

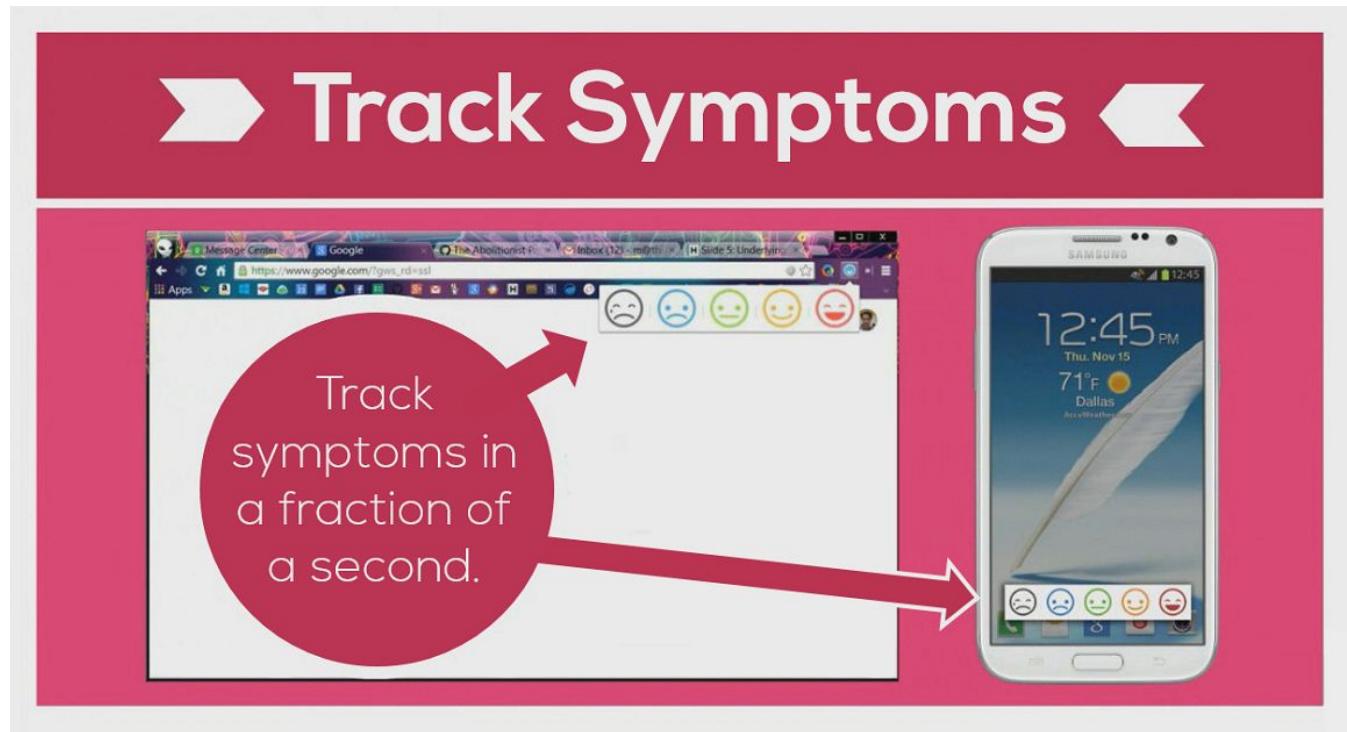
Consumer Health Data Aggregator Challenge

Mockup/wireframes of the app

Data Collection

Track Symptoms

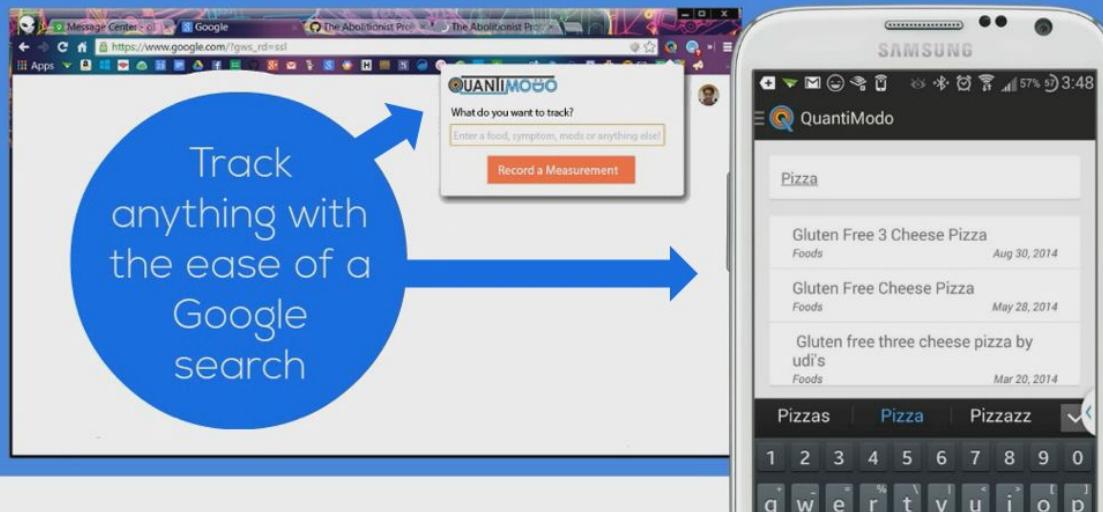
QuantiModo consists of a website and suite of mobile applications and browser extensions that allow users to rate their symptom severity within a fraction of a second using a unique popup interface.



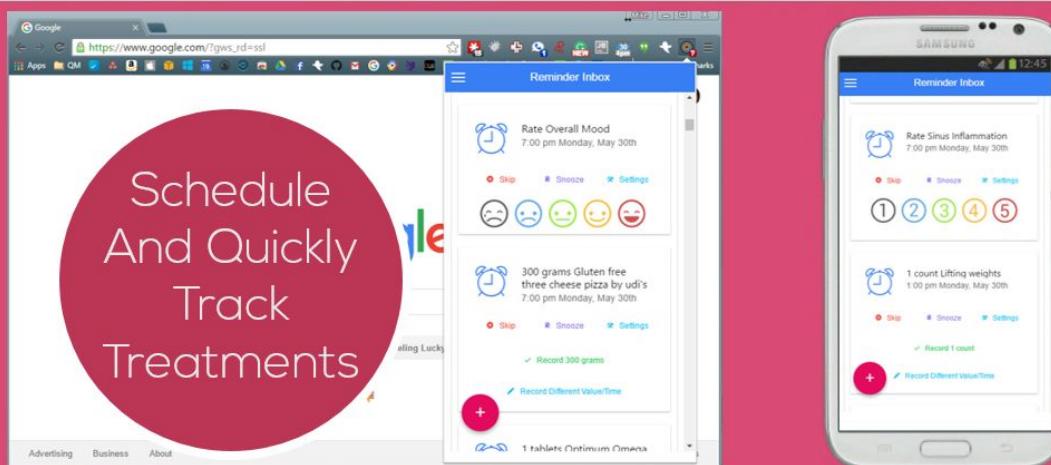
Track Factors that Could Influence Them

It also allows users to track medications, diet, and anything else with about the same effort required to do a Google search.

► Track Factors ◀



► Reminder Inbox ◀



Data Aggregation

The QuantiModo Connector Framework can automatically import your existing data from over thirty other digital health apps and devices such as Fitbits, Withings wireless scales and blood pressure monitors.

The screenshot shows the QuantiModo Business Plan interface with the following details:

- Left Sidebar:** Includes sections for Relationships, Reminders, Track Factors, History, Variables, Import Data (Your Account, Developers, Researchers), Help & Feedback, and a user profile for Mike Sinn.
- Top Bar:** Shows tabs for Starred - Google Drive, QuantiModo Business Plan, and Account | Quantimodo. The URL is https://app.quantimo.do/api/v2/account/connectors.
- Content Area:** Displays six connector cards:
 - Facebook:** Last updated 12 seconds ago: 2 new measurements. Tracks social interaction. Sync or Disconnect.
 - FitBit Flex:** Last updated 19 days ago: 27 new measurements. Tracks steps, distance, calories burned and active minutes. Update Scheduled or Disconnect.
 - Fitbit:** Last updated 19 days ago: 27 new measurements. Tracks sleep, diet, and physical activity. Update Scheduled or Disconnect.
 - Fitbit Aria:** Last updated 19 days ago: 27 new measurements. Tracks your weight body fat percentage and body mass index (BMI). Update Scheduled or Disconnect.
 - Fitbit Charge HR:** Last updated 19 days ago: 27 new measurements. Tracks workouts, heart rate, distance, calories burned, floors climbed, active minutes and steps. Update Scheduled or Disconnect.
 - Fitbit Charge Large:** Last updated 19 days ago: 27 new measurements. Tracks all-day stats like steps taken, distance traveled, calories burned, stairs climbed, and active minutes. Update Scheduled or Disconnect.

Data Analysis

Then we analyze the data using pharmacokinetic modeling techniques to determine which of the hundreds of factors in daily life most improve or exacerbate one's symptoms and what their optimal

daily values are. Then the user can search for any outcome they want to improve such as overall mood or inflammatory pain and see which factors are most significant.

The screenshot shows a web browser window for the QuantiMODO app at <https://app.quantimo.do/api/v2/account/user-relationships>. The left sidebar has a dark theme with categories like Relationships, Yours, Common, Reminders, Track Factors, History, Variables, Import Data, Your Account, Developers, Researchers, and Help & Feedback. The main content area has a light background. At the top, there's a search bar with 'Inflammatory Pain' entered. Below it is a 'Predictor Variable' input field with placeholder text 'Enter a medication, food, or anything that you want to know the most likely effects of...'. A section titled 'Strongest Predictors Of Inflammatory Pain' lists four items:

- Omega 3 Fatty Acids** (Treatments)

HIGHER Omega 3 Fatty Acids predicts LOWER Inflammatory Pain
Inflammatory Pain is, on average, 5% HIGHER after around 7.95mg Omega 3 Fatty Acids
Inflammatory Pain is, on average, -27% LOWER after around 359.74mg Omega 3 Fatty Acids
- Calories Burned** (Physical Activity)

HIGHER Calories Burned predicts LOWER Inflammatory Pain
Inflammatory Pain is, on average, 23% HIGHER after around 900.99kcal Calories Burned
Inflammatory Pain is, on average, -5% LOWER after around 2546.07kcal Calories Burned
- Sleep Quality** (Sleep)

HIGHER Sleep Quality predicts LOWER Inflammatory Pain
Inflammatory Pain is, on average, 13% HIGHER after around 0.56/1 Sleep Quality
Inflammatory Pain is, on average, -13% LOWER after around 0.84/1 Sleep Quality
- Acetyl-L-Carnitine** (Treatments)

HIGHER Acetyl-L-Carnitine predicts LOWER Inflammatory Pain
Inflammatory Pain is, on average, 20% HIGHER after around 0mg Acetyl-L-Carnitine
Inflammatory Pain is, on average, -11% LOWER after around 460.53mg Acetyl-L-Carnitine

Each item has a set of social media-style sharing icons (like, dislike, share, etc.) to its right. A blue circular icon with a question mark is in the bottom right corner of the main content area.

Based on my own data, for example, I've identified that Omega 3 Fatty Acid intake is the strongest predictor of inflammatory pain for me and that 360mg on average precedes a 27% decrease in my inflammatory pain.

Strongest Predictors Of Inflammatory Pain

Omega 3 Fatty Acids (Treatments)

HIGHER Omega 3 Fatty Acids predicts LOWER Inflammatory Pain
 Inflammatory Pain is, on average, 5% HIGHER after around 7.95mg Omega 3 Fatty Acids
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Data Visualization

► Presentation Layer ◀

Personal Analytics Dashboard

Real Time Decision Support

The dashboard shows several graphs and data points:

- Experiment 1: Determine Effect of Sleep on Mood**
 - O₃ BEFORE Sleep vs Mood (July)**: Minutes of Sleep = 405, Mood Score Average = 4.7
 - O₃ After Sleep vs Mood (August)**: Minutes of Sleep = 50, Mood Score Average = 4.73
- Determine Effect of Atkins Diet on Energy**
 - O₃ During Atkins Diet**: Games Of Protein = 111, Energy Rating Average = 2.7
 - O₃ Before Atkins Diet**: Games Of Protein = 405, Energy Rating Average = 2.7

The smartphone screen displays real-time notifications:

- 9:17 WED, MAY 29: You've had 1,172 steps today. Your stress level is lowest after 10,014.
- How are you?
- 9:16 AM
- 9:16 AM
- 9:16 AM
- 9:16 AM
- You've had 0.5 hours at McDonald's today. Your blood pressure is best after 0 hours.
- You've had 0 ug of Vitamin D today. Your mood is best after 25 ug.

Research Platform

Anyone is able to instantly create a study on our site which generates a study participant authorization URL and a natural language study examining the relationship between the selected variables.

Study Creation

The screenshot shows a web browser window with the URL <https://app.quantimo.do/api/v2/studies/471/edit>. The page title is "Study: How does inflammatory pain relate to mood?". The left sidebar shows a user profile for "Mike Sinn" and navigation links for Relationships, Reminders, Track Factors, History, Variables, Import Data, Your Account, Developers, Researchers, and Studies. The main content area displays the study details:

- Status:** Unpublished
- Participant Authorization URL:** <https://app.quantimo.do/api/v2/study/4LM7ifnrX3EgAusN>
- Share:** Buttons for Facebook, Twitter, and Google+.
- Study Name:** How does inflammatory pain relate to mood?
- Logo:** A placeholder image labeled "200x200". A "Select image" button is below it.
- Study Question (140 character limit):** Short explanation of the goal of the study that will be shown on the participant authorization page.
- Description:** A text input field for the study's purpose.
- Participant Instructions (2000 character limit):** These instructions will be shown on the participant authorization page. Please describe in detail what data the study participants should be collecting and how they should collect it. Also, explain the purpose behind the study and provide any other relevant information.
- Long Description:** A large text area for detailed study instructions.
- Outcome variable***: Overall Mood
- Predictor variable***: Inflammatory Pain
- Learn More Url**: http://

At the bottom are buttons for Cancel, Publish, Save, and Take a screenshot.

Study Participant Authorization Page and Generated Study

The screenshot shows a web browser window with the URL <https://app.quantimo.co>. The browser interface includes a toolbar with various icons like mail, calendar, and search, and a bookmarks bar with items like 'Mike', 'Other bookmarks', and 'JB'. The main content area displays a study summary and participation options.

Would you like to donate your data to this study?

How does inflammatory pain relate to mood?

Principal Investigator: Mike Sinn
Contact: m@thinkbynumbers.org
Study Question: What is the relationship between Inflammatory Pain and Overall Mood?
Participant Instructions: Track Inflammatory Pain and Overall Mood with these [apps or devices](#).

Share buttons: [Facebook Share](#), [Twitter Tweet](#), [G+ Share](#)

[Participate in this study](#)

Relationship Between Inflammatory Pain and Overall Mood

Inflammatory Pain (Symptoms)
Higher Inflammatory Pain predicts Lower Overall Mood
Overall Mood is, on average, 4% HIGHER after around 1.92/5 Inflammatory Pain
Overall Mood is, on average, -10% LOWER after around 2.66/5 Inflammatory Pain

Study Abstract
These data suggest with a high degree of confidence ($p=0$) that Inflammatory Pain (Symptoms) has a weakly positive predictive relationship ($R=0.487$) with Overall Mood (Emotions). The highest quartile of Overall Mood measurements were observed following an average 1.92/5 Inflammatory Pain. The lowest quartile of Overall Mood measurements were observed following an average 2.66/5 Inflammatory Pain.

Study Background
In order to reduce suffering through the advancement of human knowledge, I have chosen to share my findings regarding the relationship between Inflammatory Pain and Overall Mood.

Study Objective
The objective of this study is to determine the nature of the relationship (if any) between the Inflammatory Pain and the Overall Mood. Additionally, we attempt to determine the Inflammatory Pain values most likely to produce optimal Overall Mood values.

Study Design
This study is based on data donated by 2 QuantiModo users. Thus, the study design is equivalent to the aggregation of 2 separate $n=1$ observational natural experiments.

Data Analysis
It was assumed that 0 hours would pass before a change in Inflammatory Pain would produce an observable change in Overall Mood. It was assumed that Inflammatory Pain could produce an observable change in Overall Mood for as much as 7 days after the stimulus event.

Data Sources
The QuantiModo platform was used to aggregate data from the data sources.
Data was collected using these Data Sources

Developer Platform

Developers of mobile health applications can easily embed our data aggregation and analytics functionality within their own applications.

Interactive Developer API Documentation

pairs	Show/Hide List Operations Expand Operations
reminders	Show/Hide List Operations Expand Operations
units	Show/Hide List Operations Expand Operations
GET /v1/units	Get all available units

Implementation Notes
Get all available units

Response Class (Status 200)

[Model](#) [Model Schema](#)

```
[  
  {  
    "name": "string",  
    "abbreviatedName": "string",  
    "category": "string",  
    "minimumValue": 0,  
    "maximumValue": 0,  
    "conversionSteps": [  
      {  
        "operation": "string",  
        "value": 0  
      }  
    ]  
  }  
]
```

Response Content Type [application/json ▾](#)

Parameters

Parameter	Value	Description	Parameter Type	Data Type
access_token	<input type="text"/>	User's OAuth2 access token	query	string
id	<input type="text"/>	Unit id	query	integer
unitName	<input type="text"/>	Unit name	query	string
abbreviatedUnitName	<input type="text"/>	Restrict the results to a specific unit by providing the unit abbreviation.	query	string
categoryName	<input type="text"/>	Restrict the results to a specific unit category by providing the unit category name.	query	string

Response Messages

HTTP Status Code	Reason	Response Model
401	Not Authenticated	

[Try it out!](#)

GET /v1/unitCategories	Get unit categories
GET /v1/unitsVariable	Units for Variable

tags Show/Hide | List Operations | Expand Operations

variables Show/Hide | List Operations | Expand Operations

Technical specifications

Data Sources

Current

The **QM Connector Framework** automatically pulls data from dozens of applications and devices including:

MyFitnessPal	Tracks diet.
RunKeeper	Tracks your workouts.
WhatPulse	Tracks keyboard and mouse usage.
GitHub	Tracks code commits.
Moodscope	Tracks mood.
Up by Jawbone	Tracks sleep, exercise, and diet.
Fitbit	Tracks sleep, diet, and physical activity.
Facebook	Tracks social interaction. QuantiModo requires permission to access your Facebook "user likes" and "user posts".
Withings	Tracks sleep, blood pressure, heart rate, weight, temperature, CO2 levels, and physical activity.
MoodPanda	Tracks mood.
RescueTime	Tracks productivity, phone, and computer usage.
MyNetDiary	Tracks diet and exercise.
Weather	Tracks weather.
Sleep as Android	Tracks sleep duration and quality.
Fitbit Aria	Track your weight body fat percentage and body mass index (BMI).
Fitbit Charge Large	Track all-day stats like steps taken, distance traveled, calories burned, stairs climbed, and active minutes
Fitbit Charge HR	Track workouts, heart rate, distance, calories burned, floors climbed, active minutes and steps
FitBit Flex	Tracks steps, distance, calories burned and active minutes.
Fitbit One	Tracks steps, distance, calories burned and stairs climbed.
Fitbit Zip	Tracks steps, distance and calories burned.
JAWBONE Up Move	Tracks steps, exercise, overall calories burned, hours slept and quality of sleep, food, drink, calories, nutrients and use the UP App Food Score to quickly know if you are eating right.

JAWBONE Up	Tracks hours slept, light vs. deep sleep and waking moments, food and drink.
Withings Activite	Tracks steps, distance and calories burned.
Withings Activite Pop	Tracks walking and running steps taken.
Withings Aura	Track your sleep on your smartphone (iOS).
Withings Pulse	Tracks steps, elevation, distance and calories burned.
Withings Pulse O2	Tracks steps, elevation, distance, running and calories burned.
Withings Smart Body Analyzer	Tracks air quality, heart rate, fat mass and weight.
Withings Smart Kid Scale	Tracks baby's weight.
Withings WiFi Body Scale	Tracks weight, BMI and fat mass.
Withings Wireless BP Monitor	Tracks blood pressure.
Withings Wireless Scale WS-30	Tracks weight and BMI measurement with Position Control.
Withings Wireless Scale WS-50	Tracks heart rate.
Slice	Tracks purchases.
Google Calendar	Automate your tracking by creating calendar events with a title containing the value, followed by the unit, followed by the variable name. For instance, if you want to track an apple every day, create a repeating daily event called "1 serving Apples." Br
Google Fit	Tracks fitness activities
Quantimodo Wordpress Plugin	Tracks anything
MoodiModo for Android	Tracks mood and anything else.
MoodiModo for iOS	Tracks mood and anything else.
MoodiModo Chrome Extension	Tracks mood and anything else.
Quantimodo Chrome Extension	Tracks anything.
Quantimodo Sync for Android	Sync all your tracking data.

Current 2015 Edition Common Clinical Data Set Data

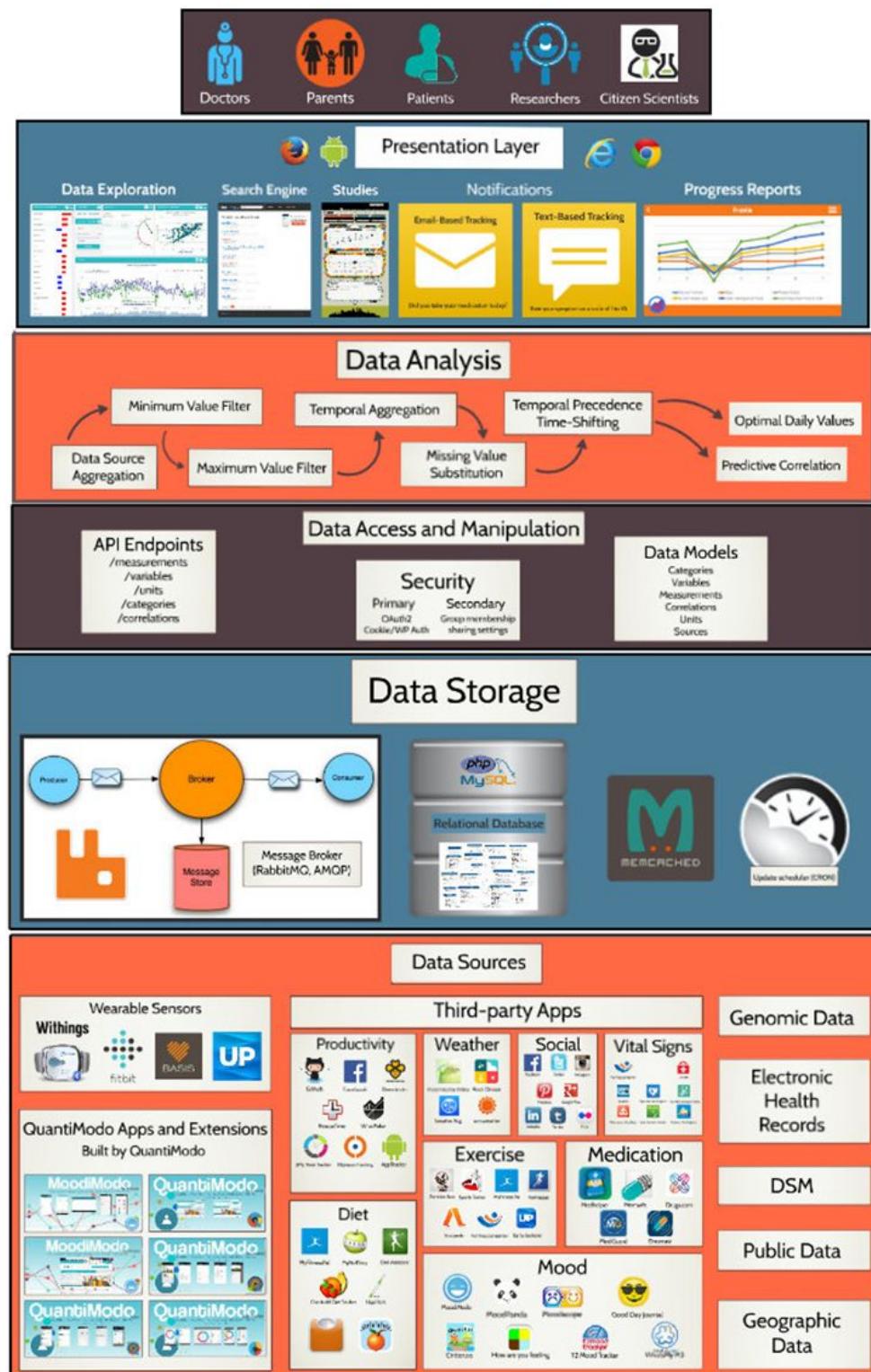
- Medications
- Laboratory Tests
- Medication Allergies
- Problems
- Vital Signs
- Immunizations

Planned 2015 Edition Common Clinical Data Set Data

- Sex
- Race
- Ethnicity
- Preferred Language
- Smoking Status
- Care Plan Field(s), including Goals and Instructions
- Procedures
- Care Team Member(s)
- Unique Device Identifier(s) (UDIs) for a Patient's Implantable Device(s)
- Assessment and Plan of Treatment
- Goals
- Health Concerns
-

System Architecture

System Architecture Overview



Native Client Tracking Applications

QuantiModo™ for Android™

Figure 1:



Figure 1 - Screenshots of QuantiModo™ application for Android

QuantiModo™ for Android enables the user to easily track diet, medication, physical activity, anything else that can be quantified and automatically upload the data for analysis. A web browser extension that lets the user track diet, medication, physical activity, or anything else that can be quantified works simultaneously without disrupting internet activity (including video streaming).

QuantiModo™ for Chrome™

Use QuantiModo™ for Chrome to effortlessly track anything! The user can track his/her sleep, diet, medication, physical activity, and anything else that can be quantified.

HOW TO RECORD A MEASUREMENT

1. **CLICK THE EXTENSION** - Click the QuantiModo™ icon in the upper right hand side of the browser. It might be hidden. In that case the user will have to drag the divider line to the right of the URL field to see it.
2. **SELECT A VARIABLE** - Type the name of the variable that one wants to track. If it's an existing variable, the settings should be populated automatically and the user can move to step 3. If the user never entered data for that variable before he/she will need to click in the grayed out area with his/her mouse and adjust the settings for that variable before he/she can send the measurement.
3. **ADD MEASUREMENTS** - Then enter the value for the measurement and select the correct units.
4. **SEND MEASUREMENTS** - After pressing the "ADD" button data is then sent to <https://quantimo.do/>.

Item/Step Number #1
Universal Tracker Browser Extension™ for Chrome:
Figure 2

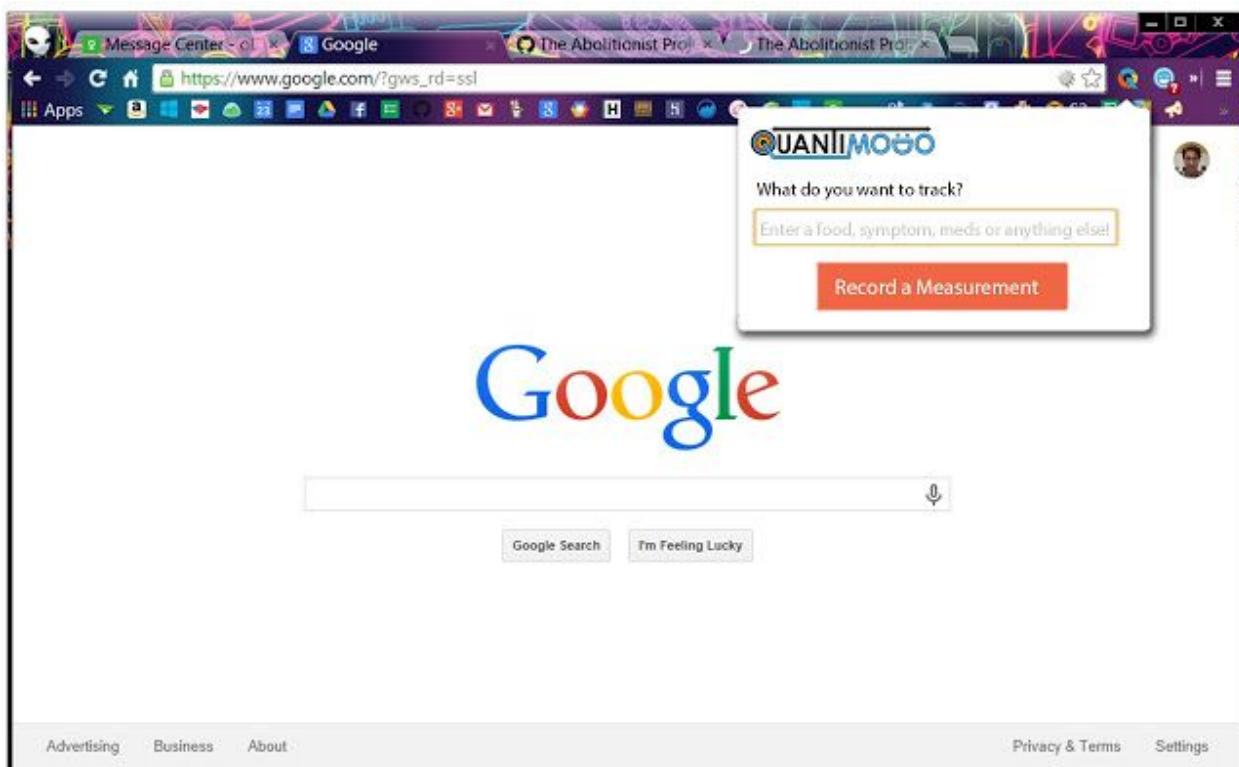


Figure 2 - Screenshot showing ability to track anything with the QuantiModo™ Universal tracker extension.

Login Screen:
Figure 3

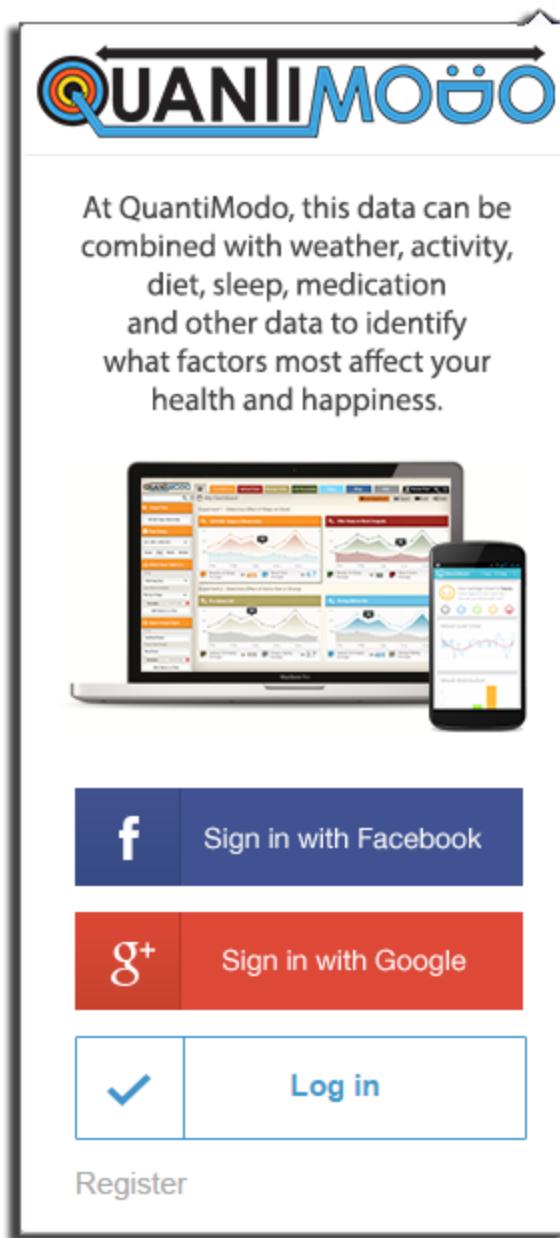


Figure 3 - Example of login pages on apps and sites. Login available with social media, Google, and the website.

That should use the same WordPress authentication logic found at
<https://quantimo.do/wp-login.php>

Once they are logged in, they see this screen which uses the QuantiModo™/api/variables/search endpoint to autocomplete. If they press enter or click on a variable, it should move to the next screen. This should function just like Google's autocomplete search.

Select Variable Screen:

Figure 4

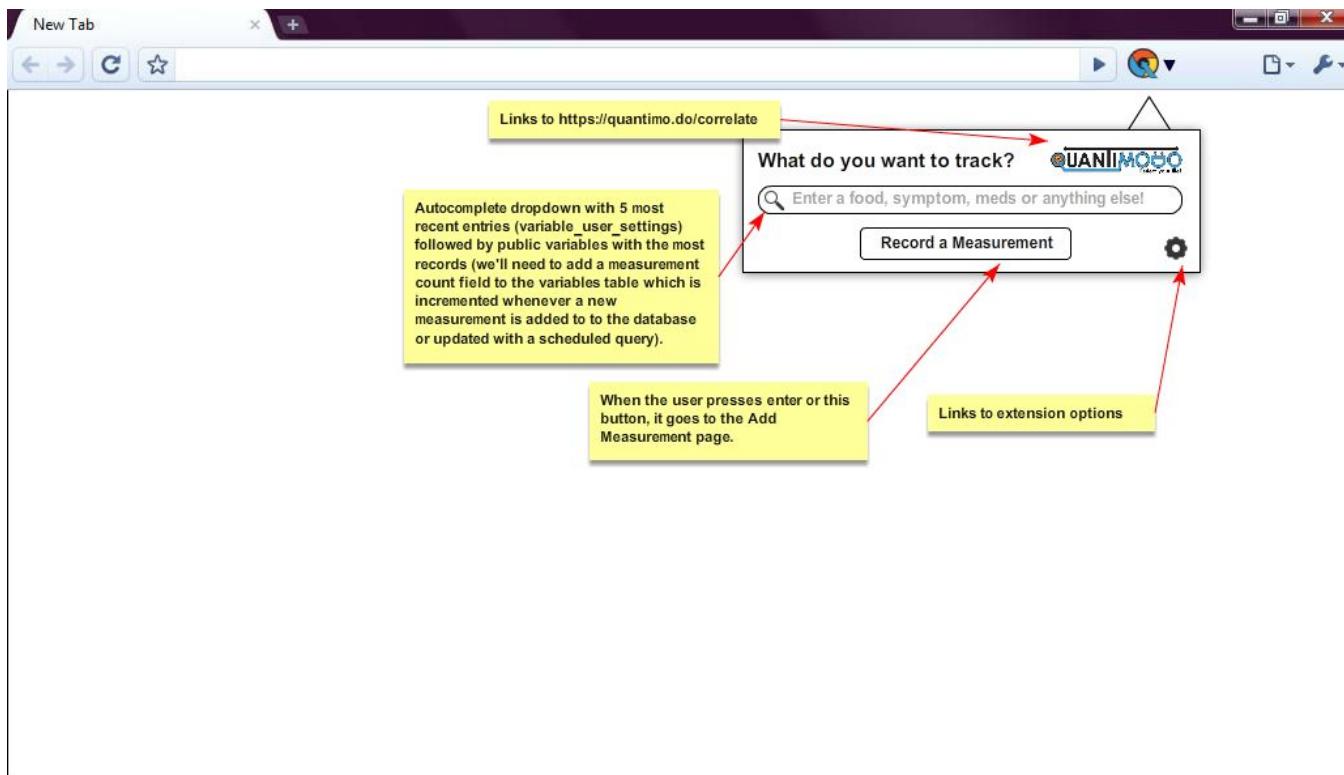


Figure 4 - Detailed diagram showing each aspect of the QuantiModo™ Universal Tracker Chrome extension. If the variable was one that existed and came up on the autocomplete, they see this screen where they may submit a measurement.

Add Measurement Screen:

Figure 5

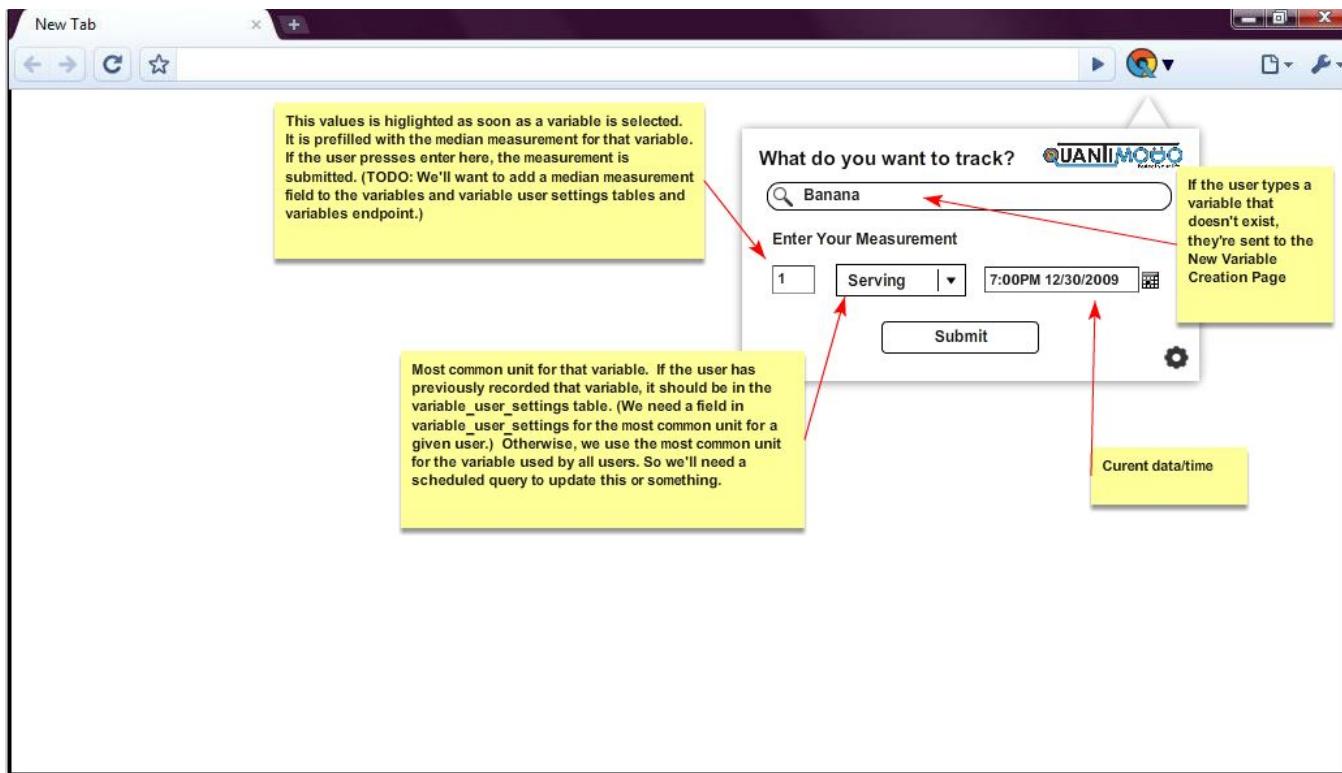


Figure 5 - Diagram showing how the measurement of each variable is tracked on QuantiModo™ Universal Tracker Chrome extension.

If the variable that they entered does not already exist, the API call for the variables will return an empty array. If this happens, the user should instead be sent to the "Add Variable and Measurement" screen to create a new variable in addition to reporting their first measurement for that variable.

Add Variable and Measurement Screen:

Figure 6

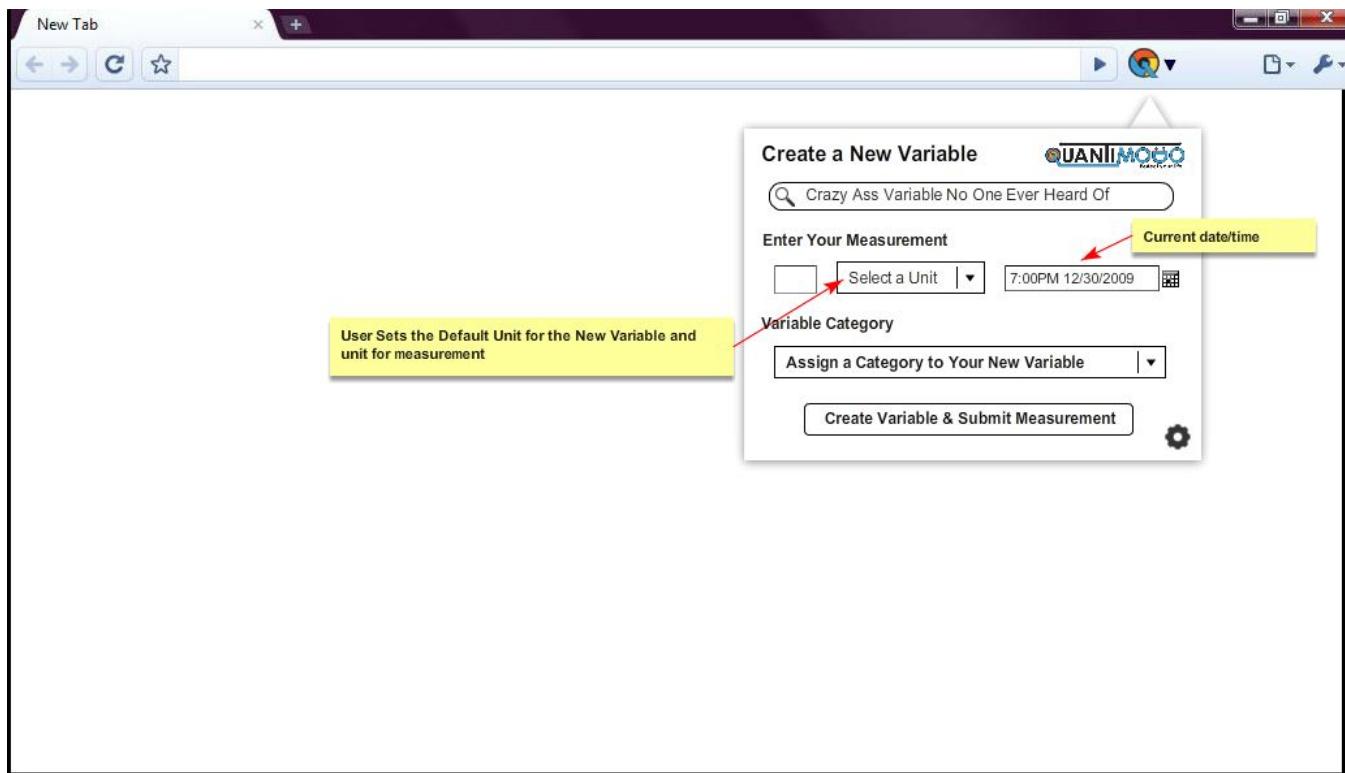


Figure 6 - Screenshot outlining new variable addition, and ease of tracking any variable

Item/Step Number #2
MoodiModo™ Mood Tracking App for Android:

Figure 7



Figure 7 - Screenshots showing MoodiModo™ application for Android. Highlights simple pop up tracker using user-friendly faces.

Item/Step Number #3
MoodiModo™ Mood Tracking Extension for Chrome:

Figure 8

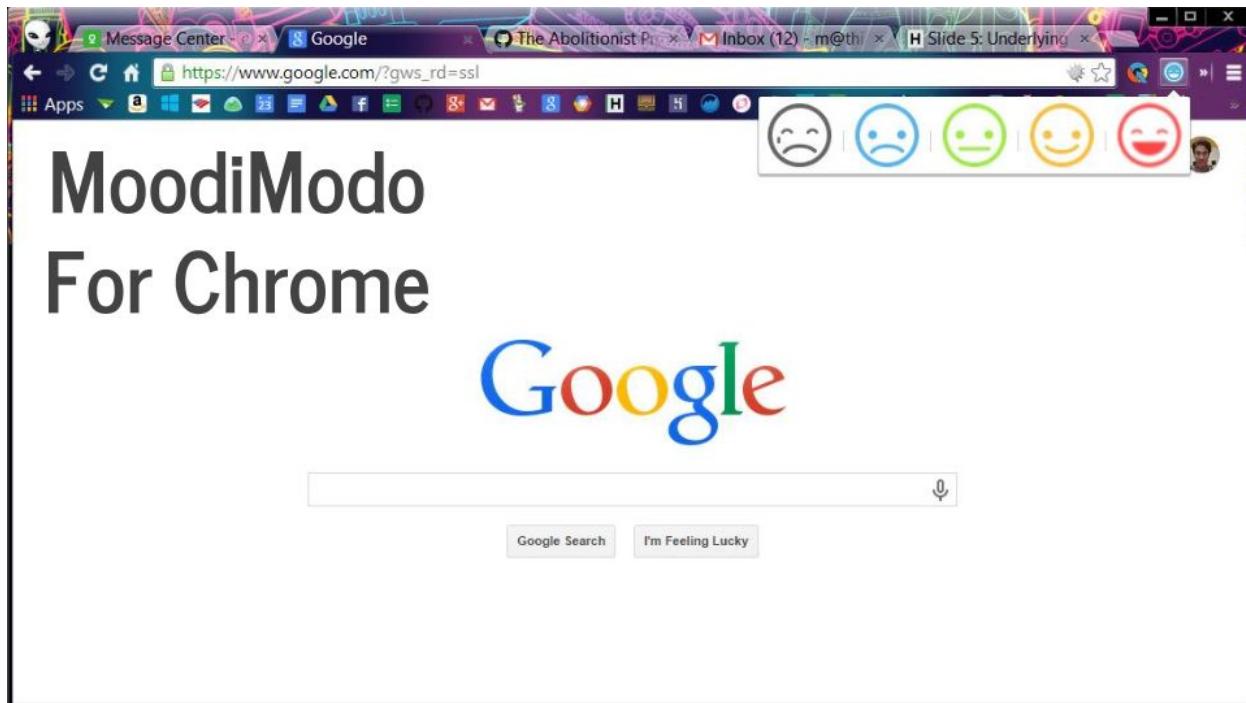


Figure 8 - Screenshot of MoodiModo™ Chrome application highlighting user-friendly face trackers that can be used to track any variable.

Item/Step Number #4

QuantiModo Sync™ Android App:

Figure 9



QuantiModo Sync for Android

Figure 9 - Screenshot showing QuantiModo™ Sync for Android, and the ease of connecting apps and devices.

QuantiModo Sync™ is an Android app that can extract data from other Android applications and send it to the QuantiModo™ website to be analyzed.

Note that the user's phone must be rooted for QuantiModo Sync™ to access the databases.

Tracking apps that are currently supported include:

- Medhelper
- Sleep as Android
- SportsTracker
- MyFitnessCompanion
- MyFitnessPal
- Good Day Journal
- T2 Mood Tracker
- Accupedo
- Cardiograph
- How are you feeling?
- Zombies Run
- Medisafe
- Call Recorder
- Data Habit

QuantiModo™ Sync is open source, so if a user wants to add an app, he/she just needs to make a converter for it. A converter transforms the data from a tracking app's database into a form that can be posted to the QuantiModo™ API.

Email/SMS Based Tracking

Tracking that comes to the user is simple and effective.

1. Set Questions - The user asks questions that matter to them.
2. Get Prompted Daily - AskMeEvery will email or text the user at the time they choose.
3. Reply - The user just replies with their answer and the present invention stores the data for this user.

Sign up as easy as...

Ask me

How long did you exercise?

by emailing me at

mike@quantimo.do

START NOW

Most Common Questions

- How long did I sleep?
- How many minutes did I exercise?
- Was it a good day?
- When did I wake up?
- How far did I run?

Examples

- Did I floss?
- Did I eat breakfast?
- How do I feel (1-10)?
- How many miles did I run?
- Did I take my vitamins?
- How many cups of water?
- How many pushups?
- What time did I go to sleep?
- How many minutes exercising?
- How long did I practice Spanish?
- How long did I work?
- How many pages did I read?
- Did I feel depressed today?
- What am I grateful for?
- Did I drink alcohol?
- How many vegetables did I eat?
- Did I blog?

Methodology Diagram/Description

Basic System Overview

Figure 10

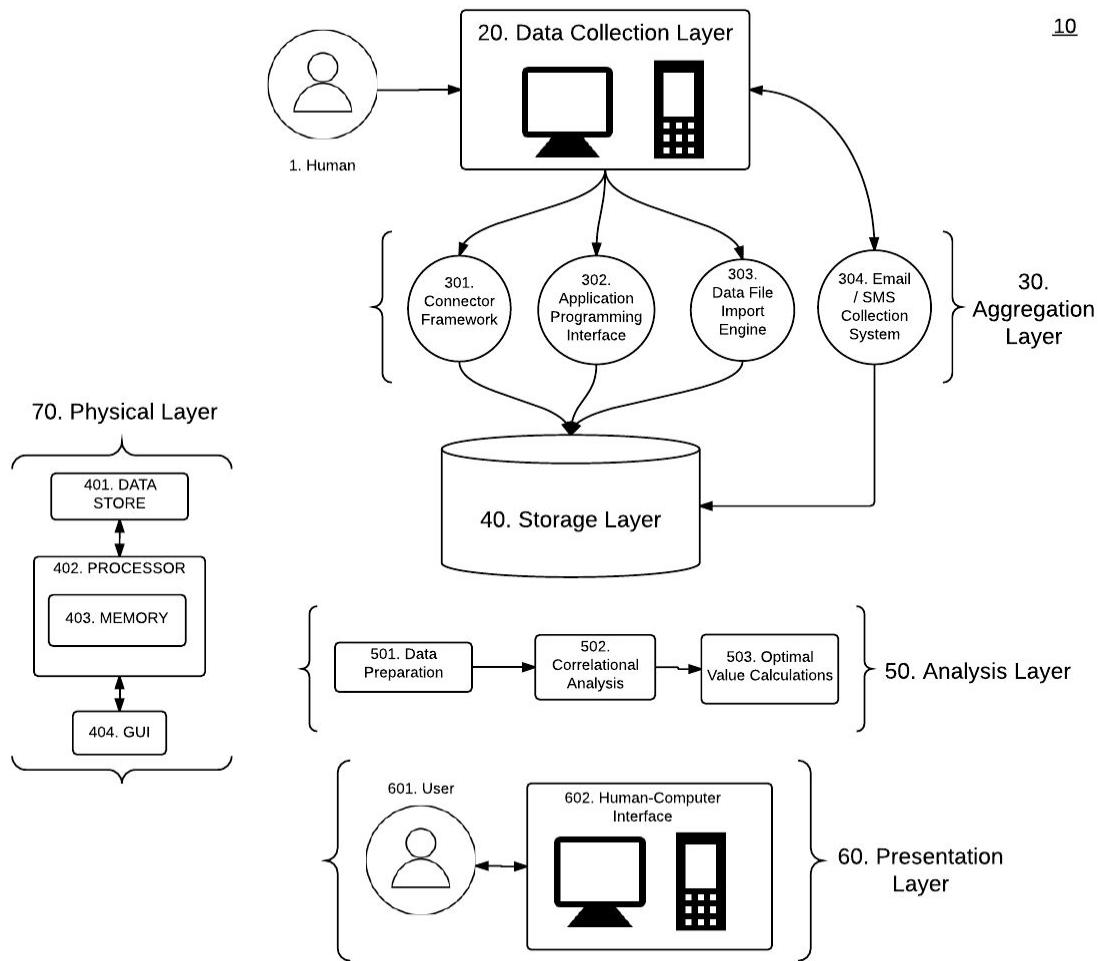


Figure 10 - Diagram of framework used to determine predictive factors.

Figure 10 is an example framework that determines the factors most predictive and the values predictive of a specific output value for any given quantifiable aspect of human existence. The basic framework includes five basic layers:

1. Data Collection Layer 20 - A data collection layer which involves manual or automated collection of data on any given human 402 via life-tracking devices and other human-computer interfaces 401.
2. Data Aggregation Layer 30 - The data aggregation layer acquires, extracts, transforms, and normalizes the data export file formats and data structures in order to load them into standardized structure in a physical data store 301.
3. Physical Layer 70 - The physical layer computer layer encompasses the aggregation, analysis, and storage layers. It is responsible for short and long term data storage as well as processing and aggregation of the data.
4. Analysis Layer 50 - The analysis layer determines the most predictive factors with respect to a given quantifiable outcome aspect of human existence, and the value ranges most likely to produce an optimal outcome.
5. Presentation Layer 60 - The presentation layer consists of a human-computer interface 602 which provides the analytical insights to the user 601.

Figure 11

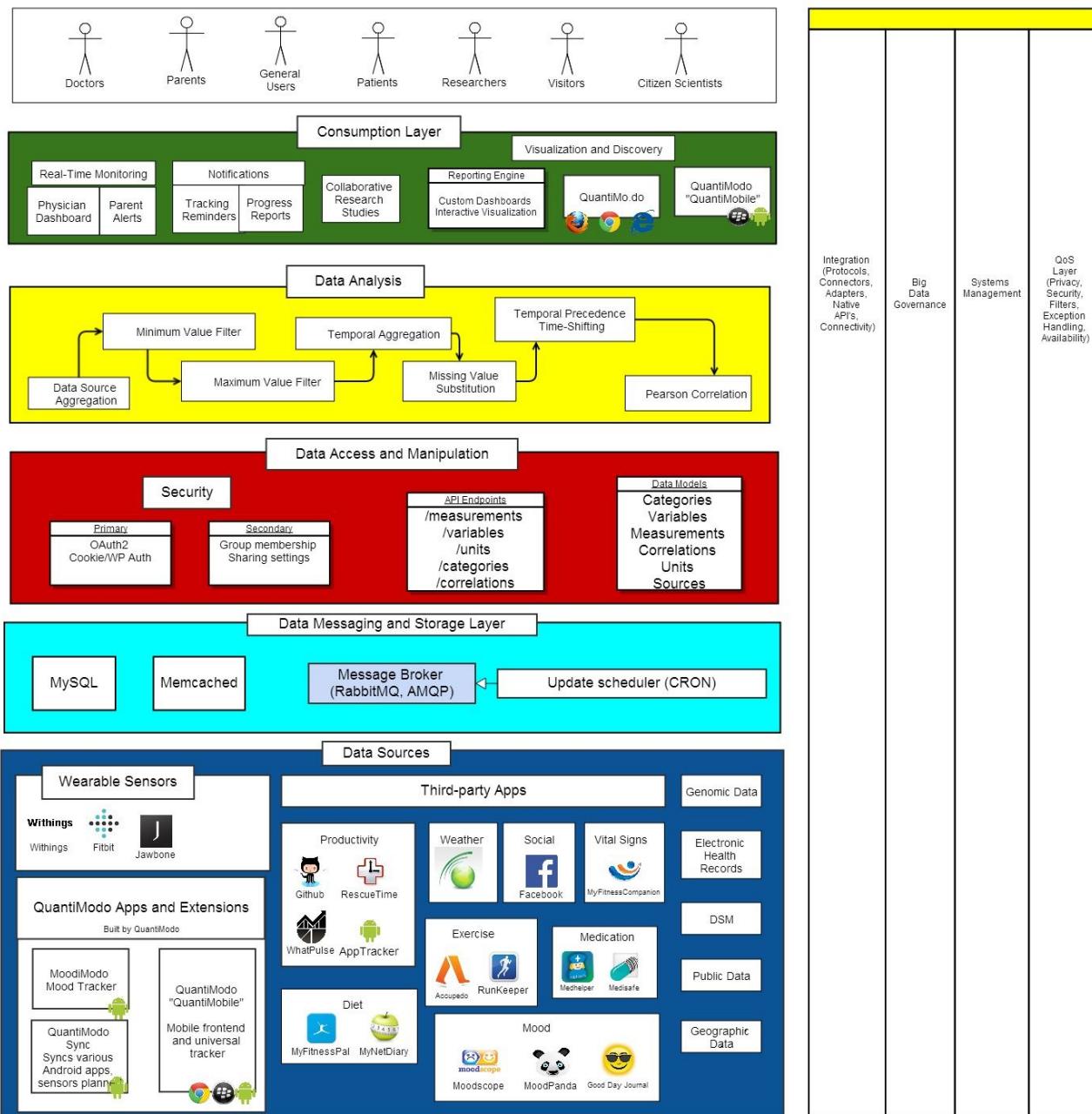


Figure 11 - A user-friendly look at each of the each individual layer referenced in Figure 10.

Collection

It all begins with self-tracking and initial data collection. This can be done using wearable sensors, third party applications, and client applications.

Figure 12

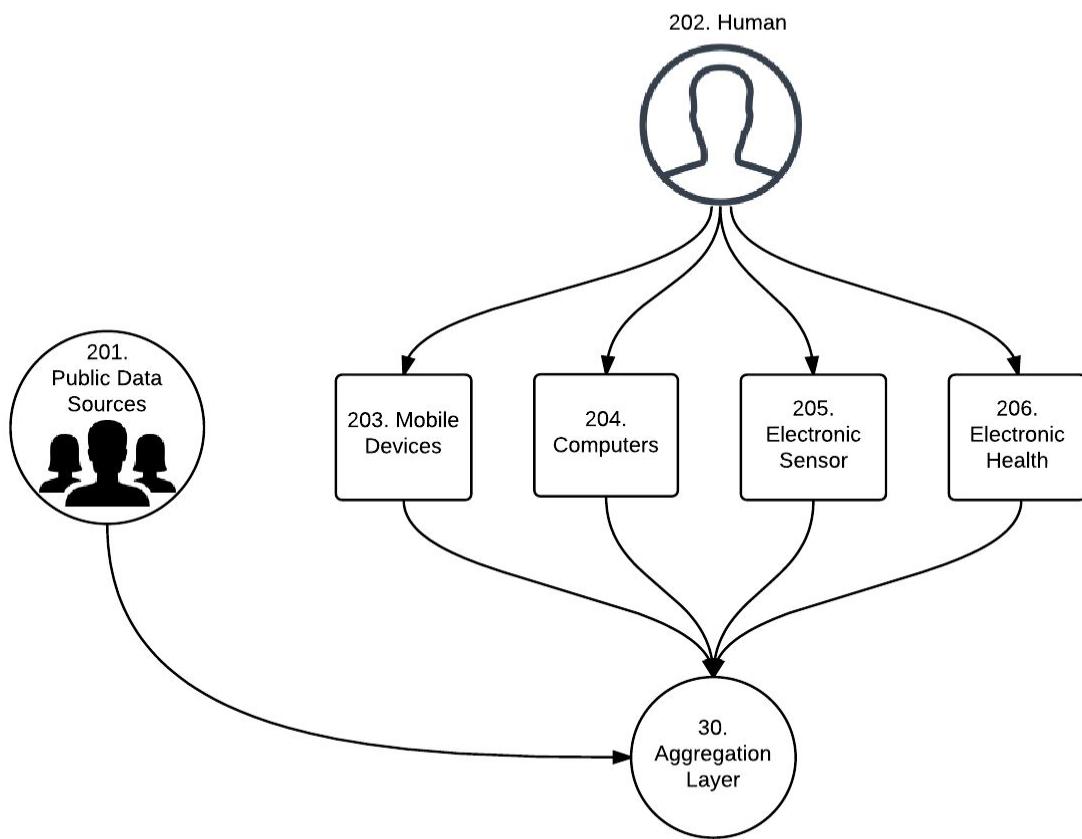
20

Figure 12 - Diagram showing the present invention's method of data collection ranging from human and public data sources ultimately ending up at the aggregation layer (30).

Data Types

Ultimately, the system should be able to handle the following data types:

- Omics data (e.g., genomics, proteomics, metabolomics, etc.)
- Image and physiological data (e.g., CT, PET/SPECT, sMRI, fMRI, rMRI, DTI, EEG, MEG, ultrasound, cellular level imaging, multi-electrode recording, etc.)
- Clinical data (e.g., lab tests, pathology, imaging, diagnosis, electronic health records, etc.)
- Multiscale data (genomic, epigenomic, subcellular, cellular, network, organ, systems, organism, population levels)
- Multiplatform data (desktop, cloud-based storage, etc.)
- Data from multiple research areas and diseases (e.g., common inflammatory pathways in cancer, obesity, immune diseases, and neurodegenerative diseases)
- Data with special considerations (e.g., sparse data, heterogeneous data, very large or very small datasets)
- Human-computer interfaces and visualization

Automated Data Acquisition

At the present time, it requires a great deal of effort and diligence on the part of the self-tracker to gather all of the data required to identify the triggers of mental illness and quantify the effectiveness of different treatments. Tracking one's mood, diet, sleep, activity, and medication intake can be extremely time-consuming. The present invention automatically pulls data from a number of data sources (adding more all the time).

The data sources would include:

- Bio-metric Devices: that could measure vital signs and biomarkers
- Purchase Records: Data regarding consumption of foods and supplements could be automatically collected by and inferred from receipts or other financial aggregation services like Mint.com or Slice.
- Auditory Records: Voice recognition may be used to quantify emotion through conscious verbal expression, spectral analysis of the magnitudes of different frequencies of speech would probably be a better means of quantifying unconscious human affect and thus providing more accurate data for the machine learning process. CommonSense is a cloud-based platform for sensor data.
- Visual Affect Data via Web-Cameras: By tracking hundreds of points on the subjects' face, InSight can accurately capture emotional states.
- Prescription Records: Microsoft HealthVault can automatically collect lab results, prescription history, and visit records from a growing list of labs, pharmacies, hospitals, and clinics.

Aggregation

Figure 13

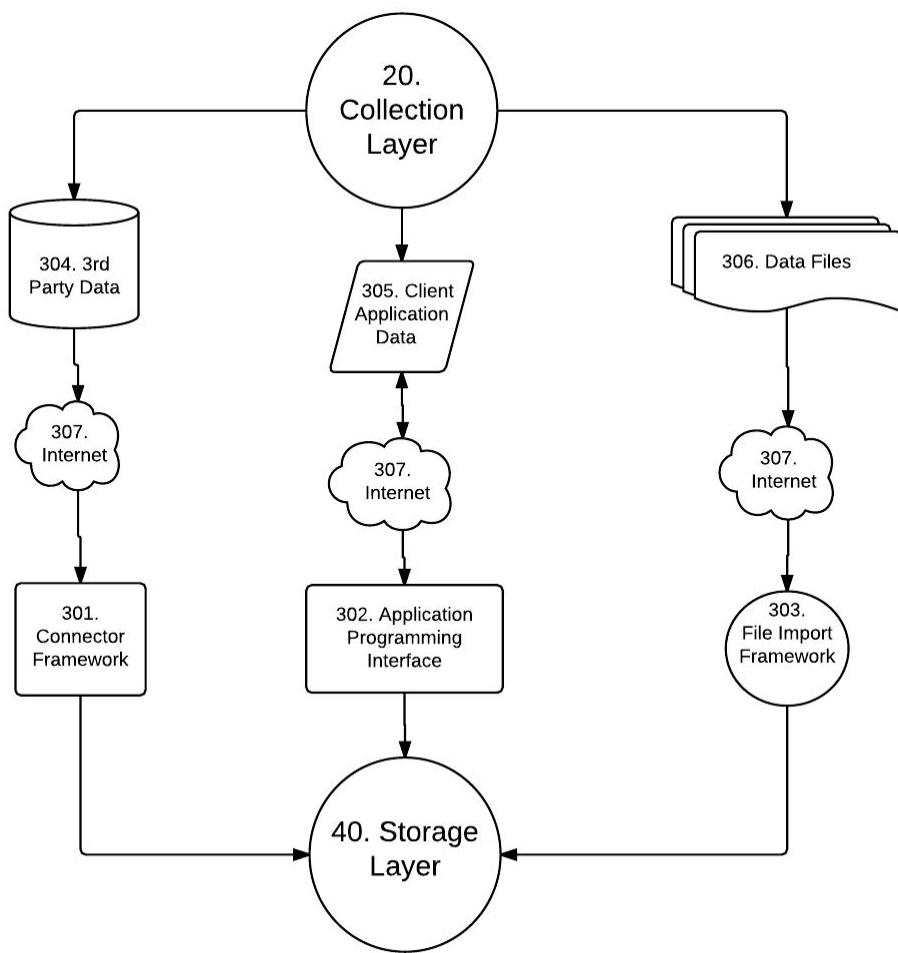


Figure 13 - A detailed outline showing the method of aggregation. The data is taken from the collection layer moved through various sources, through the internet, through our API or one of our frameworks, and ultimately ends at the storage layer (40).

Application Programming Interface (API)

The present invention consists of an application programming interface (API) for receiving and sharing data, a spreadsheet upload/import module, a connector framework to pull data from existing third party API's, and software development kits (SDKs). The QuantiModo™ Connector Framework (a component of the present invention) will allow ongoing regular import of user data after a single user authorization.

Data is stored and retrieved from the database using the QuantiModo™ API.

Figure 14

correlations.json : Correlations	Show/Hide List Operations Expand Operations Raw
GET correlations	Get correlations
GET public/correlations/search/{search}	Get correlations
measurements.json : Measurements	Show/Hide List Operations Expand Operations Raw
GET measurements	Get measurements for this user
POST measurements	Set measurement
POST measurements/v2	Set measurement
measurementSources.json : Measurement sources	Show/Hide List Operations Expand Operations Raw
GET measurementSources	Get measurement sources
POST measurementSources	Set measurement source
measurementsRange.json : Measurements range	Show/Hide List Operations Expand Operations Raw
GET measurementsRange	Get measurements range for this user
oauth2.json : OAuth2	Show/Hide List Operations Expand Operations Raw
GET oauth2/authorize	Authorize
pairs.json : Pairs	Show/Hide List Operations Expand Operations Raw
GET pairs	Get pairs
sharing.json : Variable sharing details	Show/Hide List Operations Expand Operations Raw
DELETE sharing	Delete variable sharing
POST sharing	Share variable
GET sharing/{variableName}	Get variable sharing details
unitCategories.json : Variable measurement units	Show/Hide List Operations Expand Operations Raw
GET unitCategories	Get unit categories
units.json : Variable measurement units	Show/Hide List Operations Expand Operations Raw
GET units	Get all available units
GET unitsvariable	Get all available units for variable
user.json : Get authenticated user	Show/Hide List Operations Expand Operations Raw
GET user	Get authenticated user
variableCategories.json : Variable categories	Show/Hide List Operations Expand Operations Raw
GET variableCategories	Get unit categories
variables.json : Variables	Show/Hide List Operations Expand Operations Raw
GET public/variables	Get public variables
GET public/variables/search/{search}	Get variables by search query
GET variables	Get variables by category name
POST variables	Set variable
GET variables/{variableName}	Get variable by name
GET variables/search/{search}	Get variables by search query
variableUserSettings.json : Variable user settings	Show/Hide List Operations Expand Operations Raw
POST variableUserSettings	Change variable user setting

Figure 14 - Overview of the API's elements that are chief component of the present invention

API Endpoints

API Endpoints allow client applications such as the QuantiModo™/MoodiModo™ suite of mobile

applications, Chrome extension, and website interfaces to retrieve data for local visualization. These can be used in analysis or to store data.

The present invention uses a standard REST API that supplies and accepts data encoded in JSON format. The Application Programming Interface (API) are the pipes that store or retrieve information to allow client applications, browser extensions, and websites to retrieve data from or send data to the database for storage.

User Variable Relationship's Endpoint

A predictive power is a value representing the magnitude of the time-shifted relationship between a predictor/outcome pair of variables.

Pairs of Predictor and Outcome Measurements

In order to determine the predictor/outcome relationship between two variables, the present invention requires a two dimensional array containing hypothetical predictor measurements paired with the corresponding outcome measurements for that time.

Variable Settings Hierarchy

The present invention determines which variable settings to use for analysis in this order of precedence:

- 1.variable-user-settings
2. variables
3. variable-categories

The values stored in the variable_user_settings table always take precedence over the default value in the variables table. If there are no values in the variable_user_settingstable, then the values in the variables table take precedence over the default values in the variable_categories table. If there are no variable settings in the variables table, the variable-categories settings are used.

Item/Step Number #5
High Level Measurement Processing Algorithm

Figure 15

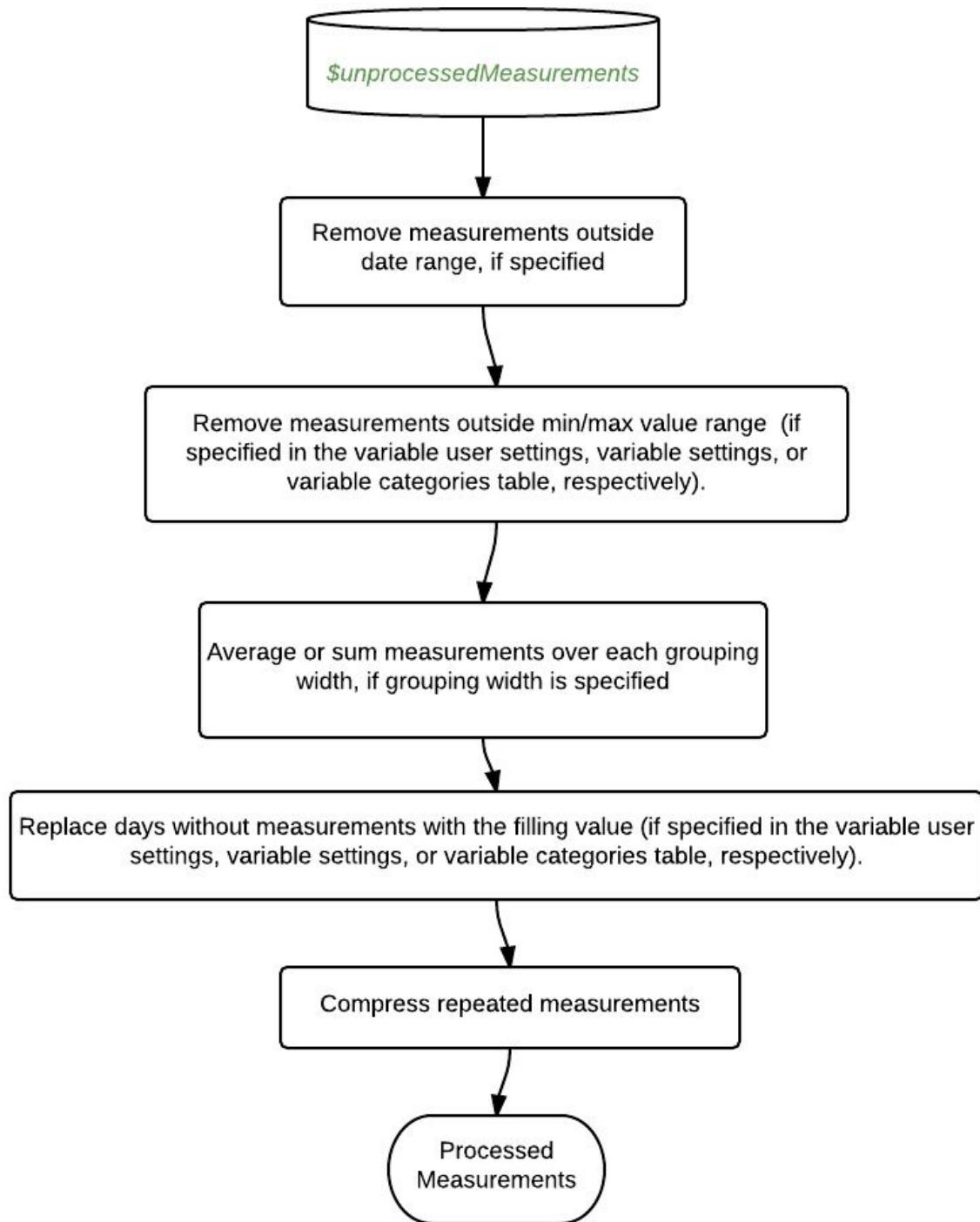


Figure 15 - Step-by-step diagram showing the methodology for converting unprocessed measurements to processed measurements. Shows ways that the present invention is able to create "cleaner" and more accurate data.

Item/Step Number #6

Detailed Filtering, Filling, Temporal Aggregation, and Pairing Algorithm

(Broken down into three separate images to make it easier to read each individual element.)

Figure 16a

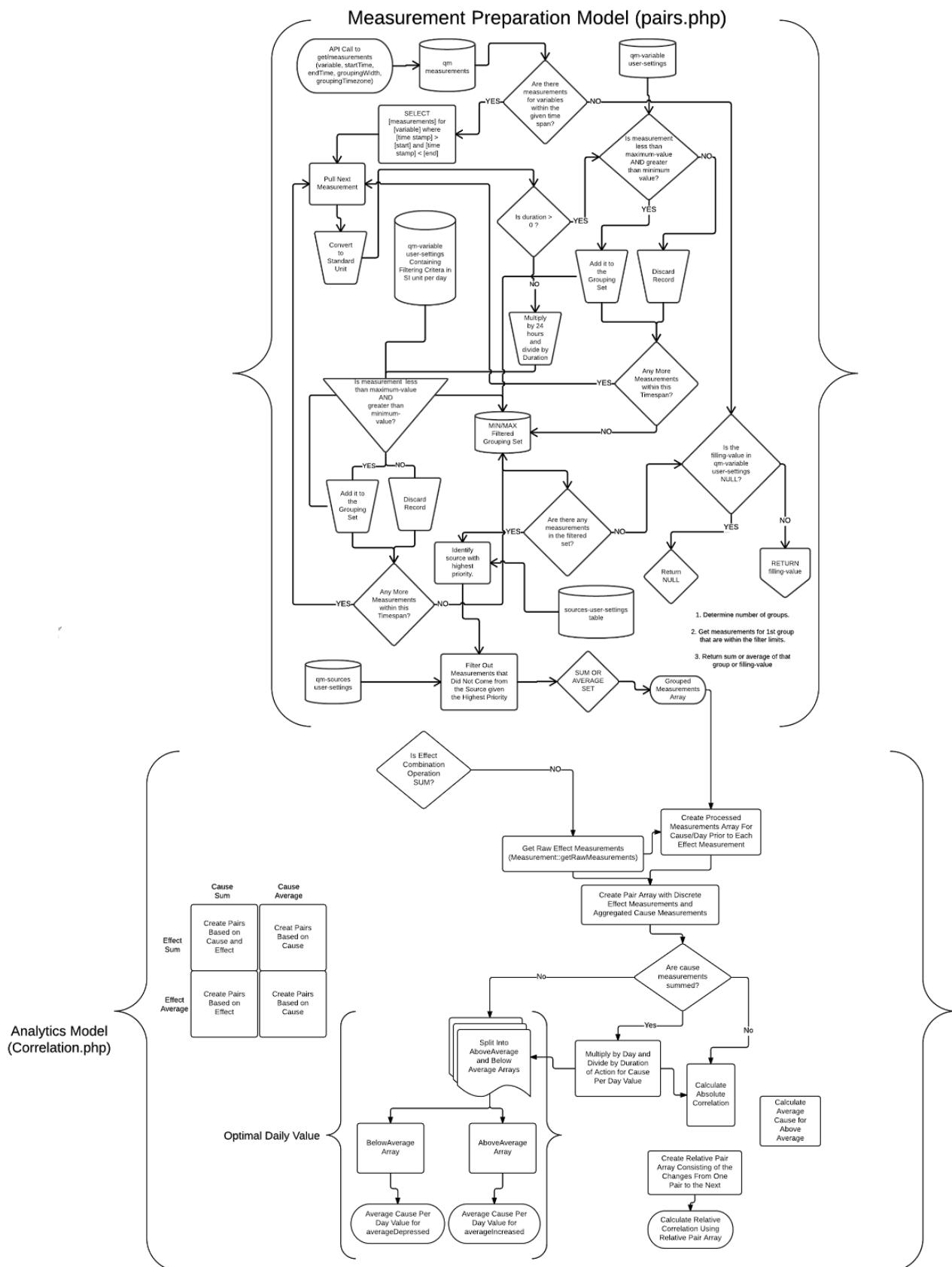


Figure 16 - Complete overview of the algorithmic process used for data filtering, filling, temporal aggregation, and pairing.

Item/Step Number #16b (Zoom)

Measurement Preparation Model (pairs.php)

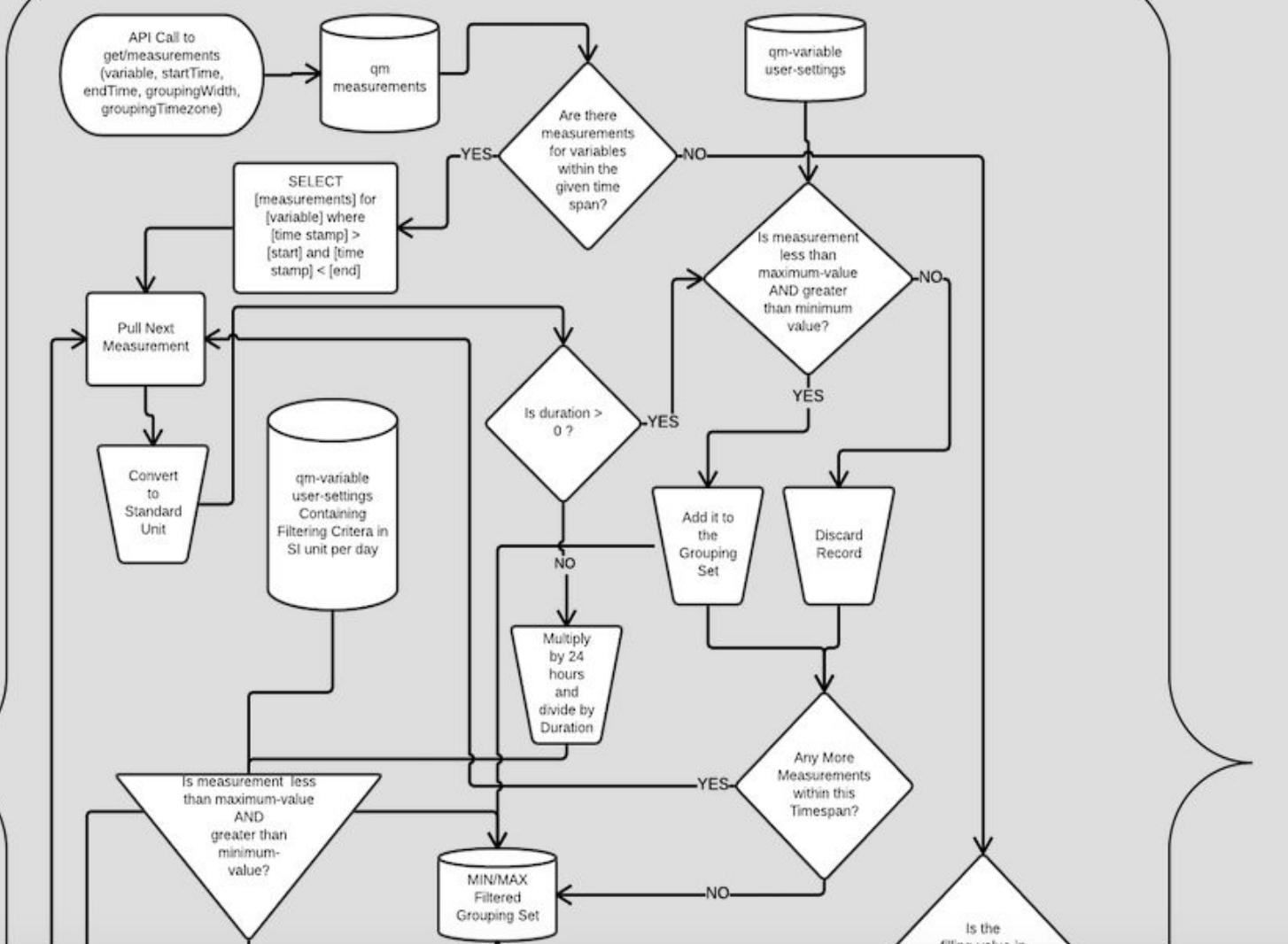


Figure 16b - Top third of figure 16a.

Item/Step Number #16c (Zoom)

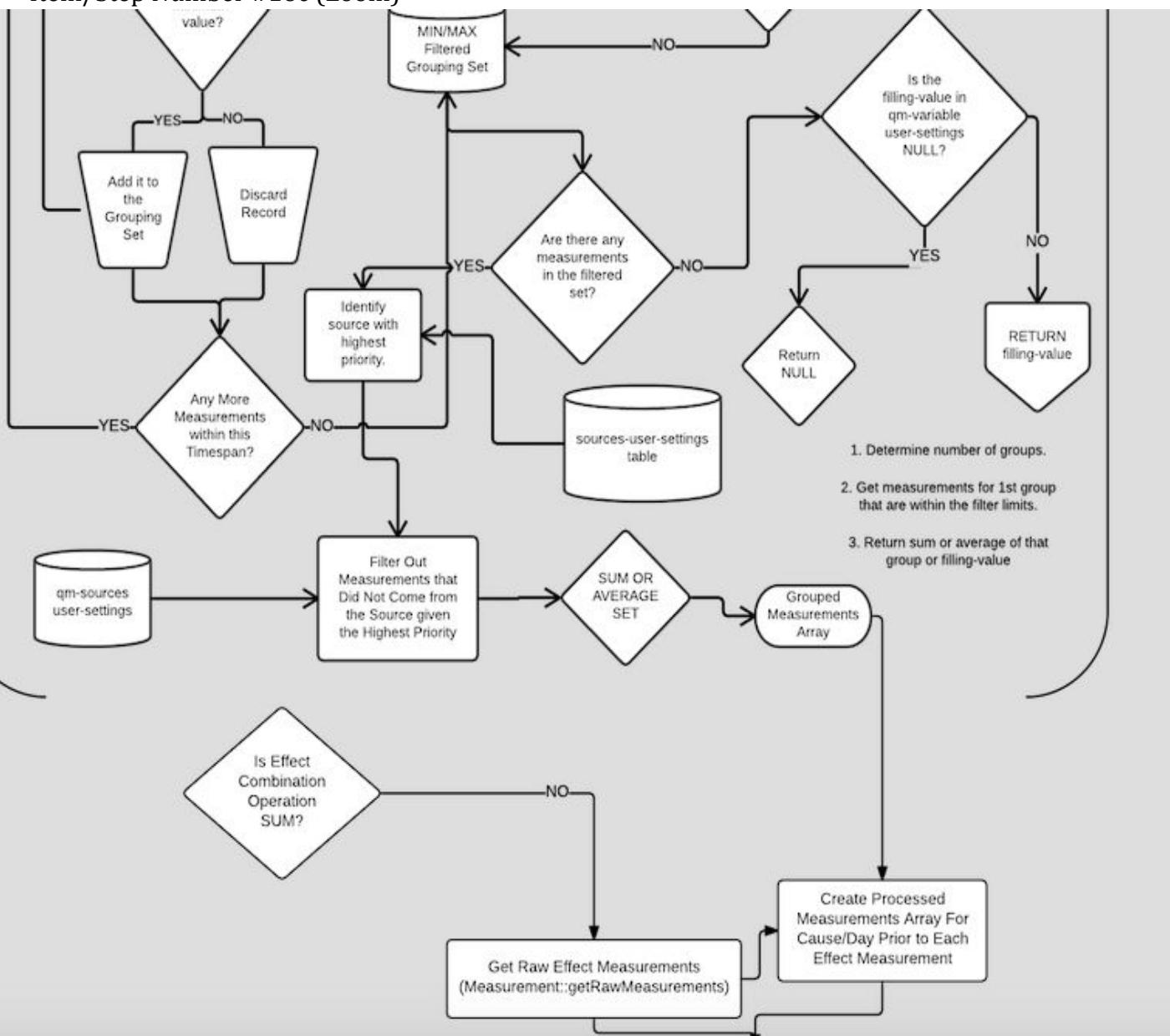


Figure 16c - middle third of figure 16a

Item/Step Number #16d (Zoom)

Analytics Model
(Correlation.php)

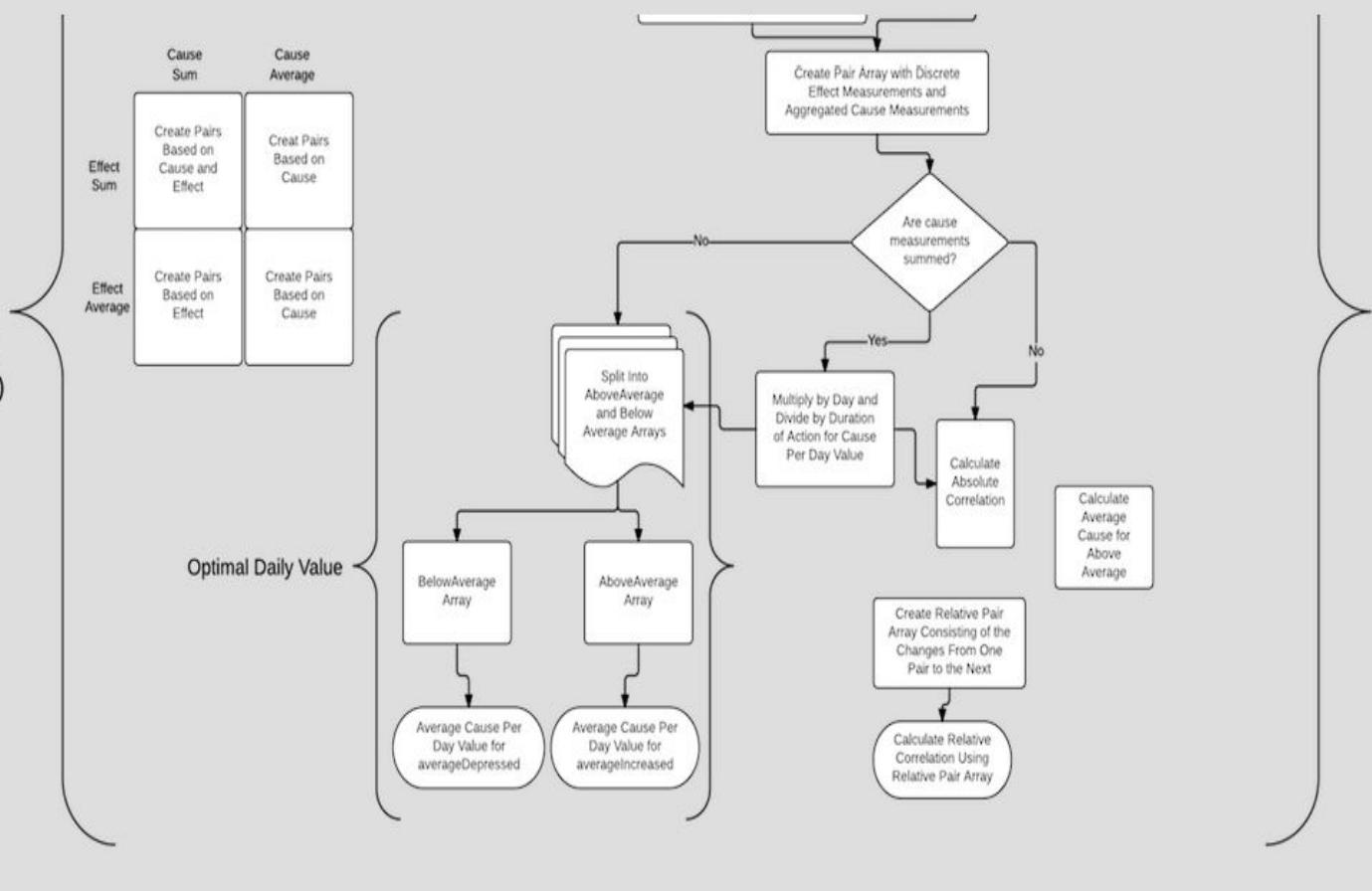


Figure 16d - Bottom third of figure 16a

Figure 17

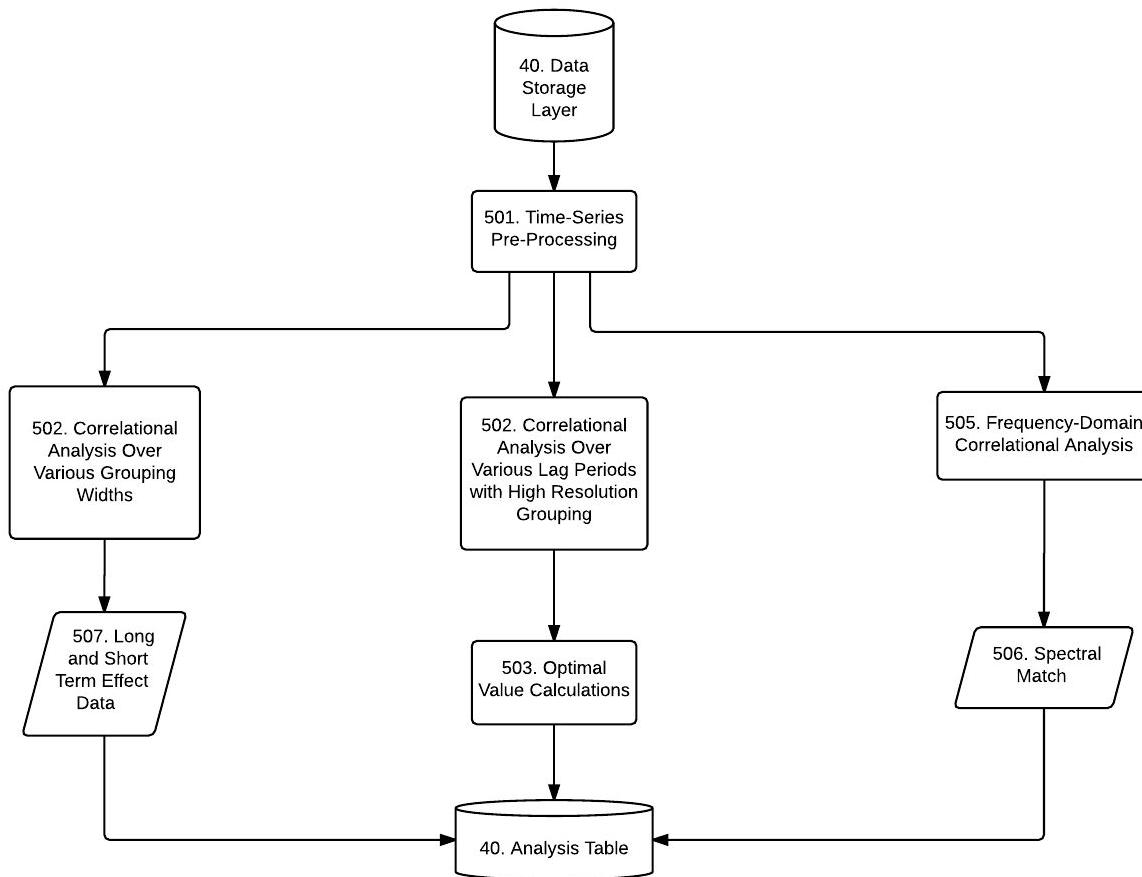


Figure 17 - A diagram that shows the present invention's method for data analysis. Data moves from the storage layer (the final destination in aggregation process) to the analysis table. During this process a large number of predictor/outcome analyses are run including temporal analysis.

Before reaching the analysis table the following processes occur:

- filtering of unreasonable values likely to be erroneous
- unit normalization to make separate sources of data compatible
- appropriate zero-filling in time-series data in cases which the absence of data is indicative of the absence of stimuli
- temporal bucketing of time-series data to create 1 to 1 element arrays of measurement pairs or hypothetical treatment(s) and outcome variable(s)
- determination of **consistency** of findings by comparing the strength of one subject's predictor/outcome relationship with those of different users with different samples
- determining the **specificity** of a relationship by comparing the strength of one subject's predictor/outcome relationship with those of different users with different samples and with other similar demographic, symptomatological, genetic, environmental, and treatment predictor/outcome profiles, or other common characteristics
- determination of **causal temporality** by incremental shifting of the hypothetical outcome array relative to the treatment array and performing different types of predictor/outcome relationship analysis to determine likely **onset delay**, **time to peak effect**, and **duration of action** for a particular treatment(s) and outcome pair of variables

- determination of likely causal direction by comparing the **net effect** to the **reverse net effect**
- determination of the strength of association between all treatments and outcomes using predictive/outcome relationship analysis of each treatment event combined with aggregated outcome events over the previously determined estimated duration of action following the estimated onset delay
- crowd-sourced plausibility estimation by allowing user to indicate their view of the plausibility of each relationship through a computer human interface
- evaluation of the coherence of a given treatment(s)/outcome causal relationship by comparison to the conclusions of available formal epidemiological and laboratory findings
- incorporation of ongoing interventional data to validate or disprove a relationship determined using merely observational data
- crowd-sourced joining of synonymous variables to be merged during analysis,
- crowd-sourced tagging of ingredients or related variables to be merged during analysis
- crowd-sourced tagging of similar variables in order to determine if they produce similar outcomes, lending the strength of analogy to the likelihood of predictor relationships
- using life-tracking data and predictor/outcome relationship to create an overall life-optimization score for the user to motivate said him/herself through gamification reward techniques,
- using said complete context to complete useful activities selected from the group consisting of customizing a treatment, customizing a test, ordering a treatment,
- determination of treatment variable values most predictive of above average outcome values
- determination of treatment variable values most predictive of below average outcome values
- determination of treatment variable values most predictive of a specific outcome value range
- presenting relationships with a given variable in order by significance though a human-computer interface
- establishment of optimal value ranges for treatment variables with respect to important outcome variables
- electronic notifications to users when data indicating treatment values are outside optimal ranges
- sharing of data for specific variables with other users such as physicians

Item/Step Number #7

Algorithm to Calculate Predictor/Outcome Relationship Over Time

Figure 18

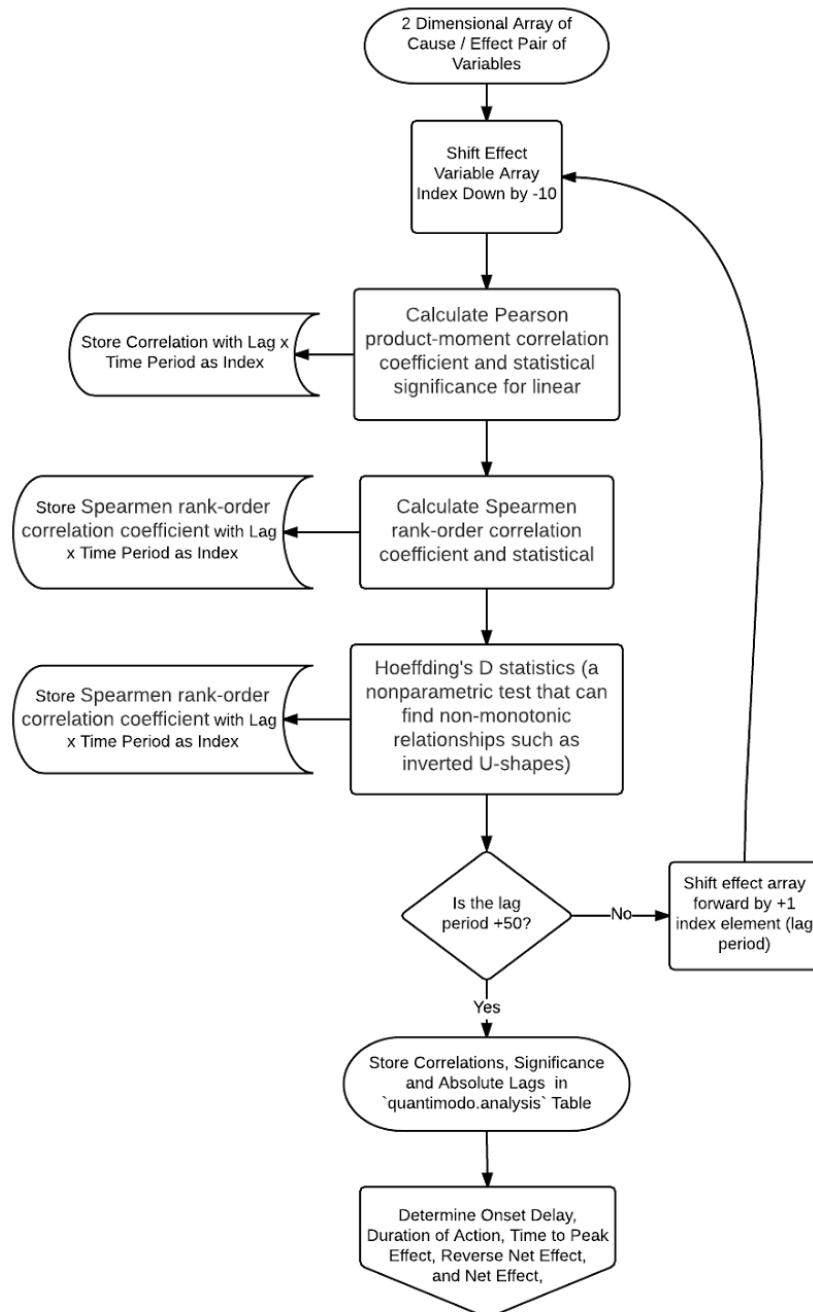


Figure 18 - Overview of the predictor/outcome algorithm analysis that is run to determine variables relationships, while taking time into account.

Item/Step Number #8

Algorithm to Determine Onset Delay, Time to Peak Effect, Duration of Action, Net Effect, and Reverse Net Effect

Figure 19

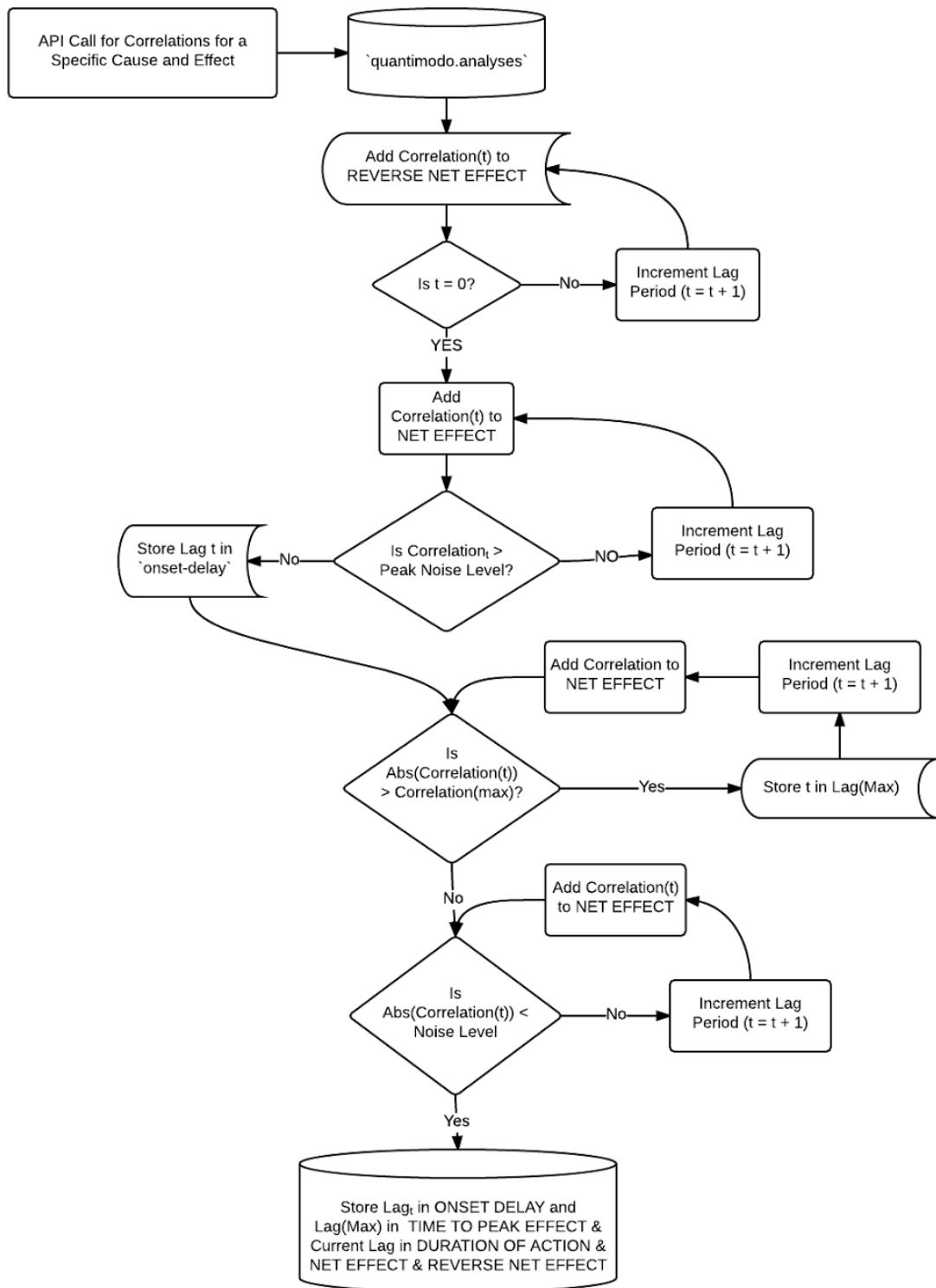


Figure 19 - Diagram of the algorithm that is used to determine the previously mentioned onset delays, time to peak effect, duration of action, net effect, and reverse net effect.

Item/Step Number #9
Algorithm to Calculate Optimal Daily Values

Figure 20

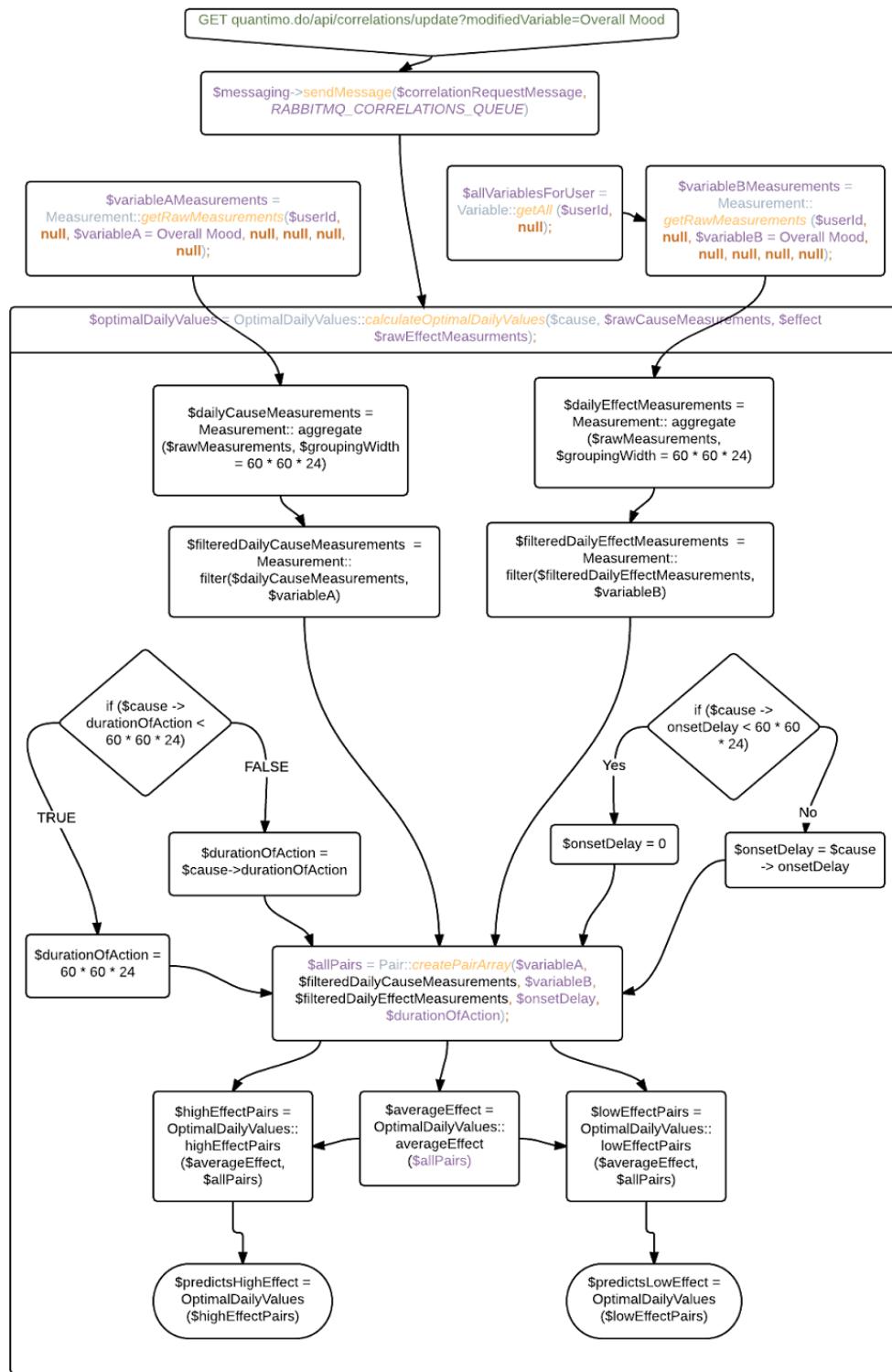


Figure 20 - Diagram of the algorithm used to determine optimal daily values of each variable.

- All of the data is stored in a MySQL relational database.
- Memcached is used to improve data access performance.
- In order to process all requests and distribute workload among multiple servers the present invention utilizes the RabbitMQ messaging broker.

- The present invention also uses a CRON job to automatically import new data from other services at regular intervals.

Item/Step Number #10

Filtering Erroneous Data

Self-tracking apps often produce erroneous data. The present invention's max/min filter can remove inaccurate values. Filter values are on a per day basis. (i.e. Any more than 1000 mg of Aspirin today would be filtered out). All filtering events are logged so that users may review and identify errors.

The filtering process:

1. The present invention can filter out measurements for a given variable within a specific timespan that is likely to be erroneous.
2. It can also average/sum the measurements that are not filtered out. If no acceptable measurements are present within the given timespan, then the API should return the "filling-value" set in the qm-variable-user-settings table instead. This is further illustrated in the flowchart above.

For example, when a user forgets to track his/her sleep, traditional trackers will enter a zero which is not likely the true value. With the present invention, a user can set a minimum daily value figure so that zeros sent to the system are filtered out. The system knows that the user has forgotten to track his/her sleep and enters no data point which keeps the information as accurate/clean as possible.

A maximum value filter is another example. If one forgets to turn off a sleep tracker for example, after a predecided maximum of say 14 hours, the present invention recognizes this data is erroneous .

Figure 21



Figure 21 - The present invention can produce charts of the sleep/mood predictor/outcome relationship for a user choosing to share her/his data anonymously.

Filling Gaps Between Measurements

If there are no acceptable measurements within the requested time frame, the API needs to return a user-defined substitution (filling-value), if one has been specified. If none has been specified, the API returns a NULL value which is a gap in the data. For medications the substituted filling-value will usually be 0. If a user didn't record medication for that day, it probably means that user didn't take it. It is important to have zeros instead of null values, because the present invention needs the zero points to create points on its xy scatter-plot which is used to determine predictive powers between input behaviors and output states.

With Filling:

Figure 22

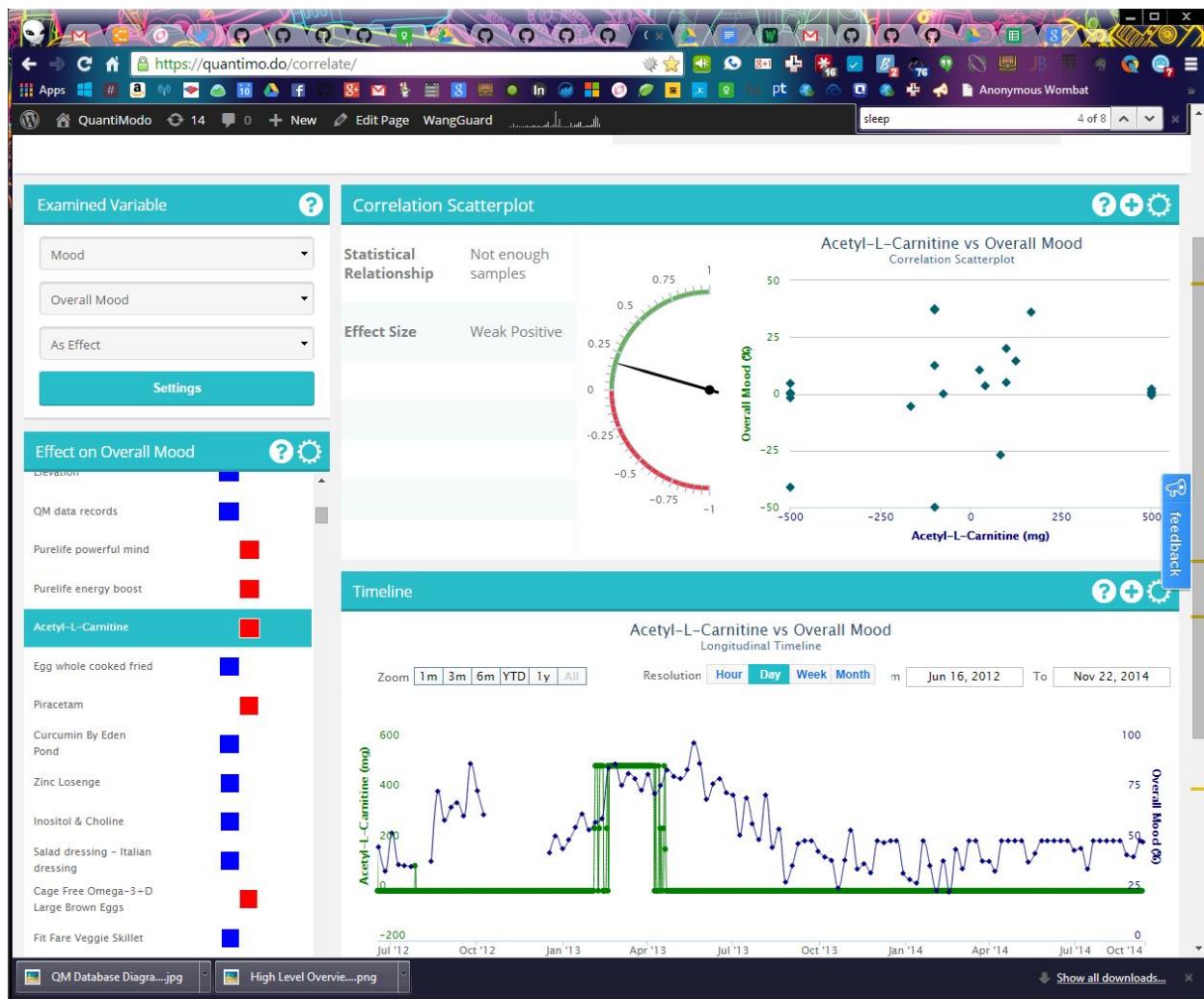


Figure 22 - Filling-type Key

- *filling-type = 0 -> No filling should be performed. i.e. Null values should be provided when measurements are not present for a given time period over which measurements are requested.*
- *filling-type = 1 -> The value in the filling-value field is provided when there are no measurements for a given time period.*

The interval and value (filling-value) of these generated measurements are defined by the user settings, and stored in a separate MySQL table qm-variable-user-settings.

Filling is performed when the present invention is missing values where it should have 0's. The most common usage of 0 filling is in the case of foods and medications.

As explained under Figure 22, the filling-value is the value that will be used instead of null values if the filling-type is set to 1.

Say a user wants to see how bananas affects their mood. On a day a user did not have a banana for example, they are unlikely to track. The present invention can be set to enter a zero for them. The user may also enter a zero manually in retrospect.

Figure 23

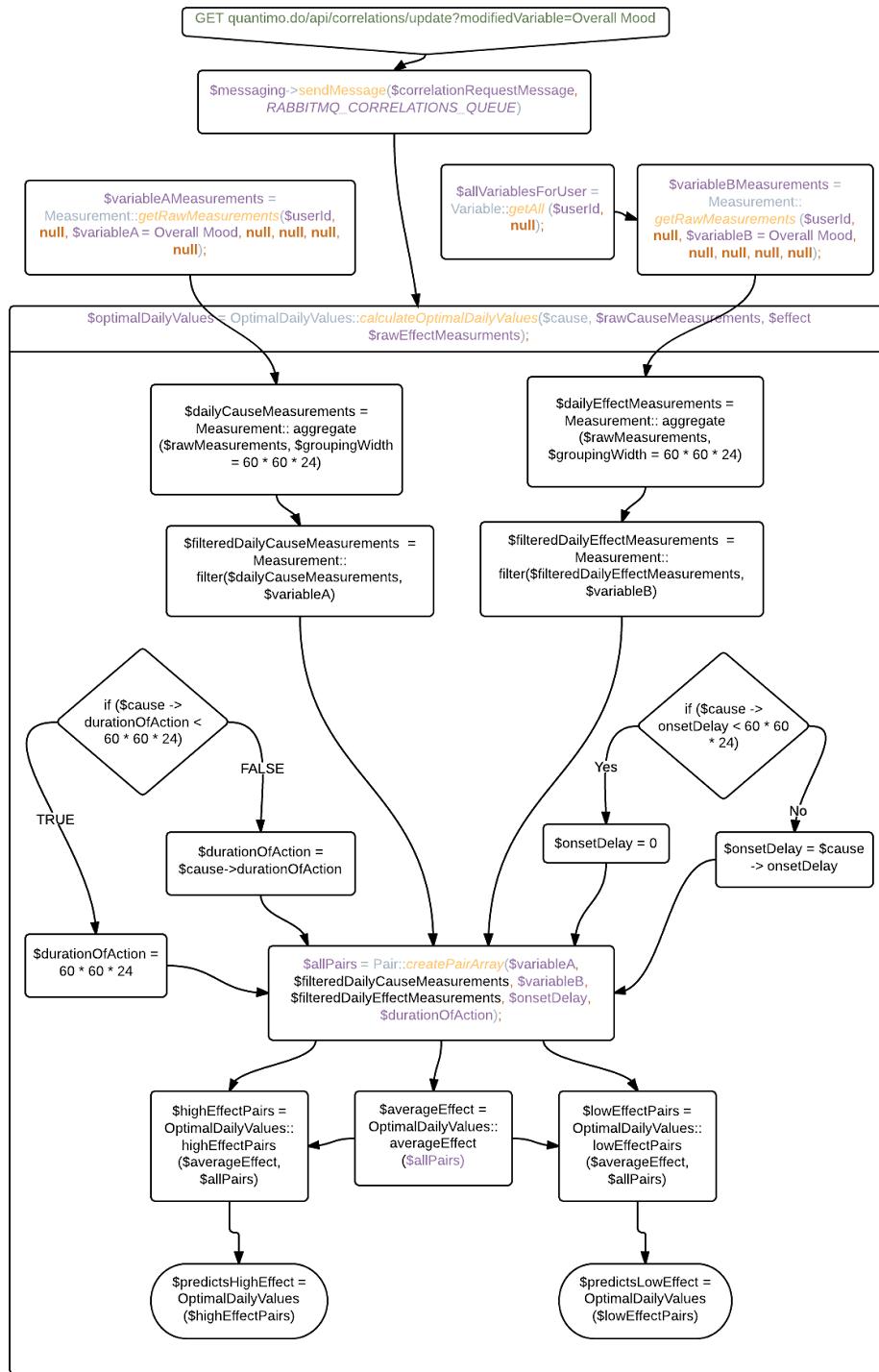


Figure 23 - The present invention's predictive identification capability.

Predictive Identification

Predictor/Outcome Relationships

The Pearson product-moment correlation coefficient is a measure of the linear predictive power (dependence) between two variables X and Y.

- 1 is total positive correlation
- 0 is no correlation

Compliance with HIPAA Regulations (and other applicable law)

DATA SECURITY POLICY IN BRIEF

QuantiModo focuses on security from the ground up. Our Data Center (managed by Amazon Web Services) is SAS 70 Type II certified, SSAE16 (SOC 2) Compliant, and features proximity security badge access and digital security video surveillance. Our server network can only be accessed via SSL VPN with public key authentication or via Two-factor Authentication over SSL. We run monthly Qualys Vulnerability Assessments on our production environment. Additionally, our network can only be accessed via multi-factor authentication, and all access to our web portal is secured over HTTPS using SSL 256-bit encryption. Additionally, all staff members with access to Client Data receive certification as a HIPAA Privacy Associate.

DEFINITION OF TERMS & SYSTEM USERS:

Client — A customer of QuantiModo.

User — An individual with access to a QuantiModo Application.

Admin — A Client User with the capability of viewing and managing certain aspect of Client's QuantiModo Account.

Member — A Client User whose account is provisioned through Client's Web Portal. A Member cannot login or otherwise access any QuantiModo Application directly. All Member Data stored in our system is de-identified in compliance with the HIPAA "Safe Harbor" de-identification standard.

Developer — A User that can create vendor applications in Validic for the purpose integrating mobile health apps and/or devices.

QuantiModo Admin — A QuantiModo employee with access to managing a Client's account.

DATA CENTER AND HARDWARE

All QuantiModo application and database servers are physically managed by Amazon Web Services in secure data centers within the United States. Our security procedures utilize industry best practices from sources including The Center for Internet Security (CIS), Microsoft, Red Hat and more. All data center facilities are certified SSAE 16 (SOC 2) Compliant and have 24/7 physical security of data centers and Network Operations Center monitoring.

Physical Security

All servers are located in a Data Centers managed by Amazon Web Services within the United States. Physical access is controlled both at the perimeter and at building ingress points by professional security staff utilizing video surveillance, intrusion detection systems, and other electronic means. QuantiModo employees do not have access to physical server hardware.

Data Access and Server Management Security

QuantiModo has IPSec VPN connections to our hosting environment. Only select QuantiModo employees are able to access the server network.

Environmental Safeguards

All Amazon Web Services data centers are equipped with automatic fire detection and suppression (either wet-pipe, double-interlocked pre-action, or gaseous sprinkler systems), climate and temperature controls ,fully redundant uninterruptible Power Supplies (UPS), and generators to provide back-up power for each physical site.

DATA STORAGE AND BACKUPS

All Member Data stored in our system is de-identified in compliance with the HIPAA “Safe Harbor” de-identification standard, and all data is encrypted at rest using 256-bit AES. QuantiModo production database servers are replicated across multiple availability zones. Database backups use a fully disk-based solution (disk-to-disk) and full system backups, are performed daily, weekly, and monthly. Daily backups are retained for a minimum of 7 days, weekly backups are retained for a minimum of 4 weeks, monthly backups are retained for 3 years. Backups are stored in multiple geographic availability zones within Amazon Web Services.

Client Data Policies

Client Data includes data stored by Clients in QuantiModo applications, information about a Client’s usage of the application, data instances in the CRM system that we have access to, or data that the Client has supplied to use for support or implementation. Here are the special considerations we take into account when managing Client Data:

1. Client Data is not to be disclosed outside of QuantiModo, except to the Client who owns the data or to a Partner who has been contracted by the Client to manage or support their account.
2. Client Data should only be shared using a secure sending method. Approved sending and sharing methods include Dropbox, Google Drive, emailing of encrypted files or use of a Client-provided secure transfer method.
3. Client Data should only be stored temporarily outside of the QuantiModo Application if at all. If there is a need to archive Client Data (for example, data provided by a Client during implementation or training), the data should be stored on a central file server and deleted from any personal computers. This includes report exports, contact lists, and presentations that contain Client information, and Client agreements.

4. Client Data should only be accessed on a need-to-know basis. Specifically, a Client's account should only be accessed to provide support, troubleshoot a problem with that account, or for supporting the system as a whole.
5. Client Data should never be changed except with the explicit permission of the Client, with the exception of repairing data quality issues.

Destruction of Server Data

In order to maintain system integrity, Client Data that has outlived its use is retained up to 60 days before it is destroyed. The data may remain in our backup files for up to 14 months, as it is our policy to maintain weekly backups for a minimum of 52 weeks before those backups are destroyed. De-identified activity data from Members may be stored in perpetuity for future analysis.

Disposal of Computers and Other Data

Old computers and servers used to store or access client information receive a 7-pass erase that meets the U.S. Department of Defense 5220-22 M standard for erasing magnetic media; the devices are then recycled or resold to manufacturers. Paper information in the office is discarded using a document shredder or a commercial secure document shredding service.

Incident Response

QuantiModo security administrators will be immediately and automatically notified via email if implemented security protocols detect an incident. All other suspected intrusions, suspicious activity, or system unexplained erratic behavior discovered by administrators, users, or computer security personnel must be reported to a security administrator within 1 hour.

Once an incidence is reported, security administrators will immediately begin verifying that an incident occurred and the nature of the incident with the following goals:

1. Maintain or restore business continuity
2. Reduce the incident impact

3. Determine how the attack was performed or the incident happened
4. Develop a plan to improve security and prevent future attacks or incidents
5. Keep management informed of the situation and prosecute any illegal activity

Determining the Extent of an Incident

Security administrators will use forensic techniques including reviewing system logs, looking for gaps in logs, reviewing intrusion detection logs, interviewing witnesses and the incident victim to determine how the incident was caused. Only authorized personnel will perform interviews or examine evidence, and the authorized personnel may vary by situation.

Notifying Clients of an Incident

Clients will be notified via email within one hour upon detection of any incident that compromises access to the service, compromises data, or otherwise affects users. Clients will receive a status update every 4 hours and upon incident resolution.

APPLICATION SECURITY

All data transfer and access to QuantiModo applications will occur only on Port 443 over an HTTPS encrypted connection with 256-bit SSL encryption.

System Updates and Security Patches

As a hosted solution, we regularly improve our system and update security patches. No client resources are needed to perform these updates. Non-critical system updates will be installed at predetermined times (typically 2:00 a.m. Eastern on Thursdays). Critical application updates are performed ad hoc using rolling deployment to maximize system performance and minimize disruption. All updates and patches will be evaluated in a virtual production environment before implementing.

Vulnerability and Security Testing

QuantiModo performs Qualys Vulnerability Assessments and creates external security reports of our production environment once a month. Additional internal security testing is performed on the testing environment before code is checked into a master repository.

User Login and Session Security

Members are not able to directly login to QuantiModo's Validic Application. All Member logins and sessions are authenticated via a secure OAuth 2.0 access token.

Application Password Management

Admin passwords must have at least 8 characters with at least one number and one letter.

QuantiModo Admin passwords must have at least 8 characters with at least one number and one letter, and at minimum either one capital letter and/or one special character.

DISASTER RECOVERY

Validic maintains real time data stores mirrored across multiple geographic availability zones in Amazon Web Services within the United States. In a disaster situation, the full Validic platform will be recreated and available in a different availability zone within 1hr of disaster declaration.

HIPAA & PHI COMPLIANCE

In addition to the above HIPAA compliant policies for data storage and handling, the following procedures are in place to ensure HIPAA compliance:

1. All QuantiModo employees receive annual HIPAA Business Associate training and certification
2. QuantiModo web-based applications receive annual internal HIPAA audits

PHI Handling Policy

All QuantiModo staff members are made aware of relevant external regulations as part of their induction process, and all staff who may come into contact with PHI are trained in our PHI handling processes.

QuantiModo anonymizes PHI upon receipt and destroys the original except in exceptional circumstances. Where anonymization is not possible (for example for technical reasons or where a product problem can only be recreated using PHI or if the Client specifies the data cannot be anonymized (e.g. if we are investigating a problem on a Client's workstation), access to the data is restricted and the data is destroyed or returned to the Client as soon as it is no longer needed. Under no circumstances should identified data be added to the company dataset library.

QuantiModo expects professional integrity of our collaborators, Clients and partners providing PHI to us and will assume that they have obtained the data subject's consent to use their data in this way.

Where a Business Associate agreement or similar contract relating to PHI is in place, QuantiModo staff members work under the terms of that agreement. Where no such agreement exists, the QuantiModo PHI handling policy and process are followed.

QuantiModo conducts periodic internal audits on compliance with this policy.

Business/sustainability plan

How does the submitter propose to enter the market and lead to a successful app?

Issue analysis

Nearly half of Americans suffer from at least one chronic condition, and the number is growing. The severity of many of these conditions such as arthritis, depression, hypertension, ADHD, anxiety and diabetes can be influenced by hundreds of factors in daily life. Human minds do not have the bandwidth or statistical processing power required to account for all these factors, their synergistic relationships, and the time delays before their effects are observed.

Health care organizations generate increasing amounts of electronic data, as more and more of the process becomes digitized – for example, through e-prescribing, electronic medical records (EMRs), digital imaging scans, pharmacy data, lab data, admissions systems, billing systems, insurance claims data, and regional health information exchanges. Recent technological advances, from self-tracking applications and devices to genetic sequencing, have produced a torrent of structured quantitative data on all aspects of human existence, including diet, physical activity, sleep, social interaction, environmental factors, symptom severity, vital signs, and others.

This data holds tremendous potential to obtain optimal daily values (analogous to USDA recommended daily allowances) for treatments and reveal root causes of chronic conditions, particularly mental illnesses such as depression. Recent industry initiatives to improve care, lower costs, and track trends have created a need to aggregate these volumes of data and analyze it in ways that can provide insights to maximize performance. Yet, information collected in different formats by systems that are not interoperable is likely to yield few insights.

Unfortunately, it is currently very difficult for electronically access their health data from different health care providers using a variety of different health IT systems. The lack of interoperability between electronic health record (EHR) systems remains a significant barrier to realizing the tremendous potential of this data. Fast Healthcare Interoperability Resources, and the FHIR API seeks to make it easier to move between vendor systems at different providers and to third-party applications for direct use by consumers.

Because there was no universal large-scale platform capable of aggregating this disparate data and deriving new scientific insights, the Harvard Mind First Foundation, and QuantiModo have developed a web framework and mobile applications for collecting, integrating, analyzing, and visualizing quantitative data from a wide array of sources.

Solution description

We propose to further enhance the platform's data collection, analysis, and sharing capabilities by carrying out a three-phase advanced development plan. The successful completion of this plan will result in a dramatic acceleration in the pace of clinical research and discovery. Building on decades of experience in data science, years of development, significant personal investment, and on our established collaborations with leaders in biomedical computing, informatics, and big data science, we will:

AIM 1: Acquire, integrate, and normalize all data as specified in the 2015 Edition Common Clinical Data Set from devices, applications and EHR using FHIR Draft Standard for Technical Use 2 (DSTU2)

Challenge: To acquire, extract, transform, and normalize the countless unstandardized data export file formats and data structures and load them into a standardized structure that can be easily analyzed in order to derive clinical insight. All data as specified in the 2015 Edition Common Clinical Data Set will be aggregated. The technical implementation will utilize Uses FHIR Draft Standard for Technical Use 2 (DSTU2).

Approach: We will develop an application programming interface (API) for receiving and sharing data, a spreadsheet upload/import module, a connector framework to pull data from existing third party API's, and software development kits (SDK's). The system will be verified for compatibility with different health IT developer systems implemented in production settings, 1 of which will be from the top 10 systems measured by Meaningful Use attestation per HealthIT.gov. Apps must be integrated with a minimum of 3 unique health IT developer systems in 2 unique provider settings.

Impact: The API connector framework will allow ongoing regular import of user data after a single user authorization. SDK's will enable developers to implement easy automatic sharing options in their applications. An increase in the quantity of data will produce a proportional increase the number of clinical discoveries made.

AIM 2: Calculate the personalized correlation between every quantifiable factor and symptom severity and determine optimal daily values of these factors for each user

Challenge: To quantify the effectiveness of treatments for specific individuals, reveal hidden factors exacerbating their illness, and determine personalized optimal daily values for these factors.

Approach: We will develop time-series data mining algorithms to quantify correlations between every combination of variables for a given subject. We will also design algorithms capable of determining the minimum quantities of nutrient intake, sleep, exercise, medications, and other factors necessary to minimize symptom severity.

Impact: This will mitigate the incidence of chronic illnesses by informing the user of symptom triggers, such as dietary sensitivities, to be avoided. This will also assist patients and clinicians in assessing the effectiveness of treatments despite the hundreds of uncontrollable variables in any prescriptive experiment.

AIM 3: Establish a research commons to anonymously pool data in stratified user groups and share discoveries

Challenge: To allow users to publish their findings and reduce error in correlational analysis by increasing user sample size through the grouping of data from relatively homogeneous groups of users.

Approach: We will expand the WordPress content management system and the QuantiModo API to serve as a platform where anyone can share, access, and analyze anonymous data and publish studies. We will also enable grouping of data among relatively homogenous groups of users stratified by their environmentomic, microbiomic, demographic, genomic and/or diseasesomic profiles.

Impact: Clinicians and those suffering from chronic conditions will have access to the personalized effectiveness rates of treatments and the percent likelihood of root causes.

This work will usher in an era of personalized preventative medicine through crowdsourced clinical research by providing (a) a new secure platform capable of aggregating massive amounts of heterogeneous life-tracking data, (b) a tool to help clinicians and those suffering from chronic conditions determine personalized effectiveness rates of treatments and the percent likelihood of root causes, and (c) the ability to run and publish large-scale observational research studies in a matter of minutes on stratified user groups.

Financial estimates

Sponsor Application Revenue Model

The pricing model used to charge pharmaceutical and insurance sponsors is broken down in the following table.

\$2.00	per patient	Tier 1	Pilot (below 50K)
\$1.50	per patient	Tier 2	50K to 100K users
\$1.25	per patient	Tier 3	100K to 250K users
\$1.00	per patient	Tier 4	250K to 500K users
\$0.80	per patient	Tier 5	500K to 1M users
\$0.65	per patient	Tier 6	Over 1M users

The price per patient using each application declines as the number of patients increases based our a 6 tier pricing system.

106,000 people die annually in the U.S. from properly prescribed drugs. Initial sponsor applications will be focused on tracking adverse reactions to the medications known to produce the most adverse reactions. The monthly costs to each sponsor pharmaceutical or insurance sponsor for tracking one of the top problem medications are listed in the table below for each user base/size tier.

Top Problem Med Groupings	Monthly cost per number of users					
	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
Prednisone	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
Methotrexate	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
ADD/ADHD Meds	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
Diabetes Meds	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
Arthritis Meds	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
Diuretics Meds	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
Proscar	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
Cold and Flu Medications	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000
Blood Thinners	\$40,000	\$75,000	\$125,000	\$250,000	\$400,000	\$650,000

Monthly Revenue Projections

	Jan	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
Grouping 1								\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
Grouping 2								\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
Grouping 3								\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
Total	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$80,000	\$80,000	\$120,000	\$120,000	\$120,000	\$520,000
	Jan	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
Grouping 1	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000
Grouping 2	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000
Grouping 3								\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000
Total	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000	\$290,000	\$290,000	\$290,000	\$290,000	\$290,000	\$2,640,000
	Jan	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
Grouping 1	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000
Grouping 2	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000
Grouping 3	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000
Total	\$575,000	\$575,000	\$575,000	\$575,000	\$575,000	\$575,000	\$575,000	\$925,000	\$925,000	\$925,000	\$925,000	\$925,000	\$9,000,000
	Jan	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
Grouping 1	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000
Grouping 2	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000
Grouping 3	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000
Grouping 4	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000
Grouping 5	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000
Total	\$1,665,000	\$1,665,000	\$1,665,000	\$1,665,000	\$1,665,000	\$1,665,000	\$1,665,000	\$1,900,000	\$1,900,000	\$1,900,000	\$1,900,000	\$1,900,000	\$21,390,000
	Jan	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Total
Grouping 1	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000
Grouping 2	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000
Grouping 3	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000
Grouping 4	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000	\$650,000
Grouping 5	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000	\$250,000
Total	\$2,475,000	\$2,475,000	\$2,475,000	\$2,475,000	\$2,475,000	\$2,475,000	\$2,475,000	\$2,850,000	\$2,850,000	\$2,850,000	\$2,850,000	\$2,850,000	\$31,950,000

Combined Expense and Revenue Projections

Pharma Revenue Model						
Income Statement						
Budget for 2016 - 2020						
			2016	2017	2018	2019
Income:	\$		520,000	2,640,000	9,000,000	21,390,000
Total Revenue			520,000	2,640,000	9,000,000	21,390,000
Expenses:						
Compensation:						
Salaries			280,000	525,000	700,000	1,225,000
Insurance Expense			20,000	20,000	20,000	20,000
Legal			25,000	35,000	45,000	60,000
Marketing			12,000	18,000	24,000	36,000
Professional Fees and Royalties			104,000	528,000	1,800,000	4,278,000
Rent Expense			12,000	12,000	18,000	24,000
Software Development			156,000	792,000	2,700,000	6,417,000
Travel Expense			20,000	40,000	60,000	80,000
Total Expense	\$		629,000	1,970,000	5,367,000	12,140,000
Net Income		\$	-109,000	670,000	3,633,000	9,250,000
						14,128,000

Engagement plan

Target Market

Primary Market Segments

Pharmaceutical Companies - There are currently 12 major drug categories. Each category contains 30 to 50 drugs. We would engage the pharmaceutical manufacturers that provide these medications and help them support physicians using a sponsorship model. This model will allow QuantiModo to provide treatment and symptom-specific tracking applications for aiding physicians and patients to communicate and monitor their health. This model and technology also provides pharmaceutical clients with a valuable marketing tool and aggregated population level health data directly related to their products.

Insurance Companies - Health plan providers need a more personalized approach to help their members and have found a way to do so with provider-and patient-reported digital health data. By incorporating this data into a centralized repository, payers can analyze and use this information to create and improve their various member services. For example, in addition to supporting patient-specific care-management models, integrated data could enable the creation of wellness programs, preventive or disease-management care initiatives or even health-coaching programs. This personalized data can go beyond incentivizing and motivating healthy lifestyles; it can also help payers increase member engagement, a critical objective for many health plan providers. QuantiModo offers a cloud-based data-integration platform that enables providers and patients to input digital health data through disparate wearables, applications and devices. This enables payers to then access and analyze the data via a single, integrated platform.

Future Market Segments

1. **Visitors to the QM Search Engine** – By and large, our customers are people who search online for ways to improve their health or happiness (not self-trackers). Indeed, 72% of internet users - over 2 billion people - have searched online for solutions to their health issues in the last year. These are people who don't necessarily track anything, but would like to improve some aspect of their life. Visitors to our search engine are currently using consumer reports and Internet forums to identify the product that will best improve a specific aspect of life. Similar to Wikipedia and other health social networks, we expect that these unregistered data consumers will comprise 90% of the initial traffic.
2. **Self-Trackers** – The primary targets are the 70% of all adults who track a health indicator electronically and would like an effortless way to derive actionable insights from their data. By anonymizing and mining the data obtained from these individuals, we will use it to inform the people who search for ways to improve their lives via the QM search engine.
 1. **Active Self-Trackers** – The basic user is the most critical component of QuantiModo. These are people who track their mood, diet, symptoms or medications actively and supply the data to QuantiModo for analysis. These users will receive the most personalized information regarding hidden root causes of illness and effective treatments. According to the Wikipedia user segmentation model, this should comprise something on the order of 1% of our overall user base.
 2. **Passive Self-Trackers** – These people do not have to be self-trackers. They could connect to one of our passive data sources such as World Weather Online, Rescuetime, Facebook, Github, Call Recorder, etc. This would likely comprise the remaining 9% of the primary user base.
3. **Principal Investigators** – QuantiModo will acquire data by providing academic researchers, citizen scientists, disease advocacy organizations, and influencers such as self-help gurus and bloggers a platform for human behavioral and clinical data.
 1. **Researchers** who would like to use our pool of anonymous data to dramatically reduce the cost and time that goes into collecting, analyzing, and publishing new research.
 2. **Self-Help Experts** who would like a platform to easily validate their strategies and gain exposure.

4. **Developers** who would like to use our open API as a back end for their apps.
5. **Physicians** who would like to gain greater insights into the root causes of their patients' conditions and identify the optimal treatments and dosages.
6. **Parents** who want to find ways to improve their child's health, happiness, behaviour, or academic performance.
7. **Patients** searching for better ways to manage their condition.

Marketing Strategies

- **Automatically Generate Millions of Study Posts** for each cause and effect pair of variables showing the relationship between them. This will lead to a massive number of organic search results.
- **Shareable Infographics** highlighting new discoveries are extremely well-positioned for high viral velocity.
- **Group Studies** allowing users to invite friends, family or the general public to pool their data in "group studies".
- **Influencers** such as self-help gurus would be able to use the QuantiModo Research Platform to recruit participants in crowdsourced studies to quantify the effectiveness of different strategies and techniques.
- **Crowdfunding** – donors can have their own quantified-self sites hosted by us to display their content and do studies on their focus of interest.
- **Academic Research Studies** would provide academic researchers, citizen scientists, disease advocacy organizations and influencers such as self-help gurus and bloggers a platform for human behavioral and clinical data.
- **Provide a Market for Quantified Self Apps** - supply an Application Programming Interface (API) that is easy to use and conforms to established industry guidelines for information and security, as well as supply app templates for users to use in building applications
- **An App to Track Every Symptom** - It would take approximately one day of development time to clone our existing mood-tracking app MoodiModo and modify it to track a symptom or condition other than mood. For instance, BackiModo could track back pain or FibroModo could allow the user to rate fibromyalgia symptom severity. This could be done for hundreds or thousands of symptoms and conditions allowing us to target niche keywords allowing us to be at the top of many search results.

Critical Milestones

Product Development and Deployment

Deploy applications focused on tracking the top 10 drugs producing adverse effects, reaching 880,000 patients and generating \$2.6 million in revenue within two years.

Marketing

Phase I: Hiring a VP of Sales, Marketing and Business Development full-time with experience in the health information technology area. Complete value-added reseller agreements, leverage personal relationships and word of mouth. Begin discussions with marketing firms.

Phase II: Leverage strategic relationships with MedSocket to obtain five pharmaceutical or insurance sponsorships within the first year.

Provider partnership

Submitters are strongly encouraged to partner with a healthcare provider or EHR vendor for activities such as app development or pilot testing; evidence of partnership should be demonstrated with signed letters of intent on partner letterhead (i.e., we will not be reviewing actual business agreements).

Partnerships

QuantiModo already has extensive collaborative relationships with various partners. These include, but are not limited to:

MedSocket - MedSocket provides a patented clinical decision support system with our 1-Click Decision Support (1-CDS) and an innovative patented medical search engine (1-Search). Our technology is designed from the clinician's perspective, with specific attention to their needs and requirements. They have already developed many strong relationships with throughout the pharmaceutical and medical community. Medsocket has committed to work closely with QuantiModo in the development and marketing of this product. Sales through the relationship with MedSocket focused on a product that allows patients to monitor their status and encourages a physician/patient visit if the parameters move to abnormal levels.

Mind First Foundation – The Mind First Foundation is a subgroup within the Harvard Personal Genome project focused on the interplay between genetics and mental illness. QuantiModo has developed a mood and treatment tracking application to be used by the Mind First Foundation to collect data in an effort to identify the genetic roots of mental illness. QuantiModo will leverage this connection to obtain new connections to clients in the research community.