However, further research must be conducted before definitive claims can be made. Research looking at the effects of dyad-linked incentives in a controlled laboratory setting is underway and will be reported on in next year’s report.

**Fighting vaccine hesitancy with self-affirmation**

The previous sections investigated how we can leverage social processes to boost vaccination uptake. In the following sections, we return to individual motivation, more specifically, persuasion.

One group of people that has proven surprisingly difficult to persuade is the anti-vaccination movement. The anti-vaccination movement represents one of the strangest stories in public health. Despite an avalanche of evidence proving vaccines are safe and effective, vaccine hesitancy is on the rise; WHO named it one of the top ten global health threats of 2019. To understand vaccine skepticism, we must recognize that people’s beliefs are often more about psychological needs than objective facts. Anti-vaccination beliefs allow parents to feel as if they’re going above and beyond to protect their children. We tested if meeting these psychological needs through self-affirmation—specifically, by reminding people of their past successes—would make them more open to the facts about vaccination.
We recruited 1,087 soon-to-be mothers to either tell us about a time when they felt like good parents, a time when they felt like bad parents, a time when they felt intelligent, or to complete an unrelated task. We then had them read a persuasive passage about vaccination safety and tell us about their intentions to give their child the MMR vaccination.

We found that soon-to-be mothers who self-affirmed their intelligence reported higher intentions to vaccinate.

This result appears to be related to how our participants processed the persuasive passage. Those who had self-affirmed their positive qualities thought the passage about vaccination safety was more convincing, valid, and reasonable than those who hadn’t self-affirmed.

When we think about changing attitudes, our default response is to prove others wrong by presenting evidence and facts. This study suggests we might need to do the exact opposite. By making people confident and secure in themselves, we can equip them to take on the challenging task of re-evaluating their worldviews.
Spite and maximizing frames increase interest in flu shot

Previous research has shown that framing healthy eating as taking a stand against manipulative junk food advertising increases healthy eating in adolescents. This strategy works by tapping into adolescents’ values of social justice and autonomy. We wondered whether framing vaccination as taking a stand against one’s insurance company may have similar benefits.

800 individuals were randomly assigned into 1 of 3 conditions:

» Control
» Maximize (get a flu shot to maximize your insurance benefits)
» Spite (get a flu shot to spite your insurance company)

We expected that participants in the spite condition would show the greatest intentions for getting a flu vaccine.

Compared to control, the Maximize and Spite conditions both increased the percentage of people interested in getting a flu vaccination.
Framing the flu shot as a way to maximize a benefit or spite one’s insurance company led to about 10% more people interested in flu vaccination when compared to control.

**Conclusion**

Vaccination is a powerful way to prevent illness. However, the availability of effective vaccines does not automatically translate into improved health. In order to get vaccinated, people often need to overcome significant psychological barriers. In this chapter, we looked at three ways to boost vaccination uptake: *emotions, social processes* and *persuasion*.

First, behavior is often guided by *emotions*, like disgust, fear, and pain. Our research showed that interventions that can diffuse unhelpful emotions and leverage useful emotions can lead to increased vaccine uptake. Second, people are inherently social beings, and make decisions that are influenced by *social processes*. People care about others and about what others think is the right thing to do. Manipulating social processes offers a powerful approach to influence vaccination behaviors. Third, people are susceptible to *persuasion*. In our research, affirming self-worth and framing vaccination as aligned with one’s values increased intentions to vaccinate.
References
3 LIFESTYLE: A HEALTHY HOME AND WORKPLACE
LIFESTYLE: A HEALTHY HOME AND WORKPLACE

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Introduction

Vaccination is an important pillar in preventing illness. But prevention is obviously not only a matter of medicine. How we live our lives day-to-day has a long-term impact on our health. In this chapter, we focus on lifestyle as a second pillar of prevention. It is probably unnecessary to convince you that many Americans lead unhealthy lifestyles and suffer the health consequences. Still, here are some frightening statistics from the Centers for Disease Control and Prevention. On any given day, 37% of adults consumed fast food. Only 23% of adults aged 18 and over met the Physical Activity Guidelines for both aerobic and muscle-strengthening activity. 72% of adults aged 20 and over were overweight. 15% had diabetes. Mental health is another unseen epidemic, affecting over 18% of adults in the United States.

What can we do? When organizations or public health officials want to encourage people to lead a healthier lifestyle, the usual approach is to present people with information about why a healthy lifestyle is important, as well as about how much exercise to engage in or how many fruits and vegetables to eat. The problem with giving information about how to make healthy lifestyle changes is that it assumes people properly process, retain, retrieve, and act on this information. In reality, people easily forget, and healthy lifestyle changes last only a few weeks at best.
In this chapter, we discuss several solutions we designed based on principles of behavioral science. We offer four broad categories of solutions: **rewards**, **social forces**, **dealing with negative feelings**, and **positive psychology**.

First, solutions that make use of **rewards** try to offer people a carrot to nudge them towards a healthier lifestyle. We will discuss many different rewards-based solutions: monetary incentives, taking away rather than giving (leveraging “loss aversion”), creating a feeling of progress (leveraging the “goal gradient” effect), gamification, points, discounts, and health feedback framed as “Real Age”.

The second category of solutions is based on **social forces**. People care about what other people do and what other people say. In this category, we discuss two solutions: digital coaching and a novel social-coordination device we developed.

The third category aims to **deal with negative feelings**. While it’s often wise to be positive and focus on the good things, dealing with negative feelings in the right way can make a difference. We discuss two solutions: the idea of reappraising pain as something good, and the strategy of focusing on the immediate mechanisms rather than on the future harms (leveraging “present bias”).

Finally, the fourth category is **positive psychology**, or the branch of psychology that focuses on positive experiences: flourishing and happiness. We discuss two solutions: reflection on purpose in life and happiness challenges.
A diagnostic tool for physical and mental health

Before we can think of solutions, we need a careful diagnosis to better understand the problem. As a decision guide for upcoming health interventions, we developed a diagnostic tool in collaboration with the University of Amsterdam. The tool provides information on a target population’s current health status, engagement in current health behaviors, and barriers to a healthier lifestyle.

In June and July of 2019, 150 University of Amsterdam students filled in an exploratory questionnaire measuring their self-reported physical and mental health status as well as concrete health behaviors, including diet, physical activity, mental health practices, smoking behavior, alcohol & drug use, and sleep. For instance, students reported their average weekly frequency of exercise, meditation, and unhealthy meals.

The questionnaire also measured barriers to healthy behavior across domains. Students were asked to rate how important the corresponding health behavior is for them personally (i.e., self-importance), for people close to them (i.e., subjective norms), how often they have attempted and failed to engage in a health behavior (self-control), and how often they forget to engage in a health behavior (i.e., forgetfulness). The questionnaire also measured whether students had formed habits for the corresponding health behavior. The results are reported below for two health behavior domains: exercising and mental health.

In this sample, students rate exercise as more important to oneself and others, as less likely to be forgotten, and as more habitual compared to mental health practices such as meditating or journaling.
EXERCISE WAS RATED AS MORE IMPORTANT TO ONESELF AND OTHERS, AS LESS LIKELY TO BE FORGOTTEN, AND AS MORE HABITUAL

Based on these results, we developed a five-week intervention at the University of Amsterdam to help students practice mindfulness meditation. For more on this intervention, see the section titled Can choosing one’s incentives help encourage meditation?

How to best incentivize exercise: Gaining points, losing points, or both?

In spite of the proliferation of wearable activity trackers, physical activity remains at an all-time low. Recent evidence from a large randomized controlled trial suggests that wearing an activity tracker alone, without supplementation of other behavior change techniques, may be ineffective for increasing step counts or moderate-to-vigorous physical activity. However, pairing these technologies with behavioral science-based interventions may hold the promise that wearables on their own haven’t been able to deliver.

We tested a points-based financial incentive system where participants could: a) earn points for physical activity (which were redeemed for cash at the end of the study), b) lose pre-awarded points that corresponded to the total amount attainable, or c) both gain points when meeting goals and lose points when not meeting goals. We hypothesized that when points were framed in terms of losses (where people would start with points that they could lose if they didn’t hit their physical activity goal), they would achieve greater physical activity than when a points-based system was framed in terms of gains (where people would earn points if they did hit their step goal). The final “combined” condition had the advantage of loss aversion in the “loss” condition as well as the friendlier approach of the
“gain” condition, but we predicted that the mixed message would not be as strong as the pure loss condition.

Participants were randomly assigned to one of these four intervention groups: Reward, Punishment, Combined, or Control. The intervention consisted of a points-to-cash system in which, depending on the condition, points were earned, lost, or both, based on meeting a daily step-count goal tailored to the activity level of each participant. Step goals were assigned based on baseline level of activity in Week 1, and gradually increased over time when participants met their step goals. The points were then exchanged for money after the study, with 6 points being valued at $1 USD. All participants downloaded the Pattern Health mobile application and were given Fitbit devices to track their physical activity for the seven weeks of the study, during which participants were given personally tailored step goals that dynamically increased each week.

The loss-frame group was found to be most effective at increasing adherence to step-count goals, with loss-frame group participants achieving their step-count goals on 53% of days. By the final week of the intervention, 36% of the loss-frame group was achieving an average of more than 10,000 steps per day, an increase from just 7% at baseline. Adherence was determined by calculating the proportion of days per week in which the step-count goal was met (e.g., if the step-count goal was met an average of 3 out of 7 days in a week for a condition, then that condition’s adherence was 42.8%).

The mean increases in steps per week were 13.84%, 10.73%, 5.34%, and 0.47%, for the Reward, Punishment, Combined, and Control groups, respectively. In other words, the Reward and Punishment groups increased their step counts by an average of more than 10% on average each week throughout the intervention. Further, the mean improvement from Week 1 to Week 7 was 1425 steps per day for
the Punishment group, compared to -75 steps per day for the Reward group, -2751 steps per day for the Combined group, and -1944 steps per day for the Control group. All treatment groups had better overall adherence than the Control group.

On top of the adherence results, participants felt that the points-to-cash economy was motivating, accurately reflected activity, and was fair. This is important because even if an intervention is highly effective, it will not result in physical activity improvement if people are not willing to use it. Most participants (95%) opened the app on at least 80% of the days throughout the intervention. Participants liked the app, and perceived the app as motivating. Half (50%) of the sample rated the motivational value of the app at an "8" or higher on the 10-point scale with 10 being "very motivating".

Interestingly, the Combination group started the intervention with the most adherence; participants in this group met their step-count goal 78.5% of the days in the second intervention week, the first week following baseline. By week 4 (three weeks after baseline), however, the Combination intervention became less effective than the Loss-frame group, indicating that the combination of gain and loss frames may not be a sustainable strategy for promoting increased physical activity.

**Can choosing one’s incentives help encourage meditation?**

Monetary payments are often used to incentivize behavior. Payment structure and amount, referred to as incentive schemes, are researched extensively within the realm of physical health behavior. However, the impact of incentive schemes on mental health behavior remains underexplored. In this experiment, we tested whether choosing one’s own incentive scheme can be used to motivate people to establish and adhere to a meditation practice.4

Students from the University of Amsterdam were recruited to engage in daily online guided meditation sessions (5–15 minutes) over a period of 36 days. Participants were randomly assigned to an exogenous condition in which one of two incentive schemes were assigned to them, an endogenous condition in which the participants chose one of two offered incentive schemes, or a control group that did not receive monetary incentives. The two incentive schemes consisted of a 2€ payment for each completed meditation session, or an 8€ payment upon completing a 3-day meditation streak. Adherence to meditation practice was assessed by recording which guided sessions participants listened to, followed by a brief attention check question that asked about the content of the guided session.

This study is still ongoing. We hypothesized that participants who receive an 8€ payment after completing 3-day streaks will complete more meditation sessions than participants who receive 2€ for each completed session. We also hypothesized that participants who chose their incentive scheme themselves would complete more meditation sessions than participants who were assigned
an incentive scheme, regardless of which scheme they chose. The results of this study will be relevant to policy makers who are interested in using incentives to encourage better mental health behavior.

**Boosting exercise through the illusion of progress**

A prominent barrier for persisting with exercise is the perception of sheer endlessness to one’s exercise routine.

In order to combat this feeling of never crossing the finish line, we are currently testing the impact of mulligans (i.e., free passes for missing a day) on adherence to weekly exercise. With the help of mulligans, the goal of achieving a daily exercise is broken up into more manageable blocks. Because mulligans count toward one’s daily exercise goal, they create an illusion of progress—making it seem as if one is relatively closer to completing their weekly exercise goal than they were before. The motivational power of mulligans is based on the goal-gradient effect—the phenomenon that goals become more motivating when the end is in sight.

**People will work harder to achieve a goal as the goal gets closer. This is called Goal Gradient, and it has been shown to impact behavior in many domains, such as the number of coffee cups purchased.**


We believe that the goal gradient hypothesis is also applicable in the context of exercise behavior. At the beginning of the study period, participants received an exercise punch card with a circle for each day of the week over 3 weeks. Each day, participants used the punch card to indicate whether or not they completed their step-count goal, which is based on their previous 7-day step-count. During the final 3 weeks of the 6-week study period, we continued to track participant’s steps without a punch card.

Sample exercise punch card with fixed mulligans on Monday and Friday of each week.
We hypothesized that participants who received mulligans with their exercise punch card would be more likely to meet their daily step-count goal on days not covered by the mulligans, and would have a higher average weekly step count compared to participants who did not receive any mulligans. Data collection is expected to be completed by December 2020.

How do gamification and incentives interact? EXPERIMENT COMPLETE

With streaks, punch cards, and mulligans, we have entered the world of gamification. Gamification is different from material incentives, like paying people money or giving them gifts. Gamification motivates people because games are fun by themselves. They have intrinsic value, and we don’t need extrinsic motivation, like material incentives, to play games. Nevertheless, gamification and incentives are often combined. In a series of studies we investigated how gamification and incentives interact in the context of rewards programs.

Gamification is the application of some game-like characteristics, like points or competition, to an activity. Within the realm of behavior science, gamification is often implemented as an online marketing technique to encourage engagement with a product or service. Since gamification implies the addition of game elements (such as points, levels, and badges) as incentives, the key aspect of gamification are rewards that provide extrinsic motivation to the user. With regard to health behaviors, which are often motivated by both intrinsic and extrinsic forces, gamification offers a potentially powerful intervention to keep people motivated.


Rewards programs are found in grocery stores, mobile applications, gas stations, and the local bakery. Often, these programs offer monetary incentives—typically in the form of discounts or points toward an item for purchase. In the domain of health behavior, companies that promote apps designed to help people stay healthy will offer rewards to incentivize their users to remain engaged with the app.

We know that gamifying unpleasant activities, such as providing points or an external reward for exercising or dieting, can motivate people to stick with these activities. However, research suggests
that material rewards can crowd out intrinsic motivation for certain behaviors, meaning that your enjoyment of an activity can be diminished after being provided an external reward.\textsuperscript{7}

To investigate this phenomenon further, we studied a rewards program that combines gamification (in the form of points) and material rewards on motivation and exercise behavior.

In Study 1, we collaborated with a mobile application for eating healthy. The app included a rewards program offering points for healthy behaviors, which could be redeemed for discounts on the application provider’s webshop. We inserted an informational message within the app and varied the reward scheme highlighted within the message to be points toward discounts, points only, or no reward. Across a sample of approximately 39,000 users, we found that twice as many people clicked the link to redeem their points as compared with users clicking to redeem points for discounts in the webshop, but both the points and discount rewards groups clicked the link more than users given the health-related message without any reward.

In Study 2, an email was sent to users of an exercise app which provided information about the importance of a healthy lifestyle and highlighted one of four rewards prompts, with the goal of assessing which reward scheme would produce the greatest level of exercise behavior. Exercise behavior was measured through the user’s step count during the two weeks following the email. In the email, users were either made aware of the possibility to collect points or not, and were introduced to the provider’s webshop or not. Results showed that when points were mentioned, linking them to the webshop increased users’ step count compared to when the webshop was not mentioned.

Contrary to study 1, where we found that more people redeemed points than discounts, study 2 showed that people who were given points linked to a webshop exercised more during the post-
intervention period than people who were given points that weren’t linked. Therefore, study 3 was an attempt to disambiguate the contradictory results found in studies 1 and 2.

In study 3, we created a cognitive training game and varied the reward scheme provided during the game. Participants could either receive points, discounts toward a webshop, points toward discounts, or were assigned to a control group where they received no reward. We were interested in whether people would choose to play more rounds of the game if they were given a reward, or whether offering a reward in the form of discounts to an unknown webshop would backfire and result in a low number of chosen rounds.

We found that participants who were told they would receive points, discounts, and points toward discounts for their performance played more rounds of the game as compared with people who received no reward. Participants who received only points completed the highest number of rounds, which suggests that gamifying a cognitive task by providing a reinforcing scoring system to track performance may be a more effective way of incentivizing people to engage in cognitive health task than offering monetary incentives in the form of discounted webshop purchases, or offering no reward incentive.

However, when we compared the average highest score across rewards groups, we found that those offered a discount based on game accuracy showed the highest scores across groups, and was higher than the no reward group. Overall, there was no difference across the three rewards groups for the average high score, suggesting that offering points, discounts, or both rewards incentivize people to play well. The other thing to note is that those offered discounts chose to play less rounds, but played more accurately during those rounds, than those offered points or the combination of points and discounts. This suggests that rewards may exert their influence in different ways, depending on what behavior is being measured.
Taken together, these studies suggest that providing rewards as discounts or points increases motivation to engage in health behaviors. Using gamification to boost health behaviors with these kinds of rewards may help people develop healthy habits over time.

**Does telling people their Real Age motivate them?**

What if I told you that you were younger, or older, than you thought? What if I also told you that, unlike your chronological age, which is out of your control, you also have this thing called Real Age that is largely determined by your life choices? How might this information affect your motivation to live a healthier life?

Real Age is a health age score that is determined by the rate of healthy behavior choices across a number of important health categories, such as exercise, nutrition, and stress. Although determining Real Age is more complicated than counting the years you've been alive, this score may be a better predictor of your longevity and the quality of your life during years ahead.8,9 This is because your Real Age takes into account your lifestyle choices, providing a number that better predicts your chances of dying from age-related diseases, like cardiovascular disease.

One question that has not received much research attention is whether receiving positive or negative Real Age feedback differently motivates people to engage in a healthier lifestyle. To address this gap, we decided to examine the effect of positive and negative feedback from a Real Age score on people's motivation to engage in healthier behaviors.

We sampled users who took a Real Age test, a feature on Actify's website at the time, to see whether users whose Real Age was older than their chronological age were less likely to engage in health-
related content on the website or not. We predicted that people who received an older Real Age score would be less motivated to engage in health behavior. This is because people tend to avoid negative information even if it could be useful—a phenomenon known as the ostrich effect. Our results showed that people who received a Real Age score that was younger than their chronological age returned to the website more often compared to people who had received an older Real Age score.

People avoid information that could contain bad news for them, even when this information could be useful to them. This is called the ostrich effect, named after the myth that ostriches bury their heads in the sand to avoid danger.


Although Study 1 confirmed that those with a younger Real Age were more motivated to continue being healthy, these results were correlational, leaving us unable to determine whether the positive Real Age feedback increased people’s motivation to be healthier.

To determine whether a younger Real Age score could motivate people to be healthier, we designed an experiment with four experimental groups. After taking a Real Age test, participants received a fabricated Real Age score that deviated from their chronological age in direction (younger or older) and degree (±3% or ±15% of chronological age). We also included a control group who received no Real Age score but still took the Real Age test, consisting of questions about nutrition, exercise, sleep, stress, tobacco and alcohol use, and social support, as well as some demographic questions.

We found that motivation to begin a healthier lifestyle did not differ between people who were randomly assigned a younger Real Age score compared to those who received an older Real Age score, although there was a trend among those who received young Real Age scores to be more motivated to engage in health behaviors compared to older age groups. Contrary to our initial hypothesis, we found that participants who were assigned a much older or younger Real Age (±15% of chronological age) were more motivated to be healthy than those assigned a slightly older or younger
Real Age (±3% of chronological age). In addition, telling people their Real Age was slightly older than their passport age resulted in a backfire effect of reducing motivation to begin a healthier lifestyle.

In an additional study, we assessed whether people would be more motivated to be healthier if they received a positively framed, as compared with a negatively framed, message regarding the consequences of their health behavior. Users of a recipe app received either a positively framed message stating, “You stay young when you eat healthy”, or a negatively framed message stating, “You age faster if you do not eat healthy”. Results showed that people who received the positively framed message were more likely to click on a notification directing them to the app’s recipe overview page.

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Overall, these initial findings suggest that telling someone that they are younger than their chronological age, or telling someone they could stay young by being healthy, results in a slightly greater motivation to be healthier in the future. However, our findings also suggest that telling people their Real Age is slightly older than their passport age results in a backfire effect of reducing motivation which is largely driven by participants who expect their Real Age to be younger, but who received an older Real Age score, akin to worse-than-expected news. Further analysis revealed that receiving a slightly older Real Age decreased self-efficacy levels, which in turn lead to a reduction in motivation, suggesting the importance of tailoring messages about Real Age to improve one’s confidence in being able to make healthier choices in the future.

**People prefer a digital coach to gamification and incentives**

If you are developing a new mobile app to help users develop new healthy habits, what would be the most appealing concept to your users? Gamification, material incentives, or a digital health coach? We partnered up with Actify to test these different ways to frame a new app. We developed three lifestyle app prototypes and tested whether gamification, incentives, or a digital coach proved most appealing to potential users. In a gamified app, users would play an intrinsically enjoyable game that also would benefit their health. The incentives prototype combined traditional material incentives with “moral” incentives (earning money for charity) to incentivize healthy behavior. Finally, the digital health coach would provide each user with social satisfaction from being able to chat with a health coach, in addition to providing personalized advice to help achieve a healthier lifestyle.

**App Prototypes**
Across four studies, Actify and CAH collected both qualitative and quantitative data that evaluated the attractiveness and ease of understanding for each prototype. Our team conducted phone interviews and online user tests which provided qualitative feedback on design and style of the prototypes, as well as a better understanding of the factors that made each prototype attractive or unattractive to the user. After some iterations, we drew up mock advertisements for each app concept, put them on the web, and analyzed their popularity on the basis of click-through rates. In our final study, we used the mock advertisements in an online experiment to collect app ratings according to a number of criteria, such as engagement, ease of use, level of excitement, and motivation to engage in healthy behaviors. In addition, we collected feedback on the perceived function of the app, willingness to pay for the app and potential users’ interest in overall usage. After analyzing the data, we found that potential users rated the digital health coach as the most successful concept.

**Increasing standing during meetings with a light**

Working in an office means getting stuck in the inevitable marathon meeting, sitting in the same chair for hours at a time. Sitting through meetings can get uncomfortable after a while, and you might get the urge to stand up and stretch your legs. That discomfort is something we should be paying more attention to, as sitting for long periods of time is associated with a number of negative outcomes (see [Leveraging present bias to reduce sedentary behavior](#)). Unfortunately, you also don’t want to draw a lot of attention to yourself or disrupt the meeting by standing up. We have developed the “Shine and Rise” to help solve this problem. The Shine and Rise is a small light that flicks on every once in a while as a reminder to stand up. We hope that it will help to make standing up in meetings more socially acceptable and to help remind people that even during meetings, it is important to take care of our bodies. Moreover, since the lamp tells everyone at the same time that they need to stand up, people will no longer feel embarrassed to be the only one standing up. In that sense it is a social coordination device: It coordinates a social situation in which it is difficult for an individual to act alone. Currently, the Shine and Rise has been beta-tested in our office here at CAH, with plans to test it in a different office setting once we have developed a version that we think will be most effective.

**Changing the pleasantness of exercise pain using reappraisal**

Physiological discomfort is often cited as a barrier to initiating and persisting with exercise. But exercise pain isn’t just physical—it is also influenced by cognitive and emotional factors. In a recently published study, we tested the impact of reinterpreting pain as helpful, a strategy
known as cognitive reappraisal. We expected that positive reappraisal would lead to higher exercise persistence and improved affect during exercise.

We randomly assigned 78 participants between the ages of 18 and 55 to listen to a voice recording that framed the purpose of pain as a sign of muscle building (‘Helpful’) vs. a sign of muscle tearing and possible injury (‘Harmful’). We measured exercise persistence, operationalized as the number of bench press repetitions completed before and after the recording, as well as affective valence, pain valence, pain intensity, exercise-task anxiety, and arousal.

Participants in the Helpful condition felt less negatively about their pain, but they did the same number of bench press repetitions as those in the Harmful condition. No other affective variables differed between the two groups.

**Framing exercise pain as a positive sign of muscle growth made people feel less negatively toward exercise pain, compared to framing exercise pain as a negative sign of possible muscle injury.**

This experiment shows that it is possible to change feelings during exercise without changing the physiological nature of exercise—people can still lift weights the same number of times but feel less negatively about their pain. Since affect during exercise is associated with future exercise intentions,
it is possible that a reappraisal manipulation like this one could also lead to improvements in people’s plans to exercise in the future.

**Leveraging present bias to reduce sedentary behavior**

We typically think of engaging in healthy behaviors as sacrificing today in order to reap rewards (or avoid catastrophe) tomorrow. Organizations devoted to promoting a healthy lifestyle also tend to frame their messages in this way—focusing on the long-term outcomes that are associated with a particular behavior. Unfortunately, threatening people with the spectre of distant consequences rarely has much of an effect on behavior, even when those consequences are dire. People care about seeking pleasure and avoiding pain right now—a phenomenon called present bias. Furthermore, the likelihood of facing one of these future consequences is uncertain, meaning that this kind of messaging is asking people to sacrifice now for the mere possibility of avoiding a negative outcome in the future.

Rather than focusing on abstract, potential future outcomes, we decided to see what would happen when we developed messaging that focused on what was happening to people’s bodies in the present moment. The behavior we chose for this project was standing up more often at work. Research shows that we spend more than half of our waking hours sitting down. Sitting for too long can cause blood to collect in one’s leg veins, putting added pressure on these veins, it can cause joints to stiffen, muscles to weaken, and digestion to slow. Prolonged sitting is also associated with harmful long-term health consequences. Sitting for hours on end is positively associated with an increased risk of serious ailments such as heart disease, type 2 diabetes, and certain cancers.

We have collected data from one online study using Mechanical Turk (N = 1,203). Sixty-five percent of our participants said that they used Mechanical Turk as either a part-time or full-time job and 42% reported working over 20-hours per week on Mechanical Turk. In this study we gave participants
one of four messages about the dangers of prolonged sitting: a message highlighting the long-term consequences of sitting too much (e.g., diabetes, cancer, etc.); a message explaining the body’s immediate reaction to prolonged sitting (blood pooling and putting more pressure on veins, joints stiffening, etc.); a message explaining both the body’s immediate reaction to prolonged sitting as well as its long-term consequences; and a generic control message that simply told participants that health researchers recommend standing once every 30-60 minutes (this message was present in all conditions). After completing a few survey questions about their opinions and reactions to the message themselves, participants were asked if they would like to take 30-seconds to stand up. They were also told that if they agreed, they would have to stand for at least 30-seconds and they would not be paid for this extra time. If they did not agree to stand, then they would simply move on to the rest of the study.

Across all conditions, 73% of participants agreed to take 30-seconds to stand, suggesting that given an opportunity to stand, most people will take it (even when that opportunity comes with a minor cost). However, even with this high rate of standing, a larger percentage of people reported standing up when the messaging did not include information about the long-term consequences of sitting for too long. In other words, a message informing participants of the immediate effects of sitting for too long did not increase standing relative to the control, but informing participants of the long-term effects of sitting for too long decreased rates of standing.
Although standing rates were smaller when discussing long-term consequences, participants did rate messages that involved long-term, short-term, or both kinds of messages as more informative, vivid, and motivating than control messages.

When motivating people to be healthier, rather than focusing on long-term outcomes, tell people what these behaviors are doing to their bodies right now. Not only will this make them more likely to engage in the behavior, but it will also help them feel more informed about what it is they are doing for their health when they remember to stand. Although we are just beginning to understand the ways in which emphasizing present versus future outcomes can motivate people to engage in more healthy behaviors, this first study signals a promising start.
Increasing purpose in life and exercise intentions through values

When someone has a purpose, they are engaged with life-long goals that are meaningful to them. Research has shown that purpose in life is associated with a number of positive health behaviors, such as exercising, eating healthy, and using preventative health care services. However, the majority of this research is correlational, leaving us unsure whether having a purpose causes one to engage in positive health behaviors, if people who engage in positive health behaviors have greater feelings of purpose, or if there is a third variable affecting both purpose and health.

Purpose in life can be defined as an ultimate aim that one makes progress towards that is meaningful to the self and contributes to matters larger than the self. Researchers argue that one’s purpose is motivational in nature, meaning that the person is motivated to do activities that align with their purpose. For example, religiosity can be a source of purpose in life, which is pursued through activities such as attending bible school or praying every day. Greater purpose in life has been associated with healthier decision-making and lower mortality. Researchers hypothesize that purpose in life may be related to physical health because purpose enables us to do the things that are important by making barriers appear less daunting.


We wanted to examine whether a causal relationship exists between purpose in life and intentions to exercise. Before we could test for a causal relationship between purpose and exercise intentions, we needed to increase people’s sense of purpose. In order to do this, we examined whether cueing one of two types of values—self-transcendence (activities aimed at helping others) or self-focused (activities aimed at focusing on the self)—increase people’s sense of purpose. Next, we wanted to see if increasing people’s sense of purpose in life would lead to greater intentions to exercise.

We hypothesized that those who reflected and wrote about self-transcendence values would report higher purpose in life and greater intentions to exercise than those who wrote about self-focused values and a control group. We suspected that self-transcendence values would enable individuals...
to understand that they are a part of and contributing to something that is bigger than themselves. Therefore, these individuals were expected to engage in positive health behaviors in order to further contribute to something beyond their personal needs.

We tested this hypothesis with 1,083 participants on an online survey platform. Participants who reflected on and wrote about self-transcendence values and those who reflected on and wrote about self-focused values both reported higher purpose in life than the control participants. However, no difference in ratings of purpose in life was found between the self-transcendence values and self-focused values.

Lastly, the self-focused condition reported greater intentions to exercise than the self-transcendence condition and the control. An additional analysis showed that self-focused values and purpose in life independently led to greater intentions to exercise.
Findings from this lab study will be implemented into field experiments in order to understand how we can connect one’s purpose to their health and improve adherence to health behaviors. If this strategy is successful, fostering purpose may become a promising pathway to support health and well-being.

**Reducing employee anxiety with short happiness challenges**

Many employers are actively pursuing ways to increase their workforce’s well-being in hopes of improving their organization’s productivity, employee retention, and innovation. Employee well-being is linked to a myriad of positive benefits, both for the employee and the employer, as employees with higher levels of well-being exhibit better job performance, life satisfaction, physical health, and are more likely to innovate at work.\(^\text{14,15}\)

Methods or intentional activities that aim to cultivate positive feelings, behaviors, or cognitions are often referred to as **positive psychology interventions (PPIs)**. For instance, PPI strategies such as writing gratitude letters, practicing optimistic thinking, replaying positive experiences, and socializing have been shown to increase well-being in nonclinical samples.

Reading:


Through our partnership with Guilford County, North Carolina, we tested whether a PPI in the form of daily happiness challenges could address the root problem of low local government employee well-being.

For a period of three weeks, all 2,388 Guilford County government employees were randomly assigned to either a treatment group, which received daily emails containing short happiness challenges, or to a control group, which did not receive the happiness challenges. The theme of the daily challenges centered on mindfulness and gratitude.
Today's well-being and happiness-boosting challenge:

Research suggests that recalling positive events can improve our happiness. Today's challenge is to write down (on paper, your computer, in your phone, or elsewhere) 3 positive things that happened to you in the past few weeks.

From the Guilford County Happiness Project, thanks for participating!

Both groups reported their wellbeing through twice-weekly surveys, which asked employees to evaluate their life satisfaction, purpose, happiness, and anxiety. Our results showed a reduction in anxiety for employees who received daily happiness prompts, yet little difference in life satisfaction, purpose, or happiness.

Table: Two-tailed comparison of means test, comparing survey response scores

<table>
<thead>
<tr>
<th></th>
<th>TREATMENT GROUP</th>
<th>CONTROL GROUP</th>
<th>DIFF.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction</td>
<td>7.31</td>
<td>7.14</td>
<td>+0.17</td>
</tr>
<tr>
<td>Purpose</td>
<td>7.81</td>
<td>7.63</td>
<td>+0.18</td>
</tr>
<tr>
<td>Happiness</td>
<td>6.95</td>
<td>6.83</td>
<td>+0.12</td>
</tr>
<tr>
<td>Anxiety</td>
<td>6.12</td>
<td>5.76</td>
<td>+0.37*</td>
</tr>
</tbody>
</table>

** p<0.01, *p<0.05

Note: Scores for each survey questions are averaged across all six survey dates. Unit of observation is one person, so n=876 for "All surveys".
Employers spend nearly $700 per employee each year on well-being initiatives, a number that is rising quickly. The Guilford County Happiness Project successfully reduced employee anxiety. The implication that a short, cheap, and relatively easy daily challenge program can, at least in the short term, reduce self-reported anxiety among county employees can be tremendously useful to local government leaders.

Based on feedback from the employees at Guilford County and previous technical constraints, a number of refinements were made before the launch of studies 2 and 3.

In Study 2, also in partnership with Guilford County, North Carolina, we are currently running a similar randomized controlled trial, in which all County employees have been randomly assigned to either a treatment group receiving emails containing short happiness challenges, or to a control group that does not receive the happiness challenges. To assess the persistence of the reduction in anxiety, we have extended the timeframe to eight weeks, while at the same time reducing the challenge frequency from daily to three times per week. This decision was based on Guilford County Employees citing an overwhelming number of emails in the initial study, as a lower frequency of wellbeing tasks are more effective due to the associated novelty and meaningfulness. We also have expanded the reach to include challenge themes encompassing multiple facets, such as expressing gratitude or practicing acts of kindness. Again, both groups report their wellbeing through weekly surveys, which ask employees to evaluate their life satisfaction, purpose, happiness, and anxiety. Lastly, we will flip treatment and control groups at the end of the study period, allowing employees assigned to the control group to also receive the happiness challenges. Data collection will be completed by summer 2020.
Study 3 aims to replicate the approach in partnership with the City of Greensboro, North Carolina, which started in January 2020. In this version, we have further reduced the challenge frequency from three times per week to once per week, while extending the overall study period to twelve weeks. We have also increased agency through choice: giving participants in the treatment group the choice of 2 challenges per week. Upon choosing 1 of the 2 challenges, participants are asked to complete a commitment contract, specifying when and at what time they will complete their chosen challenge. Lastly, we decided to further lower the number of well-being check-ins from weekly to bi-weekly.

### Sample Email Study 3

#### Choose your Happiness Challenge for this week

{[Image of email with options to choose personal values or take a walk]}

From the Employee Happiness Project, thanks for participating!

If you want to opt-out and not receive any challenge or survey emails, please click here (please allow for 1-2 days to process).

City of Greensboro - 300 W Washington St - City Administration - Greensboro, NC 27401 - USA

### Commitment Contract Study 3

#### Commitment

You have selected your Happiness Challenge! Now choose a time and date to complete it. Evidence shows that making a plan increases the likelihood that you follow through.

I’m going to complete my “Visualize Your Day” Challenge on...

- [ ] Friday this week

at:

- [ ] 10:00am

We will now send you an automated email of your commitment contract for this week’s Happiness Challenge. Print it or save it as your desktop background.

Powered by Qualtrics
## Conclusion

In this chapter we discussed a second pillar in disease prevention: living a healthy lifestyle. We discussed several solutions that can be grouped in four categories: *rewards*, *social forces*, *dealing with negative feelings*, and *positive psychology*. Our research shows that progress can be made by a nuanced use of material and immaterial rewards, of personal and social approaches, and of positive and negative forces—at home and in the workplace.

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FINANCE: SAVING FOR HEALTH CARE AND HEALTH INSURANCE
Introduction

In this chapter, we discuss some of our work on saving for health care and health insurance. We end with finance, although in a sense it should be the start and the source of people's health journey. Living healthily is costly, and so is health care. That is why we represent it as the roots of the Tree of Healthy Life.
Our research on personal health finance focuses on Kenya, where we teamed up with a local partner to tackle health access via finance. The World Health Organization estimates that over 150,000 Kenyan children died from preventable causes in 2011 alone. One reason is that people simply cannot afford to get treatment for themselves or their children, particularly those living in informal settlements and rural areas. In 2015–2016, more than one in three Kenyans lived on less than the international poverty wage (US$1.90 per day). For these individuals, a simple cough can quickly become pneumonia if left untreated. Parents often have to make tough decisions between basic necessities like food, shelter, and medical care. Saving for health care and health insurance can be difficult, but life-saving.

Unfortunately, health insurance coverage in Kenya is very low, about 19% nationally. The vast majority of those with health insurance are covered by the national health insurance, called NHIF (National Hospital Insurance Fund). The Kenyan government aims to have full health coverage for all of its citizens by 2022. Most individuals will be covered by NHIF, with the majority having to pay for at least a portion of their premiums, and government subsidies covering the rest of the cost.

In this chapter, we introduce a novel product launched in Kenya: a digital wallet to save for health care and for health insurance. We discuss barriers and catalysts we identified for users saving money into the wallet. Then we discuss several solutions, including: placebo insurance cards to increase trust, a game to improve fluency with the savings process, a calendar to plan and track savings, an improved user journey that identifies possible barriers and solutions for savers, and messages that leverage social norms. Another way for individuals to fund health insurance is to get help from family or friends, such as through remittances. We discuss some obstacles to leveraging remittances. Finally, before people can start saving for their insurance premiums, they must enroll. We briefly discuss how vouchers can leverage loss aversion and nudge people to sign up.

**A digital health wallet with special benefits for young mothers**

How can a government provide healthcare to so many of its citizens effectively? One solution is the use of digital wallets. M-PESA, launched in 2007, is a digital wallet that allows users to deposit, withdraw, and transfer money, as well as pay for goods and services, using deposited money stored electronically on the users’ phones. By 2010, M-PESA had become the most successful mobile phone-based financial service in the developing world.

To help Kenyans with their health finances, we partnered with M-TIBA, a digital wallet similar to M-PESA. However, this wallet is only used for healthcare costs. An M-PESA user can transfer money to their M-TIBA wallet and use it for most health costs at participating M-TIBA clinics. Unlike M-PESA, which charges transaction fees, M-TIBA is completely free to use and users can add anyone as a dependent, allowing family and friends to benefit from their health savings. A person can sign up for
M-TIBA and then save as little as 10 cents at a time. The goal of M-TIBA is for users to save little by little, so that when a health issue arises, the individual can dip into their M-TIBA wallet to pay for medical care. Our partners hope to use M-TIBA as a method to save and pay for NHIF health insurance premiums.

While enrollment in M-TIBA has been high (about 2.5 million users since its start in May 2016), savings rates have been low. Most users have never saved in their health wallets. CAH Health, in collaboration with the PharmAccess Foundation and CarePay, has worked to increase savings in these health wallets. We have provided our partners with a number of solutions to the various problems that arise at different stages in the process of achieving this goal.

Our work on health financing in Kenya involves work with i-PUSH, a special program that provides subsidized NHIF insurance to low-income Kenyan mothers who have young children or are expecting, as well as their immediate family members. Women in the program are asked to save towards their NHIF health premiums using M-TIBA, with the goal of increasing health access and financial security to those who need it most. They are provided a year of health insurance for free, and a second year at a 50% discount.

**Saving for health insurance: Barriers and catalysts**

It is difficult for young Kenyan women to save money for health care and health insurance because of competing expenses, such as food, shelter, and school fees for their children. Additionally, whereas women tend to be in charge of the household (which includes caring for the health and well-being of the family), men are commonly in charge of finances. Therefore, if the man does not value saving for health emergencies or insurance, then health financing becomes even more challenging. Most women who have subsidized health insurance still do not save for their premiums, causing them to lapse in coverage after one year. We wanted to learn more about the experiences of young women in setting money aside for health insurance, particularly the obstacles they face and how those obstacles might be resolved, with an eye to determining what works and what could be improved upon for future health insurance savings programs.

We conducted 48 in-depth interviews of women of reproductive age, and we centered on 3 primary touchpoints: enrollment into the health insurance program, saving for premiums, and utilization of clinics.
We found that, overall, women are excited about having and saving for health insurance, but implementation issues such as users receiving incorrect or incomplete information, users not receiving their insurance card, and dependents not being added to the coverage hamper the success of the program. We also found several catalysts of saving, such as using the benefit, having the insurance card, having a savings calendar, and practicing saving. Finally, we also found that women prefer self-reliance in longer-term saving, but seek outside help in emergencies.

Improving implementation (e.g. quick, efficient disbursements of insurance cards) and changing users’ relationships with healthcare from reactionary to proactive are important steps for the future success of health insurance savings programs.

“I was happy because there are days I go to the hospital without enough money and the drugs are expensive. Currently it is okay to just give them the [NHIF] card.”
- Respondent in Nairobi

**Improving trust with placebo insurance cards**

Another issue at the root of the lack of health insurance coverage in Kenya is that many people don’t see the immediate benefit of insurance. Kenyans like to see their money work for them, so they may invest in small loans that will provide an increase in income from accumulated interest, or they may try to buy and sell goods to make a profit. They see health insurance as a waste, since they feel like they are losing their money each time they pay into it and may not receive anything in return. In addition, there can also be a general lack of trust of new people and new programs. There is a high incidence of fraud in the informal settlements, with scammers trying to enroll people into new “programs” and sending people fraudulent text messages. Because of this, new legitimate programs face increased scrutiny and are often dismissed as scams, particularly if they are asking for money without giving an immediate benefit, as is the case with health insurance.
One potential way we found to increase trust comes from our previous qualitative work on young women saving for subsidized health insurance—providing insurance cards in a timely manner. One of the primary reasons many users gave for not saving or engaging in the insurance program was because they received their insurance card very late, or never received it at all. Even though program users could use their national ID cards to access services, this fact was not widely known, and those who were aware of it often did not fully trust it. Since they did not have the card, they felt like they weren’t really part of the program, thus reducing trust and engagement in the program.

We helped our partners with the design of an official-looking interim insurance card, with the goal of prompting users to save more for next year’s premiums, and utilizing their coverage more frequently. The insurance card did not have a real function, since it was not issued by the insurer and was not required for people to have their expenses reimbursed. But we hypothesize it has psychological benefits similar to placebo pills. It has a placebo effect. The insurance card may be used in subsequent subsidized health insurance programs to help increase trust and legitimacy.

Prototype of card

**Practice saving with a savings game**

When organizations want to encourage people to save money, the usual approach is to give those people information about why they should save, as well as about how they can save. The problem with giving people information about how they can save is that it assumes people properly process, retain, retrieve, and act on that information. In reality, people are forgetful. They forget what the information is and where they can retrieve it (e.g. where they kept the brochure, etc.). Even if they still have the information available at the time that they need it, it may be difficult or tedious to go through all of it. The problem is exacerbated when a savings product gets more complicated (i.e., it requires many steps involving passwords or login information in order to save). Moreover, knowledge of how to do things mainly relies on procedural memory rather than declarative memory, making information less likely to produce meaningful change.
Given that individuals may struggle to save for their health insurance premiums via their digital health wallets because of the many steps involved, we suggested that our partners’ field agents play a savings simulation game with users when they are signing up for the wallet. The game is meant to be fun while also allowing individuals to practice transferring their money. In order to play, the person first rolls a die. Whatever number the die lands on is multiplied by ten, and a field agent transfers this amount of money into the person’s M-PESA digital wallet. As soon as the customer receives the money, they must then transfer it to their M-TIBA health savings wallet as quickly as possible. They then repeat the game multiple times to see how fast they can get at transferring to their health savings wallet. This game makes the act of saving rewarding and fun while also getting the customer comfortable with the process of saving and giving the agent the opportunity to help them with any obstacles they may run into when trying to save.

**A calendar to plan and track saving**

Even if we have the intention to save money, we often postpone our savings because we lack a specific plan, or we may simply forget because nothing reminds us of our plan. This is called the intention-action gap.

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**Declarative memory** is articulable knowledge, as in the definition of a word, a fact about the world, describing a location, or a memory from one’s past. **Procedural memory** is memory for motor or cognitive skills, which are generally difficult to verbally explain (as in riding a bicycle, or when one can’t remember a phone number, but knows which buttons to push as soon as a keypad is presented.)

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**The intention-action gap** is the difference between what people say they would like to do and what they actually do. Often we plan to do something good for ourselves (e.g. exercise after work), but fail to do so. We have a desire to exercise, but when it comes time to do so, we choose not to do it or forget.

Health insurance needs to be renewed each year, which means families need to have the savings available to pay for insurance each year. Keeping track of long-term savings is a challenge.

To combat this challenge, we developed a health savings calendar for our partners to distribute to individuals when they sign up for health insurance. This calendar consists of several features which are meant to help individuals remember and keep track of their savings, including:

» Space to write in their savings plan within the calendar dates.
» A story on each new page that shows how having health insurance can help avert health disasters.
» A tracker in which they fill in a block every time they save 10 Kenyan Shillings.
» Reminders for how to transfer money to their health savings wallet.
» A space to personalize their calendar with pictures of their family.
A better user journey for young women saving for health insurance

We worked with our partners to create an optimal health insurance user journey based on our collaborative work. This journey incorporates the previous insights from the interim health insurance card, savings game, and savings calendar. In addition, it includes other recommendations from our qualitative work, such as making certain that users are able to add all of their family members to their coverage and providing confirmation of milestones reached. All of these elements were incorporated into an ideal user journey, with the ultimate goal of creating the best possible opportunity for young Kenyan women to access and sustain health care via health insurance.
Changing social norms about health insurance

An important obstacle young Kenyan women face is that obtaining health insurance is uncommon in the informal settlements. Whereas it is socially normative to have health insurance in many developed countries, the opposite is true in the informal settlements in Kenya. However, in these settlements there are other social norms and cultural institutions that provide financing for health emergencies, such as harambees and chamas. A harambee is a call for financial assistance by an individual or a group, typically for a bigger expense such as a building project or single large medical expense. A chama is a group comprised typically of women who usually meet once per month and contribute to a group pot of money that is then paid to one of the group’s members each meeting.

Social norms are powerful drivers of human behavior. They push people to engage in or shy away from various behaviors, based on how they think their social world views those behaviors. Descriptive norms are a type of social norm that refers to an individual’s perception of what other people typically do. Injunctive norms refer to an individual's perception of the extent to which others would approve or disapprove of a particular behavior. Oftentimes, people can have inaccurate representations of descriptive and injunctive norms, and so informing people of how other people actually behave (descriptive norms) or believe one should behave (injunctive norms) can be quite effective. For example, telling people that many of their peers have and approve of health insurance can prompt more people to seek it out.


We helped create text messages for the women in our partner’s health insurance program aimed at changing their behavior towards saving for their premiums (as well as using their existing health coverage) by communicating social norms. The messages in the table below use norms to encourage the users to save for their health.
Leveraging remittances to finance health insurance

Kenyan society is more collectivistic than most western societies. As we have seen previously in our social norms work and the phenomena of the harambee and chama, Kenyans often come together to help each other financially. Strong connections and accountability serve valuable roles in helping individuals and groups manage their money and financial shocks. Because of this, we and our partners thought that encouraging remittances—typically money sent between family and friends—could be an effective strategy to increase savings for health insurance premiums.

Twenty in-depth interviews were conducted with health insurance beneficiaries—half of whom had received at least one remittance to help pay for their premiums and half of whom had not. All respondents had been included in our partner’s 200-person “Smartlink” test, in which respondents were given assistance in asking for remittances by being provided an SMS asking for financial help that could be forwarded to friends and family.
We found that remittances are a familiar practice to both those who have remitted and those who have not. Remittances specific to health premiums mostly came from spouses and parents. Many people expressed difficulty and anxiety around asking others beyond spouses and parents for money for their premiums. Hesitation to ask a broader audience was attributed in part to the nature of health insurance—it is perceived as a non-emergency luxury good which most people do not have. In addition, the remittance “Smartlink” test worked for some participants, but not in the way expected. Instead of the SMS being forwarded, remitters simply showed the message to the person being asked to remit in-person.

“The people here will not support you easily because they cannot pay for someone’s NHIF yet they don’t have it.” - Respondent in Nairobi

**Boosting health insurance uptake with vouchers**

Our partners’ health insurance program is attractive, in part, because it is heavily subsidized—women only pay half of the typical yearly premium. The problem is that people don’t seem to value this benefit until they receive it: they don’t feel like they lose anything if they don’t get the subsidized insurance. We wanted to create a way to emphasize the size of the subsidy and provide a convenient reminder for when users need to sign up and where to do so, as well as feel the loss of the subsidy if they chose not to obtain it.

We helped create a voucher worth 3,000 Kenyan Shillings that could be used to buy health insurance, and our partners distributed them to potential i-PUSH participants. From an economic perspective, offering people a 3,000 Kenyan Shilling reduction in their insurance premiums is exactly the same as giving them a 3,000 Kenyan Shilling voucher. In both cases, they pay half price for their insurance, but research suggests that people respond more to loss than an equivalent gain, a phenomenon known as loss aversion. In response, we thought that providing Kenyans with physical vouchers worth 3,000 Kenyan Shillings, which they would lose if they didn’t use the voucher, would work better than telling them that they could gain 3,000 Kenyan Shillings when they sign up for the subsidized insurance.

In order to emphasize the size of the insurance subsidy, we helped design a voucher that would make this amount of money feel more concrete. We wanted the voucher to feel as much like “real money” as possible, thus engendering a sense of loss if one failed to make use of it. We also used
the absolute amount of the subsidy (3,000 Kenyan Shillings) as opposed to the percentage (50%), as psychologically, the absolute amount is perceived as more substantial.

People tend to value losses more than gains, a phenomenon called **loss aversion**. Therefore, instead of framing an incentive as a bonus (i.e., a gain), one may be more successful influencing behavior by framing it as a potential loss.


**Conclusion**

This chapter was all about financing care, and helping people set aside money to prepare for unexpected health shocks. Finance is the last stop in our journey down the levels of personal health management. In our metaphor, it is the roots of the tree. The chapter introduced M-TIBA, a digital wallet to help low-income Kenyans save for health care and for health insurance. We discussed barriers to saving money into the wallet, offered solutions, and identified catalysts. We also briefly discussed leveraging remittances to help fund health insurance, as well as the problem of signing up for health insurance when the social norm to do so is very weak. We offered solutions based on several behavioral principles: the placebo effect, procedural memory, gamification, implementation intentions, social norms, and loss aversion.

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2. Learn more about M-TIBA at https://m-tiba.com/about.html
3. Learn more about i-PUSH at https://www.pharmaccess.org/service/i-push/
REFLECTION: GOOD METHODS FOR BEHAVIOR CHANGE
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On the morality of paternalism

In this concluding chapter, we reflect on all our work and on the methods we used in this work. We start with a reflection on the kinds of interventions we develop.

Most of our projects involve addressing real-world health challenges with the methods and findings of behavioral science. Sometimes, though, we face larger questions about the field itself. Behavioral science interventions, from education to mandates, all have one thing in common: they’re paternalistic, in that they involve attempting to change someone’s behavior for their own good. Questions of paternalism have been hotly debated by philosophers and moralists for centuries. When, if ever, can we justify interfering with someone’s free will?

WHY “PATERNALISM”?: The term paternalism has been consistently used in past work to refer to policies that influence others’ behavior for their own good. Modern thinkers often struggle with the gendered
implications of this term and its heavy-handed tone. We use the word paternalism for consistency with previous literature, but agree that it’s time to consider an alternative term that describes the concept without relying on outdated notions of social hierarchies.

CAH Health attempted to answer this question as part of a grant from the Robert Wood Johnson Foundation on the morality of paternalism. We conducted 11 empirical studies to understand what people care about when deciding if different behavioral interventions are justifiable.

Past work on paternalism is mostly philosophical. Our experimental perspective unearthed several surprising and sometimes contradictory facts about how people view behavioral interventions.

**Question 1: What aspects of a situation do people consider important for moral judgments?**

In our initial theoretical work, we hypothesized that behavioral interventions would be seen as justifiable when the benefits of an intervention outweighed the costs to free will. We identified 14 specific factors of a situation that might be relevant to costs and benefits.

We asked 573 people to think about one of four different behaviors: getting the influenza vaccine, getting the HPV vaccine, quitting smoking, or getting potentially risky genetic testing for an unborn child.

For each behavior, participants told us how morally justifiable interventions would be, and then also rated the behavior on our factors—for example, how much benefit would someone receive from quitting smoking, and how much cost would they incur? This let us study the relationship between costs/benefits and the moral judgments people made.

We found a simpler story than we were expecting. The average person was pretty comfortable with behavioral interventions. As long as the benefits of intervention were large enough, intervening was seen as justified. If the behavior had costs to the person doing it, or it touched on a ‘sacred’ (private, personal or intimate) domain, intervention was a little less acceptable. However, people are generally willing to accept limits on their liberty for the greater good.
Question 2: How do people view different behavioral interventions?

People might approve of paternalism in an abstract sense, but not all behavioral interventions are created equal. Policies such as defaults have a stronger influence on behavior than lighter interventions such as choice architecture, and as such, infringe more on free will. It isn’t enough to know when paternalism is seen as justifiable—we must also determine which specific interventions are acceptable in specific circumstances.

To answer this question, we asked 300 people to consider 19 different behavioral interventions and rank them in order of acceptability. We noticed a few interesting trends in the data. First, people hate penalties, but they love rewards. A financial penalty for making a bad behavioral choice is financially identical to a financial reward for making a good choice, but financial penalties are very unacceptable in comparison. Similar results were found for increasing and decreasing friction.

**Friction** is the sum total of the forces that make performing a behavior more difficult, such as time investment, resource investment, or red tape.

Second, defaults are surprisingly disliked, despite their efficacy in changing behavior. Defaults are ubiquitous in behavioral science, and often defended as transparent, but our participants saw them as quite strongly limiting freedom of choice. Behavioral scientists might want to think twice about using defaults in delicate situations.

Lastly, everyone in our sample tended to approve of low-touch policies like education and simplification, which provide tools for better decision-making without limiting free will. However, they acknowledged that these policies were less effective at changing behavior than interventions like financial incentives or decreasing friction, showing a sophisticated understanding of motivation and behavior.
Question 3: How can we build an algorithm to predict and recommend justifiable interventions in specific situations?

Our final study combined the findings of our previous work, letting us trace people's viewpoints all the way from the behavior of interest to a specific policy of choice. To make sure our results reflected the perspectives of lay audiences as well as the people who would be making these types of decisions, we sampled both 100 medical professionals and 1,509 people chosen from an online participant pool.

We asked them to consider one of four different behaviors, ranging from extremely unpopular targets for intervention (prayer in public schools) to extremely popular targets (smoking cessation). They rated their behavior on different cost-benefit factors much as we described earlier, and then also rated the overall acceptability of certain policies for changing that behavior.

Our results both confirmed and refined our previous learnings: The benefits of a behavior are the most important factor, but people do take costs into account as well, and are reluctant to intervene in highly sacred areas.

With the data from all our studies combined, we generated an algorithm to serve as the backbone of a practical tool for decision-makers.
If you’re thinking about how to help your employees, clients, or members live healthier or happier lives, consider taking a look at what our research can say about the right way to proceed.

**Behavior Mapping: How we diagnose behavioral problems**

Behavior Mapping is a method the Center for Advanced Hindsight uses to make sure the interventions it designs have an impact on people’s behavior. The basics of Behavior Mapping are simple: in facilitated groups, participants begin mapping out the journey to achieve the ideal behavior. Then, they identify barriers along that path. Finally, they begin brainstorming solutions around key barriers before sharing back to the group.
Behavior Mapping is a crucial step in designing an intervention. You have to know what is causing the problem in order to solve it. You also have to know the environment that people are making their decisions in, if you want to influence those decisions. Even a great intervention will not make a dent in the problem if it’s not addressing a real barrier. In the following, we outline CAH’s method of Behavior Mapping.

**What is Behavior Mapping?**

*Theory of Behavior Mapping*

A significant part of why people don’t exercise more or eat healthier is not structural, but behavioral. Evidence suggests that awareness of the benefits of health behaviors and even possessing positive intention to enact those behaviors do not translate into action. Behavioral science refers to this as the intention-action gap. So, people go with what they already do (status quo bias), is easiest (friction) and what most other people do (social norms). Instead of just rolling out new programs or even teaching people about the benefits of healthy behaviors, we should be focusing on the context in which people make healthy decisions and using behavioral science to optimize these solutions.

We leverage a combination of Human Centered Design and Behavioral Economics to understand behavioral issues and develop solutions. Our philosophy is to put the individual at the focal point of our solutions, recognizing that as a human, they are subject to a host of behavioral biases. With this drive, we design solutions both for what people are able to tell us they want and need, and what they are not. Where traditional Human Centered Design organizations would consider a project finished, we go further by employing rigorous evaluation methods to ensure our solutions work.

The first step in that process is to define one (or multiple) specific key behavior(s) that we want our target audience to perform. Behavior Mapping helps us to very specifically zoom in on that key behavior that we want to change. During the mapping process we focus on identifying barriers that prevent the desired action. Overall, the process of Behavior Mapping helps us structure our thoughts and devise successful interventions that tackle the root of the problem instead of what we think the problem is.

*Process of Behavior Mapping*

The Behavior Mapping exercise starts by writing down the full process of the behavior in its ideal form, from start to finish. What are the steps people have to take to achieve the desired behavior? This should be as specific as possible; thinking about forms, clicks, signatures, calls, and
whatever other steps people take to complete a particular behavior. Participants list these steps at the top of the behavior map. Next, we visualize the individual’s daily routine and imagine whether there are barriers that would prevent individuals from completing any of the steps on their journey to the desired behavior. Participants write these barriers on post-it notes and place them under the relevant step. For example, if the target user group is very busy, they might not have time to fit a daily walk into their schedule.

Following barriers, we brainstorm solutions (e.g. automatically schedule it on your agenda) and hard constraints (e.g. no park nearby to walk in) rather than barriers. We write these solutions and hard constraints down and place them at the bottom of the map in order to clear them from our mind so that we can focus only on barriers.

After placing all of the barriers on the map, we consolidate and classify each barrier as either social, individual, and structural. For example, having friends who don’t like to walk is a social barrier to walking, a lack of knowledge about convenient walking trails is an individual barrier, and a lack of walking trails itself is a structural barrier.

In the final step, we identify potential interventions to overcome the barriers we’ve identified. We identify ways to eliminate sources of friction and encourage the desired behaviors. We leverage principles like loss aversion, social proof, and self-herding.

The entire process is interactive and takes about 2 hours. A behavior map can be done in many ways, but we like to use colorful post-it notes, sharpies, and a conference room.

**Deliverables of Behavior Mapping**

The outcome of Behavior Mapping is a user journey that details the necessary steps towards the ideal behavior, barriers on this journey, and interventions to overcome common barriers. The behavior map helps you identify gaps in your understanding of the problem and visually organizes the process to achieve the desired behavior, while at the same time highlighting challenges, barriers, and opportunities.

CAH Health will prepare a behavioral brief for each attendee that summarizes learnings and identifies key opportunities and potential solution areas. In addition, we create a list of potential interventions for you and your team to prioritize for testing as well as the Behavioral Map and all of its post-it notes in an easily readable PDF document.
CONCLUSION: A COMPREHENSIVE APPROACH TO CHANGING HEALTH BEHAVIORS

In this report, we have illustrated the power of behavioral science in helping people to live healthy lives. In doing so, we advocate a comprehensive approach to health behavior. Taking care of your health does not just mean going to the doctor when you are ill and taking your medicines. It also means doing the things that will prevent you from getting ill, and taking care of your health finances so that you can afford to get help when you need it. We discussed behaviors and behavior change along these three stages: curative care, prevention and finance. These three stages are equally important and should be part of a comprehensive approach to health behavior. Because health is like a tree. The roots, nested in a nutrient-rich soil, represent health finances. A solid trunk represents prevention. And leaves and branches that can grow and grow again after winds and storms cause damage represent care. We called this the Tree of Healthy Life. A tree is an ecological system in itself. And so is a person’s health journey: good finances, well-planned prevention, and proper care are complicated aspects of a person’s health journey.

Throughout many case studies, we have shown that whether people’s health journey will be a flourishing one, or one on the decline, depends to a large extent on their behaviors. We have shown how behavioral science helps us diagnose problems, design solutions, and design experiments to study the impact of solutions. In the first chapter, we focused on the patient journey of self-care: taking one’s medicines, refilling them in time, monitoring one’s illness, taking measurements, and making necessary lifestyle changes. We discussed several behavioral problems and solutions based on principles of behavioral science, like commitment devices, reminders, goal-setting, and implementation intentions. In the second chapter, we zoomed in on vaccination—a primary pillar of prevention. We looked at three broad ways to boost vaccination uptake: emotions, social processes and persuasion. The third chapter, still in the domain of prevention, focused on living a healthy lifestyle, beyond the patient journey. We analyzed several ways to influence lifestyle behaviors (exercising,
eating healthily, meditating, etcetera) based on principles of behavioral science. We offered four broad categories of solutions: rewards, social forces, dealing with negative feelings, and positive psychology. In the fourth chapter, we zoomed in on personal finance as it relates to health. We discussed some of our work on saving for health care and health insurance in Kenya. For this research, we collaborated with M-TIBA, a new digital wallet to help low-income Kenyans save for health care and for health insurance. Again, we based our solutions on a broad range of behavioral-science principles: the placebo effect, procedural knowledge, gamification, implementation intentions, social norms, and loss aversion.

In this last chapter we added some methodological reflection to the plentitude of research we discussed. Reflection is necessary, because sometimes solutions create new problems. We discussed the problem of paternalism. Philosophers and other thinkers have long discussed potential moral problems related to helping people irrespective of whether people have asked for help. To the extent that behavioral-science interventions are paternalistic, we cannot ignore this issue. As researchers and designers of programs that impact people’s lives we have to be sensitive to the moral complexity of nudging people in this or that direction. As empirical researchers we don’t stop with reflection, so we ran several studies to measure people’s moral intuitions on different types of behavioral interventions, in different circumstances. We find that in judging the moral acceptability of a behavioral science informed policy, people care the most about the benefits of a behavior. That reinforces our belief that, like us researchers, people care about good outcomes, and that it’s fine to be a little bit paternalistic, if it’s for the good.

Reinforced in our commitment, we continue our research on health behaviors: on vaccination, workplace health, breaking points, social accountability, purpose in life, and the moral justifiability of behavior-change policies. New directions we are taking include the following: health behaviors in times of COVID-19, not only hygienic behaviors but also exercise, healthy lifestyle, and meaningful connections while working from home; getting ready (behaviorally) for the COVID-19 vaccine; leveraging the COVID-19 experience for motivating other behaviors, like flu vaccine uptake; preparing for misinformation via games; and many more exciting research directions. We are looking forward to sharing learnings about these topics in our next report.
OUR TEAM

CAH Health
Research for this report was conducted by:

Dan Ariely
Dan Ariely is the James B. Duke Professor of Psychology and Behavioral Economics at Duke University and a founding member of the Center for Advanced Hindsight. He does research in behavioral economics on the irrational ways people behave, described in plain language. Irrationally Yours, Predictably Irrational, The Upside of Irrationality, The (Honest) Truth About Dishonesty, the movie Dishonesty and the card game Irrational Game are his attempt to describe his research findings in non-academic terms, so that more people will discover the excitement of behavioral economics and use some of the insights to enrich their own lives.

Jan Willem Lindemans
Jan Willem Lindemans leads the Health team at the Center for Advanced Hindsight. His research covers a wide range of health behaviors: from lifestyle, vaccination and self-care to the personal finance of health. He has extensively collaborated with partners in the healthcare industry, global health, and health tech. Before arriving at Duke, he was postdoctoral researcher and founding codirector of the Penn Social Norms group at the University of Pennsylvania.
**Nina Bartmann**
Nina is a senior behavioral researcher at CAH Health, focusing on applied behavioral economics research in the field of health and finance. She received her MA in International and Development Economics from Yale University and her MSc in Behavioral Economics from Tilburg University in the Netherlands. Nina’s work focuses on workplace health, lifestyle app development, and health care savings in Kenya.

**Catherine J. Berman**
Catherine Berman is a senior behavioral researcher at CAH Health and a PhD student at University of North Carolina at Chapel Hill. Her research spans topics including psychological wellbeing, positive emotions, and health behaviors.

**Judson Bonick**
Judson Bonick is a senior behavioral researcher at CAH Health. He has a background in public policy and social work but decided to move to experimental and applied behavioral science after becoming frustrated with failed classical economic policies. His work focuses on health care savings and access in informal settlements in Kenya. He is passionate about creating real, measurable change in the world, and also about his dog, Huckleberry.
Jenna Clark
Jenna Clark has a Ph.D. in social psychology from the University of North Carolina at Chapel Hill. Her research background focuses on how we use technology to create, strengthen, and maintain our social relationships. At the CAH Health, she focuses on helping people live healthier lives with behavioral science in spite of themselves.

Jonathan Cloughesy
Jon graduated from the University of California Santa Barbara, where he studied Biopsychology and Applied Psychology. At CAH Health, Jon specializes in building social connection via technology to improve health. He is passionate about behavioral science, and aspires to help build a healthier, happier world for us all.

Jonathan Corbin
Jonathan has a Ph.D. in developmental psychology from Cornell University, with a research background focusing on biases in both decision making and memory. He enjoys connecting insights from basic psychological theory to the applied world as well as improving open science practices in applied settings. His current research in the lab focuses on improving savings behaviors and designing a healthier workplace.
Becky Reeves
Becky completed her Master’s in Psychology from UNCW in 2007, a PhD in Experimental Psychology from the University of Kentucky in 2011, and a 2-year post-doctoral fellowship at Tufts University in 2016. Her research interests involve decision-making under uncertainty, social support, and cognitive and emotional barriers to successful behavior change.

Shanta Ricks
Shanta Ricks received her M.A. in Psychology from North Carolina Central University and now works within the Common Cents Lab and Health teams at the Center for Advanced Hindsight. Her research interests are examining the intersection between mental and physical well-being.

Birgit Probst
Birgit received her MSc in Social and Health Psychology at Utrecht University in the Netherlands. She believes in the close interplay between physical and mental health and loves to support better health behavior by applying science. Birgit is based in Amsterdam and at CAH Health, she focuses on workplace health.
**Aline Holzwarth**

Aline is an applied behavioral scientist, specializing in digital health research and scientifically informed product design. Aline is Head of Behavioral Science at Pattern Health, a digital health platform designed to inspire and accelerate innovation and deliver more impact with less hassle. She is Principal of the Center for Advanced Hindsight at Duke University, which is Dan Ariely’s applied behavioral science lab that helps people be happier, healthier and wealthier.

**Ting Jiang**

Ting is Principal at the Center. She received her Ph.D. degree in Experimental Economics and publishes findings crossing a broad range of disciplines, ranging from economics, psychology to anthropology. For the past 10 years, she has devoted herself to applied research and applying scientific thinking and processes to help solve real life problems. She has led projects globally consulting for diverse organizations, companies and tech startups.
CAH Health Alumni

The following CAH Health alumni also contributed to the research:

**Julie O’Brien**
Julie is a behavioral scientist working at the intersection of health and technology. She’s spent her career designing and testing scalable solutions that close the gap between what people want to do and what they actually do. She recently joined WW where she’s building an applied behavioral science team to support the digital experience. Prior to that she was a Principal Behavioral Scientist at Duke University’s Center for Advanced Hindsight a faculty director for the Centene Center for Health Transformations, and a co-founder of the Behavior Shop. She has a PhD in Social Psychology and created the behavioral research function at Opower.

**Rachel Kahn**
Rachel is a Senior Associate Consultant at VAL Health, a healthcare-focused behavioral economics consulting firm. She works with companies all over the healthcare ecosystem, from payers to hospital systems to digital health companies, to implement creative solutions designed to increase patient and provider engagement. Prior to that she was a Behavioral Researcher at CAH Health for 2.5 years, with a particular interest in medical decision-making as it pertains to over- and under-utilization of healthcare.
Ruth Appel
Ruth is a PhD Student in Stanford University’s Department of Communication and Stanford Graduate Fellow. She studies the intersection of Behavioral Science and Computer Science, with the aim of leveraging psychological targeting ethically and for the common good. Before starting her PhD, she worked as a Research Associate at CAH Health. She holds a Master in Public Policy from Sciences Po Paris and a B.Sc. in Economics from the University of Mannheim.

Lindsay Juarez
Lindsay is a Director at Irrational Labs. Her research specialty is self-control and designing interventions that make taking the daily behaviors that lead to healthier, wealthier, and happier people—such as exercising or saving for retirement—not just easier but also more enjoyable and fun.

Matt Bodien
Matt is an Associate Director at Egg Strategy, a consumer insights, brand strategy and innovation consultancy. He partners with organizations to help them better understand the behaviors, attitudes, motivations, and perceptions of their consumers through qualitative and quantitative research.
Julie Miller

Julie is a PhD Clinical Psychologist and applied behavioral scientist whose expertise lies in merging BeSci, UX, data analytics, and innovative technologies to create novel yet effective solutions to practical problems (especially in health). Julie currently works in government as a behavioral scientist and innovation leader. In addition, she is the behavioral science consultant for several technology companies (primarily in digital health and AI), and she continues in her role as Senior Behavioral Scientist at CAH, leading the digital health team on a clinical trial of more than 7,000 patients with heart failure.