# On the Run:
## Using Smartphones to Track
## Millennial's Purchase Behavior

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## Abstract

The rise in on the go food & beverage consumption, particular by Millennial's (18-29 yrs.) has brought increased attention within the food & beverage industry. The ability to offer insights into this unique purchasing behavior beyond simply what was bought would be a great asset to the industry. For the research community, this offers an opportunity to investigate the usage behavior of an on the go consumer, as data collection occurs.

Building on previous longitudinal repeated-measures approach research (Bailey et al., 2011), a pilot test was conducted where respondents were provided an Android smartphone pre-loaded with an app-based mobile survey. The survey was launched by the users whenever they made immediately consumable purchases during the course of a month. This sample was comprised of about 275 millennial's (18-29 yrs.) in the southern California area. Questions included: where they were, what they purchased and what the motivators for the purchase were. The survey incorporated barcode scanning, along with taking pictures of the products to augment the survey data. Use of an Android smartphone including voice and data package was leveraged and provided as an incentive for the respondents' during the test period, combined with a monetary incentive paid at completion. This paper will examine the response rates, user engagement, data quality, and user experience during the month long pilot study. This research adds to previous work to better understand on the go mobile behavior and product consumption.

**Keywords**: Longitudinal, mobile phones, Mobile Survey

## 1.0 Introduction

The rise in consumption of food & beverages "on the go," particularly among younger consumers, has brought increased attention within the consumer packaged goods and retail industries. For the purpose of this research effort, we've called these occasions "Grab & Go" moments, defined as any food or beverage purchase that was intended to be consumed within one hour of purchase, regardless of location. Mobile in-store utilization of smartphones for product information is also seeing a great deal of growth, particularly for this demographic. Recently it has been reported that 38% of cell phone users in this age group have utilized their device to perform real-time price checking while in a store within the past 30 days (Smith, 2012). This tendency to leverage technology for the purpose of gathering information invites the research community to develop methodologies that pair with this native behavior.

The longitudinal nature of this data collection also provides an opportunity to investigate changes in the respondent's behavior over time.

Building on previous longitudinal repeated-measures approach research conducted by Nielsen's Life360 team, a pilot test was conducted where respondents were provided an Android smartphone pre-loaded with an app-based mobile survey.  The survey was launched by the users whenever they made immediately consumable purchases during the course of a month. This sample was comprised of 268 Millennials (aged 18-29) in the southern California area. Questions included: where they were, what they purchased and the motivators for their purchases. The survey incorporated GPS data capture, barcode scanning, along with taking pictures of the products to augment the survey data. Use of an Android smartphone including voice and data package was leveraged and provided as an incentive for the respondents' during the test period, combined with a monetary incentive paid at completion.

This research will examine the response rates, user engagement, data quality, and user experience during the month-long pilot study. Specifically this analysis will focus on variance that occurs with regard to the completion time for respondents' survey submissions.

## 2.0 Usability of Mobile Surveys

The growth of mobile devices in the US is estimated to now be inclusive of 48 percent of the adult population, including 66 percent of those less than 35 years of age (Nielsen). Additionally, 38 percent of the adult population in the US has downloaded at least one app to their phone (Purcell, 2011). With this population continuing to grow the opportunity to leverage this technology for survey research becomes greater. This behavior is most common within the 18-29 year old age group, according to the same Pew research, with 60 percent reporting app usage (Purcell, 2011). Since respondents in this research were all given the same device on which the application was optimized, the mode effects due to screen resolution or formatting should be minimal (Callegaro, 2010). There has been similar research conducted in the past with the Nielsen Life360 product, which has shown promise for leveraging smartphones as data collection instruments over a period of time. The key to maintaining cooperation is to maintain simplicity in the task presented to the respondent as well as allowing them control over features related to the survey (Lai et al. 2009).

Other Nielsen research suggests that people, especially "millennial's" age 18-34, use their phones during down times throughout the day, further supporting the idea of "on-the

go" surveys. (Bailey et al. 2011). This familiarity helps speed up the learning curve when it comes to device familiarity that has been observed in other long-term research (Cook et al. 2011). A concern of this methodology is that mobile surveys do not lend themselves well to text input. Respondents much prefer selecting fixed responses and may be more likely to select a fixed response option over a text choice, even when providing a text response may be more accurate (Peytchev & Hill 2010). However, more recently this effect was not observed when respondents were using their own mobile devices to complete the survey (Wells et al., 2012). This would suggest that device familiarity may play a large role in participation and data quality for mobile survey respondents. That is, when respondents are using their own smartphones, they could be more familiar and thus more willing, to take longer mobile surveys or provide open-ended responses.

Regardless, the implications of these effects are significant when leveraging a mobile application for self-initiated reporting of purchases as was deployed in this study. Our goal in this research was to provide a streamlined mobile app for any qualified respondent, regardless of whether or not they owned a smartphone. Thus, all respondents in our study were given a smartphone. A limitation of utilizing this self-initiated approach is that it is not possible to calculate a true completion percentage, so compliance can become difficult to truly define as the baseline is not known.

## 3.0 Longitudinal Behavioral Changes

When inviting respondents to participate in a longitudinal repeated measures study such as this one, there is concern over how the native behavior will be affected. In order to properly collect and represent something such as purchase behavior, it is important to design the study so as not to impact the behavior being studied. It has been demonstrated that in a repeated measures study, practice effects can impact behaviors such as the ability to complete a task or process information faster (Petersen et al. 1998.) The same research demonstrated that while task completion can be accelerated, the skill in which it is completed does not necessarily increase in tandem. Another consideration is that actual data may not always match the perceived behavior for a respondent, when collected over a period of time (Lee and Waite, 2005). While there are concerns with repeated measures research, it does offer the benefits of being able to measure changes over a period of time. It can be especially insightful when the design of the research allows for comparison of self-reported data against actual results. An example would be to compare self-reported completion time against the actual completion time recorded by an application (Joyce and Stewart, 1999). Smartphones allow for the collection of more reliable insights in a longitudinal study through their ability to capture "in the moment" information from a respondent (Chen 2011). A Smartphone's ability to collect additional paradata during a study further enriches the value of a repeated measures study. Leveraging a device which respondents are increasingly integrating into their daily lives provides great potential for the future.

## 4.0 STUDY DESIGN

A one month Pilot test was conducted to determine the viability of this approach, as well as to provide some preliminary insights to the study sponsors.

## 4.1 Sample

The goal was to recruit 300 total respondents, located within the southern California geographic area. Respondents were recruited in six counties between the ages of 18-29 years of age, split evenly between male and female. They were recruited through a non-probability sample, via either direct email or banner ads, hosted through opt-in sources. In the end, the field had a slightly more female skew:

**Table 1: Respondent demographic Profile**

|  |  | Male | | Female | | Total |
|---|---|---|---|---|---|---|
|  |  | *(n)* | % | *(n)* | % | *(n)* |
| Age |  |  |  |  |  |  |
|  | 18-22 | 8 | 47.1 | 9 | 52.9 | 17 |
|  | 23-29 | 107 | 43.1 | 141 | 56.9 | 248 |
| Race |  |  |  |  |  |  |
|  | Asian | 18 | 40.0 | 27 | 60.0 | 45 |
|  | Black | 8 | 33.3 | 16 | 66.7 | 24 |
|  | White | 71 | 45.2 | 86 | 54.8 | 157 |
|  | Other | 18 | 46.2 | 21 | 53.8 | 39 |
| Income |  |  |  |  |  |  |
|  | Under $25,00 | 22 | 38.6 | 35 | 61.4 | 57 |
|  | $25,000-$49,999 | 25 | 34.2 | 48 | 65.8 | 73 |
|  | $50,000-$74,999 | 21 | 39.6 | 32 | 60.4 | 53 |
|  | $75,000-$99,999 | 13 | 46.4 | 15 | 53.6 | 28 |
|  | $100,000 + | 22 | 59.5 | 15 | 40.5 | 37 |
| Education |  |  |  |  |  |  |
|  | Some High School | 8 | 88.9 | 1 | 11.1 | 9 |
|  | High School Graduate or Equivalent | 13 | 46.4 | 15 | 53.6 | 28 |
|  | Some College | 43 | 38.4 | 69 | 61.6 | 112 |
|  | College Degree (BA, BS) | 46 | 47.4 | 51 | 52.6 | 97 |
|  | Higher Degree (Masters, PhD, etc.) | 5 | 27.8 | 13 | 72.2 | 18 |
|  | Other | 0 | .0 | 1 | 100.0 | 1 |

*Respondent is defined as submitting at least one survey which was completed within one hour of survey launch. See methods section for compliance procedures.
**Demographic data was missing from 3 of the participants

## 4.2 Methods

Respondents were asked to log all Grab & Go purchases they made in the moment during the course of the one-month study. This approach was intended to minimize recall bias; as a result no retrospective entry approach was developed. This would include answering a series of questions, scanning the barcodes on these items, or entering purchase information through a series of menus within the application. The script was broken into three sections, which was not apparent to the respondent.

The three sections were:

1. Location factors: Destination type, destination name, factors that brought the respondent to the destination (store, restaurant, cafeteria, etc).

2. Item entry: Barcode scanning, non-barcode open end collection, item characteristics (8 oz., diet, etc.)
3. Personal motivation for purchase: Attitudes about the trip, reasons for the purchase, activities being performed before and after the trip.

The respondents received $25 per week for their participation, up to a total of $100 if they completed all facets of the study. Payments were made using a re-loadable Visa reward card issued to each respondent. In addition, all respondents were given an LG Optimus smartphone with 200 voice minutes and unlimited data access. This phone has a 3.8" touchscreen display and runs on the Android operating system. Payment of their final incentive was dependent upon their return of the device at the conclusion of the study.

Compliance was determined based on the frequency of surveys being completed. If a respondent did not send one survey every 3 days they were flagged and received an email reminder. If they did not respond to the email within 48 hours, they received a second email along with a phone call follow-up. Each week, those respondents who were deemed to be compliant received an email thanking them for their participation and letting them know that Nielsen was receiving their information.

Data points captured were:
   a. Timestamps for overall time to complete, as well for each individual section
   b. Purchase Behavior (Where, What, Why etc.)
   **c.** GPS data capture to understand path to purchase

At the conclusion of the field period, which included an online exit survey, 15 respondents were interviewed to gather qualitative insights on their experience.

## 4.3 Analysis

The points listed below cover the aggregate level analysis of data that will be explored. Only fully completed surveys were used to calculate results, thus as a result it was not possible to run breakoff analysis.

Survey data (Quantitative)

1. Timing: Completion time for surveys

   - Overall average
   - Average per item purchased
   - Average time for barcoded entry vs. non-barcoded item entry

2. Purchase behavior: Explore Purchase Behavior for patterns

   - Average submissions per week
   - Ratio of barcoded/non-barcoded items logged
   - Items logged per event
   - Completions at location where purchase occurred

Interviews (Qualitative)
Qualitative interviews (15) with selected users were conducted to collect in-depth insights from respondents to further understand their engagement, motivation and recommendations regarding the following areas:

1. Motivation to join and engage with the research
2. Feedback regarding study design (length of participation, tasks
3. View of incentives provided
4. User experience

Respondents were contacted through email and asked to participate in a 30-minute interview. Respondents were selected to provide a diversity of age, gender and survey activity.

Table 2: Interview participant characteristics

| | Gender | | Age | |
|---|---|---|---|---|
| Usage | Male | Female | Under 25 | Over 25 |
| Heavy (40 or more surveys) | 3 | 2 | 3 | 2 |
| Medium (15-16 Survey) | 2 | 3 | 1 | 4 |
| Light (5 or less surveys) | 2 | 3 | 3 | 2 |

## 5.0 Results

A total of 3,559 completed surveys were submitted by 268 respondents during the pilot. The mobile application utilized for data collection calculated time based on two different methodologies. An elapsed time variable takes into account time where the survey is actively open on the device screen. Times when a survey is started and stopped in progress were factored into this variable. Timestamps were also inserted into the survey to gauge the completion time for the three key sections of the survey: location factors, item entry and personal motivation. The beginning and end of the each series of questions was stamped; however these did not take into account app closure in progress as the elapsed time variable did. As a result, a combination of both elapsed time and section completion time based on timestamps was used to identify valid cases for the purpose of this analysis.

The intent of the pilot was to capture purchases in the moment and not retrospectively, so only cases where the elapsed time measured greater than 60 seconds and less than one hour were included. In tables below where section time is displayed, completion within 20 minutes combined with the elapsed criteria was used.

## 5.1 How Long Did it Take?

Overall completion time for submitted surveys steadily decreased over the course of the month. The decline in the mean completion time implies that as users became more familiar with the survey questions and design over time they were able to more efficiently enter their purchases.

Table 3: Overall Timing of Surveys (Minutes)

Surveys Launched and Completed within 1 Hour (Minutes)
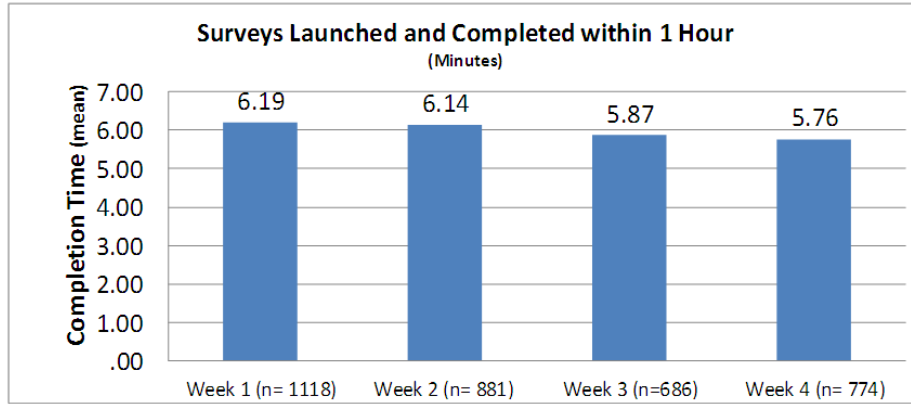
The survey length was not reported to be an issue for respondents that were interviewed. They reported that it generally took them between two and five minutes to complete, which is in line with the data captured.

In addition to the overall completion time, the time to complete based on item count was investigated.
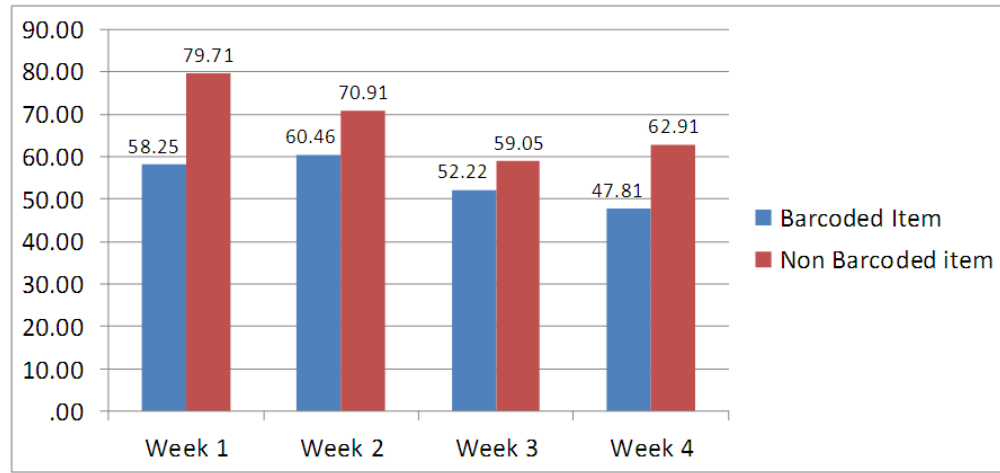
Table 4: Time to Complete by number of items (Minutes)
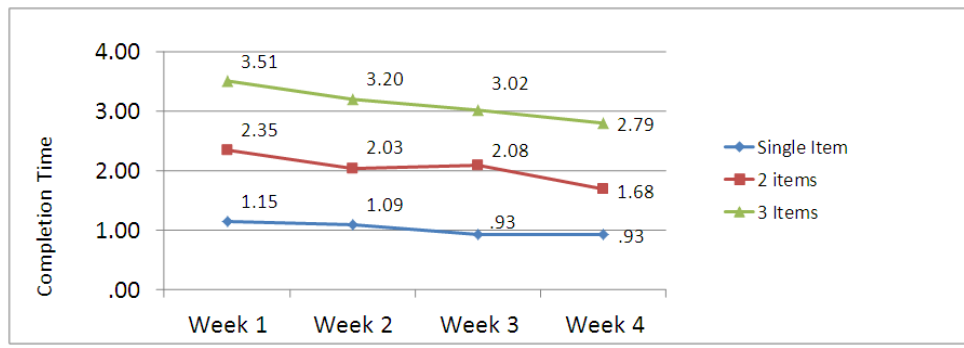


Even when looking at multiple item purchases, the completion time still decreases, however single item purchases saw the smallest decline.

Table 5: Single-item trips: Time to Enter Barcode Items vs. Non-Barcode Items (Seconds)

As expected, it was quicker to enter an item with a barcode item than a non-barcoded item. The completion time for both item types does display some variance in the final two weeks, which warrants some further investigation in future analysis.

## 5.2 Did their Activity Change?

Upon examination of the time to complete tasks, the next natural areas to examine are the type of items entered and if change occurred over time. Based on the differences in the entry time noted previously the first item is the ratio of barcoded items vs. non-barcoded items entered. In order to examine the differences through an equal comparison, cases where only a single item was purchased were included in Table 6 below.

Table 6: Single item trips: Barcode vs. Non-Barcode
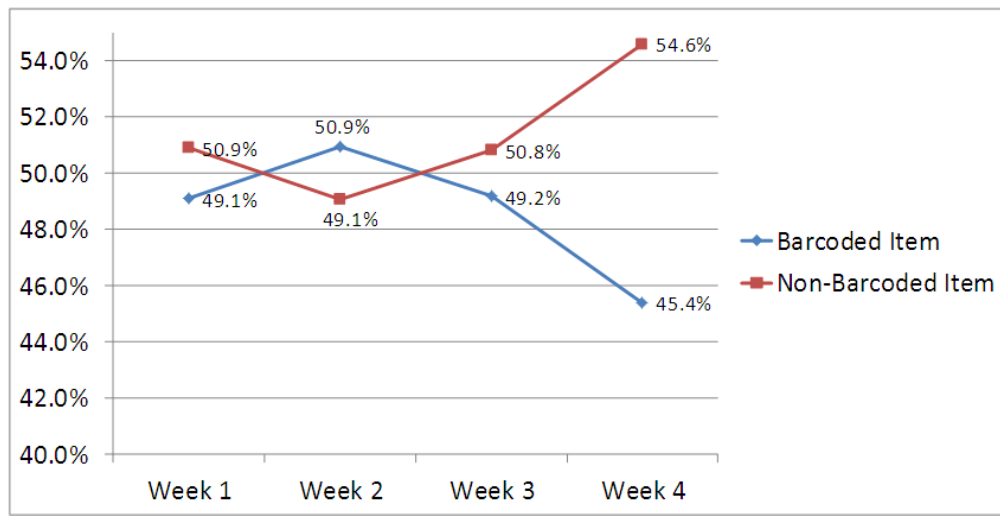


The results show that there was a noticeable shift over the course of the study from barcoded items to non-barcoded items. This goes against the belief that respondents would select the easier path of barcoded items. In the qualitative interviews, some participants did report a change in the products they purchased during the period. Specifically, some noted a conscious shift to healthier snacks and lower-cost items due to the awareness yielded by their study participation. If, in fact, behaviors are changed by simple awareness of frequency and type of snacks being purchased, precautions will need

to be made to mitigate this effect in future rounds. Other researchers have found a similar effect in daily food tracking studies where in the moment thoughts of snacking are captured (Shea & Roberts, 2012). This area deserves more investigation, as well as a validation of the entry method selected against the actual products purchased.

Table 7: Surveys Submitted by Respondent (Weekly)
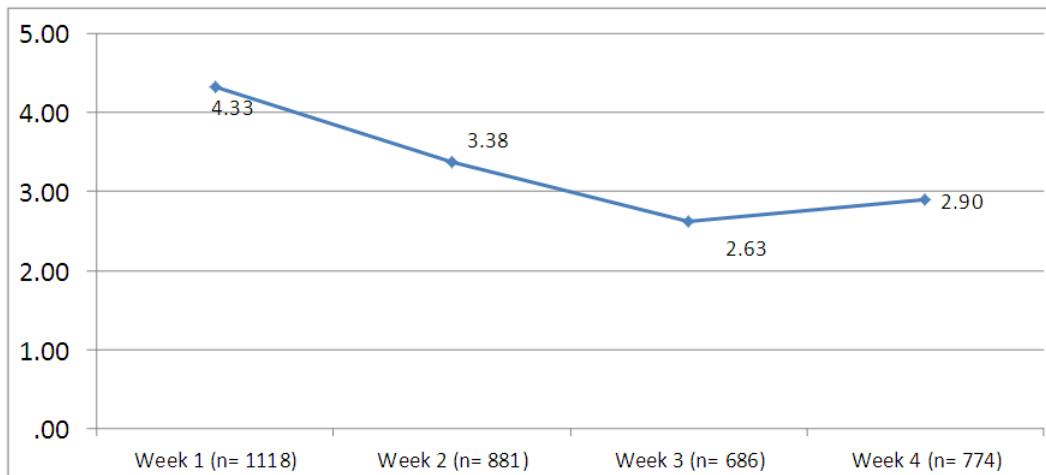


The study process was understood by most; however some respondents thought they needed to purchase items specifically for the study as opposed to recording what they normally bought.

Schedules varied weekly for these respondents — and as a result, so do their purchases. Several respondents, especially those with infrequent purchase behaviors, reported increases in purchases because they felt obligated to complete the task presented to them.

Motivation to participate, however, was reported to be unchanged over the course of the month; many stated that the surveys were not a great burden to incorporate into their routine. In fact, several mentioned that it was no burden because buying Grab & Go items was something they were already doing.

Table 8: Items per visit
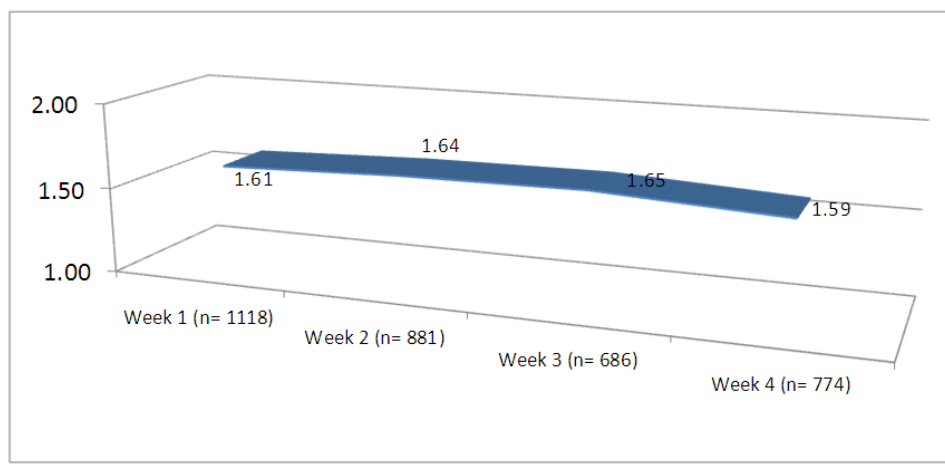


While there was variance observed in terms of the number of surveys and item types entered during the course of the study, the average number of items purchased per trip did not change much.

And even though the respondents were instructed to complete and submit their survey when purchasing the items, the results show that most did so after they left the location. The self-reported cases could have been launched while at the location, but completed elsewhere as the final question was the data point. Through collaboration with Locately, a GPS analytics firm we were able to collect the coordinates during the survey and map to the actual location. The validation of this self-reported data against the GPS data will be reviewed in future research.

Table 9: Surveys Submitted from Purchase Location
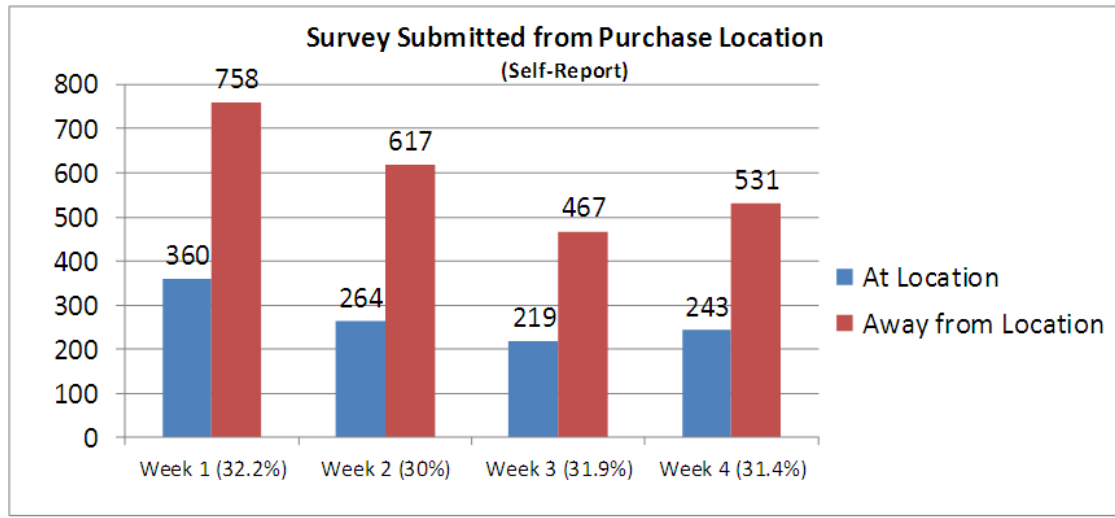


The most common reported issues that led to non-compliance were cases involving a dead smartphone battery, or forgetting their phone at home or work.

Taking photographs of products purchased was reported to be an issue for some respondents. The most frequently mentioned issue was that if the items were consumed before a respondent remembered to log them, some would not enter their purchase as they had nothing left to scan or to photograph. There were also respondents who reported feeling uncomfortable snapping a photo in public as it would draw unwanted attention. Several noted they would wait until they were in private to take the photo, which in effect closed out the survey. Respondents who already owned a mobile phone reported that carrying a second device did not affect their participation, though it was an inconvenience.

## 6.0 Conclusions

Leveraging smartphones for data collection led to the discovery of some differences in behavior over the course of the study.  As expected, the overall completion time for a survey decreased as the study period progressed. It was quicker to enter a barcoded item than a non-barcoded item, however the variance in timing across the four weeks along with the emergence of more non-barcoded items being captured in single item trips does warrant further investigation. This begs the question of why this shift occurred, if this was the path of least resistance for a respondent. While the qualitative interviews provided some insights, there were no mentions of scanning related issues. There were some cases of reported changes to the frequency and type of purchases due to the self-awareness that was reported as a result of participation. A more detailed review of the products that were logged during these trips would be necessary to validate the notion that the greater sample population truly shifted from barcoded food and snack items to

healthier items that would need to be entered manually. Since other research has shown a similar effect (Shea & Roberts, 2012), this is an area that merits further research, as well as consideration during the planning stage.

The decrease in time to complete could be due to users becoming more comfortable with the layout and navigation of the survey, as well as use of the device on which it was administered. There was a drop-off in submissions per respondent over the four weeks, but there was not much change in the number of items that were being entered per trip. Qualitatively, it was reported that this type of purchase behavior varies weekly, which could explain this change.

The other area of particular interest is that respondents self-reported completing the survey at the purchase location only about 31% of the time. The respondents were directed to complete the survey while at the location, so in this initial pilot study there was not a scripted path for them to retrospectively enter their data. This was realized to be a potential need, but it was also found to add too much complexity for the initial phase. The qualitative interviews offered some possible explanations for this behavior, which were tied to the methodology. Some respondents reported that they felt uncomfortable completing the survey in public, particularly taking the photos. As a result they would either complete the survey after leaving the location or complete the entire survey from another location altogether. In some cases, the respondents had forgotten their device at home or at work and as a result would complete surveys from those locations. These reported issues, combined with the data collected validate the need for a retrospective path to be developed in order to better qualify the results that are submitted in these cases.

Future testing will also examine the option of having respondents download the application onto their own device. This will further streamline the process for some respondents and will allow for comparison against the behavior of respondents who complete the surveys on a device provided to them.

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