
Way to Health Structure

Introduction

Way to Health is an online behavioral economic intervention toolbox for researchers and study participants. Researchers have access to off-the-shelf and customizable tools for behavioral economics studies. Study participants have an online home for their participation and the ease of integrated wireless biometric devices to report their progress. This platform is currently available for research conducted by the Way to Health team and collaborators. More information can be found at www.waytohealth.org.

Background

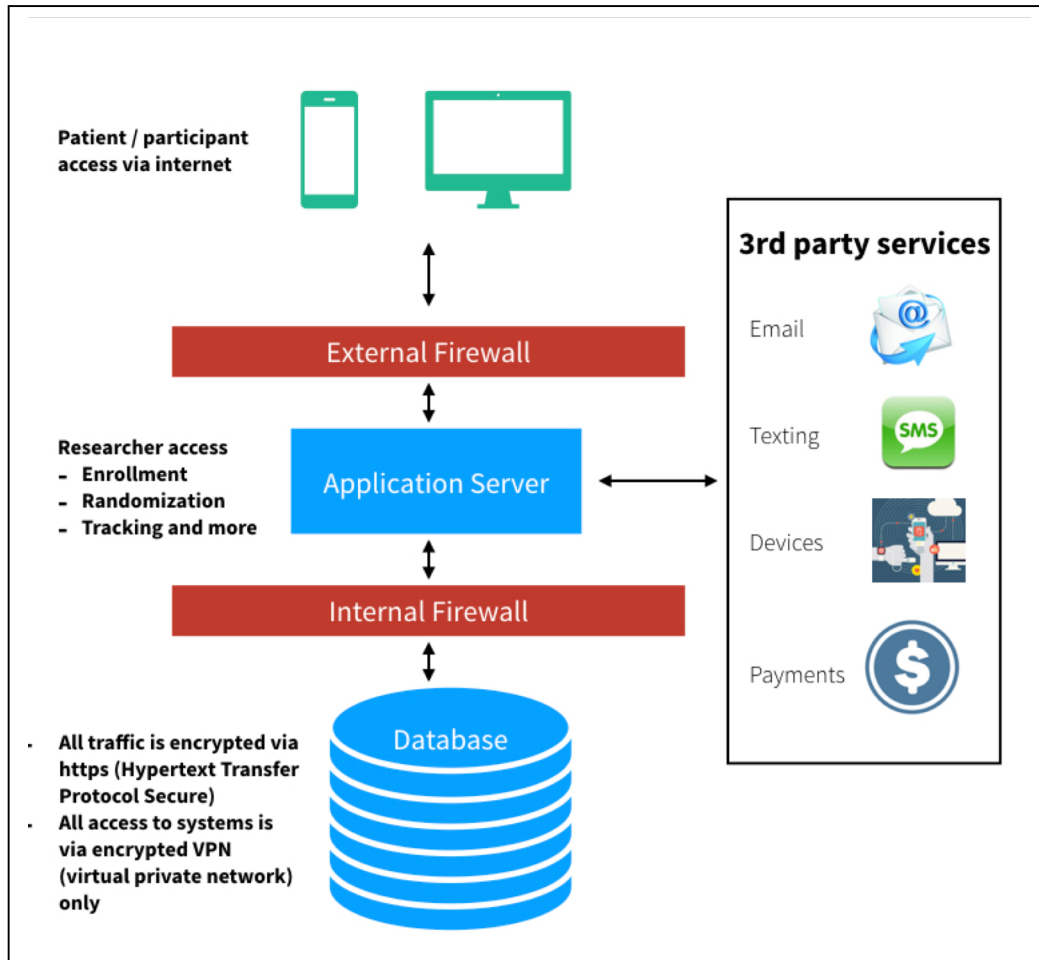
Behavioral economics presents clues to why we continue to engage in behaviors that harm our health and offers promising strategies to change those behaviors. However, those strategies require testing and refining and the needed research has been expensive to implement and difficult to scale. The hours required to recruit and communicate with study participants, monitor their progress, conduct the appropriate measurements, and account for incentives have in the past limited the scope and possibilities of the science.

The American Recovery & Reinvestment Act of 2009 Grand Opportunity program from the National Institute on Aging presented an opportunity to build an IT infrastructure that can facilitate the application of behavioral economic research for health among large and small populations and allow for the seamless integration of measurement and communication technologies into protocols.

Description

Way to Health consists of several connected layers, reflecting the programming, hardware, and data security needs of the overall project. These layers are depicted graphically in **Figure 1** below.

Figure 1. Way to Health Structure

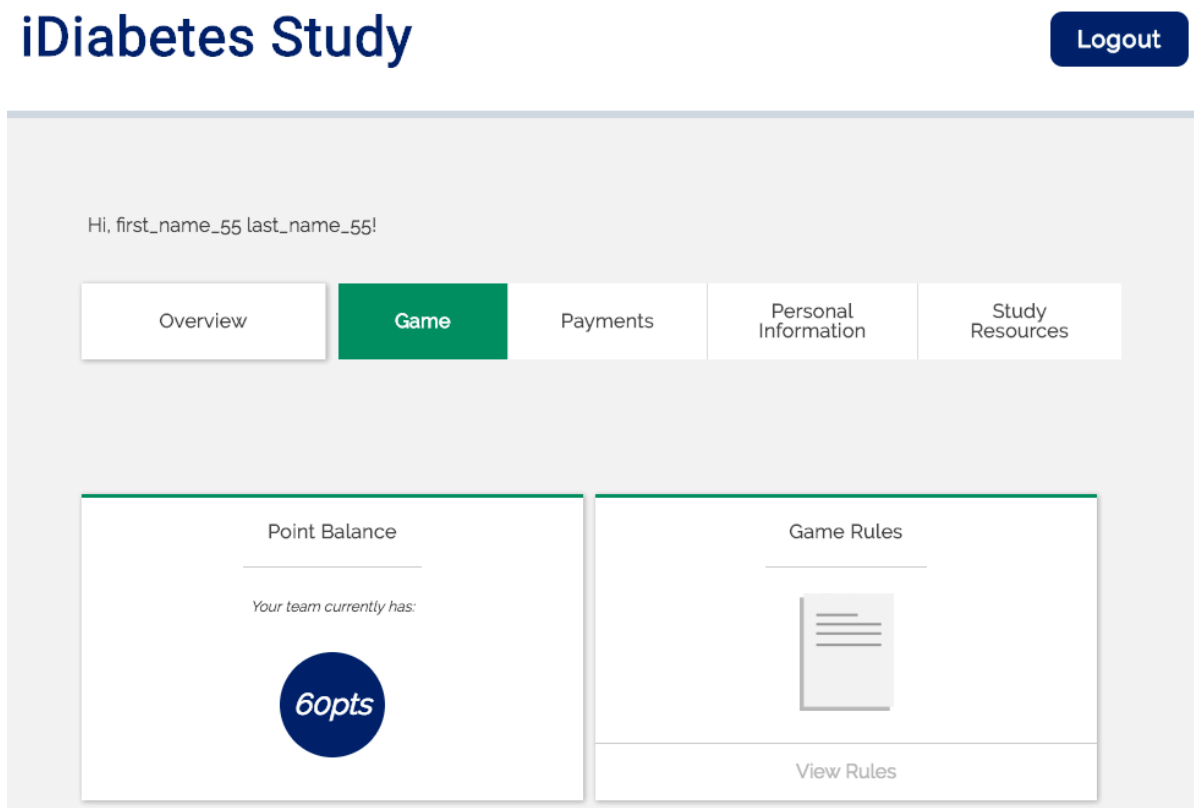


Client Layer (1): Study Participants

The **client layer** is for study participants. Participants can interact with Way to Health through the participant portal, SMS/MMS message, email, interactive voice recording (IVR), and directly through devices and their mobile applications. The participant portal is the most visible part of Way to Health and feels like a web portal—a set of web interfaces like those on any public site. It is a mobile-friendly website that can be rendered on a computer, phone or tablet. It is designed with both aesthetics and function in mind with a careful eye to the user experience. The participant portal can be used for enrollment and/or intervention communication, but it is not required. If the study chooses to use the participant portal for enrollment, study participants set up an account that includes personal login and other required information. The participants can then use that account to answer survey questions, communicate with the

research team and report on progress. Individual studies, programmed by the research teams, determine the content of the participant portal. For example, weight-loss studies may include charts as feedback about progress while a medication adherence trial that leverages financial incentives might display a virtual account balance and an adherence summary. See **Figure 2** for an example of the participant portal.

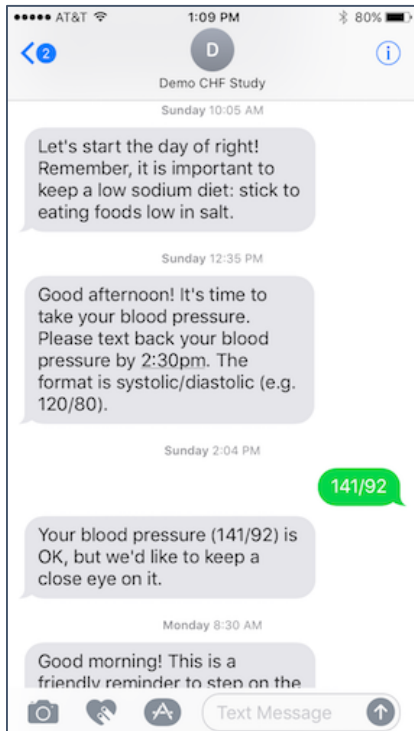
Figure 2. Participant portal interaction



The screenshot shows the 'iDiabetes Study' participant portal. At the top right is a dark blue 'Logout' button. Below the title is a navigation menu with five tabs: 'Overview', 'Game' (highlighted in green), 'Payments', 'Personal Information', and 'Study Resources'. A greeting message reads 'Hi, first_name_55 last_name_55!'. The main content area is split into two columns. The left column, titled 'Point Balance', shows 'Your team currently has:' followed by a blue circle containing the text '60pts'. The right column, titled 'Game Rules', features a document icon and a 'View Rules' link at the bottom.

In many cases, however, the participant portal is not necessary. Participants may engage with WTH indirectly through integrated devices and their mobile applications, as well as direct communication through SMS/MMS, IVR, email, and direct survey links. See **Figure 3** below for an example of a participant experience with text-based interactions.

Figure 3. Participant text based interactions



Application Layer (2): Research Teams

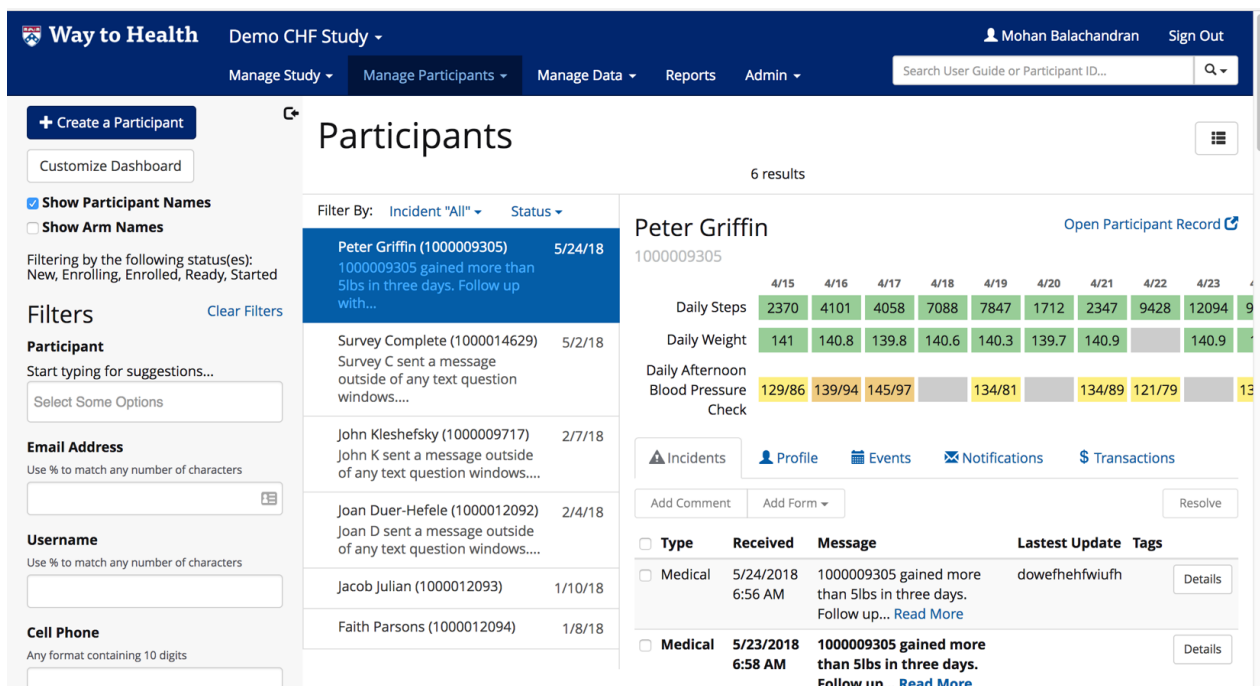
The **application layer**, or administrative portal is designed for the research teams. It is the engine for the behavioral interventions of the research. It is also where researchers access the tools to build their studies. For studies that need to randomize participants, this layer implements the randomization. For studies that need to send out periodic text message or e-mail reminders, this layer has embedded the programming to allow for automated reminders. More generally, this layer contains the programming sufficient to support a varied collection of modular elements of study designs:

- Presentation and information content (a unique identity, design, and information for a particular study)
- Participant selection (who is eligible, and do potential subjects meet those criteria?)
- Randomization (none, one arm, multi arm, stratified randomization, adaptive randomization)
- Interfaces with financial systems for the accrual and disbursement of funds for studies that involve monetary incentives.
- Interfaces with e-mail, telephone, and text messaging

- Interfaces with devices, such as wireless pill bottles, pedometers, weight scales, blood pressure cuffs, and glucometers
- The provision of any online consent documents or other information
- Interfaces with the database layer

The fundamental aspect of this layer is it allows researchers with essentially no web programming experience to customize the content of a useful research study web site. For example, the programming modules enable a researcher to scroll through a menu to program a study with N participants, with a (none, two arm, three arm, ..., n arm) randomization scheme, financial payments of \$X delivered to a bank account at determined milestones, and feedback provided to a particular peripheral or handheld device at pre-specified intervals or on specific dates. The modular approach can never replace all programming expertise, but it can make the deployment of individual studies more efficient by facilitating implementation of features likely to be shared by many studies. **Figure 3** provides an example of the page that a project manager might see at the outset of a project designed to use pedometers to improve exercise.

Figure 3. Administrative Portal



The screenshot shows the 'Way to Health' administrative portal for a 'Demo CHF Study'. The user is logged in as Mohan Balachandran. The main section is titled 'Participants' and shows 6 results. A filter is applied for 'Incident: All' and 'Status'. The first participant, Peter Griffin (ID: 1000009305), is highlighted. A detailed view for Peter Griffin shows a table of daily metrics from 4/15 to 4/23, including Daily Steps, Daily Weight, and Daily Afternoon Blood Pressure. Below this, there are tabs for Incidents, Profile, Events, Notifications, and Transactions. A list of messages is shown, including one from 5/24/2018 stating '1000009305 gained more than 5lbs in three days. Follow up... Read More'.

Database Layer (3): IT Experts and Research Teams

The **database layer** stores data in a MySQL database, with appropriate information and environmental security. The system provides access to investigators and on-platform statistical

support, along with audit logging to ensure the protection of personal health information. This system has the highest level of security. Details of which are available at <https://policy.waytohealth.org>.