Bitesome - Nutrition Tracking for Public Health Research

Jenna Kim[1], Shuhao Lin[1], Giannina Ferrara[1], Jenna Hua[2], Edmund Seto[1]
[1] University of Washington, [2] Stanford University

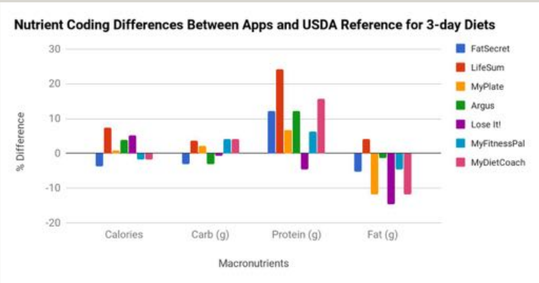
Stanford MEDICINE

SCHOOL OF PUBLIC HEALTH
UNIVERSITY of WASHINGTON

Introduction

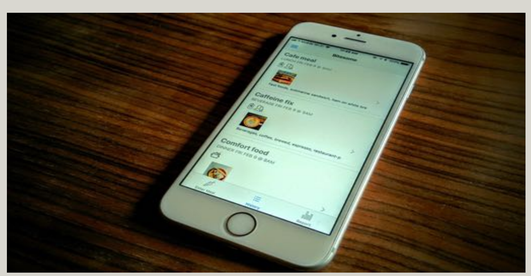
Nutrition is an essential element of individual and population health. Accurate measures of dietary patterns may assist researchers in studies related to diet and nutrition.

We recently conducted a feasibility study in which we rated the top Android and iOS diet-tracking apps in terms of their usability, functionality, and coherence with behavior change theory. We found a significant amount of variation between different apps in how they tracked data as well as the resulting nutrition data, and also identified that none provided features for study coordinators to interact with the users.



Thus, we desired to develop a new nutrition-tracking app that met the requirements of accurate nutrition assessment as well as include features for study coordinators to utilize the app for public health research studies.

Bitesome is a diet and nutrition-tracking app originally developed for the NIH NIMHD Native-CHART Center. It is used within a multi-level intervention program on hypertension in Native American and Pacific Islander populations. The app is available on both Android and iOS operating systems, and is supplemented with a web dashboard for study coordinators and a cloud service. Study coordinators can use the dashboard to view participants' cumulative and extensive data on meals consumed in order to engage in tailored focus group conversations over the intervention period.



Development of Bitesome

Requirements & Implementation

After reviewing the existing nutrition tracking apps on the iOS and Android stores, we developed requirements that would best fit the needs of the researchers and the users of public health research studies. Here are our requirements and corresponding implementation details for our new Bitesome app:

Usability

- Both iOS and Android OS support
  - Use of the Ionic mobile app framework
- Meals consist of breakfast, lunch, dinner and snack, that are further broken down to individual food items
- Help section for users (e.g., food models, portion sizes)
- Video tutorial
- Accompanying website for nutritional information

Food and Nutrient Coding

- Consistent and accurate nutrient coding
  - Use of the USDA food database
- Enable users to enter in their own food data if not found in USDA

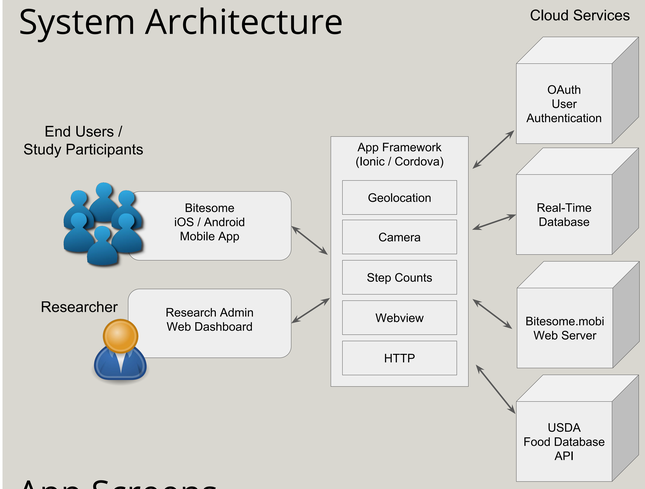
Research Study Features

- Identification of individual users, but privacy-aware
  - Use of email and gmail authentication
  - Use of non-identifying user code for privacy
- Collect characteristics associated with meals (e.g., fast food, home-made, eating with others, etc.)
- Integration of sensor data (e.g., photos of food items, GPS tracking of time and location of meals, step counts)
- Dashboard for researchers to manage and access users' data and access data in real-time (Implementation still in progress)
- Integration with cloud services to readily scale to support large numbers of users (Currently using Firebase)
- User access to different research studies (Implementation still in progress)

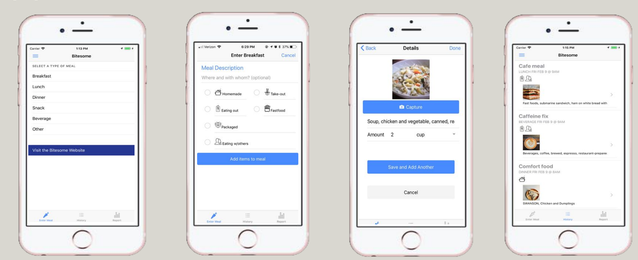
User Feedback

- Display a history of a user's meals in order of recent time
- Display food-specifc micronutrient details
- Display a report of a user's dietary patterns
- Display a heatmap of nutrient temporal patterns

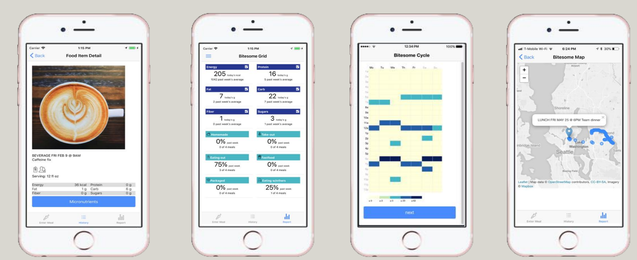
System Architecture



App Screens



Select type of meal to enter | Select meal details | Enter serving size | View history of meals and food items



Check details of individual food item | Report | Nutrient temporal patterns | GPS tracking of meal locations

Innovation

The most innovative quality of Bitesome is perhaps its ability to be integrated with nutritional research studies.

While Bitesome is publicly available on the app stores for individuals to use by themselves as a personal nutrition/diet tracker, it can also be utilized in research studies to effectively collect necessary data from large numbers of participants.

Bitesome supports observational nutritional studies, in which the goal is to monitor dietary intake and to code nutrition based on the standard USDA food database as a reference.

Bitesome also supports interventional study designs, in which researchers can tailor interventions dynamically by accessing study participants' nutritional intake data in real-time during the study.

Bitesome provides a separate dashboard interface for research staff, which provides access to consented participants' data within a study, which is distinct from the personal data available to individual study participants.

Video Demonstration:
www.bitesome.mobi/tutorial

Future Work

Currently the app is available for download and use. The ENACTS study will begin recruitment in 2018.

Our future objectives include:

- Develop compatibility with Open mHealth and Apple Research Kit
- Improve data accessibility via cloud for researcher staff
- Explore use in other research studies
- Customize features/functionality for different studies
- Explore the use of other food databases, particularly for culturally-tailored foods
- Integrate image classification and machine learning
- Develop alternative versions, including a simplified "lite' edition that is even easier to use for certain populations
- Study usability and validity for different user groups

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Contact: Edmund Seto eseto@uw.edu