Preliminary Study of Patrons' Use of the PlayMyWay Play Management System at Plainridge Park Casino: June 8, 2016-January 31, 2017

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Executive Summary

Rationale

During 2011, the Commonwealth of Massachusetts passed legislation permitting the expansion of legal gambling within the state. This legislation also included a number of public health research and responsible gambling requirements. To fulfill these requirements, the Massachusetts Gaming Commission developed three complementary programs that intersect with licensed gambling venues: (1) the GameSense responsible gambling information center; (2) the Voluntary Self-exclusion program; and (3) the PlayMyWay software for electronic gambling machines. PlayMyWay is a gambling *pre-commitment* or *play management* system that allows individuals to set gambling budgets supported by software-enabled budget reminders. According to the Massachusetts Gaming Commission, "PlayMyWay is intended to help players make decisions about gambling, allow them to monitor and understand their playing behavior in real time, and support their decisions" (Massachusetts Gaming Commission, 2016b). During 2015, four years after the original 2011 gambling expansion legislation passed, the Plainridge Park Casino (PPC) slots parlor and racetrack opened in the town of Plainville, Massachusetts. PPC is the first gambling venue within the United States to use play management software on its electronic gaming machines. On June 8, 2016, the PlayMyWay software became available to all patrons at PPC. This preliminary report is part of a planned multi-year research and development agenda. It describes the initial use patterns of PlayMyWay and provides a first look at how use of PlayMyWay relates to gambling activity. This evidence lays the foundation for future work to address key PlayMyWay evaluation questions in more detail (e.g., safety, effectiveness, and reach) and provides an opportunity to develop data-informed goals for the system, generally, and its constituents, specifically.

In this initial report, we focus on the following topics:

(1) Sample Characteristics – To describe key aspects of the study sample and PlayMyWay enrollees, including characteristics such as gender, age, and region.
(2) Game Characteristics – To describe the gambling activity environment (e.g., numbers and types of machines, and betting options) in which the data collection took place.
(3) Cash Activity – To describe how individuals in our sample in general, and PlayMyWay enrollees in particular, interacted with the available gambling machines, in terms of financial transactions, including bill insertions, funds withdrawals, and ticket redemptions.
(4) Gambling Activity – To describe the gambling activity of our study sample in general, and PlayMyWay enrollees in particular, such as PPC visitation and wagering behavior.
(5) Budget & Notification Activity – To describe PlayMyWay enrollment trends and budget activity, including numbers of notifications received, change occurrences, and compliance with self-selected budget limits.

Method

In brief, this report contains a secondary data analysis of gambling activity records and PlayMyWay budget records for 101,024 individuals who gambled at PPC between June 8, 2016 and January 31, 2017.

The software at the center of the PlayMyWay program is a product of Scientific Games. This software allows individuals to voluntarily create a computer-assisted budget system for daily, weekly, and monthly gambling budgets. Individuals who enroll in PlayMyWay receive notifications when their gambling activity approaches, reaches, and/or exceeds the player's self-identified budgetary amounts. Users can play through budget notifications; that is, the PlayMyWay system does not force a hard stop once users exceed their self-identified budget points. Users can check their gambling activity by logging in to their PlayMyWay account. The Massachusetts Gaming Commission refers to this component as the *tracking feature*. As mentioned, PlayMyWay became available at PPC on June 8, 2016. PlayMyWay is only available to Marquee Rewards cardholders who gamble at PPC. Marquee Rewards is a free program that allows registered individuals to collect rewards and benefits for gambling activity at PPC and other Penn National properties.

With support from Scientific Games, PPC made two primary types of records available for the analyses contained within this report: (1) Marquee Rewards records and (2) PlayMyWay records. The Marquee Rewards records provide us with information about the sample characteristics, game characteristics, cash activity, and gambling activity information. The PlayMyWay records provide us with information about a player's budget and notification activity. However, the data provided to the Division on Addiction did not include any means of linking the Marquee Rewards records with the PlayMyWay records; therefore, it has not been possible to link specific gambling-related information and activities with specific PlayMyWay system budget-related activities.

The Marquee Rewards records related to gambling activity were split upon delivery into records associated with PlayMyWay enrollees (i.e., Marquee Rewards members who were enrolled in PlayMyWay at the time the data was collected) and non-enrollees (i.e., Marquee Rewards members who were not enrolled at the time the data was collected). However, the criteria used to generate these separate gambling activity files led to serious flaws in the data provided to the Division (e.g., created instances of missing data). These problems limited our confidence and ability to use the data. For more information about these data abstraction code design flaws, see Appendix A of the main report.

The Division completed a variety of data review and reduction activities in advance of completing the analyses. This allowed us to identify analyses that are appropriate for the available data, even given its limitations. More specifically, for this preliminary report, we describe the study sample and its game and cash activity characteristics. We also report their gambling activity (e.g., visitation to PPC, wagering, and net winnings; i.e., total amount won minus total amount wagered). We examine this information prospectively and by key factors (e.g., age, gender, and region). We examine the data to determine whether our sample includes any "natural groups," that is, clusters of individuals who tended to gamble similarly and distinctly from others. We explore all of these aspects for the sample as a whole, and by PlayMyWay enrollment. In addition, we examine PlayMyWay budget activity patterns, such as enrollment and un-enrollment trends over time. We also investigate budget-setting patterns, such as sizes of budgets and rates of budget changes. Finally, we explore how budget notifications were delivered and the factors associated with compliance (e.g., seemingly following a budget notification) and non-compliance (e.g., seemingly ignoring a budget notification).

Key Findings

In the following discussion, we highlight key findings of interest. Additional findings not described here are available in the main report.

The PlayMyWay records sample included 7,507 individuals who ever enrolled in PlayMyWay during the study period (June 8, 2016 to January 31, 2017). Of the 7,507 cardholders in our analytic sample, we identified three primary groups of enrollees: (1) 6,398 (85.2%) were **stable** (i.e., enrolled in PlayMyWay and remained enrolled in the program for the period of this study); (2) 96 (1.3%) were **erratic** (i.e., enrolled, un-enrolled, and re-enrolled in the program at least once, but were enrolled in PlayMayWay at the end of the study period); and (3) 1,013 (13.5%) were **dropouts** (i.e., enrolled in the program, but at the end of the study period were un-enrolled from the program).

Recall that the Marquee Rewards records data delivered to the Division were split by PlayMyWay status. This allowed us to complete preliminary comparisons of various gambling behaviors among PlayMyWay enrollees vs. non-enrollees. As a reminder, at this point the reported analyses do not provide evidence of causal relationships. The non-randomized design and aforementioned data anomalies preclude saying that these differences are related to PlayMyWay user status. The analyses do, however, provide important early insight into PlayMyWay and will guide future evaluation efforts.

Of the 101,024 cardholders for whom we had gambling activity data, 92,168 (91.2%) appeared only in the Marquee Rewards records gambling activity data for those not enrolled in PlayMyWay. We designated these individuals as *non-users* (i.e., people who never enrolled in PlayMyWay). The rest of our analytic sample consisted of 8,856 Marquee Rewards subscribers who had used PlayMyWay at some point. We designated this group as *PlayMyWay users*.

In our sample, nearly 10% of both men and women were PlayMyWay users. The majority of these PlayMyWay users were from New England states, with most from Massachusetts. The PlayMyWay users had an average age of 53.8 (SD = 16.3) and were significantly younger than the non-users (mean = 58.7, SD = 15.3).

We observed some differences in the cash activity of PlayMyWay users and non-users. Specifically, PlayMyWay users had significantly more cash activity than non-users on slot machines and electronic table games. For example, during the entire study period, PlayMyWay users inserted significantly more cash into slot machines than non-users (difference of means = $620.50, $p < 0.00001$). They also withdrew more funds than non-users (difference of means = $692.31, $p < 0.00001$).

With respect to gambling activity, PlayMyWay users tended to wager less money as well as lose less money per day compared to non-users. Whereas the median PlayMyWay-user wagered $347.8 and lost $47.5 per day, their non-user counterparts wagered $485.3 and lost $62.9. Over time, PlayMyWay users also exhibited slightly more variation in amount wagered than non-users.

We observed that, among non-users, visitation to PPC was relatively stable during the study period. Each day, on average, 2,648 non-users visited PPC. We anticipated that the average number of PlayMyWay users would increase over time, as cumulative enrollment increased. However, instead we observed an initial increase in average number of PlayMyWay users each day, followed by a plateau, and eventual decrease.

We separated the non-users and PlayMyWay users each into two natural groups. Within each separation, we called the larger group the typical users and the smaller group the atypical users. Of the 92,168 non-users, 92,017 cardholders were classified as typical, and the remaining 151 were classified as atypical. Compared to atypical non-users, typical non-users wagered less money at PPC during the study period (typical: median = $879, atypical: median = $512,200), made fewer visits to PPC (typical: median = 2, atypical: median = 72), and tended to lose less money at PPC (typical: median = -$127, atypical: median = -$94,200). Of the 8,856 PlayMyWay users, 8,814 were classified as typical and 42 were classified as atypical. Similar to the non-users, compared to atypical PlayMyWay users, typical PlayMyWay users also wagered less money at PPC during the study period (typical: median = $569, atypical: median = $254,500), made fewer visits to PPC (typical: median = 2, atypical: median = 78), and tended to lose less money at PPC (typical: median = -$87, atypical: median = -$24,810).

A plot of PlayMyWay daily enrollments showed high adoption rates when the program was launched, followed by a gradual decline and eventually an adoption rate plateau. In this sample, almost 15% of individuals un-enrolled from PlayMyWay at least one time. Of those who un-enrolled, most (79.1%) un-enrolled just once. Furthermore, most people who un-enrolled did so very quickly. Of the 1,392 un-enrollments recorded during the study period, 5% happened within the first minute after enrollment and a third happened within the first hour. Just under half of all un-enrollments from PlayMyWay occurred by the end of the first day. After the first day, the rate of un-enrollments slowed, with just under three quarters of un-enrollments occurring by the end of 30 days. The final un-enrollment we observed occurred just over 232 days after the individual's initial enrollment.

Although PlayMyWay users have the option of setting a combination of daily, weekly, and monthly budgets, most (84.8%) set one type of budget during the study period. The majority of users (57.1%) set only a daily budget, followed by users who only set a monthly budget (18.8%). A smaller proportion of users (15.2%) set a combination of budgets. Of users who set a combination of budgets, most (77.9%) set all three types of budgets.

Among the 7,507 PlayMyWay users, the median initial daily budget was $75, the median initial weekly budget was $200, and the initial median monthly budget was $300. About 7.6% of PlayMyWay users changed their daily, weekly, or monthly

budget. Budget changes most often reflected an upward revision to limits. They evidenced a 366.6% increase in the daily budget to $350, the weekly budget increased by 350% to $900, and the monthly budget increased by 233.3% to $1000.

We examined the notifications that PlayMyWay users received during the study period. Just over half of all PlayMyWay users (57.8%) approached their budgets. Overall, slightly less than two thirds of all PlayMyWay users (63.0%) never exceeded their budgets; just over one third of all users (37.0%) exceeded their budgets at least once during the study period. Of the 4,336 users who approached their budgets, three quarters (75.3%) of them reached their budgets and two thirds (64.1%) of them both reached and exceeded their budgets.

Those who received budget notifications tended to have set lower budgets compared to those who did not receive notifications. The daily, weekly and monthly median budgets of $32, $100, and $200, respectively, for those who received a notification were less than the corresponding median values of $100, $300, and $500 for those who did not receive a notification.

Changing budgets shared a direct relationship with notifications. Users who received notification that they were approaching their set budget (e.g., "You have spent 75% of your daily budget") were 7.9% more likely to change their budgets than those who never approached their budgets. Users who received notification that they reached their set budget (e.g., "You have reached 100% of your daily budget") changed their budgets 3.9% more often than those who only approached their budgets. Users who received notification that they exceeded their set budget (e.g., "You have spent 125% of your daily budget") were 1.1% less likely than users who received reached notifications to change their budgets, with 12.3% of users who received exceeded notifications changing their budgets during the study period.

Un-enrollment also was associated with notifications. Users who reached or exceeded their budgets also were more likely to un-enroll from PlayMyWay after one day compared to users who approached or never approached their budgets. However, users who never approached their budgets were more likely to un-enroll within one day compared to users who approached, reached, or exceeded their budgets.

We examined notification rates that occurred after people reached or exceeded their self-determined budgets. For this analysis, we removed from consideration any instances where users un-enrolled from PlayMyWay or changed their budgets within the same day (i.e., about 9.6%) so that we could report this rate among steady PlayMyWay users (i.e., those who did not un-enroll or change budgets within the same day of receiving notification). About 9.5% of the time, steady users did not receive any additional notifications for that day (i.e., potentially stopped gambling). Steady users received between 1 and 10 additional notifications in 41.4% of instances and between 11 and 100 additional notifications in 46.7% of instances. Among 2.3% of notification instances, steady users received more than 100 additional notifications. One steady user received 554 additional notifications within the day after reaching their daily budget. This was the maximum number of notifications anyone in the sample received.

During the study period, 8.9% of steady users received no additional notifications in all instances of reaching their daily budget; 91.1% of steady users received at least one additional notification.

Discussion & Recommendations

Any new responsible gambling program, such as PlayMyWay, warrants comprehensive, independent, and objective evaluation. The Massachusetts Gaming Commission is supporting this approach to responsible gambling by supporting a multi-year research and development agenda for PlayMyWay and enabling the data exchange among Scientific Games, Plainridge Park Casino, and the Division on Addiction. This report provides the first observations of PlayMyWay at Plainridge Park Casino.

Some observations provide an opportunity to guide future goal development and evaluation planning. For example, whereas other jurisdictions have reported enrollment rates around 1%-2% (e.g., Nelson et al., 2008; Schottler Consulting, 2009), the early enrollment rate in Massachusetts was about 8.7%. Incentives might explain elevated enrollment in Massachusetts. A randomized trial of the effect of incentives could establish the accuracy of this assumption. Likewise, over time, enrollment declined before reaching a plateau. Also, nearly 15% of enrollees appear to have un-enrolled from PlayMyWay. Program administrators now have the opportunity to decide whether they believe these rates are satisfactory targets for enrollment and retention, and future evaluations can determine whether the program continues to meet such targets. Also, future research can test new ways to elevate enrollment and retention rates, if that is a primary goal.

Early comparisons suggest that PlayMyWay enrollees generated less gambling activity (i.e., visits, wagering, net losses) compared to those who did not enroll. However, as noted previously, the current analyses preclude making causal statements about this relationship. It is possible that PlayMyWay contributes to these differences. It also is possible that PlayMyWay does not, and that instead the people who enrolled in PlayMyWay already were more conservative gamblers than their counterparts. Likewise, it is possible that their decision to sign up for PlayMyWay accompanied a decision to become a more conservative gambler. The preliminary observation of such differences provides the Massachusetts Gaming Commission the opportunity to consider whether such gambling activity changes are a programmatic goal. Whether less gambling activity represents an optimal outcome or not is a subjective decision. Future research can evaluate PlayMyWay against identified gambling activity benchmarks informed by this report.

Notifications are an important part of the PlayMyWay system. We examined notifications in a number of ways. Notably, enrolling in PlayMyWay does not guarantee the receipt of notifications. About half of enrollees never approached their self-determined budgets, and therefore never received any notifications. The observation of patterns of ongoing notification indicated that most people who received notifications from PlayMyWay did not stop gambling. We observed that for more than 90% of the instances where steady PlayMyWay users reached their daily budget, they continued to gamble that day. Interpreting the meaning of the observation of ongoing notifications is difficult. Although general discussions of pre-commitment suggest that stopping gambling is a primary goal because such systems are intended to eliminate emotion-based decision making while gambling (Ladouceur, Blaszczynski, & Lalande, 2012), other goals are possible. For example, an alternative goal might be that notifications increase awareness of gambling expenditures, but do not necessarily elicit a hard stop of gambling. Other outcomes are possible, as well. In any event, these observations provide the Massachusetts Gaming Commission with information that allows them to consider what impacts they seek from notifications. Future research, then, can evaluate whether the PlayMyWay system realizes those impacts.

Notifications also were associated with both upward budget changes and un-enrollment from the program. Additional evaluation of notifications and potential notification variants are needed to determine whether these upward budget changes are indicative of a problem or flaw in PlayMyWay or its presentation. Alternatively, users might be using the budgeting system in an alternative but still useful manner (e.g., entering a budget amount that represents only a percentage of that user's actual dollar amount allocated for that gambling session).

In summary, the report represents the first phase of a multi-year research and development agenda for PlayMyWay. It provides the first look into how real gamblers use and interact with PlayMyWay at Plainridge Park Casino. The reported analyses are observational. They have the capacity to guide the development of data-informed system goals and future research topics. Major data limitations prevented us from assessing key differences in gambling behavior between PlayMyWay users and non-users, and among PlayMyWay users before, during, and/or after using PlayMyWay. These limitations also hampered a complete assessment of how budget notifications might relate to both gambling and cash activity. Other data limitations included missing data due to both data abstraction processes and data collection issues by the PlayMyWay system. Future work involving a randomized design will help establish causal relationships between PlayMyWay enrollment and key outcomes. Improved data quality and guidance with respect to data-informed program goals is imperative before a complete assessment can be conducted and more concrete conclusions are possible.

1. Introduction

1.1. Background

During 2011, the Commonwealth of Massachusetts passed legislation permitting the expansion of legal gambling in the state. This legislation specifically authorized the development of one slots parlor and no more than three destination resort casinos ("An Act Establishing Expanded Gaming in the Commonwealth," 2011). Because gambling is associated with the potential for a broad range of public health consequences, positive and negative, the legislation also included a number of public health research and responsible gambling requirements (Shaffer & Korn, 2002). Some of these requirements include maintaining a smoke free environment within the casino, providing gambling-related substance use and mental health services on site, and managing an annual research agenda to monitor the effects of gambling expansion on economic and social outcomes, in additional to other areas of research (Massachusetts Gaming Commission, 2014).

To develop an organized approach to fulfill these public health research and responsible gambling legislative requirements, the Massachusetts Gaming Commission (MGC) developed a Responsible Gaming Framework (Massachusetts Gaming Commission, 2014). A primary goal of this framework is to "…inform gaming regulation in Massachusetts and provide an overall orientation to responsible gambling practices and policy adopted by the MGC and gaming licensees" (Massachusetts Gaming Commission, 2014, p.3). Among other activities, the Responsible Gaming Framework's recommendations indicate three complementary programs that intersect with licensed gambling venues: (1) the GameSense responsible gambling information center; (2) the Voluntary Self-exclusion program; and (3) the PlayMyWay software for electronic gambling machines. As we describe in more detail later, the PlayMyWay tool is a budget setting software tool that is incorporated into electronic gaming machines. This pre-gambling commitment or "pre-commitment" strategy is intended to help players set budgets for the maximum amount of money they would like to spend gambling during each gambling day, week, or month, and then have easy access to financial information about their betting in relation to these budgets.

Four years after the original legislation passed during 2011, the Plainridge Park Casino (PPC) slots parlor and racetrack opened during 2015 in the town of Plainview, Massachusetts. PPC is the first gambling venue in the United States to use play management software on its electronic gaming machines. The PlayMyWay software became available to all patrons at PPC on June 8, 2016.

This preliminary report describes the initial use patterns of PlayMyWay and a first look at how use of PlayMyWay relates to gambling activity. This evidence lays the foundation for future work to address in more detail key evaluation questions (e.g., safety, effectiveness, and reach) associated with PlayMyWay.

1.2. Electronic Gaming Machines

Electronic gaming machines (EGMs; including electronic table games, pokies, slot machines, and video lottery terminals), have been an important area of focus for researchers studying gambling-related problems. At least three aspects of EGMs have contributed to this interest: (1) popularity among gamblers; (2) the frequency with which EGM players report the experience of gambling-related problems; and (3) unique structural characteristics that might be associated with excessive gambling behavior.

EGMs are one of the most popular forms of gambling within casino settings. During 2016, the Gaming Technologies Association of Australia reported that there were more than 865,000 EGMs in the United States alone (Ziolkowski, 2017). A gaming industry survey reported during 2012 that about 71.6 million adults, or 32% of the US population age 21 or older, gambled at a casino. Among these casino goers, approximately 61% reported that their favorite type of casino games were slot machines or video poker (American Gaming Association, 2014). Welte, Barnes, Tidwell, Hoffman, and Wieczorek (2015) provided slightly different statistics. They estimated that approximately 26% of US adults gambled at casinos in the past year. This finding was consistent with rates they reported 10 years before. In calculating these rates, they could not separate in-casino slot machine use from in-casino participation in other forms of gambling (e.g., table games, poker).

However, they did report that 17% of participants also gambled at slot machines not in casinos or racetracks or on the Internet during the past year. Similarly, in their analysis of data from the British Gambling Prevalence Survey, Wardle et al. (2007) found that 14% of all respondents and 21% of past year gamblers reported playing slot machines during the past year.

Several studies make a connection between EGMs and gambling-related problems. Studies of treatment seekers frequently find that most gambling-related treatment seekers and helpline callers believe that the use of electronic gambling machines is associated with their gambling-related problems, or is a primary factor in their gambling-related problems (Druine, 2008; Jonsson & Rönnberg, 2008; Linnet, 2008; Potenza et al., 2001; Tavares et al., 2003). Although treatment seekers are not representative of the population at large (Berkson, 1946), other general population studies show that there is an association between playing EGMs and experiencing gambling-related problems. However, these problem gambling rates often are less than other types of gambling activities. For instance, in their report on the British Gambling Prevalence Study, Wardle et al. (2007) noted that 2.6% of individuals who reported playing EGMs met criteria for problem gambling, compared to 7.4% of individuals participating in online gambling, 5.2% of those who bet on dog races, and 5.2% of those who played table games in a casino. In the 2009 Survey of the Nature and Extent of Gambling, and Problem Gambling, in the Australian Capital Territory, Davidson and Rodgers (2010) found that 1.7% of individuals reporting EGM use met Canadian Problem Gambling Index criteria for problem gambling, compared to 3.0% for bingo, 2.1% for Keno, and 2.1% of casino type games on the internet. Research has determined that broader gambling patterns, such as “involvement” (i.e., number of gambling activities during the past year) explain much of the relationship between playing particular games and the experience of gambling-related problems (LaPlante, Nelson, LaBrie, & Shaffer, 2011). However, even after controlling for gambling involvement, past year EGM play often continues to be a significant, albeit weakened, predictor of the experience of gambling-related problems. Davidson and Rodgers (2010) also reported that 92.2% of individuals that met criteria for moderate risk and problem gambling reported playing EGMs in the past year, compared to 38.1% of low risk or not problem gamblers. Hence, it is possible that EGM play is a marker for people who are at risk for gambling-related problems. It also is possible that EGM play could be a factor in the development of gambling-related problems. In some cases, individuals’ specific risk factors and environmental pressures might amplify or attenuate the role of EGM play.

People have speculated about why EGMs might create risk for their users. Researchers have identified a variety of EGM characteristics that they believe might play a role in establishing and reinforcing problematic gambling behavior. For example, players betting on EGMs can independently increase their rate of betting. An increased rate of betting can result in an increased number of plays. In contrast, the speed at which people place bets in dealer-led table games is limited by the speed of the dealer and the time it takes for the people involved to read the cards or dice and determine a winner. Additionally, players can underestimate the number of games played, potentially leading to increased monetary loss (Ladouceur & Sévigny, 2005). Compared to other slower-paced types of gambling (e.g., card games), EGMs display results, identify winners, and award payouts with relative immediacy. This speed of play can reinforce repetitive play patterns. Less time between the initiation of the bet and the outcome can lead to an increased play rate (Chóliz, 2010), perhaps due to the strength of the association between the operant (i.e., game) and the reinforcer (e.g., credits, sounds, lights, etc.). Sounds associated with wins on EGMs can provide positive reinforcement, increase arousal as measured by heart rate and skin conductance, and cause players to overestimate their number of wins (Dixon, MacLaren, Jarick, Fugelsang, & Harrigan, 2013). Finally, EGMs can employ “near misses” to reinforce players’ behavior. A near miss can present as all but one symbol matching across reels, with the final matching symbol landing immediately below or above the payoff line. Near misses often are interpreted differently than standard losses, and can reinforce players’ belief that they are due for a win, potentially encouraging them to continue playing (Parke & Griffiths, 2004). Partial losses or “losses disguised as wins” also can occur on EGMs that allow multiple betting lines. We can define partial losses as a player winning an amount less than the total amount bet[1]. With partial losses, the EGM displays the same sounds and animations as a standard win. Therefore,

[1] For example, suppose that a gambler is playing 50 lines per spin on a machine with a betting unit of $0.01 ($0.50 total per spin). If one of those lines has a payout of $0.10, another has a payout of $0.20, and the gambler loses on the other forty-eight ($0.30 won total), then the

players can experience these partial losses as wins. Partial losses can result in increased reinforcement of gambling behavior and overestimation of number of wins accumulated during a gambling session (Dixon, Harrigan, Sandhu, Collins, & Fugelsang, 2010). Notably, decreasing reel spin speed to slow the overall gambling experience has not been shown to be effective in reducing gambling-related problems (Blaszczynski & Nower, 2002). More research is necessary to fully understand the relationships between such game characteristics and gambling behavior.

The literature focusing on EGMs still includes many unanswered questions. For instance, although treatment seekers are likely to implicate EGMs as a contributor to their problems, some research suggests the general population rates of EGM-related gambling disorder are comparable to that of other types of gambling. Dowling, Smith, and Thomas (2005) were unable to find conclusive evidence that EGMs stimulate higher rates of addiction compared with other types of casino gambling. In their review of the Productivity Commission (1999) data, they found that rates of problem gambling among EGM users were similar or less than rates among users of most other types of gambling. Volberg (1997) reported similar results in her examination of gambling and problem gambling patterns in Oregon. Other work raises questions about treatment seeker findings more generally. Abbott (2006) suggested that increased treatment seeking associated with EGM use might be explained by increased availability (i.e., machine to person ratio), compared to other types of gambling, or just increased popularity. Nonetheless, as noted previously, if EGM use is a predictor of gambling-related problems, more evidence is necessary to determine the nature of the causal relationship, and how it intersects with environment and individual risk factors (Welte et al., 2015; White et al., 2006). Finally, not all EGMs share every feature or gambling characteristic, and some of the potentially relevant gambling characteristics are not exclusive to EGMs. Consider video poker (a type of EGM) and blackjack (a table game). In both games, there are basic strategy guidelines that people can memorize (i.e., which cards to hold when in video poker; when to hit, stand, double-down, split and surrender in blackjack) and then recall and implement quickly. In both, experienced players and experts can play significantly more hands per hour than beginners.

1.3. Play Management

Although there remains much to learn about the specific causal role of EGMs in the development of risky and excessive gambling behavior, key stakeholders already have been exploring ways to mitigate EGM-related harm. In theory, one potential way to limit the risks associated with gambling is provide tools that facilitate gamblers' ability to manage their own gambling behavior. A common description of these management tools is "pre-commitment." Ladouceur et al. (2012) define pre-commitment as "a system that enables gamblers to set money and time limits expenditure prior to the commencement of a session of play. It is based on the principle that decisions relating to expenditure (a) ought to be made in a state of non-emotional arousal, and (b) once made, must be adhered to for the remainder of the session" (p. 2). Pre-commitment systems are intended to prevent excessive time and monetary loss among gamblers who have difficulty with self-control and to make gamblers think about implementing budgeting techniques before they play Ladouceur et al. (2012). More specifically, "Pre-commitment is an RG [responsible gambling] tool that applies to certain forms of gambling offered by both land-based and online gaming operators. Depending on the gaming venue or website, spending limits can include deposit, play, loss, win and bet limits. Time limits can be made for a session of play within daily, weekly, and monthly time frames" (Ladouceur, Shaffer, Blaszczynski, & Shaffer, 2016).

Pre-commitment systems typically are built into or on top of their host casino's player tracking or customer rewards systems (e.g., Plainridge Park Casino's Marquee Rewards program). After a user enrolls in a pre-commitment system and sets limits (e.g., stop-losses, time limits), when the user approaches or reaches one of these limits, the system alerts the user. The nature and formats of these alerts vary system to system. Some allow gamblers to monitor their gambling behavior by looking at an on-screen clock, timer, or dollar meter (Blaszczynski, Gainsbury, & Karlov, 2014; Ladouceur et al., 2012; Ladouceur & Sévigny, 2005). Others use pop-up messages or warnings (Auer, Schneeberger, & Griffiths, 2012; Broda

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result of the spin is the gambler's net loss of $0.20. Depending on the design of the game, the EGM might still flash or highlight the two winning lines, making it look to the untrained eye that the gambler was a [net] winner.

et al., 2008; Kim, Wohl, Stewart, Sztainert, & Gainsbury, 2014). Ladouceur et al. (2012) identified two aspects that researchers and others can use to classify or show the difference between pre-commitment systems. Specifically, all pre-commitment tools are either (1) *full* or *partial*, and either (2) *mandatory* or *voluntary*. With a full pre-commitment system, once users reach one of their designated limits, the system prevents them from continuing to play, either on their current machine or on another machine in the gambling venue. Said another way, users face a "hard stop" when they reach one of their limits. In contrast, with a partial pre-commitment system, users have the discretion to continue playing beyond their designated limits. The system merely sends users notifications comparing their play to their limits (e.g., when the amount they spend is greater than one of their monetary limits). A mandatory (or non-voluntary) pre-commitment system requires all players using the player tracking or customer rewards system to set limits. In contrast, a voluntary pre-commitment system gives gamblers the choice of whether to set limits.

During early October 2014, the Massachusetts Gaming Commission adopted the term *play management* in place of pre-commitment. Consequently, in this report, we will use the term *play management* instead of pre-commitment.

1.3.1. Scientific Evaluation of Play Management Systems

The scientific evaluation of play management systems is quite limited. As a result, we still know little about the likely uptake of voluntary play management, and the types of people who might use such systems. In addition, there is scant research related to the system characteristics that are well received, and the potential impacts of play management on actual gambling behavior. As such, play management systems remain an intervention type in need of in-depth scientific investigation.

Research suggests that gamblers are open to the availability of responsible gambling systems in gaming venues, including play management. For example, Bernhard, Lucas, Dongsuk, and Kim (2006), reported that about 75% of all participants had a positive impression of a responsible gambling device on a video lottery machine. Although many people reported favorably about the system, few recreational gamblers (i.e., those who did not report gambling-related problems) said they were likely to use the tool. Other research shows that research participants who actually received pop-up messages related to their limits in fact said that the tool was helpful in monitoring monetary behavior (Wohl, Gainsbury, Stewart, & Sztainert, 2013). However, although the majority of gamblers have a favorable attitude towards the concept of pre-commitment (Ladouceur et al., 2012; Schellinck & Shrans, 1998), the impact of such systems might not be universal. Low risk gamblers who might benefit from the tool tend to perceive pre-commitment as unnecessary for their own gambling (Omnifacts Bristol Research, 2007). Even worse, some problem gamblers have mentioned being worried that loss alerts actually could cause them harm, such as by inducing chasing losses or re-enforcing incorrect assumptions about odds of winning (Bernhard et al., 2006). More than one study (Omnifacts Bristol Research, 2005, 2007; Schottler Consulting, 2010b) reported that high-risk gamblers set higher limits and were more likely to exceed their limits in larger monetary amounts than their low risk counterparts. It is imperative that researchers examine these systems to determine whether their impacts vary for vulnerable users.

Few studies have examined the types of features that people who use play management software might favor. As mentioned earlier, some play management systems are quite flexible for users. That is, gamblers might have the opportunity to engage in different types of limits, and opt in to different types of budget-related consequences, or have different limit-related information delivered to them. Bernhard et al. (2006) examined the utilization of a voluntary responsible gambling device on video lottery machines in a laboratory casino. Participants could choose to interact with a variety of features such as: setting time/monetary limits, viewing summary expenditure statements, and viewing limiting options. Roughly half (51%) of all participants chose to interact with any of these features while gambling. The most popular feature that people did seek out was the summary statement (i.e., a description of the gamblers wins and losses in the past day, week, month or year); about one third (34%) of participants chose to use this feature. A minority set monetary limits (3.0%) and time limits (1.3%). People who had gambling-related problems were more likely to use limiting features (Bernhard et al., 2006). Other research shows that, in general, when given the option, gamblers are much more likely to set

a monetary limit (roughly 80%) than a time limit (between 20% and 30%) (Lalande & Ladouceur, 2011; McDonnell Phillips, 2006).

Despite interest and generally positive feelings toward play management tools, studies that examined uptake of play management systems typically report limited voluntary engagement among gamblers. One evaluation in Australia found that 6 months after implementation 2% of rewards cardholders at one venue (N = 17,000) had signed up for the program (Schottler Consulting, 2009). Other South Australian government funded studies have reported that recruitment is a major barrier for the study of and implementation of voluntary play management systems (Responsible Gambling Working Party, 2010a, 2010b; Schottler Consulting, 2010b). Research on EGMs in Nova Scotia reported that the use of monetary and time limits varied widely among gamblers, from 3% to 17% (Bernhard et al., 2006; Omnifacts Bristol Research, 2007). Similarly, research suggests that there is limited involvement in play management opportunities among Internet gamblers. Nelson et al. (2008), for example, reported that about 1% of Internet gamblers in a sample of nearly 47,000 elected to set their own gambling limits. Ladouceur et al. (2012) raised questions about the attractiveness of play management and why recruitment/retention remains low even with the use of incentives. Reported rates of gambler engagement with play management systems raise concerns about whether voluntary programs can successfully reach potential users in a cost-effective manner. Additional research is needed.

Studies examining involuntary play management tools report similar levels of engagement. Internet betting service providers often impose involuntary deposit limits and enable voluntary limits, for example. Research suggests that very few people (1.2%) set personal limits (Nelson et al., 2008). Likewise, few players (0.3%) actually attempt to exceed involuntary limits, or their own personal limits (Broda et al., 2008). Voluntary play management tools such as Playscan, displayed higher engagement when users first encountered the tool; however, engagement decreased with each repeated use of a feature (Forsström, Jansson-Fröjmark, Hesser, & Carlbring, 2017). This could suggest that players intend to use the tool's features to limit their play, but might continue to play while ignoring the tool.

Finally, effectiveness research suggests that play management engagement is associated with inconsistent outcomes. Gamblers report increased awareness of their behavior and confidence while playing with player card-based play management systems (Schottler Consulting, 2010a). Similarly, Omnifacts Bristol Research (2005, 2007) reported that gamblers using their player cards to interact with self-limiting and other responsible gambling functions found that the play management system helped them gamble more responsibly, maintain limits, and spend less time and money gambling. Pop-up message systems also had an impact on how much time people spent gambling. Kim et al. (2014) found that among a small sample of college students, those who set and received time limit notifications spent less time gambling than those who did not set or receive at time limit notification. Auer and Griffiths (2014) also found that a small proportion of their sample was influenced to cease play after receiving a notification related to how many consecutive games the patron had played. With respect to play management options on the Internet, Nelson et al. (2008) reported that approximately 10% of those who set their own limits discontinued gambling at the website entirely. Among that same sample, self-limiters reduced the frequency of days they placed a bet and the number of bets placed per day after imposing their limits. Since research shows that a minority of gamblers use play management systems, the effectiveness of such systems for gamblers, in aggregate, is still generally unknown. More empirical evidence is needed to consider play management as a beneficial preventative resource (Ladouceur et al., 2012). This report contributes to that needed evidence base.

1.4. Current Study

The Reno model defines responsible gambling as, "…policies and practices designed to prevent and reduce potential harms associated with gambling; these policies and practices often incorporate a diverse range of interventions designed to promote consumer protection, community/consumer awareness and education, and access to efficacious treatment" (Blaszczynski, Ladouceur, & Shaffer, 2004, p. 308). Although a variety of forces (e.g., public responsibility, public opinion, legislative requirements, business requirements, etc.) can encourage jurisdictions to employ responsible gambling interventions prior to their full evaluation, such evaluation is a necessary activity to assure safe and effective public health

outcomes (Blaszczynski et al., 2004; Ladouceur, Blaszczynski, Shaffer, & Fong, 2016; Shaffer, Ladouceur, Blaszczynski, & Whyte, 2015). In the absence of independent evaluation, it is not possible to know whether an intervention has a positive, negative, neutral, or complex effect on the key outcomes.

In the spirit of this model and consistent with the state's Responsible Gambling Framework, the purpose of the current study is to examine the initial introduction of Massachusetts's play management system, PlayMyWay. In law and policy there are numerous examples where well-intentioned programs proposed for the public good lead to unintended negative consequences, what some in the prevention field call backfiring (Stibe & Cugelman, 2016). For example, evaluations of alcohol warning advertisements have found mixed results. Light/moderate drinkers exposed to an alcohol warning message increase their negative attitudes and decrease their positive attitudes towards drinking, while heavy drinkers actually decrease their negative attitudes towards alcohol (Brown, Stautz, Hollands, Winpenny, & Marteau, 2016). Similarly, backfiring has been seen with tobacco control messaging where graphic images can lead to smokers reacting defensively (van 't Riet & Ruiter, 2013), experiencing cravings (Loeber et al., 2011) and having positive cognitions (Süssenbach, Niemeier, & Glock, 2013). It remains to be determined whether play management systems can help gamblers select budgets and adhere to them as intended, without generating adverse effects or unintended consequences. Therefore, evaluation of play management systems, such as PlayMyWay, in general is essential to ensuring the public's health. Such evaluation of PlayMyWay also can be used as a platform for discussion about how well PlayMyWay, specifically, achieves such goals and how other program-specific goals might emerge from such study outcomes.

Because the available scientific evidence associated with play management tools is limited, mixed, and inadequate for making large-scale intervention decisions, it is important to build the evaluation of PlayMyWay on a strong foundation. To accomplish this, the Massachusetts Gaming Commission and the Division on Addiction are cooperating in a multi-year research and development agenda for PlayMyWay. Our first analyses will be descriptive and comparative. This strategy will provide a basic understanding of the patrons who enroll in PlayMyWay and how they use it. As we will describe in greater detail later, this report provides the preliminary results of a secondary data analysis of player information -- both PlayMyWay and non-users -- collected from June 8, 2016 through January 31, 2017. This information includes basic demographics, financial transaction information, game types, gambling behavior (e.g., wagering, losses), and PlayMyWay system activity records (e.g., budgets and budget sizes).

The Division's evaluative process of responsible gambling initiatives typically begins with preliminary assessments of a program's safety, impact, and effectiveness (Gray, LaPlante, Keating, & Shaffer, 2016, forthcoming; Gray, LaPlante, & Shaffer, forthcoming). The Massachusetts Gaming Commission suggests that "PlayMyWay is intended to help players make decisions about gambling, allow them to monitor and understand their playing behavior in real time, and support their decisions." This general description of the purpose of PlayMyWay provides an opportunity to examine PlayMyWay in multiple ways. As a first step in examining PlayMyWay, we had the opportunity to analyze actual gambling records and PlayMyWay system records. This approach is unique with respect to access to and types of data (i.e., in vivo records, rather than self-report). However, as described fully in Appendix A, the data available to the Division for these assessment analyses provided inconsistent and inadequate opportunities to examine each of these evaluative areas. Hence, in this preliminary report, we focus upon describing the following areas:

(1) Sample Characteristics – To describe key aspects of the sample as a whole, and by PlayMyWay enrollment, including characteristics such as gender, age, and region.
(2) Game Characteristics – To describe a detailed description of the gambling activity environment (e.g., numbers and types of machines, and betting options) in which the data collection took place.
(3) Cash Activity – To describe how individuals in our sample as a whole, and by PlayMyWay enrollees, interacted with the available gambling machines, in terms of financial transactions, including bill insertions, funds withdrawals, and ticket redemptions.
(4) Gambling Activity – To describe the gambling activity of our study sample in general, and PlayMyWay enrollees in particular, such as PPC visitation and wagering behavior.
(5) Budget & Notification Activity – To describe PlayMyWay enrollment trends and budget activity, including numbers of notifications received, change occurrences, and compliance.

2. Methods

2.1 Methodological Summary

This report includes secondary analyses of the Marquee Rewards betting records and PlayMyWay records of 101,024 individuals who gambled at PPC between June 8, 2016 and January 31, 2017. To help readers understand the progression of this report, we provide a brief roadmap here. Specifically, we begin with a general overview of the study environment. This includes descriptions of the participants for whom we received data (Section 2.2.1) and the study location (Section 2.2.2), an in-depth explanation of the mechanics of the PlayMyWay system (Section 2.2.3), some information on the databases at PPC that served as the sources of the data (Section 2.2.4), and a statement about IRB oversight (2.2.5). Next, we provide definitions and explanations for all variables (Sections 2.3.1 and 2.3.2). After that, we list the criteria used to generate the subgroups of participants and working data files used to conduct our analyses. Specifically, we set the beginning and end of the analytic study period (i.e., the time period over which we studied participants' behavior) (Section 2.4.1), introduce the subgroups of participants used in the analyses of demographics, financial activity, and gambling activity (Section 2.4.2), detail the filters we used to clean the data files containing records of interactions with PlayMyWay itself (Section 2.4.3), and present detailed descriptions of our analytic samples (Section 2.2.4). Finally, we lay out our analytic plan, listing the analyses we will perform using the participants' demographics, financial activity, and gambling activity (Section 2.5.1), and the analyses of their interactions with PlayMyWay (Section 2.5.2.).

2.2. Procedural Details

2.2.1. Participants

We received data for 140,197 individuals who had joined the Marquee Rewards program and gambled at PPC between January 1, 2016 and January 31, 2017. Of these, 101,024 gambled at PPC between June 8, 2016 and January 31, 2017, the study period. Additional participant characteristics are available in Section 3.1.1, Sample Characteristics.

2.2.2. Setting

PPC served as the setting of this report. PPC is a casino that opened in Plainville, Massachusetts during June of 2015. PPC offers live harness horse racing April-November and simulcast racing year-round. In addition, PPC offers electronic gaming and acts as a state lottery retailer. The types of available EGMs include electronic table games (e.g., blackjack, three card poker, craps, roulette), video poker, and slot machines.

2.2.3. Play Management Software

PlayMyWay is a product of Scientific Games. In collaboration with the Massachusetts Gaming Commission, Scientific Games adapted its play management budgeting software for the Massachusetts gambling environment. In brief, the software allows individuals to voluntarily create a computer-assisted budget system for daily, weekly, and monthly financial budget amounts. Individuals who enroll in PlayMyWay receive notifications when their gambling activity approaches, reaches,

and/or exceeds their self-identified budgetary amounts. Users can play through budget notifications; that is, the PlayMyWay system does not force a hard stop once users exceed their self-identified budget points.

Release and Operating Characteristics

PlayMyWay became available at PPC on June 8, 2016 (Massachusetts Gaming Commission, 2016a; Metzger, 2016).[2] PlayMyWay is only available to Marquee Rewards cardholders. Marquee Rewards is a free program that allows registered individuals to collect rewards and benefits for gambling activity at PPC and other Penn National properties. Cardholders can enroll in PlayMyWay by using a GameSense kiosk at PPC or through touchscreens built into the EGMs at PPC. Cardholders are invited to enroll in PlayMyWay once every 30 days when they insert the rewards card. This invitation cycle started for all cardholders the first day that PlayMyWay became available at PPC.

Marquee Rewards cardholders who sign up for PlayMyWay can set daily, weekly, and/or monthly budgets. They can choose to set just one budget type, two out of the three, or set all budget types. These budgets are meant to represent how large a net loss (i.e., total amount wagered minus total amount won) a member is willing to accumulate during the given time periods. For example, suppose that a cardholder set a daily budget of $50, played 200 spins at 20 lines per spin at $0.05 per line ((200 spins)(20 lines/spin)($0.05/line) = $200), won $100 on one spin, won $60 on another, and won nothing on the other 198 spins ($160 won total). Then that player would have a net loss of $200 - $160 = $40 that day, and would not be over his or her daily budget of $50.

Players can change their PlayMyWay budgets at any time, either at a gambling machine or at one of the GameSense kiosks. These changes also can include activating or deactivating budgets entirely. For example, a user can switch from having a daily budget of $100, a weekly budget of $500, and no monthly budget, to having no daily budget limit, a weekly budget of $300, and a monthly budget of $1000.

As PlayMyWay users gamble and use the machines on the PPC floor, information on their play is stored on two computer servers: the casino management (i.e., ACSC) server and the PlayMyWay server. The ACSC server stores records of bets (e.g., spins on an EGM) and wins (i.e., cash awarded for winning lines). The PlayMyWay server processes information from the ACSC server and maintains updated sums denoting how much the user has lost over the current one-day, one-week, and one-month time periods. The one-day periods begin at 6:00 a.m. (i.e., 06:00:00). The one-week periods begin on Sunday at 6:00 a.m. (e.g., the week of Sunday, October 15 began at 2017-10-15 06:00:00 and ended at 2017-10-22 05:59:59). The one-month periods begin on the first of the month at 6:00 a.m. (e.g., the December 2016 period started at 2016-12-01 06:00:00 and ended at 2017-01-01 05:59:59). As described in more detail below, the PlayMyWay server uses this information to generate and send budget-related messages. The PlayMyWay server also stores information related to individuals' PlayMyWay activity, such as enrollment and budget changes.

The PlayMyWay system sends notifications to its users as they reach various percentages (e.g., 50%, 75%, 100%, 125%, 150%, etc.) of the budgets they set. Whenever a PlayMyWay user's net loss changes from below one of these percentages to at or above one of these percentages, a pop-up appears telling the user which budget triggered the notification (i.e., daily, weekly, or monthly). There are three primary types of notifications: approaching, reached, and exceeded. The approaching notification informs players when they are nearing a budget that they set and how close they are to reaching that budget (e.g., "You have spent 75% of your daily budget."). Reached notifications inform players when they have spent as much as the budget that they set (e.g., "You have reached 100% of your daily budget."). Finally, exceeded notifications inform players about budgets they have exceeded and the percentages by which they have gone over (e.g., "You have spent 125% of your daily budget.").

[2] Correspondence with developers at Scientific Games stated that PlayMyWay went live on June 8. Our data confirms that gambling activity with PlayMyWay active occurred on June 8. Most press releases state that PlayMyWay was first available on June 9. It is possible that June 9 was the first full day (6:00 a.m. to 6:00 a.m.) that PlayMyWay was active.

The notification system is responsive to any budget-related target points. This means that a user can receive multiple notifications in a row for the same budget target. For example, suppose that a user set a daily budget of $100, spent $120, and then spent another $10 each on the next two spins without winning anything. Then the user would receive a notification after the first $10 spin (net loss of $130, moving from 120% of the budget to 130%, crossing the 125% threshold), but not after the second $10 spin (moving from 130% to 140%)[3]. It is possible for a user to receive the same notification again or even a notification with a smaller percentage than the previous one. For example, if this same user won $55 on his next $10 spin (net loss = $140 + $10 - $55 = $95), and then won nothing on a $10 spin after that (net loss = $95 + $10 = $105), then that user would receive a message notifying him that he was above 100% of his daily budget. If this user's running net loss continued to oscillate between below $100 and above $100, then each time the running net loss rose from below $100 to above $100, the user would receive another reached notification for his daily budget of $100.

When a Marquee Rewards cardholder enrolls in PlayMyWay, the PlayMyWay server uses records stored on the ACSC server to calculate that member's net loss for that day, week, and month, up to the time of enrollment. This method can yield budget-related notifications at the time of enrollment. For example, suppose that someone spent $100 on September 6, 2016, spent another $20 on Monday, September 19, 2016, spent another $25 the morning of Wednesday, September 21, and then enrolled in Play My Way in the evening of September 21. Then that user would have already accumulated an initial daily net loss of $25, an initial weekly net loss of $305, and an initial monthly net loss of $405 at the time of enrollment. After the Play Management system calculates these initial sums, it compares these sums to any budgets the user sets. If the user is already above 50% on any budget, then the system will immediately display the appropriate notifications. For example, if the above user set a weekly budget of $15 and a monthly budget of $500, then the user would be over 200% of the weekly budget and over 75% of the monthly budget, and the system would notify the user with the corresponding exceeded and approaching notifications for the week and month, respectively.

Recording data and updating net losses

The ACSC server records each time Marquee Rewards cardholders insert or remove their cards from machines on the casino floor. It also records each time Marquee Rewards cardholders add value (e.g., inserting a dollar bill or a cash voucher) or remove value (i.e., printing out a voucher to be converted to cash or inserted into a machine for further play) from a machine and how much Marquee Rewards cardholders wager and win.

How often an EGM sends information to the ACSC server is different for PlayMyWay users and non-users. For non-users, EGMs send data to the ACSC server when the Marquee Rewards cardholder removes the card or when the machine has been left idle long enough for the card to be considered abandoned. For these players, the EGM sends the ACSC server the following information: (1) Marquee Rewards number, (2) the type of machine (i.e., type of game cabinet and the game software running on it), (3) the date and time of the data transmission, (4) the total amount wagered since the last transmission for that Marquee Rewards member/machine pair, and (5) the total amount won in that same time period. Returning to the example of 200 spins at 20 lines of $0.05, this means that if the user removed the Marquee Rewards card after the 200 spins, then the line of data recorded on the ACSC server for this event would have the Marquee Rewards number, the name of the cabinet and software, the date and time of the card removal, $200 for the total amount bet, and $160 for the total amount won.

For PlayMyWay users, EGMs send data to the ACSC server more frequently. The PlayMyWay server keeps track of the budgets that PlayMyWay users set and the corresponding one-day, one-week, and one-month running net losses when applicable. If each of a PlayMyWay user's running net losses are below 90% of their corresponding budgets, then the EGM sends data to the ACSC and PlayMyWay servers after either three spins or after ten minutes, whichever comes first. For

[3] Whether the user received a notification for a running net loss of 75% or 100% of the daily budget (i.e., at running net losses of over $75 and $100, respectively) on the way to $120 would have depended upon the amounts bet per spin and the results of those spins. The mechanics of exactly how and when the Play My Way system calculates running net losses and compares them to users' budgets will be covered later in the section *Recording data and updating net losses*.

example, suppose that a user set a daily budget of $50, no weekly budget, and a monthly budget of $200, and had one-day, one-week, and one-month running net losses of $10, $20, and $100. Then that user would be at 20% of his daily budget and 50% of his monthly budget. The $20 one-week net loss would not matter, because the user did not set a corresponding weekly budget. If this user played three spins that each cost a total of $0.50 (e.g., 50 lines at $0.01 per line), and won $0.00, $0.25, and $0.10 on the three spins, then the EGM would send the servers data denoting that the user had bet $1.50 and won $0.35. The PlayMyWay server would then update the one-day, one-week, and one-month running net losses to $11.15, $21.35, and $101.15.

Once the PlayMyWay server detects that one of a user's updated running net losses is at or above 90% of its corresponding budget amount, the data delivery frequency changes and the EGM sends data to the PlayMyWay and ACSC servers after one spin or one minute of idle time (again, whichever comes first). It is possible for the EGM to return to sending data every three spins or ten minutes, if each of the running net losses that were above 90% of their corresponding budgets drop to below 90% of their corresponding budgets. This can occur, for example, if a user wins a large enough prize on a spin (lowering all three net losses), or if the one-day, one-week, and/or one-month periods end and the running net losses reset to $0.

Notifications do not necessarily progress from approaching, to reaching, and then to exceeding. Consider the example where a user set a daily budget of $100 and eventually obtained a running one-day net loss of $120. Depending upon how the user obtained that net loss of $120, the user may or may not have received a notification for crossing 75% of the daily budget. For example, suppose that the user climbed to a net loss of $120 solely through spins that each cost $1. Then the user would pass through $50, $75, and $100 and would receive notifications for 50%, 75%, and 100%. On the other hand, suppose that an EGM sent data to the PlayMyWay server when the net loss was $60, and then user won nothing on three consecutive spins that cost $20 each. In this case, the EGM would not send data to the PlayMyWay server until after the three spins were completed. Therefore, the user would jump from a net loss of $60 to a net loss of $120, and would only receive a notification for a net loss of more than 100% of the daily budget (i.e., no notification for 75%).

2.2.4. Records

With support from Scientific Games, PPC made available two primary types of records for the analyses contained within this report: (1) Marquee Rewards records and (2) PlayMyWay records. The Marquee Rewards records provide information about individual player characteristics and gambling activity (e.g., types of games, bet sizes, etc.). Some records pertain to the full sample, and are independent of PlayMyWay, and some records were delivered separately by PlayMyWay enrollment status. That is, one subset of Marquee Rewards gambling activity data pertained to activity for individuals who were not enrolled in PlayMyWay (i.e., not enrolled) and the other to activity for individuals who were enrolled in PlayMyWay (i.e., enrolled). Individuals could appear in both data subsets, for example, if they had their Marquee Rewards card and played at PPC before enrolling in PlayMyWay.

The PlayMyWay records provide details about individual player PlayMyWay actions (e.g., setting a budget) and system notifications (e.g., exceeding a budget). At the time of this report, the Marquee Rewards and PlayMyWay records were wholly independent. The Division did not have access to any means of linking these record sets. Therefore, it was not possible to identify how specific PlayMyWay actions recorded in the PlayMyWay files related to specific gambling activity records recorded in the Marquee Rewards files.

The records made available to the Division for secondary data analyses included records for 140,197 Marquee Rewards members who visited PPC during the period of January 1, 2016 to January 31, 2017. More specifically, PPC delivered initial data files covering Marquee Rewards cardholder activity from January 1, 2016 through June 30, 2016, and then delivered new files covering each month after that. That is, for each of the data file types, we received one file covering activity during January 2016 through June 2016, and then a series of subsequent files covering one-month periods (i.e., July 1, 2016 to July 31, 2016, August 1, 2016 to August 31, 2016, etc.). As we inspected and analyzed the data files, we maintained

communication with PPC and Scientific Games regarding issues and inconsistencies in the data files that we encountered. When Scientific Games and PPC solved problems that we raised, we received corrected data files for further inspection and analysis.

2.2.5. Human Subjects Protection

The Institutional Review Board (IRB) of the Cambridge Health Alliance, via expedited review, approved our research activities (i.e., secondary analysis of Marquee Rewards and PlayMyWay records).

2.3. Measures

In this section, we will describe the available data from each set of records.

2.3.1. Marquee Rewards Betting Records

Sample Characteristics

The available sample characteristics were part of the provided Marquee Rewards records. These records included gender (male or female), age (year of birth), and region (zip code).

Game Characteristics

We obtained information from the Marquee Rewards records related to the characteristics of the games available at PPC. For all games, the records contained game identifiers (i.e., unique identifiers for type of game), cabinet names (i.e., inclusive of manufacturer name, model number, and cabinet type), and game descriptions (i.e., name or description of the software that comprises the game). Additionally, for slot machines (SMs), the records contained betting units (i.e., the amount bet on a single line) and maximum numbers of lines for a single spin. For electronic table games (ETGs – e.g., blackjack and roulette), the records included the minimum allowable bets. For video poker terminals (VPTs), the records included the betting unit (i.e., the amount bet on a single hand).

Cash Activity

Similarly, we obtained information from the Marquee Rewards records related to insertions and removals of Marquee Rewards cards and depositing and withdrawing funds from gambling machines. Each row of data contained a player identifier, a game identifier, a time stamp, an action (card insertion, card removal, abandoned card, [dollar] bills deposited, tickets redeemed, funds withdrawn), and a dollar amount (for bills deposited, tickets redeemed, and funds withdrawn).

Gambling Activity

As mentioned earlier in Section 2.2.4, from the Marquee Rewards records, we also had access to tables of gambling activity specific to cardholders who were enrolled in PlayMyWay, and to gambling activity specific to cardholders who were *not enrolled* in or un-enrolled from PlayMyWay (i.e., individuals who were not PlayMyWay users at different points in time). Cardholders' gambling activity in each of these subsets was dependent upon different criteria. The files for gambling activity while PlayMyWay was active contained all cardholders' activities while they were enrolled in PlayMyWay. These files did not contain any activity from these cardholders from either before they enrolled or after any un-enrollment. For brevity, we will refer to the data within these files as PlayMyWay gambling activity data. The files for gambling activity without PlayMyWay active contained all gambling activity for all cardholders who were not active PlayMyWay users at the times of each month's data pull[4]. For brevity, we will refer to the data within these files as non-PlayMyWay gambling activity data. For some cardholders, the criteria used to generate these gambling activity files led to serious flaws in the data, which limited our ability to use the data. For more on these data abstraction code design flaws, see Appendix A. These data files,

[4] PPC personnel delivered data for July 2016 through September 2016 on 2016-11-02, data for October 2016 on 2016-11-03, data for January 2016 through June 2016 and November 2016 on 2016-12-01, data for December 2016 on 2017-01-03, and data for January 2017 on 2017-02-01.

both for when PlayMyWay was active and inactive, included player identifiers (i.e., unique identifiers for each player), game identifiers (i.e., unique identifiers for type of game), amount wagered (i.e., total amount bet over a series of spins or plays)[5], amount awarded (i.e., total amount awarded for winning lines on a slot machine or winning bets at an electronic table game, over a series of spins or plays), date of activity, and time of activity.

It is worth re-stating that the gambling data delivered to us for those individuals who are identified as *enrolled* in PlayMyWay were not provided in a way that allowed us to link to their PlayMyWay records (i.e., 2.2.4. Budget Activity records).

2.3.2. PlayMyWay Records

The PlayMyWay Records included a PlayMyWay identifier (i.e., unique identifier for a PlayMyWay enrollee)[6], a system activity code, a time stamp, and any specifications for any notifications or changes in budgets. System activities include enrollments, initial budget amounts, changes in budget amounts, confirmations of changes in budgets, notifications (either approaching, reaching, or exceeding a budget), and un-enrollments. Specifications for initial budget amounts or changes in budget amounts include the budgets in question (i.e., daily, weekly, monthly) and the new dollar amounts. Specifications for notifications include the budget in question and the corresponding percentage spent (e.g., 150% of a daily limit). In the data files, these specifications were delivered to us as text strings. Staff at the Division developed a parser to extract the budget amounts and percentages from the text.[7] We received usable data for June 2016 through January 2017. As noted earlier, we are unable to link these records to the Marquee Rewards records. This is because the data were delivered to us with two distinct sets of identifiers, one for PlayMyWay and one for Marquee Rewards.

2.4. Data Quality & Sample Definitions

2.4.1 Analytic Study Period

To accurately compare the gambling behavior of those who were offered PlayMyWay and enrolled to those who were offered PlayMyWay and declined, we elected to begin our study period on June 8, 2016 (i.e., the day PlayMyWay was released to the casino floor) at midnight (i.e., 2016-06-08 00:00:00).

The budget activity files for February 2017 and March 2017 did not have the same anonymization scheme that the budget activity files for the 2016 files or the January 2017 files. Specifically, in the 2016 files and the January 2017 file, each PlayMyWay enrollee was assigned a 32-character ID. In the February 2017 file, each PlayMyWay enrollee was assigned a 40-character ID that did not match any of the IDs in any other budget activity file or ACSC data file (i.e., sample characteristics, card and cash activity, gambling activity). In the March 2017 file, each PlayMyWay enrollee was denoted by the same 40-character ID found in the sample characteristics, card and cash activity, and gambling activity data files. Thus, there was no way to connect any Marquee Rewards member's 2016 or January 2017 budget activity to their February 2017 or March 2017 data. The longest contiguous period of time for which we could study budget activity behavior was from June 2016 to January 2017. For consistency, we also limited our analyses of other data (i.e., data from the ACSC server) to this calendar date range (2016-06-08 00:00:00 to 2017-01-31 23:59:59).

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[5] For information on how often the machines aggregate amounts bet and amounts won, see Section 2.2.3.

[6] The player identifiers and the PlayMyWay identifiers are not linked.

[7] For example, on one line of data, "Day-TimeSpent:0;Day-NetLoss:150;Day-TurnOver:;Week•TimeSpent:0;Week-NetLoss:159;Week-TurnOver:;Month•TimeSpent:0;Month-NetLoss:0;Month-TurnOver:;Consecutive" was the text string. The parser interpreted the "Day-NetLoss:150" as a daily budget of $150, the "Week-NetLoss:159" as a weekly budget of $159, and "Month-NetLoss:0" as no monthly budget set. While developing and implementing a parser was within the Division staff's skill set, we recommend that those developing pre-commitment systems and pre-commitment data collection systems design more user-friendly data file formats. When data files are not in easy-to-use or easy-to-load formats, it adds extra effort and man-hours to the pre-commitment system evaluation process.

2.4.2. Marquee Rewards Betting Records: Data Review and Data Reduction

Sample Characteristics

We combined the sample characteristics files into a single data set. Starting with the sample characteristic data file for January 2016 through June 2016 and working forward chronologically, we added birth years, residential zip codes, and gender data to the list, overwriting previous months' data with newer data whenever there was a discrepancy. The combined sample characteristic data set contained demographics data for 296,068 unique player identifiers. In the data import process, there were 33 changes in birth year, 6 changes in gender, and 2,253 changes in zip code. There are reasonable explanations for changes in birth year or gender. For example, if a married couple wishes to combine the two spouses' Marquee Rewards account into a single account, then PPC might overwrite one spouse's information with the other spouse's information. Because we limit our analyses to comparing states, some of the changes or discrepancies in zip code might have zero effect on our results. As it stands, 2,292 changes represent changes in a very small fraction of the player identifiers in these data files.

Game Characteristics

We used the game characteristics files to obtain a master list of the types of machines on the casino floor. This master list contained data on the number of each kind of machine on the casino floor each month. Differences between one month's numbers of machines and the next month's numbers signified changes in the composition of the casino floor. Using the websites of the manufacturers of the various hardware, we classified each machine as a slot machine (SM), an electronic table game (ETG), or a video poker terminal (VPT). This master list contained 531 unique cabinet/software/betting unit combinations (i.e., over the period from June 8, 2016 to January 31, 2017, patrons of Plainridge Park Casino had 531 different games from which to choose).

Cash Activity

For our analysis of cash activity, we combined the cash activity files, and then removed data pertaining to card insertions, card removals, and card abandonment. We then removed any remaining cash activity data timestamped before June 8, 2016 (i.e., before the beginning of the analytic study period). The resulting data set contained 99,038 unique player identifiers.

Gambling Activity

From the gambling activity data for all of 2016 and January 2017, we obtained a roster of 140,197 unique player identifiers. We removed from consideration any gambling activity outside of the analytic study period (i.e., before June 8, 2016 or after January 31, 2017). Through this elimination, we removed 39,173 player identifiers from consideration. The remaining 101,024 player identifiers could be separated into three groups. The first group (i.e., 6,894 identifiers) contained only PlayMyWay gambling activity data (i.e., data from after PlayMyWay enrollment, but before any subsequent un-enrollment). For each of the identifiers in the second group (i.e., 1,962 identifiers), our data set contained both PlayMyWay gambling activity and non-PlayMyWay gambling activity. For those in the third and final group (i.e., 92,168 identifiers), our data set only contained non-PlayMyWay gambling activity data (i.e., either the cardholder never enrolled, or had enrolled but then un-enrolled before the gambling activity).

We searched the gambling data for every possible combination of month, day, and hour within the study period (i.e., from 2016-06-08 00:00:00-00:59:59 to 2017-01-31 23:00:00-23:59:59). We noticed significant gaps of time during which the data files contained no gambling activity from PlayMyWay users. Specifically, 682 (11.5%) out of the 5,880 possible month/day/hour combinations were not found in gambling activity data files for PlayMyWay users. Many of these missing hours combined to form contiguous blocks of time. For example, there was no PlayMyWay gambling activity on the following days: June 13, July 3 through July 4, September 8 through September 9, and December 17 through December 21. Other month/day/hour combinations combined to form sizable blocks within 21 different Friday and Saturday evenings. It is possible that some of these time gaps could be reflective of periods during which PlayMyWay users were not actively

gambling. However, because some gaps span over whole days and others occur during peak gambling time periods, we suspect many of them reflect time when the PlayMyWay server was malfunctioning and not recording gambling activity. The Massachusetts Gaming Commission was notified when the PlayMyWay system was malfunctioning, but as of the time of this report, we do not have the list of such time periods and therefore cannot attempt to match these times to any gaps or features in the data.[8] It is likely that the PlayMyWay system malfunctioning resulted in losses of PlayMyWay gambling activity data during the study period.

2.4.3. PlayMyWay Records: Data Review and Data Reduction

The raw data contained 449,964 rows of budget activities representing 8,841 unique PlayMyWay identifiers. From this we removed 392 rows of budget activities that were timestamped before the beginning of the study period (June 8th, 2016), which left 449,572 rows of budget activities representing 8,824 unique PlayMyWay identifiers. Of these 449,572 rows, 48,161 were duplicates of other rows (i.e., same PlayMyWay identifier, same date and time stamp, same activity and specifications). We removed all duplicate copies to obtain a data set containing 401,411 unique budget activities from 8,824 unique PlayMyWay identifiers.

We found that 1,297 out of the 8,824 users in the budget activity data had records of other budget activities (e.g., receiving notifications, changing budgets) that were timestamped before the user's first recorded enrollment. After removing these users' data, our dataset contained 286,644 budget activities from 7,527 users. We found 20 additional users who seemed to have either an enrollment or un-enrollment that was missing from the data. For example, if a user had two enrollments timestamped August 1 and August 31, but no un-enrollment timestamped at any time that month, then we would consider that evidence of missing data for un-enrollment. After removing these users' data, our data set contained 283,646 budget activities representing 7,507 unique PlayMyWay identifiers.

In 36,652 cases, when a user exceeded a budget, there was a matching redundant record (i.e., same PlayMyWay identifier, same timestamp, reference to the same type of budget (daily, weekly or monthly)) noting that the user had reached a budget amount. After removing the redundant records, our final data set of PlayMyWay budget activities contained 246,944 budget activities from 7,507 unique PlayMyWay identifiers.

As stated before, when a user enrolls in PlayMyWay, the system calculates net losses retroactive to the beginning of the budget type's current time period. For example, if a user had enrolled and set a monthly budget on October 13th, 2016, then the system would have calculated how much the user had spent since October 1st, 2016. If the user had spent more than 50% of the budget or more over that first part of the month, then immediately after the user confirmed the monthly budget, he would receive a notification (e.g., an "approaching" notification if the net loss was between 50% and 100% of the budget). Specifically, if the net loss at the time of signup on October 13 was already greater than the budget amount, then the user would have received a notification that he had already exceeded his budget (i.e., right after enrollment, before even a single subsequent bet or spin). The user would then have several options: (1) set a new budget; (2) un-enroll from PlayMyWay; (3) stop playing and wait until November 1st, 2016 to play again when the system resets; or (4) continue playing with PlayMyWay enabled and continue to receive notifications. We found that a significant number of users (n = 3,243) in similar circumstances chose (4).

It is possible that these users treated these first or partial days, weeks, or months of enrollment differently, and that they might have responded to notifications differently or disregarded notifications less after their partial days, weeks, or months ended. If users were ignoring notifications, and in the process generating more notifications than they would otherwise, then their data would distort the results of our analyses of the numbers and types of notifications the PlayMyWay users received. Thus, we created three filters and used them in some analyses to create a second data set from the PlayMyWay analytic sample. The first filter removed daily budget notifications that occurred the same day that the user set a daily limit.

[8] In future work, we can coordinate with the Massachusetts Gaming Commission to do this, if requested.

The second and third filters removed analogous weekly and monthly budget notifications. This supplementary data set contained the same 7,507 unique PlayMyWay identifiers but only 192,568 budget activities. We analyzed this supplementary data set using many of the same procedures as the original PlayMyWay analytic data set. The results of these analyses are briefly reported at the end of their respective sections in the body of this report, while the associated tables and figures can be found in Appendix C.

2.4.4. Analytic Samples

From the above data reductions, we arrived at three separate analytic samples.

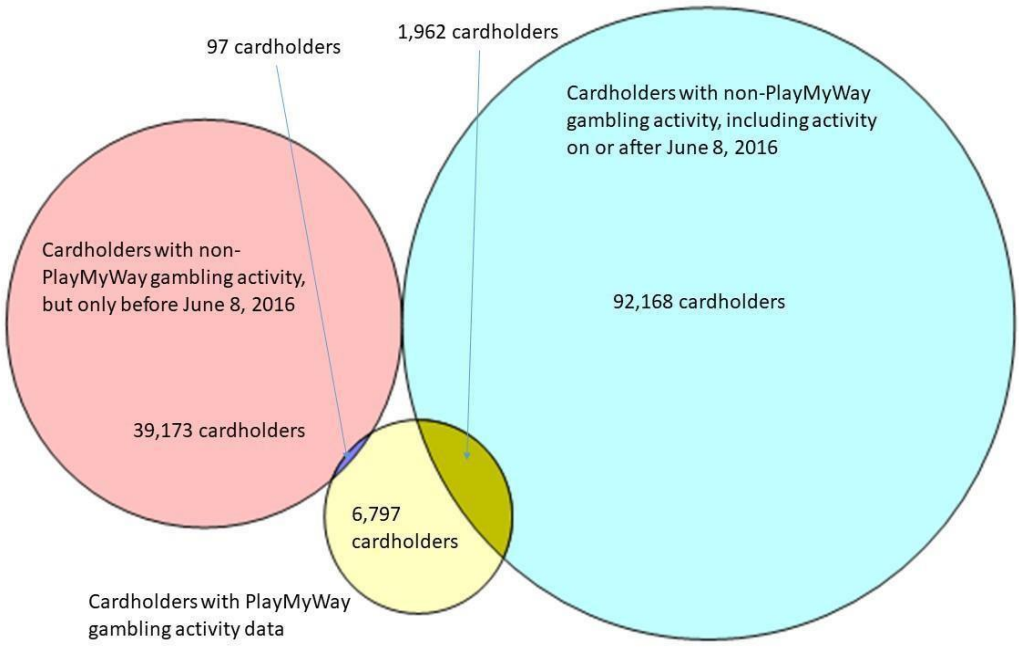
The machine analytic data set

The first analytic sample contained data on 531 game types offered on the casino floor (e.g., cabinet types, software, betting units, etc.).

The Marquee Rewards analytic data set

The second analytic sample contained the roster of 101,024 player identifiers for whom we had gambling activity data with timestamps within the analytic study period (i.e., 8,856 player identifiers, or 8.7% of cardholders, associated with PlayMyWay gambling activity from June 8, 2016 to January 31, 2017 and 94,130 player identifiers, or 93.2% of cardholders, associated with non-PlayMyWay gambling activity from June 8, 2016 to January 31, 2017; 1,962 player identifiers were common to both). We designated the 8,856 Marquee Rewards cardholders with any PlayMyWay gambling activity data (regardless of whether or not they also had non-PlayMyWay gambling activity data) as PlayMyWay users. We designated the other 92,168 cardholders on the roster, who only had non-PlayMyWay gambling activity data, as non-users. Figure 1 illustrates the numbers of cardholders in the gambling activity data files, both the 101,024 who were included in the analytic sample and the 39,173 who were not.

Figure 1: Distribution of player identifiers in the gambling activity data files.

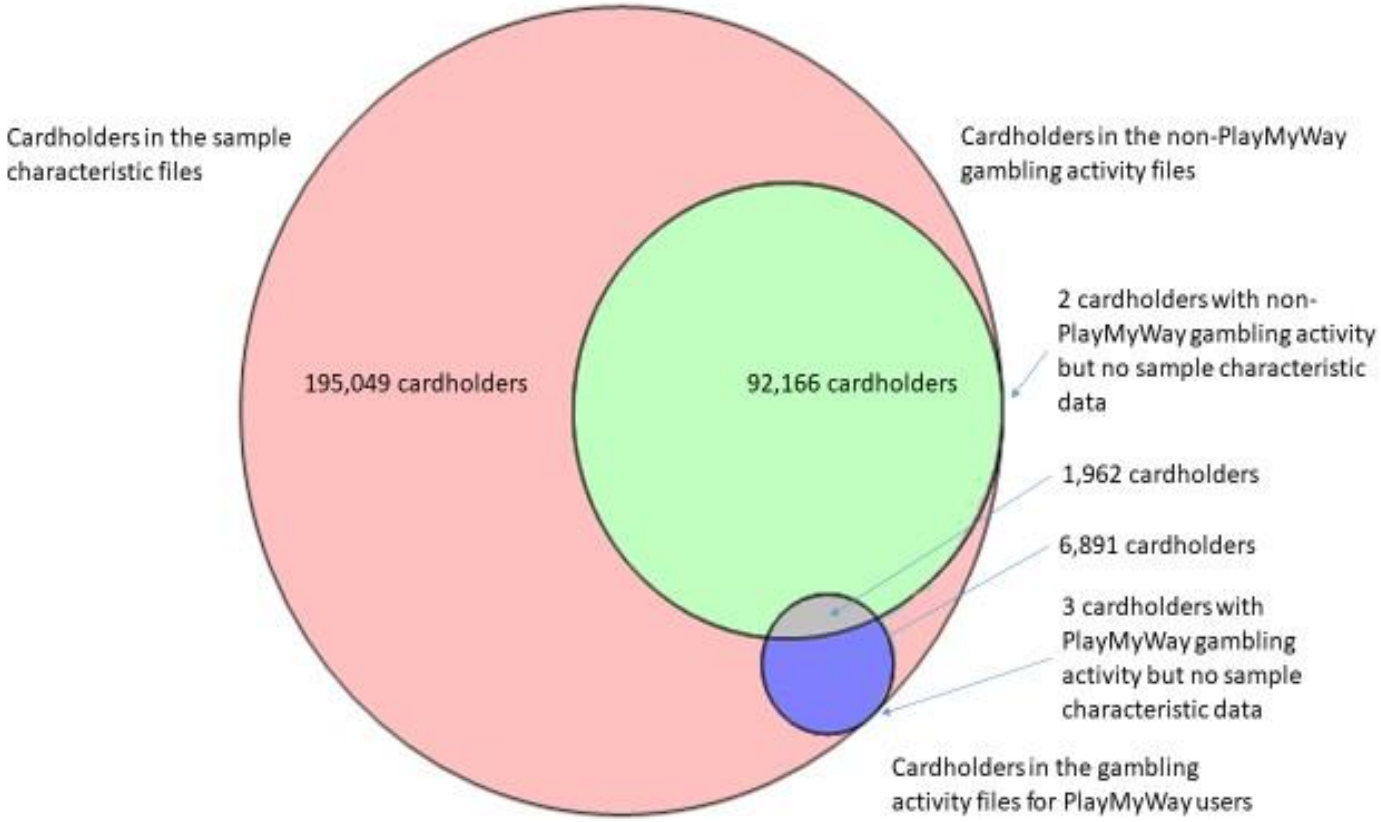


To analyze the distributions of some demographics variables, we created a demographics subset of this Marquee Rewards analytic sample. This subsample contained all player identifiers we found in both the sample characteristic files and the gambling activity files. Specifically, out of the 296,068 cardholders in the sample characteristics files, we found 101,019 in

the gambling activity data files. As Figure 2 illustrates, this subset contained 8,853 of the 8,856 PlayMyWay users and 92,166 of the 92,168 non-users. Viewing the overlap between sample characteristics data and gambling activity data another way, we did not have sample characteristic data for three PlayMyWay users and two non-users.

In Section 2.4.2, we mention 33 changes in birth year, 6 changes in gender, and 2,253 changes in zip code that occurred during the data import process. For 6 changes in birth year, 2 changes in gender, and 1,193 changes in zip code (1,201 changes total), the associated cardholder was in the demographics subset. Just as with the 2,292 changes in Section 2.4.2, these edits represent changes in a very small fraction of the cardholders in this subsample.

Figure 2: Number of Marquee Rewards cardholders included and not included in the subset used to examine the sample characteristics of PlayMyWay users and non-users.



To analyze the cash activity of PPC patrons, we created a cash activity subset of the Marquee Rewards analytic sample. This subsample contained all player identifiers we found in both the cash activity files and the gambling activity files. Specifically, out of the 99,038 cardholders in the cash activity files, we found 98,459 in the Marquee Rewards analytic data set. As Table 1 illustrates, this subset contained 8,627 of the 8,856 PlayMyWay users and 89,832 of the 92,168 non-users. Viewing the overlap between sample characteristics data and gambling activity data another way, we did not have cash activity data for 229 PlayMyWay users and 2,336 non-users.

Table 1: Distribution of player identifiers in the cash activity records.

	Player identifiers with only PlayMyWay gambling activity	Player identifiers with both PlayMyWay and non-PlayMyWay gambling activity	Player identifiers with only PlayMyWay gambling activity	Total
Player identifiers in the cash activity files	6,670	1,957	89,832	98,459
Player identifiers not in the cash activity files	224	5	2,336	2,565
Total	6,894	1,962	92,168	101,024

Note. Number of Marquee Rewards cardholders included (green) and not included (white) in the subset used to examine the cash activity of PlayMyWay users and non-users. There were 579 cardholders in the cash activity files that were not in the gambling activity data files. We did not use these cardholders' data in the analyses of cash activity.

The PlayMyWay analytic data set

The third analytic sample, from the PlayMyWay records, contained the 7,507 PlayMyWay identifiers associated with PlayMyWay budget activity between June 8, 2016 and January 31, 2017. We employed this sample for any analyses of PlayMyWay budget activity (e.g., budget size, approaching, reached, and/or exceeded budget notifications). Some of our analyses were restricted to the 3,965 out of the 7,507 who reached or exceeded their daily budget and received a notification. For example, for each of the PlayMyWay users in this subsample, we counted the number of additional reached or exceeded budget notifications they received after initially reaching or exceeding their daily budgets.

In some instances, we used both the Marquee Rewards and PlayMyWay analytic samples to describe certain aspects of PlayMyWay (e.g., trends and patterns in enrollments/un-enrollment activity). Throughout our analyses, we note up front which approach we used, as well as any instance where we either created another subsample of or transformed one of our analytic samples.

2.5 Analytic Plan

2.5.1. Marquee Rewards Betting Records

Sample Characteristics

We found the distributions of gender and age over the 101,019 Marquee Rewards cardholders in the demographics subset of the analytic sample. For age, we also found the mean, standard deviation, minimum, median, and maximum. Using the zip codes, we counted the number of Marquee Rewards cardholders from each of the six New England states.

Game Characteristics

For each month from July 2016 to January 2017, we received a data file with the list of games on the casino floor. We combined the lists into a master list we used to count the numbers of SMs, ETGs, and VPTs, and examined the month-to-month changes in the composition of the casino floor. Using July 2016 and January 2017 to illustrate, we separated the SMs by betting unit and number of lines, the ETGs by minimum bet, and the VPTs by betting unit, to show changes in the composition of the casino floor over the study period.

Cash Activity

In the cash activity data, we focused on three actions: bill insertion, funds withdrawal, and ticket (i.e., voucher[9]) redemption. Bill insertion is depositing cash into a machine. Funds withdrawal refers to when a cardholder ends their session on a machine, but still has credits (i.e., cash value) available. In these cases, the machine prints a voucher for the value remaining in the machine. Cardholders can then insert the voucher into another machine to resume play or redeem the voucher and receive cash. Ticket redemption refers to when a cardholder inserts one of these vouchers into a machine. At PPC, the only ways to add credits to a machine are to insert bills, redeem vouchers, or add free play credits (e.g., from a travel or day excursion package). The only way to remove value from a machine is to have the machine print out a voucher.

As we mentioned before, 98,459 Marquee Rewards cardholders from the second analytic sample were found in the cash activity files. We used the game identifiers and the game characteristics data to determine which lines of data corresponded to activity on SMs, ETGs, and VPTs. For each of the cardholders, we used the lines of data pertaining to bill insertions to obtain the total amount of cash deposited into SMs, ETGs, and VPTs over the study period. Similarly, we used the lines of data pertaining to funds withdrawal to get the total amount of cash withdrawn from SMs, ETGs, and VPTs over the study period. We performed similar calculations using ticket redemptions to get cardholders' total amounts redeemed in vouchers.

Gambling Activity

Normally, as in the case of the sample characteristic data and the cash activity data, it is standard to use the same procedures on each cardholder's data to calculate statistics and then combine the results into distributions meant to cover or describe the whole analytic sample. However, this would not be appropriate for gambling activity measures such as total amount wagered or total prizes won over the study period. This is because the time periods where gambling activity data might have been lost (see Section 2.3.2 and Appendix A) are different for different cardholders. Specifically, data loss depended on whether that cardholder only had PlayMyWay gambling activity data, had both PlayMyWay and non-PlayMyWay gambling activity data, or only had non-PlayMyWay gambling activity data (as illustrated in Figure 1 in Section 2.3.2 by the blue and yellow zones, the green zone, and the teal zone, respectively).

As an example, if we add a cardholder's amounts wagered across the whole analytic data set, we will obtain an estimate for the total amount the cardholder wagered over the study period. If some of that cardholder's activity is not recorded in the analytic data set, then the sum will underestimate the actual total amount wagered. For the first group of cardholders (i.e., only PlayMyWay gambling activity, blue and yellow zones of Figure 1), the two sources of lost data are the gaps in time in the files for PlayMyWay users (as described in Section 2.3.2), and the possibility of gambling activity without PlayMyWay active (as described in Section 2.2.1 and Appendix A). For these cardholders, it is more accurate to say that the sum is an estimate for the total amount wagered during the study period, minus the gaps, while PlayMyWay was active.

For the second group of cardholders (i.e., both PlayMyWay and non-PlayMyWay gambling activity data, green zone in Figure 1), there are cases where the same gambling activity appears both in a file for PlayMyWay users and in the same month's file for non-users. In these cases, there is the risk of counting the same gambling activity twice. Also, depending on when these cardholders enrolled in or un-enrolled from PlayMyWay, it is possible that the analytic data set is missing weeks or whole months of some of their gambling activity data (Both the duplication issue and the omission issue are described in more detail in Appendix A.). For this group, the sum of amounts wagered over the whole analytic data set might overestimate the total amount wagered for some and underestimate the total amount wagered for others.

Finally, for the third group of cardholders (i.e., only non-PlayMyWay gambling activity data, teal zone in Figure 1), creating a scenario where data is missing is more complicated. It requires the cardholder to enroll in PlayMyWay, but then only

[9] "Tickets" is the term native to the ACSC system. However, because of the ambiguity of this term, we refer to them as "vouchers" throughout the report.

gamble with PlayMyWay active during the gaps in time where there is no gambling activity for PlayMyWay users. However, if the cardholder was enrolled in PlayMyWay at an inopportune time, such as the date of a data pull, then it is possible that gambling activity without PlayMyWay active also might have been lost. For this third group cardholders, we best can characterize the sum of amounts wagered as an estimate (likely an accurate one for most, and an underestimate for the rest) for the total amount wagered with PlayMyWay inactive.

To summarize, the sum of all total amounts wagered has very different interpretations depending on which group the cardholder is in. Thus, it is not appropriate to calculate this statistic for all cardholders and combine them into a single distribution. Furthermore, proposing and performing meaningful statistical tests to compare the total amounts wagered for PlayMyWay users and non-users is extremely difficult if not impossible. In this report, we assume that the distributions for PlayMyWay users and non-users are different, based on the differences in the structures and patterns of possible missing data. Thus, it would be inappropriate to propose or perform a test where the null hypothesis is that the distributions for PlayMyWay users and non-users are the same.

For similar reasons, for other statistics based on the gambling activity data, such as number of days cardholders visited PPC, total prizes won, and net winnings, we did not generate single distributions or summary statistics that cover the whole analytic sample. However, we did calculate summary statistics to describe PlayMyWay users as a group by themselves and calculate a similar set of statistics for the non-users. Because of our reservations regarding missing data and interpretations of the calculations, we did not use statistical tests to compare the distributions and summary statistics of PlayMyWay users and non-users. Even if the value of a summary statistic describing PlayMyWay users' gambling activity appears to be a large amount higher or lower than the corresponding value describing non-users' gambling activity, we cannot determine how much of this difference is due to actual differences between PlayMyWay users and non-users, and how much of the difference is due to which cardholders are missing what data.

2.5.2. PlayMyWay Users

Cumulative Enrollment

In this section, we described the trajectory of enrollment-related behavior for the 7,507 cardholders in the PlayMyWay analytic data set. We found that a non-trivial number of cardholders oscillated between being enrolled and being un-enrolled over the course of the study period. Based on this behavior, we partitioned these cardholders into three groups – stable enrollees, erratic enrollees, and dropouts – and illustrated the effective number of enrollments after accounting for un-enrollments (i.e. net enrollment) on a given day over time.

Sample Characteristics by PlayMyWay Status

For the 8,853 PlayMyWay users and the 92,166 non-users in the demographics subset (see Figure 2), we calculated separate summary statistics for gender, age, and geographic location. We then commented on any differences between the distributions of the PlayMyWay users and non-users.

Cash Activity by PlayMyWay Status

For the 8,627 PlayMyWay users in the cash activity subset, we found the mean, standard deviation, and quartiles for the distributions for the total cash inserted, total funds withdrawn, and total amount redeemed in vouchers over all machines on the casino floor. We then repeated these processes three times, limiting our calculations to interactions with slot machines, electronic table games, and video poker terminals, respectively. Between interaction type and game type, we obtained a total of twelve means, twelve standard deviations, and twelve sets of quartiles for the PlayMyWay users.

We repeated this sequence on the 89,832 non-users in the cash activity subset, and obtained twelve analogous sets of statistics. To explore whether or not the distributions for PlayMyWay users were significantly different from the corresponding distributions for non-users, we performed permutation tests with random samples of 100,000 permutations and the difference in means as the test statistic (Butar & Park, 2008).

Gambling Activity by PlayMyWay Status

Following the analysis of cash activity by PlayMyWay status, we assessed several gambling-related indicators among the 8,856 PlayMyWay users and among the 92,168 non-users. We began by aggregating the data by cardholder (i.e., player identifier) and date. For each of the PlayMyWay users, we extracted all records with the corresponding player identifier from the gambling activity data files for PlayMyWay users (i.e., we did not use PlayMyWay users' data in the files for non-users). We defined a cardholder's number of visits to PPC as the number of unique dates (i.e., year/month/day combinations) in these extracted records. We operationalized weeks as Sunday to Saturday (e.g., June 5, 2016 to June 11, 2016), and used the list of dates each cardholder visited to determine the number of weeks that that cardholder visited PPC. For each cardholder, we also counted the number of months during which that the cardholder visited (i.e., the number of unique cardholder/month pairs). To obtain the total amount wagered and total prizes won by a cardholder on a specific date, we added the amounts wagered and prizes won, respectively, of all records with that cardholder/date combination. We defined a cardholder's net winnings on a given date as their total prizes won on that date minus the total amount wagered on that date. From there, for each cardholder, we defined their total amount wagered, total prizes won, and net winnings over the study period as the sum of all their individual dates' total amounts wagered, total prizes won, and net winnings, respectively. We then divided these three totals by the number of visits to get that cardholder's amount wagered per visit, prizes won per visit, and winnings per visit, respectively. We also divided the cardholders' total amounts wagered by their number of weeks visited and number of months visited to get their average amounts wagered per week and per month, respectively.

Similarly, for each of the non-users, we calculated the same statistics: number of visits; total amount wagered, total prizes won, and, net winnings on the dates they visited; total amount wagered, total prizes won, and net winnings over the whole study period; amount wagered per day, per week, and per month. The non-users, by definition, did not have gambling activity data in the files for PlayMyWay users. The calculations for non-users used only data from the gambling activity files for non-users.

For both PlayMyWay users and non-users, we examined number of visits to PPC over time and by regions, amount wagered per day, and amount lost per day. We then used *k*-means cluster analysis to categorize cardholders based on total amount wagered, net winnings, and number of visits over the study period. We then provided disaggregated analysis of gambling activity by gender and age. Through all of these analyses, calculations and tallies for PlayMyWay users were limited to gambling activity while PlayMyWay was active (i.e., did not include any records of non-PlayMyWay data). Calculations and tallies for non-users were (by definition) limited to gambling activity while PlayMyWay was inactive.

Budget & Notification Activity

In this section, we described the budget and notification activity for the 7,507 cardholders in the PlayMyWay analytic data set. We began with a brief overview of the types of budgets set by our sample of 7,507 PlayMyWay users. We then described the characteristics of budget changes for the 569 PlayMyWay users who changed budgets. We also described the magnitude of change for all 699 instances of changing budgets we observed in the data.

Next, we investigated how budget size was related to receiving notifications for the 7,507 PlayMyWay users in our analytic sample. From there, we analyzed all enrollment actions (i.e., instances when PlayMyWay users enrolled during the study period, N = 7,886), which we categorized into budget notification classes: never approached budget, approached budget, reached budget, and exceeded budget. We investigated how these budget notification classes related to changing budgets and un-enrolling from PlayMyWay.

Finally, we investigated budget compliance and non-compliance. We started by presenting a full consort diagram of budget compliance activity for our sample of 7,507 users. We looked at the number of respective notifications received per day by users at each level of non-compliance (approaching, reaching, and exceeding budgets). Next, we examined the extent to

which our sample of 7,507 users exceeded their budgets, and how the maximum extent to which users exceeded during the study period was related to budget types and budget sizes. We concluded this section with an analysis of additional notifications received in all instances of hitting (reaching or exceeding) daily budgets (*N* = 5,151 instances) amongst steady PlayMyWay users (i.e., users who did not change their budget or un-enroll from PlayMyWay that same day, *N* = 3,113 users). This analysis was also modified to reflect the number of total additional notifications received during the study period in all instances of hitting a daily budget for these steady PlayMyWay users (*N* = 2,271 users).

2.5.3. Assessing Safety, Reach, and effectiveness

Consistent with our companion reports (Gray et al., 2016; Gray, LaPlante, Keating, et al., forthcoming; Gray, LaPlante, & Shaffer, forthcoming), we attempted to tailor our analyses towards evaluating the safety (e.g., does the program lead to harmful consequences?), reach (e.g., who is utilizing the program?), and effectiveness (e.g., is the program effective in doing what it is supposed to do?) of the PlayMyWay tool. Data limitations described previously and in Appendix A prevented us from obtaining an accurate picture of a user's gambling behavior before utilizing PlayMyWay and during utilization of PlayMyWay, and therefore we were not able to evaluate these factors as planned. The Discussion reviews some future options to evaluate safety, reach, and effectiveness with forthcoming data from Scientific Games and Plainridge Park Casino. We anticipate that during late Fall 2017, Scientific Games and Plainridge Park casino will deliver revised data files that correct the issues outlined in this report. We will then immediately review the files for completeness and accuracy.

2.5.4. On Central Tendency and Dispersion

Throughout these analyses, we report two measures of central tendency (single values that describe the "average" value of a distribution, e.g., mean) and one measure of dispersion (a single value describing how all the values within a distribution group around their measure of central tendency, e.g., standard deviation). The first measure of central tendency is the mean (i.e., average). Because the mean often can be vulnerable to outliers (i.e., values that are exceedingly high or low compared to the rest of the distribution), we often pair the mean with the standard deviation, a dispersion measure based on the distances between the mean and the data values. Large standard deviations, especially standard deviations greater than the mean itself, often indicate the presence of large outliers or a distribution with an extreme right skew. Because the distributions for many of our variables are skewed, we also report the median (i.e., the 50th percentile). Unlike the mean, the median is not as vulnerable to outliers and extreme values. Thus, it tends to better describe the center of these sorts of distributions. In instances where the standard deviation is smaller than the mean, the mean should be treated as the more accurate measure of central tendency. In contrast, in instances where standard deviation is larger than the mean, the median should be treated as the more accurate measure of central tendency. In some instances, to provide a slightly more detailed view of a distribution, we also list the minimum and maximum values, or go further and list all five quartiles (i.e., minimum, 25th percentile, median, 75th percentile, and maximum).

3. Results

3.1. Marquee Rewards Betting Records

Recall that we used the gambling activity data dated between June 8, 2016 and January 31, 2017 to construct our roster of 101,024 Marquee Rewards cardholders for our analytic data set.

3.1.1. Sample Characteristics

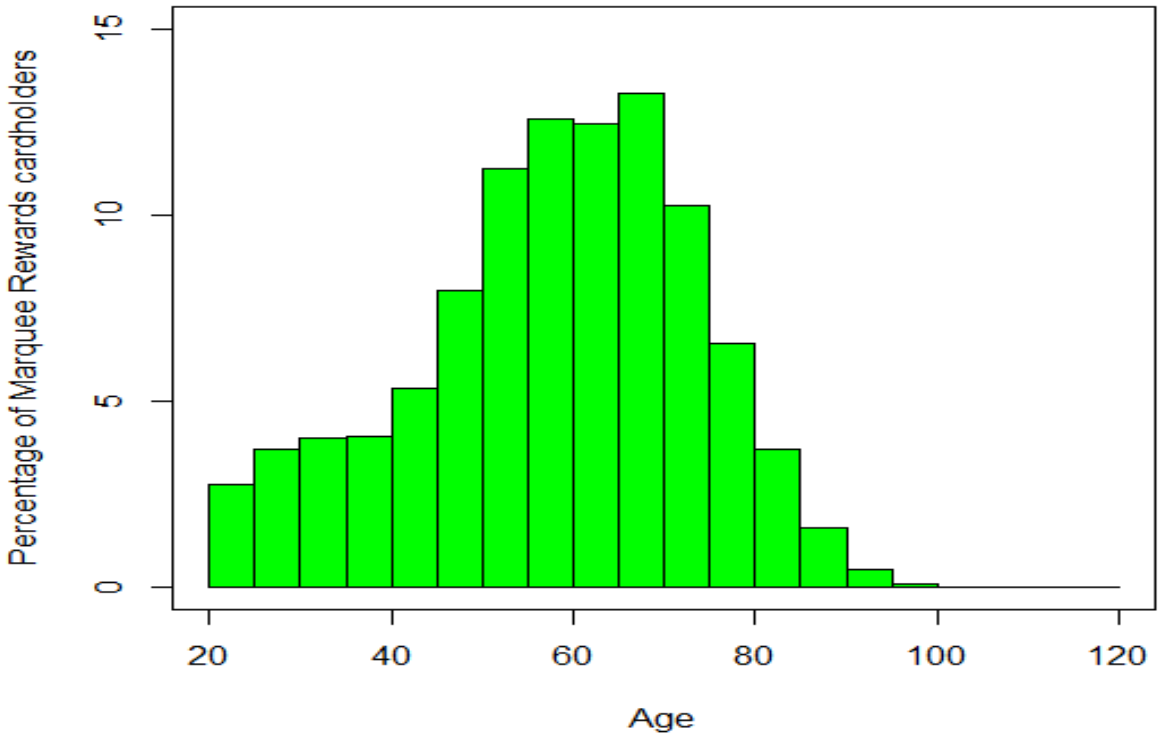
In this section, we used information from the Marquee Rewards records to describe the gender, region, and age characteristics of the cardholders in the demographics subset (see Section 2.4.4).

Gender data was available for 95,975 of the 101,019 cardholders. Of these cardholders, 40,526 (42.2%) were listed as male and 55,449 (57.8%) were listed as female.

A majority of the cardholders (77.3%) were from Massachusetts. Another 17.1% were from the other New England states. The remaining 5.6% of the cardholders were either from outside New England or did not provide information on state or country of residence.

The sample characteristics data files contained years of birth for 101,002 of the cardholders in the subset. For simplicity, we defined age as 2016 minus the year of birth listed. The mean age was 58.3 (SD = 15.5), with a median of 60 and a range from 20 to 116.[10] The sample distribution for age is in Figure 3.

Figure 3: Age distribution for the 101,002 cardholders who played at Plainridge Park Casino between June 8, 2016 and January 31, 2017.



3.1.2. Game Characteristics

In this section, using information from the Marquee Rewards records related to the characteristics of the games available at PPC (see Section 2.3.1), we provide a description of the wagering context for this report. Included in this context are the following: numbers of machines by type, betting units (for SMs and VPTs) or minimum bet (for ETGs), number of lines (for SMs), and maximum possible wager for a single play.

[10] Being listed as Age 20 in our data set is not necessarily a sign of underage gambling activity. For example, someone could have been born on January 6, 1996 and first visited PPC on January 7, 2017 – at a legal age of 21 years and 1 day. Additionally, the maximum age in our data, 116, was likely the result of an inaccurate estimation for that individual's date of birth.

We chose to begin our survey of the machines on the casino floor with the list of machines for July 2016, since it was the earliest month with its own game characteristics file[11]. That month, there were 1,555 machines and gaming stations on the casino floor (1,217 SMs, 290 ETGs, and 48 VPTs). The betting unit for each SMs was either $0.01, $0.02, $0.05, $0.25, $0.50, $1.00, $5.00, $10.00, $20.00, $100,00, or $500.00 (i.e., eleven different possible betting units). For 807 (66.3%) of the SMs, the betting unit was $0.01 (i.e., penny slots). The betting units of almost 98% of the SMs was $1.00 or less. The minimum bet for 254 (87.6%) of the ETGs was $1.00. The minimum bet for the other 36 was $0.50. The betting units for the VPTs were $0.01 (16 machines, 33%) and $0.25 (32 machines, 67%).

In January of 2017, the number of machines increased to 1,567 (1,227 SMs, 290 ETGs, and 50 VPTs). The list of possible betting units was the same, with the exception that the $10.00 SMs had been removed from the casino floor. For 821 (66.9%) of the SMs, the betting unit was $0.01. Neither the list of games nor the numbers of machines changed significantly month-to-month between July 2016 and January 2017. The largest change in composition was from September 2016 to October 2016, when PPC added 18 games and removed 18 games from the casino floor. Most of the changes could be expressed as replacement, where PPC removed a game or machine and added one with the same betting unit (e.g., replacing one penny slot game with another) or with a smaller betting unit (e.g., replacing a $10 slot machine with a $1.00 slot machine). Tables 2 through 4 list the numbers of electronic gaming machines and numbers of different games (i.e., cabinet type/game description combinations) on the casino floor in July 2016 and January 2017. Table 2 shows the counts for SMs separated by betting unit. Table 3 shows the counts for ETGs, separating those with a minimum bet of $0.50 from the ones with a minimum bet of $1.00. Table 4 shows the counts for VPTs, separating those with a betting unit of $0.01 from those with a betting unit of $0.25.

Table 2: Number of slot machines and number of different slot machine games on the casino floor in July 2016 and in January 2017.

Betting Unit	Number of SMs July 2016	Number of SMs January 2017	Number of different SM games July 2016	Number of different SM games January 2017
$0.01	807	821	329	335
$0.02	84	84	29	29
$0.05	47	47	18	18
$0.25	86	80	28	26
$0.50	6	6	2	2
$1.00	160	164	59	60
$5.00	22	22	15	15
$10.00	2	0	2	0
$25.00	2	2	1	1
$100.00	1	1	1	1
$500.00	1	1	1	1

[11] As we mentioned before, we received files that covered January 2016 through June 2016, but not June 2016 by itself. During the final preparation of this report, Floyd Barroga, Gaming Technology Manager at the Massachusetts Gaming Commission, notified us that the number of gaming positions at Plainridge Park Casino never exceeded 1,365 (personal communication, November 20, 2017). He also indicate4d that machine traffic on and off the gaming floor and the ACSC data including machines located in the system warehouse might account for the discrepancy. The data available for this report cannot account for these possibilities. Therefore, our machine counts will differ from those of the gaming commission.

Table 3: Number of electronic table games and number of different electronic table game types on the casino floor in July 2016 and in January 2017.

Minimum Bet	Number of ETGs July 2016	Number of ETGs January 2017	Number of different ETG types, July 2016	Number of different ETG types January 2017
$0.50	36	36	2	2
$1.00	254	254	11	11

Table 4: Number of video poker terminals and number of different video poker terminal types on the casino floor in July 2016 and in January 2017.

Betting Unit	Number of VPTs July 2016	Number of VPTs January 2017	Number of different VPT types July 2016	Number of different VPT type January 2016
$0.01	16	18	2	1
$0.25	32	32	8	8

The maximum number of lines someone could play on a single spin of an SM ranged from one single line on some machines to 99 lines on others. Almost all SMs on which someone could play more than 20 lines had betting units of $0.01 or $0.02. Most of the machines with betting units of $0.01 had maximum number of lines of 30, 40, 50, or 99, meaning that with the maximum number lines, a user could wager $0.30, $0.40, $0.50, or $0.99 on a single spin. There is one outlier with the largest betting unit and the largest possible amount wagered on a single spin – 99 lines at $500.00 per line, or $49,500. We have been told that this was an actual machine on the casino floor, but there are indications that it is just a test machine. At the very least, no cardholder in our analytic sample had any activity on that machine. Table 5 shows the distribution of machines by both betting units and number of lines available for a single spin.

Table 5: Number of machines on the casino floor in January 2017, by betting unit and number of lines.

Betting Unit	Number of machines	Maximum number of lines	Maximum amount for a single spin
$0.01	12	9	$0.09
	11	10	$0.10
	5	15	$0.15
	41	20	$0.20
	30	25	$0.25
	6	27	$0.27
	251	30	$0.30
	4	35	$0.35
	171	40	$0.40
	4	42	$0.42
	2	48	$0.48
	149	50	$0.50
	20	80	$0.80
	10	88	$0.88
	4	90	$0.90
	101	99	$0.99
$0.02	20	20	$0.40
	16	25	$0.50
	14	27	$0.54
	13	30	$0.60
	6	40	$0.80
	9	50	$1.00
	6	80	$1.60
$0.05	12	5	$0.25
	8	9	$0.45
	2	10	$0.50
	6	15	$0.75
	19	20	$1.00
$0.25	17	1	$0.25
	49	5	$1.25
	10	9	$2.25
	2	20	$5.00
	2	40	$10.00
$0.50	6	5	$2.50
$1.00	45	1	$1.00
	103	5	$5.00
	10	9	$9.00
	2	10	$10.00
$5.00	12	1	$5.00
	10	5	$25.00
$10.00	none		
$25.00	2	1	$25.00
$100.00	1	1	$100.00
$500.00	1	99	$49,500

3.1.3. Cash Activity

Using the cash activity subset (see Section 2.4.4), we calculated descriptive statistics for bills inserted, funds withdrawn, and vouchers redeemed. Cross-referencing with the game characteristics data, we separated the cash activity by game type -- slot machines (SMs), electronic table games (ETGs), and video poker terminals (VPTs) and found summary statistics for the separate distributions for each game type.

For simplicity, we will say that a cardholder interacts with a game type if they have some activity (i.e., bill insertion, funds withdrawal, tickets redeemed) on that type of machine. Of the 98,459 cardholders in the cash activity subset, 95,099 (96.6%) interacted with SMs. More specifically, 91,106 (92.5%) inserted at least one bill into a slot machine during the study period. Of those who interacted with SMs, 12,260 (12.8%) also interacted with ETGs and 7,813 (8.2%) interacted with VPTs. There was an overlap of 2,333 cardholders (2.5% of those who interacted with SMs) who interacted with all three game types. Overall, much smaller percentages of the subset interacted with ETGs (14,455 cardholders, 14.7%) and VPTs (9,348 cardholders, 9.5%) than with SMs. Very small percentages of the subset interacted with either ETGs (1.9%) or VPTs (1.2%) exclusively.

Figure 4 shows the overlaps between the groups of cardholders who interacted with the different game types. Similar figures showing the number of cardholders who inserted bills into, withdrew funds from, and redeemed vouchers at the different types of games can be found in Appendix B.

Figure 4: Venn diagram showing the numbers of cardholders with cash activity on slot machines, electronic table games stations, and video poker terminals.

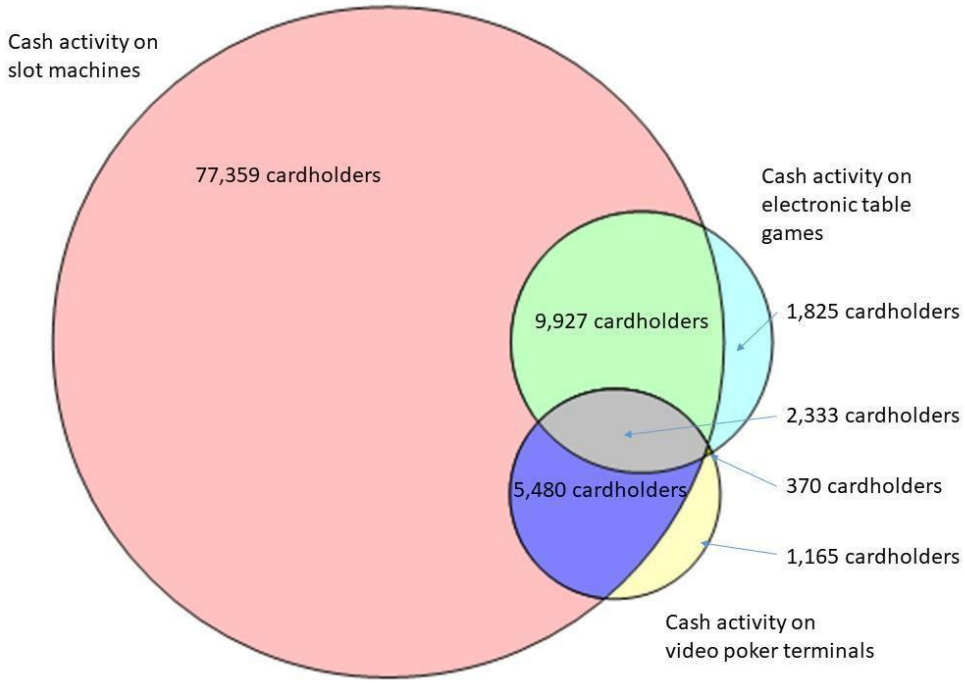


Table 6 shows descriptive statistics associated with bills inserted into SMs, into ETGs, into VPTs, and into all machines over the whole study period. The four distributions were all were skewed, each with large values orders of magnitude above the corresponding means and standard deviations. This indicates that extreme values likely influenced the mean value, making it not necessarily representative of bill insertion, in general. Instead, the medians are more representative of most cardholders. For context, it should be noted that the study period is roughly eight months, meaning that the medians correspond to between $10 and $30 per month.

Table 6: Counts, means, standard deviations, and quartiles for the distributions for the total cash inserted into slot machines, into electronic table games, into video poker terminals, and into all machines.

	N	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	91,106	$1524.17	$5831.81	$1.00	$75.00	$225.00	$870.00	$395,030
ETGs	12,690	$1033.34	$6938.57	$1.00	$21.00	$80.00	$244.75	$266,501
VPTs	7,983	$1049.50	$6002.88	$1.00	$20.00	$80.00	$300.00	$290,488
All machines	95,198	$1684.41	$6622.49	$1.00	$80.00	$240.00	$930.00	$396,330

Table 7 shows that a much smaller subset of the Marquee Rewards cardholders (78.3%) withdrew funds from machines. If a cardholder added funds (either bills or vouchers) into a machine without withdrawing funds at the end of the session on that machine, then it meant that the cardholder gambled until all the inserted credits were lost. That is not to say that all the value withdrawn from machines was converted to cash. It is likely that many of these vouchers were then used to deposit value into other machines to begin later gambling sessions. Also, it is possible that the same funds were withdrawn again and again, as a cardholder changed machines. For example, if a cardholder inserted $20 into one machine, played until he lost $1, printed a $19 voucher, started a session at a different machine, lost another $1, printed an $18 voucher, etc., then that cardholder would appear to have withdrawn a total of $190 (i.e., had $190 in vouchers printed over the 20 sessions).

Much like the distributions for total cash inserted, the distributions for funds withdrawn were skewed, with standard deviations between approximately five and nine times their respective means and exponential growth from one quartile to the next.

Table 7: Numbers of cardholders, means, standard deviations, and quartiles for the distributions for the total value withdrawn from slot machines, from electronic table games, from video poker terminals, and from all machines.

	N	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	77,112	$1,117.11	$9,973.90	$0.01	$33.25	$158.85	$639.21	$1,747,292
ETGs	7,952	$881.20	$4,388.92	$0.01	$21.51	$87.50	$303.62	$114,900
VPTs	5,476	$744.72	$3,973.69	$0.01	$18.58	$75.00	$340.61	$199,495
All machines	80,245	$1,211.64	$9,983.26	$0.01	$39.30	$173.52	$687.34	$1,747,292

Table 8 shows that a smaller percentage of Marquee Rewards cardholders (70.7%) redeemed vouchers at EGMs during the study period than withdrew funds from EGMs during the study period. This is reasonable, since a cardholder must first withdraw funds from a machine to generate a voucher to be redeemed at another machine. Furthermore, if that cardholder redeemed the voucher for cash, then there would be no corresponding redemption in an EGM to match the funds withdrawal.

Much like in the distributions for total funds withdrawn, withdrawing and re-inserting the same funds again and again may have inflated the higher values in the distributions for total value of vouchers redeemed. In the above example where a cardholder plays a sequence of twenty $1 sessions, the cardholder would have inserted a total of $190 in vouchers over those first nineteen sessions.

Table 8: Numbers of cardholders, means, standard deviations, and quartiles for the distributions for the total value in vouchers inserted into slot machines, into electronic table games, into video poker terminals, and into all machines.

	N	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	76,723	$1,684.94	$11,117.94	$0.01	$35.84	$168.73	$793.54	$1,776,244
ETGs	7,748	$791.24	$5,063.96	$0.01	$20.00	$69.00	$223.94	$194,895
VPTs	5,216	$600.21	$5,723.01	$0.01	$15.00	$50.22	$202.00	$247,264
All machines	79,477	$1,743.08	$11,238.58	$0.01	$38.41	$174.96	$814.71	$1,776,244

3.1.4. Gambling Activity

As we stated in Section 2.5.1, we will not be presenting any analyses of gambling activity data that treat the cardholders in the Marquee Rewards analytic data set as a single population. In the discussion, we will describe when and how we expect to be able to perform such analyses in the future.

3.2. PlayMyWay Users

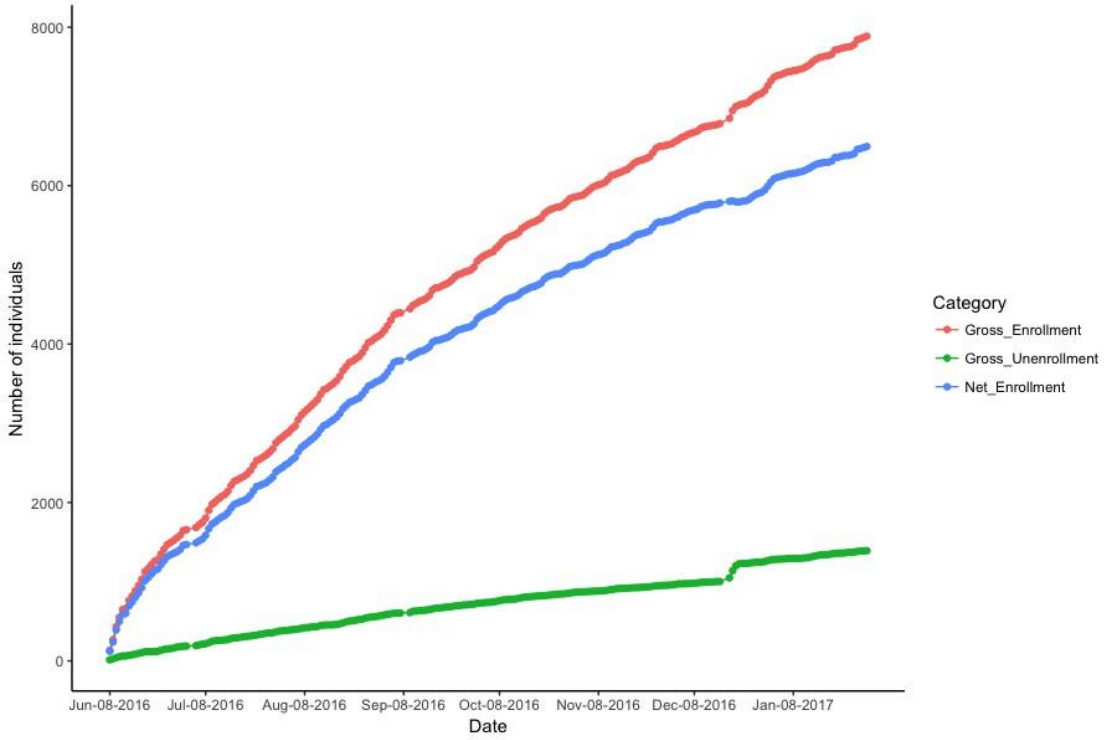
This section includes information about PlayMyWay users. Recall that due to the nature of the data available, we defined PlayMyWay status in two primary ways. First, in the Marquee Rewards records, we identified individuals who ever were present in the gambling activity data tables that were specific to PlayMyWay use. Second, in the PlayMyWay records, we simply recorded the player identifiers present. For clarity, we begin each analytic section by identifying the relevant definition and corresponding analytic data set being analyzed.

3.2.1. Cumulative Enrollment

We used the PlayMyWay records to describe cumulative enrollment in the program over time. We partitioned the 7,507 enrollees in the PlayMyWay analytic data set into three categories: (a) stable enrollees, (b) erratic enrollees, and (c) dropouts. We defined stable enrollees as cardholders who enrolled in PlayMyWay and stayed enrolled in the program for the period of the study. In the budget activity data files, these enrollees had exactly one enrollment and zero un-enrollments. We defined erratic enrollees as cardholders who enrolled, un-enrolled, and re-enrolled in the program at least once, and remained enrolled in PlayMyWay at the end of the study period (i.e., January 31, 2017). In the budget activity data files, these enrollees had more than one enrollment, and had exactly one more enrollment than un-enrollment. We defined dropouts as cardholders who enrolled in the program, but at the end of the study period were un-enrolled from the program. In the budget activity data files, each of these users had an equal number of enrollments and un-enrollments. For some, it was one of each (i.e., enroll, try PlayMyWay, un-enroll, and then never interact with it again). For others, there were multiple enrollments, each with a matching un-enrollment.

Out of the 7,507 cardholders in our analytic sample, 6,398 (85.2%) were stable, 96 (1.3%) were erratic, and 1,013 (13.5%) were dropouts. Figure 5 below displays trends in gross enrollment, gross un-enrollment, and net enrollment during our study period.

Figure 5: Number of gross enrollments, gross un-enrollments, and net enrollments over time.



3.2.2. Sample Characteristics by PlayMyWay Status

Recall that the PlayMyWay records did not have any associated sample characteristic information. Therefore, to describe the sample characteristics by PlayMyWay status, we needed to use the segregated (see Section 2.1.4) Marquee Rewards records.

As a reminder, out of the 101,019 cardholders for whom we had both gambling activity and sample characteristic data, 92,166 (91.2%) were found only in the gambling activity data for cardholders not enrolled in PlayMyWay. We designated these cardholders as non-users (i.e., cardholders who never enrolled in PlayMyWay). Another 1,962 cardholders' player identifiers were found both in the gambling activity data for those not enrolled in PlayMyWay and in the gambling activity data for those who were enrolled.[12] The remaining 6,891 cardholders only had gambling activity data in the files for PlayMyWay enrollees.[13] To provide a description of people who ever used PlayMyWay, we combined these cardholders into one group of 8,853[14] and designated them as PlayMyWay users. Some in this group continued with and are still enrolled in PlayMyWay, others enrolled but then un-enrolled, and others oscillated between being enrolled and being un-enrolled.

We examined the distributions of gender, state of residence, and age of the two groups of cardholders. As Table 9 shows, the percentages of male and female cardholders who were PlayMyWay users were 9.0% and 8.3%, respectively. About 52% of all identified PlayMyWay users in our sample were female.

[12] This is not out of the ordinary. It would be possible, for example, for someone to play at PPC without PlayMyWay in August and then enroll in September. In this case, the cardholder's August data would be in the file for those not enrolled in PlayMyWay and the cardholder's September data would be in the file for those enrolled in PlayMyWay.

[13] These cardholders gambled using a Marquee Rewards card only while they were enrolled in PlayMyWay.

[14] Three PlayMyWay users and two non-users did not have the relevant demographic data available.

Table 9. PlayMyWay enrollment status by gender.

	Number (Percentage) of cardholders		Number (Percentage by gender) of PlayMyWay users		Number (Percentage by gender) of non-users	
Male	40,526	(40.1%)	3,655	(9.0%)	36,871	(91.1%)
Female	55,449	(54.9%)	4,593	(8.3%)	50,856	(91.7%)
No Response	5,044	(5.0%)	605	(12.0%)	4,439	(88.0%)
Total	101,019	(100%)	8,853	(8.8%)	92,166	(91.2%)

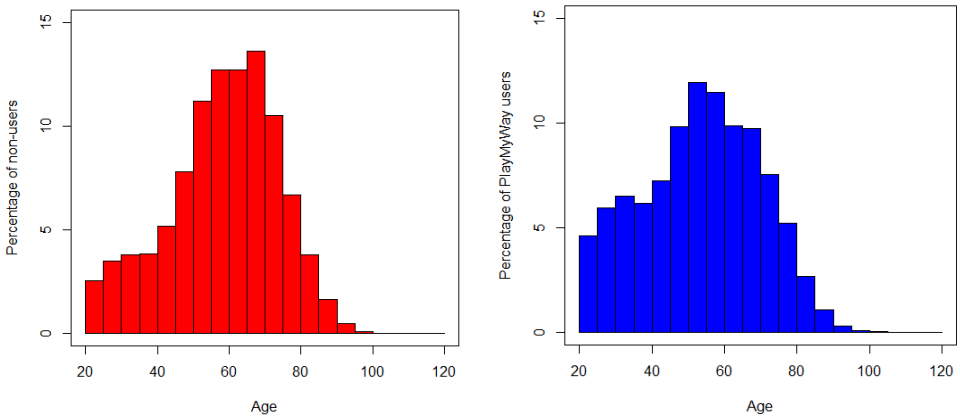
Table 10 shows PlayMyWay participation rates for the six New England states ranged from 5.1% to 8.9%. About 78% of all PlayMyWay users reported that they were from Massachusetts.

Table 10. PlayMyWay enrollment status by region.

	Number (Percentage) of cardholders		Number (Percentage) of PlayMyWay users		Number (Percentage) of non-users	
Massachusetts	78,096	(77.3%)	6,941	(8.9%)	71,155	(91.1%)
Connecticut	1,379	(1.4%)	110	(8.0%)	1,269	(92.0%)
Rhode Island	9,282	(9.2%)	782	(8.4%)	8,500	(91.6%)
New Hampshire	5,424	(5.4%)	454	(8.4%)	4,970	(91.6%)
Vermont	199	(0.2%)	11	(5.5%)	188	(94.5%)
Maine	985	(1.0%)	50	(5.1%)	935	(94.9%)
Not from New England	5,464	(5.4%)	482	(8.8%)	4,982	(91.2%)
No Zip Code Listed	190	(0.2%)	23	(12.1%)	167	(87.9%)
Total	101,019	(100.0%)	8,853	(8.8%)	92,166	(91.2%)

The demographics subset contained age data for 8,851 out of the 8,853 PlayMyWay users and 92,151 out of the 92,166 non-users. The ages of the PlayMyWay users (mean = 53.8, SD = 16.3, median = 55) skewed significantly younger than the ages of the non-users (mean = 58.7, SD = 15.3, median = 60; $t(10403) = 27.3$, $p < 0.001$). The two distributions are in Figure 6 A and B.

Figure 6 A and B: Age distributions for non-users (red) and PlayMyWay users (blue).



3.2.3. Cash Activity by PlayMyWay Status

To provide a description of any possible cash activity differences by PlayMyWay status, we used data from the Marquee Rewards records from the 98,459-member cash activity sample (see 2.4.2. for details) to describe (1) bill insertion, (2) funds withdrawal, and (3) voucher redemption behavior, with respect to (a) slot machines (SMs), (b) electronic table game stations (ETGs), (c) video poker terminals (VPTs), and (d) all machines, separately for PlayMyWay users and non-users. This sample contained 8,627 PlayMyWay users and 89,832 non-users.

Most of the cardholders (95.8% of the PlayMyWay users, 96.8% of the non-users) inserted at least one bill into one of the machines on the casino floor during the study period. The percentages of each group that inserted at least one bill into an SM (91.6% for PlayMyWay users, 92.6% for non-users) and into a VPT (8.5% for PlayMyWay users, 8.0% for non-users) were similar. The separation between the percentages of each group that inserted at least one bill into an electronic table game (19.2% for PlayMyWay users, 12.3% for non-users) was larger. The percentages for funds withdrawals were farther apart, ranging from a difference of 2.3% (VPTs) to 5.3% (SMs). With all four pairs of distributions, the percentages were higher for PlayMyWay users. The percentages for value of vouchers redeemed had a similar pattern to the percentages for bill insertion. That is, percentages for the two groups were close with respect to SMs, with respect to VTPs, and over all machines. The percentages with respect to ETGs showed more separation, with the percentages for the PlayMyWay users being higher. The differences within all twelve pairs of percentages were statistically significant, but in some cases, most of the significance can be traced to the large sample sizes, rather than meaningful differences in the percentages themselves.

Tables 11 through 16 contain summary statistics for the twelve distributions for PlayMyWay users and the twelve distributions for non-users.

The twenty-four distributions have many of the same features as the distributions generated by considering the cash activity sample as a single group (as in Section 3.1.3). First, the means and quartiles for activity over all machines were similar to the corresponding values with respect to SMs. This is expected, because all measures indicate that slot machine activity represents a dominating percentage of the gambling activity at PPC. Second, in all twenty-four distributions, the sizes of the quartiles increased exponentially from one to the next. This is also somewhat expected, since the skewed distributions summarized here come from the skewed distributions summarized in Section 3.1.3.

Table 11: Numbers and percentages of PlayMyWay users, means, standard deviations, and quartiles for the distributions for the total cash inserted into slot machines, into electronic table games, into video poker terminals, and into all machines.

PlayMyWay users	N	Percentage	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	7,899	91.6%	$2,090.87	$7,263.29	$1.00	$70.00	$260.00	$1,180.00	$245,169
ETGs	1,657	19.2%	$1,984.82	$10,085.26	$1.00	$21.00	$80.00	$320.00	$211,686
VPTs	735	8.5%	$914.32	$4,694.1	$1.00	$20.00	$60.00	$255.00	$100,801
All machines	8,266	95.8%	$2,477.22	$8,846.1	$1.00	$80.00	$289.50	$1,331.75	$245,210

Table 12: Numbers and percentages of non-users, means, standard deviations, and quartiles for the distributions for the total cash inserted into slot machines, into electronic table games, into video poker terminals, and into all machines.

Non-users	N	Percentage	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	83,207	92.6%	$1,470.37	$5,674.30	$1.00	$75.00	$220.00	$845.00	$395,030
ETGs	11,033	12.3%	$890.44	$6,320.64	$1.00	$21.00	$80.00	$240.00	$266,501
VPTs	7,248	8.1%	$1,063.21	$6,120.09	$1.00	$20.00	$80.00	$300.00	$290,488
All machines	86,932	96.8%	$1,609.02	$6,365.70	$1.00	$80.00	$240.00	$900.00	$396,330

Table 13: Numbers and percentages of PlayMyWay users, means, standard deviations, and quartiles for the distributions for the total value withdrawn from slot machines, from electronic table games, from video poker terminals, and from any machines.

PlayMyWay users	N	Percentage	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	7,176	83.2%	$1,745.00	$21,966.20	$0.01	$34.77	$189.72	$871.61	$1,747,292
ETGs	1,151	13.3%	$1,407.55	$6,096.27	$0.06	$20.00	$89.30	$447.10	$107,338
VPTs	665	7.7%	$639.58	$3,094.00	$0.04	$19.00	$76.95	$325.82	$58,393
All machines	7,446	86.3%	$1,956.42	$21,760.62	$0.01	$41.87	$215.46	$968.27	$1,747,292

Table 14: Numbers and percentages of non-users, means, standard deviations, and quartiles for the distributions for the total value withdrawn from slot machines, from electronic table games, from video poker terminals, and from any machines.

Non-users	N	Percentage	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	69,936	77.9%	$1,052.69	$7,754.86	$0.01	$33.05	$156.00	$620.24	$1,262,294
ETGs	6,801	7.6%	$792.12	$4,022.83	$0.01	$22.00	$87.32	$299.50	$114,900
VPTs	4,811	5.4%	$759.25	$4,080.45	$0.01	$18.50	$74.75	$345.95	$199,495
All machines	72,799	81.0%	$1,135.46	$7,833.91	$0.01	$39.00	$170.00	$661.38	$1,262,298

Table 15: Numbers and percentages of PlayMyWay users, means, standard deviations, and quartiles for the distributions for the total value in vouchers inserted into slot machines, into electronic table games, into video poker terminals, and into all machines.

PlayMyWay users	N	Percentage	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	6,827	79.1%	$2,352.24	$23,719.27	$0.01	$35.95	$182.85	$972.45	$1,776,244
ETGs	1,095	12.7%	$1,086.17	$4,736.24	$0.03	$20.00	$71.59	$296.25	$59,370
VPTs	583	6.8%	$601.71	$3,031.39	$0.01	$15.41	$57.25	$224.67	$43,974
All machines	7,110	82.4%	$2,475.23	$23,424.28	$0.01	$39.77	$196.27	$1,049.49	$1,776,244

Table 16: Numbers and percentages of non-users, means, standard deviations, and quartiles for the distributions for the total value in vouchers inserted into slot machines, into electronic table games, into video poker terminals, and into all machines.

Non-users	N	Percentage	Mean	Standard Deviation	Minimum	25th Percentile	Median	75th Percentile	Maximum
SMs	69,896	77.8%	$1,619.76	$8,982.76	$0.01	$35.83	$167.41	$776.90	$1,274,453
ETGs	6,653	7.4%	$742.69	$5,114.60	$0.01	$20.00	$68.53	$215.62	$194,896
VPTs	4,633	5.2%	$600.02	$5,976.68	$0.01	$15.00	$50.00	$200.50	$247,264
All machines	72,367	80.6%	$1,671.15	$9,206.27	$0.01	$38.26	$172.84	$796.59	$1,274,459

In our previously mentioned comparisons of the distributions of cash activity for the PlayMyWay users and non-users, we performed permutation tests using the differences of means between the two groups (Butar and Park 2008). For example, we performed a permutation test using the totals for cash inserted into SMs for the 7,899 PlayMyWay users and 83,207 non-users who inserted at least one bill into a slot machine. In this case, there was a significant difference between the average total amount inserted by the PlayMyWay users and the average total amount inserted by the non-users (difference = $620.50, $p < 0.0001$). In particular, on average, the PlayMyWay users inserted significantly more cash. As mentioned

above, we performed a total of twelve tests (i.e., total cash inserted, total funds withdrawn, total value of vouchers redeemed; slot machines, electronic table game stations, video poker terminals). We found significant differences in eight of the twelve measures (See Table 17), with the average from the PlayMyWay users always higher. Notably, by all measures, PlayMyWay users had more activity on SMs and more activity overall than non-users.

Table 17: Aggregates of interest, machine types, difference of means, and two-tail p-value for the permutation tests used to explore differences between the distributions of PlayMyWay users and non-users.

Aggregate of Interest	Machine Type	Difference of Means	Two-Tailed *p*-value
Total Cash Inserted	Slot Machines	$620.50	0.00000
Total Cash Inserted	Electronic Table Games	$1,094.38	0.00000
Total Cash Inserted	Video Poker Terminals	-$148.89	0.55290
Total Cash Inserted	All Machines	$868.20	0.00000
Total Funds Withdrawn	Slot Machines	$692.31	0.00000
Total Funds Withdrawn	Electronic Table Games	$615.42	0.00012
Total Funds Withdrawn	Video Poker Terminals	-$119.67	0.47908
Total Funds Withdrawn	All Machines	$820.96	0.00000
Total Value of Vouchers Redeemed	Slot Machines	$732.48	0.00002
Total Value of Vouchers Redeemed	Electronic Table Games	$343.48	0.05762
Total Value of Vouchers Redeemed	Video Poker Terminals	$1.69	0.71034
Total Value of Vouchers Redeemed	All Machines	$804.08	0.00002

3.2.4. Gambling Activity by PlayMyWay status

Recall that the PlayMyWay records did not have any associated gambling activity information. Therefore, to describe the gambling activity by PlayMyWay status, we used the segregated gambling activity data (see Section 2.2.4). The relevant groups are the 92,168 non-users and the 8,856 PlayMyWay users.

Gambling Behavior

In our study of gambling behavior, we used two different methodologies to describe the variation in gambling behavior. First, we used a method that weighted each member of a group equally, from those who visited PPC the most to those who only visited once during the study period. We refer to this as, "average by cardholder". For example, to describe the average amount wagered in a visit by a PlayMyWay user and non-user, we calculated the average of the 8,856 PlayMyWay users' amounts wagered per visit and the average of the 92,168 non-users' amounts wagered per visit, respectively. *By comparing these two averages, we can compare an average day trip to PPC by a randomly chosen PlayMyWay user to an average day trip to PPC by a randomly chosen non-user.* Second, we used a method that weighted each cardholder's day of gambling (in terms of the data, each cardholder/date combination) equally. We refer to this as "average by cardholder/date". For example, if one cardholder gambled $30 on one day and another gambled $120 on each of five days, then by this methodology the average day for these two people would be $630/6 = $105. More generally, we added the totals amount wagered over the whole study period and the total numbers of visits for the 8,856 PlayMyWay users to obtain the total amount wagered and total number of visits, respectively, by the PlayMyWay users as a group. We divided these two totals to obtain a measure for the "average visit" for the PlayMyWay users. Using a similar process, we obtained a similar measure for the non-users. *By comparing these two measures, we can compare a randomly chosen day of gambling at PPC by a PlayMyWay user to a randomly chosen day of gambling at PPC by a non-user.* This "average by cardholder/date" methodology is useful because it can be used to describe what an average day of gambling might be within a given season, month, or other time period. For example, in the *Gambling Trends* section, for each day, we calculate the average amount wagered on a particular day by those cardholders who visited that day (i.e., total amount wagered on that day divided by the total number of cardholders who visited that day). Just as each methodology has its own formula for

the mean, each methodology has its own procedure for finding other summary statistics, such as standard deviation and median. The “average by cardholder” and “average by cardholder/date” methodologies both are valid. They merely serve different purposes.

Using these values and the "average by cardholder" method described above, we obtained the means for the distributions for number of visits to PPC, total amount wagered, amount wagered per day, amount wagered per week, amount wagered per month, and net winnings, for PlayMyWay users and non-users separately. We also found the standard deviations and the medians for these distributions. Table 18 contains these summary statistics for non-users and PlayMyWay users. In each of these distributions, the standard deviation is high relative to the mean. As we stated in Section 2.5.4, this is a sign that there are a small number of cardholders with abnormally large data values, and that the medians might be more indicative of the center of the distributions than the means. For both the PlayMyWay users and non-users, the median number of visits over the study period was 2. However, the median for total amount wagered was higher for non-users (mean = $883) than for PlayMyWay users (mean = $574). Non-users wagered an average of $393 per day, $417 per week, and $512 per month at PPC, while PlayMyWay users wagered an average of $286 per day, $318 per week, and $387 per month at PPC. In terms of net winnings, non-users tended to lose more money at PPC (median net winnings = -$127) than PlayMyWay users (median net winnings = -$89).

Table 18: Mean, standard deviation, and median for non-user and PlayMyWay users’ measures of gambling activity.

	Non-users (*N* = 92,168)			PlayMyWay users (*N* = 8,856)		
	Mean	SD	Median	Mean	SD	Median
Number of visits	6.8	14.2	2.0	6.5	14.9	2.0
Total amount wagered	$7,862.1	$41,574.9	$882.8	$6,252.6	$32,009.6	$574.2
Amount wagered per day	$789.1	$2,295.9	$393.5	$594.8	$1,090.4	$285.7
Amount wagered per week	$922.2	$2,732.8	$417.0	$780.1	$1,889.6	$317.5
Amount wagered per month	$1,651.4	$6,183.6	$512.6	$1,542.8	$5,866.0	$386.6
Net winnings	-$1,251.6	$12,512.6	-$127.6	-$704.4	$3,546.4	-$89.4

We also calculated mean, standard deviation and median for amount wagered and amount lost per day using the “by cardholder/date” methodology. Table 19 contains these summary statistics for non-users and PlayMyWay users. The median amount wagered per day for PlayMyWay users was $347.8, whereas the median for non-users was $485.3 – a difference of $137.5 between the PlayMyWay user and their non-user counterpart.

Table 19: Mean, standard deviation, and median of gambling activities by enrollment status.

	Non-user (*N* = 92,168)			PlayMyWay user (*N* = 8,856)		
	Mean	SD	Median	Mean	SD	Median
Amount wagered per cardholder/day ($)	$1,156.1	$3,054.7	$485.3	$960.4	$2,432.3	$347.8
Amount lost per cardholder/day ($)	$184.1	$1,580.2	$62.9	$107.8	$397.0	$47.5
* A Kruskal-Wallis Test shows that, at the significance level of 0.01, the distributions of PlayMyWay users and non-users were statistically different.						

Gambling Trends

Figure 7 below illustrates the temporal trend in average amount wagered per day for PlayMyWay users and non-users. It shows the averaged amount wagered each day during the study period for both groups. As seen in the graph, over time the PlayMyWay users tended to wager less money per day than their non-user counterparts. The graph also shows slightly more variation in amount wagered over time for PlayMyWay users than for non-users.

Figure 7: Average amount wagered per day over time by type of enrollment.

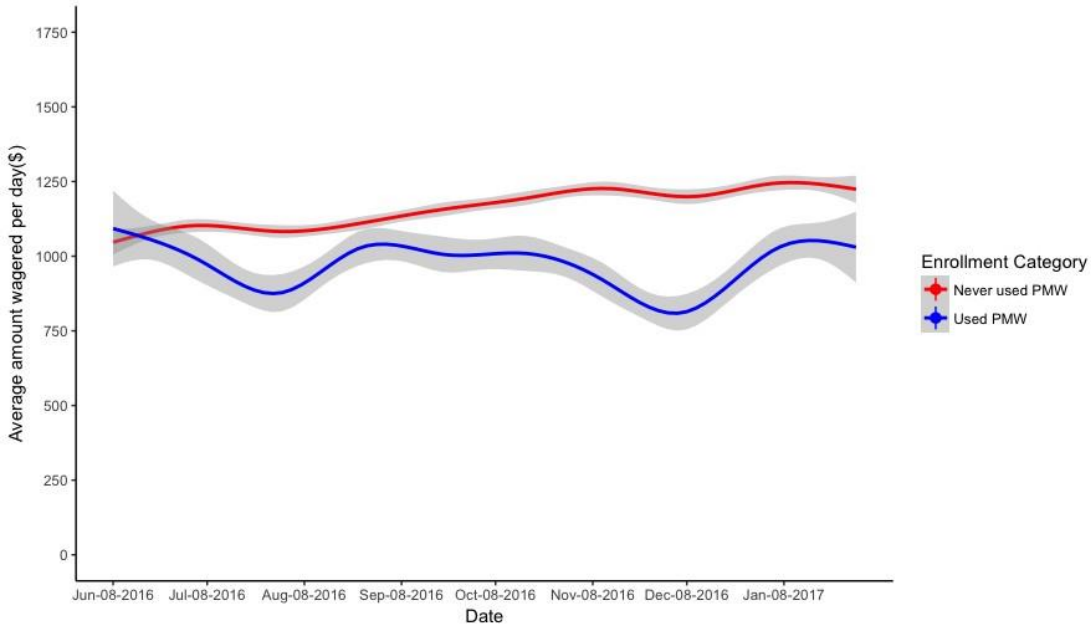
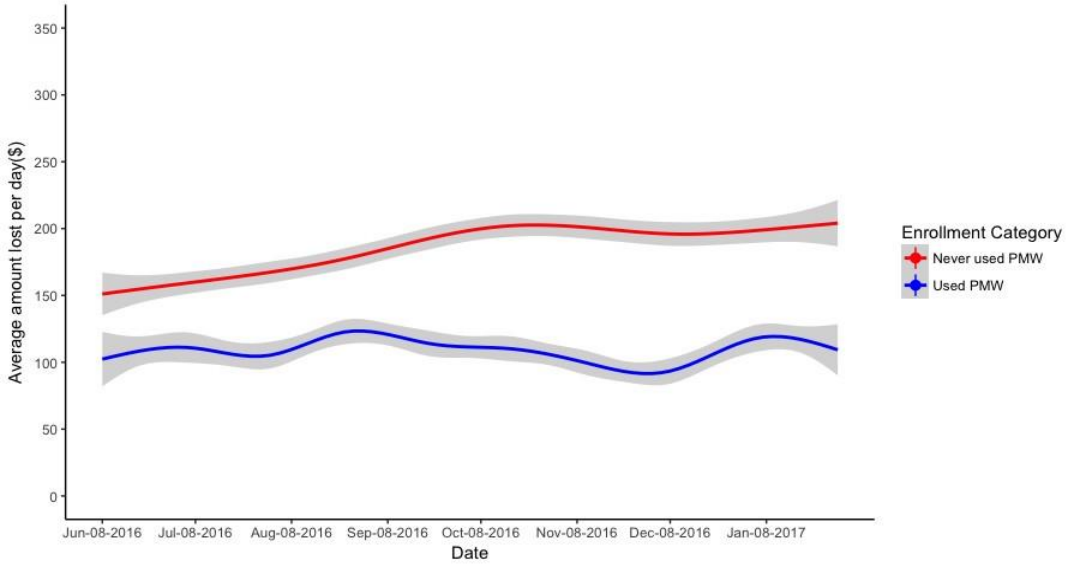


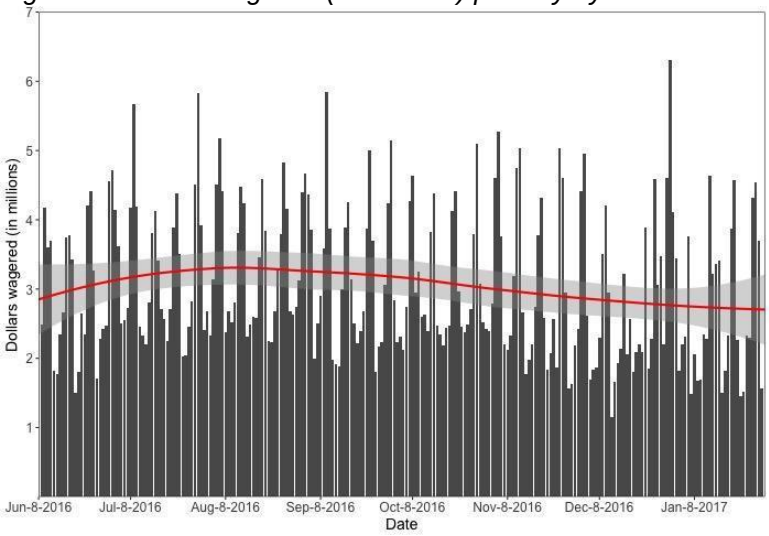
Table 19 also shows that PlayMyWay users also lost less money per day than their non-user counterparts. While the median PlayMyWay-user lost $47.5 per day on average, their non-user counterpart lost $62.9. Figure 8 visually illustrates the difference between the two groups. We see a marginal widening of the wedge between PlayMyWay users and non-users over time.

Figure 8: Average amount lost per day over time by type of enrollment.



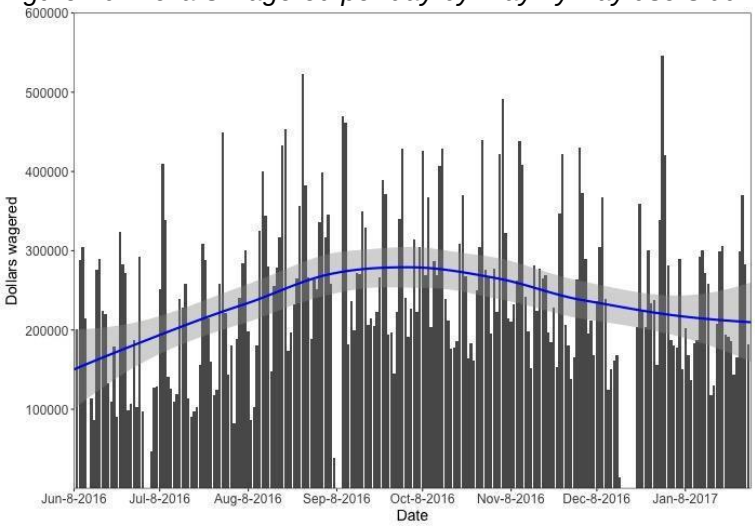
Next, we present the daily trends of total dollars wagered at PPC for our sample of 92,168 users who never utilized PlayMyWay (Figure 9) and our sample of 8,856 PlayMyWay users (Figure 10). Wagers for users who never utilized PlayMyWay increased slightly between June 2016 and August 2016, followed by a slow decline during August 2016 and throughout the remainder of the study period.

Figure 9: Dollars wagered (in millions) per day by non-users during the study period.



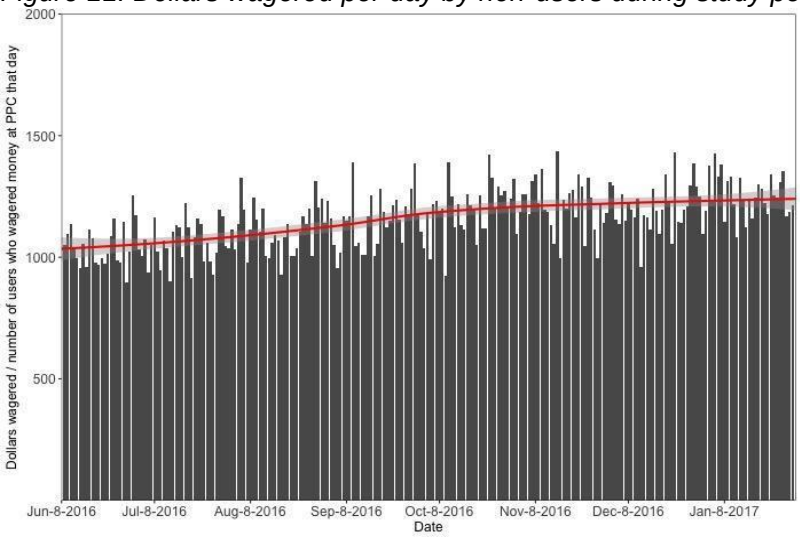
For PlayMyWay users, overall wagers increased at a sharper rate between the beginning of the study period (June 2016) and October 2016 (see Figure 10). This was followed by a steadier decline in wagering throughout the remainder of the study period, consistent with the wagering patterns of non-users.

Figure 10: Dollars wagered per day by PlayMyWay users during the study period.



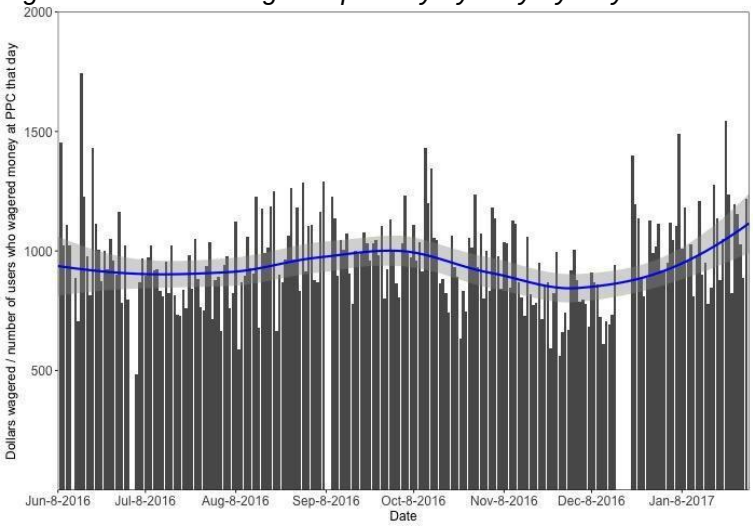
For a more accurate description of wagering activity, we divided the total amount of money cardholders wagered per day by the number of cardholders who wagered money at PPC during that day to get the total amount of money wagered per user per day for both non-users (Figure 11) and PlayMyWay users (Figure 12). Here, the trends differ more obviously. Wagers per cardholder for non-users increased slowly throughout the entirety of the study period, with slightly steeper increases between June 2016 and October 2016 and slower increases between October 2016 and the remainder of the study period.

Figure 11: Dollars wagered per day by non-users during study period, adjusted for number of non-users.



Overall wagers per cardholder for PlayMyWay users fluctuated several times during the study period (see Figure 12). Wagers per cardholder for PlayMyWay users dipped slightly between June 2016 and August 2016, followed by a small increase between August 2016 and October 2016. This was followed by a sharper decrease in wagers per user between October 2016 and December 2016 and finally an increase in wagers per user between December 2016 and January 2017. Overall, both PlayMyWay users and non-users wagered more per cardholder at the end of the study period than at the beginning of the study period. However, this path appeared to be more stable for non-users and more erratic for PlayMyWay users. One possible reason for this could that PlayMyWay users are much smaller, as a group, and therefore their representation at PPC could be more variable on any given day.

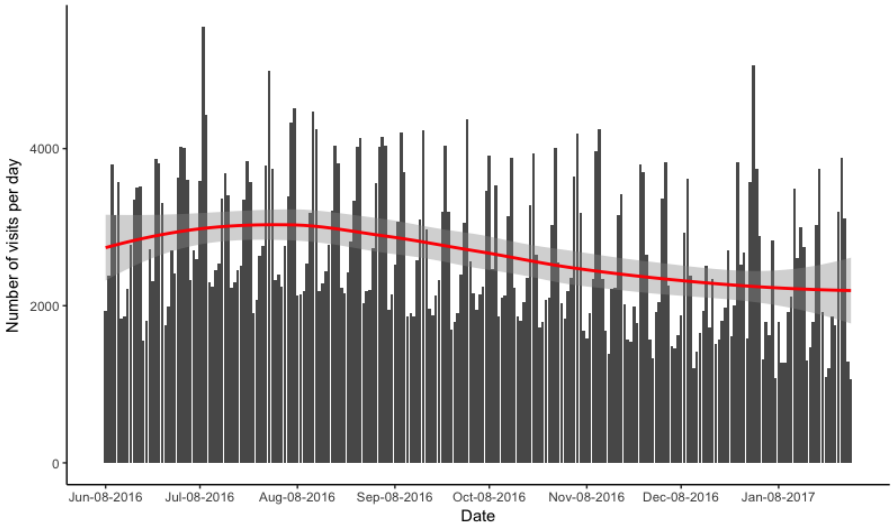
Figure 12: Dollars wagered per day by PlayMyWay users during study period, adjusted for number of users.



PPC visitation

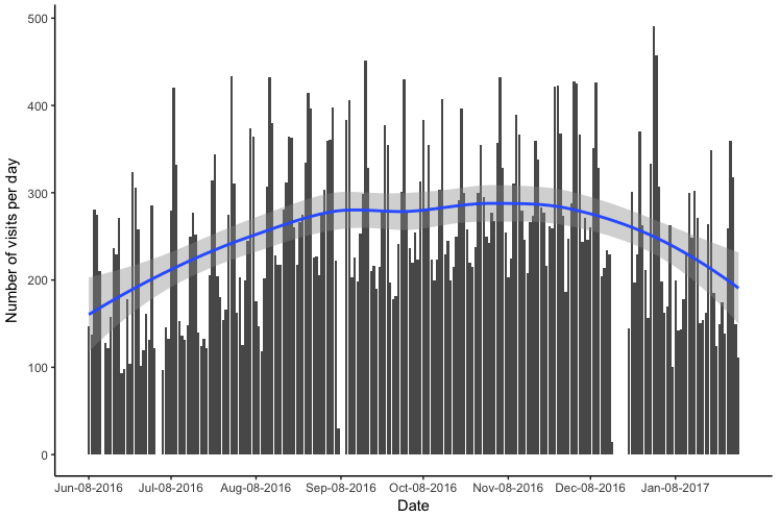
Among the 92,168 non-users, each day, on average, 2,648 visited PPC. Figure 13 below graphically illustrates the trend in visitation among non-users over time. While the temporal trend is relatively stable, we see a marginal increase in visitations during summer months (June to late August) relative to the winter months. During the study period, the largest number of visits to PPC by non-users on a single day happened on July 9, 2016 (5,550 visits), whereas the smallest number of visits happened on January 31, 2017 (1,065 visits).

Figure 13: Number of non-users per day over time.



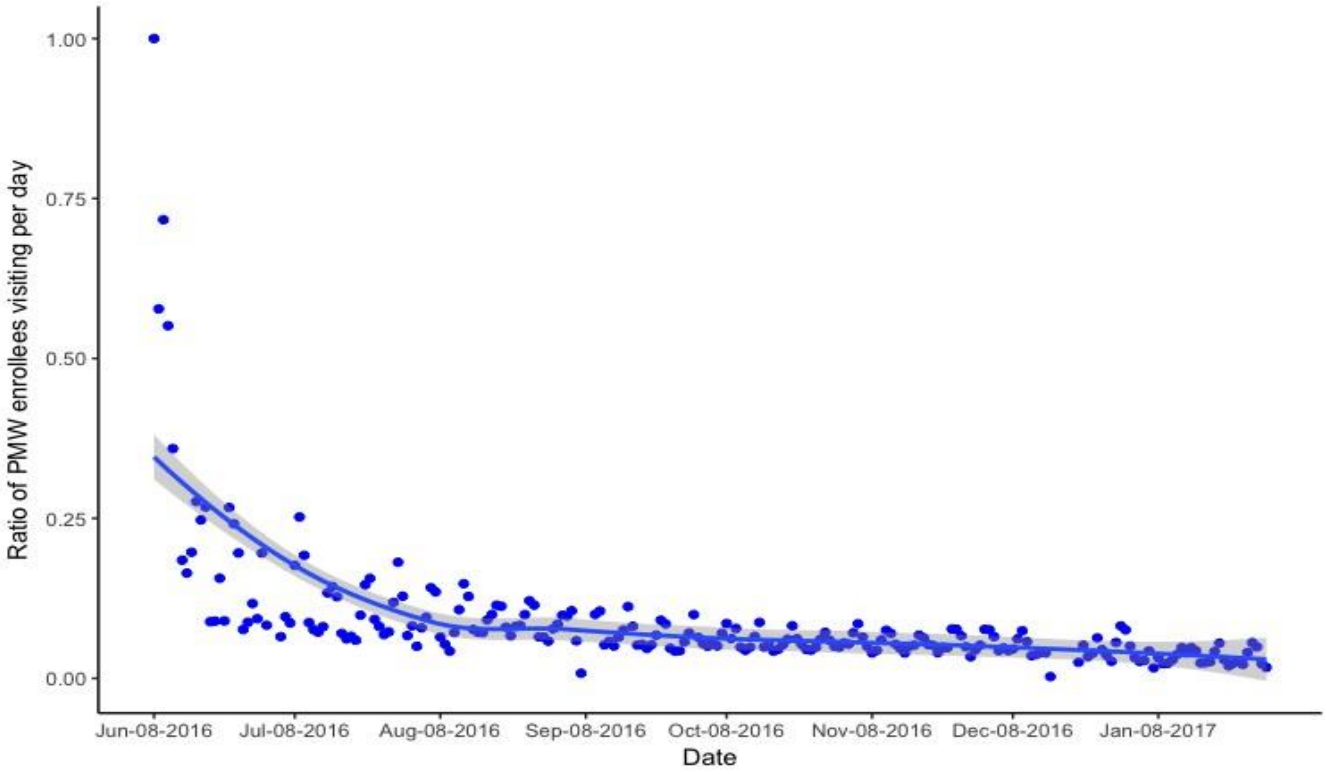
As we pointed out earlier, PlayMyWay enrollments started on the June 8, 2016. As the number of enrollments increase with time, we would expect the average number of PlayMyWay-using visitors per day to also increase, since the pool of eligible PlayMyWay users who can or might visit increases each day. However, Figure 14 below shows that while the number of PlayMyWay-visitors per day increased initially, in the months of December and January we see a drop in PlayMyWay-using visitors to PPC. However, it is important to note that from the graph below we cannot infer the reason behind the downward trend in PlayMyWay users' visits. Seasonality (the lower attendances in general during December and January), for example, could provide an explanation for the downward trend.

Figure 14: Number of PlayMyWay user visitors per day over time.



As noted above, the number of eligible enrollees who can visit PPC every day increases with time as more people sign up for PlayMyWay. To control for the day-to-day changes in the number of enrollees, we considered the ratio of PlayMyWay users who visited PPC on a given day to the number of cardholders enrolled in PlayMyWay on that day. Figure 15 shows this ratio as a function of date. From the graph, we see a decline in visits by PlayMyWay users per day as a share of net enrollment. On average, while 24.1% of PlayMyWay users visited PPC on a daily basis in the first month (between June 8, 2016 to July 8, 2016), during the last five months of the study period (between September 1, 2016 and January 31, 2016), the number of visits by PlayMyWay users as a share of enrollment plateaued at a lower level, with only 5.3% of enrollees visiting PPC on a daily basis.

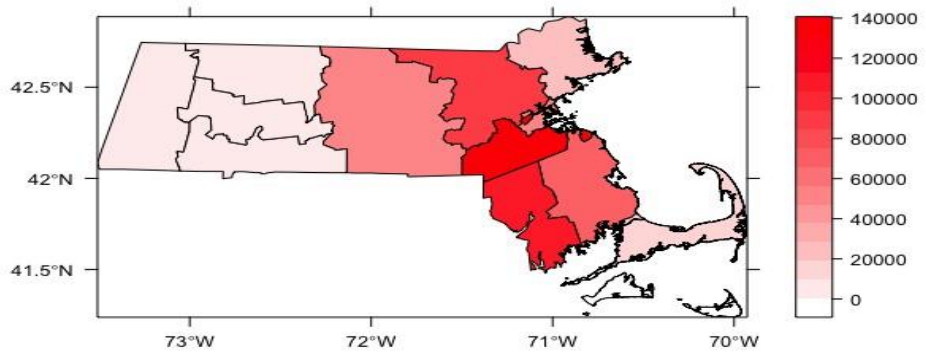
Figure 15: Number of PlayMyWay-visitors per day as a share of net enrollment.



Regional Participation

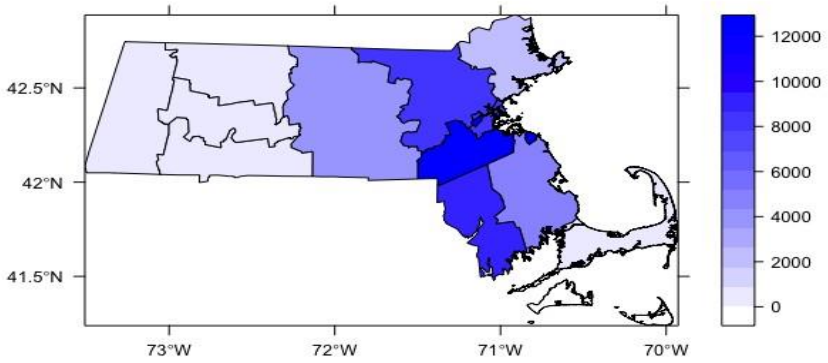
During the study period, the 92,168 non-users made 629,348 visits to PPC. At the county level within Massachusetts, the largest share of visits to PPC came from Norfolk county (115,936 visits, 18.4% of visits), Bristol county (99,618 visits, 15.8%), Middlesex county (90,098 visits 14.3%), and Plymouth county (66,483 visits, 10.6%). Figure 16 below graphically illustrates the geographical distribution of visitation to PPC among non-users. Not surprisingly, the county where PPC is located (Norfolk county) and a few neighboring counties (Bristol, Middlesex, Plymouth and Worcester) account for a majority of the visits (74.4% of total visits). Outside of Massachusetts, the largest share of visitors (46,520 visits, 7.4%) came from Providence, Rhode Island.

Figure 16: Number of visits to PPC among non-users from within Massachusetts.



The PlayMyWay users with a valid zip code (*N* = 8,820)[15] made 57,396 visits to PPC between June 8, 2016 and January 31, 2017. Among PlayMyWay users, residents from Massachusetts made 45,460 (79.2% of the total) visits. The share of visits from Massachusetts residents is comparable to the share of PlayMyWay users who are from Massachusetts (78.7%), suggesting that being in closer proximity to PPC doesn't necessarily translate into higher number of visits from PlayMyWay users. Within Massachusetts, however, distance to the casino does seem to play a role. Residents of Norfolk County, where PPC is located, contributed to the largest share of visits (9,961 visits, 17.4 %), followed by Middlesex County (8,688 visits, 15.1%), Bristol County (8,443 visits, 14.7%), and Suffolk County (6,881 visits, 12.0%). Similar to non-users, other than counties within Massachusetts, Providence, Rhode Island contributed the largest share of visitors among PlayMyWay users (5,333 visits, 9.3%). Figure 17 below illustrates the spatial distribution within Massachusetts of the number of visits among PlayMyWay users.

Figure 17: Number of visits to PPC among PlayMyWay users within Massachusetts.



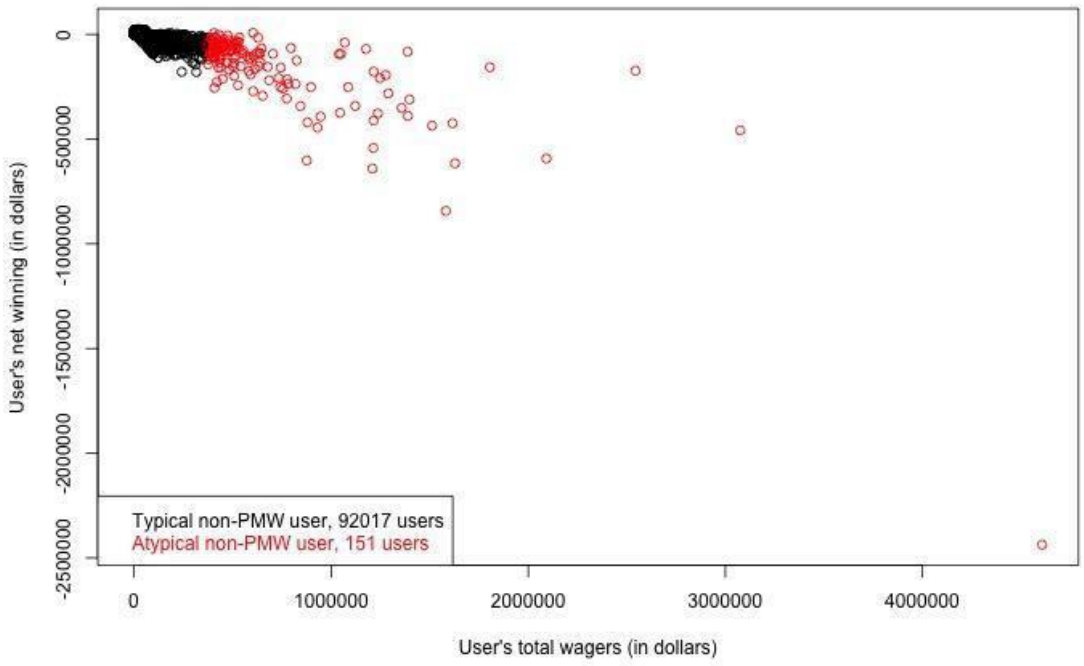
[15] In total, 8,853 individuals with relevant demographic information used PlayMyWay, but 33 players did not have a valid zip code.

Natural Betting Groups

The previous analyses provide a general description of visitation and wagering behavior among our sample of PlayMyWay users. However, we also sought to understand and characterize the nature of some within sample differences. To understand these potential differences, we employed *k*-means cluster analysis to construct natural groupings based on each users' total amount wagered, net winnings, and number of visits to PPC. We conducted two separate cluster analyses, one for non-users ($N = 92,168$) and one for PlayMyWay users ($N = 8,856$). Each analysis partitioned its group of cardholders into two subgroups. To explore whether or not the distributions of the variables (i.e., total amount wagered, number of visits, net winnings) across one subgroup were different from the corresponding distributions across the other, we performed two sets of three permutation tests with random samples of 10,000 permutations and the difference in means as the test statistic (Butar & Park, 2008). One set compared the two subgroups of PlayMyWay users. The other set compared the two subgroups of non-users.

Figure 18, a scatterplot of non-users' total amounts wagered and net winnings, illustrates the differences in the two subgroups of non-users. The first subgroup, which we designated *the typical non-users*, is the plurality ($n = 92,017$). The second group, which we called *the atypical non-users*, was a much smaller group ($n = 151$). Typical non-users wagered less money at PPC during the study period (mean = \$6,708, SD = \$21,392, median = \$879) than atypical non-users (mean = \$711,300, SD = \$531,437, median = \$512,200; $p < 0.0001$). Typical non-users also made fewer visits to PPC (mean = 6, SD = 13, median = 2) than atypical non-users (mean = 88, SD = 56, median = 72; $p < 0.0001$). Finally, in terms of their net winning, typical non-users tended to lose less money at PPC[16] (mean = -\$977, SD = \$4,366, median = -\$127) compared with atypical non-users (mean = -\$168,100, SD = \$237,548, median = -\$94,200; $p < 0.0001$).

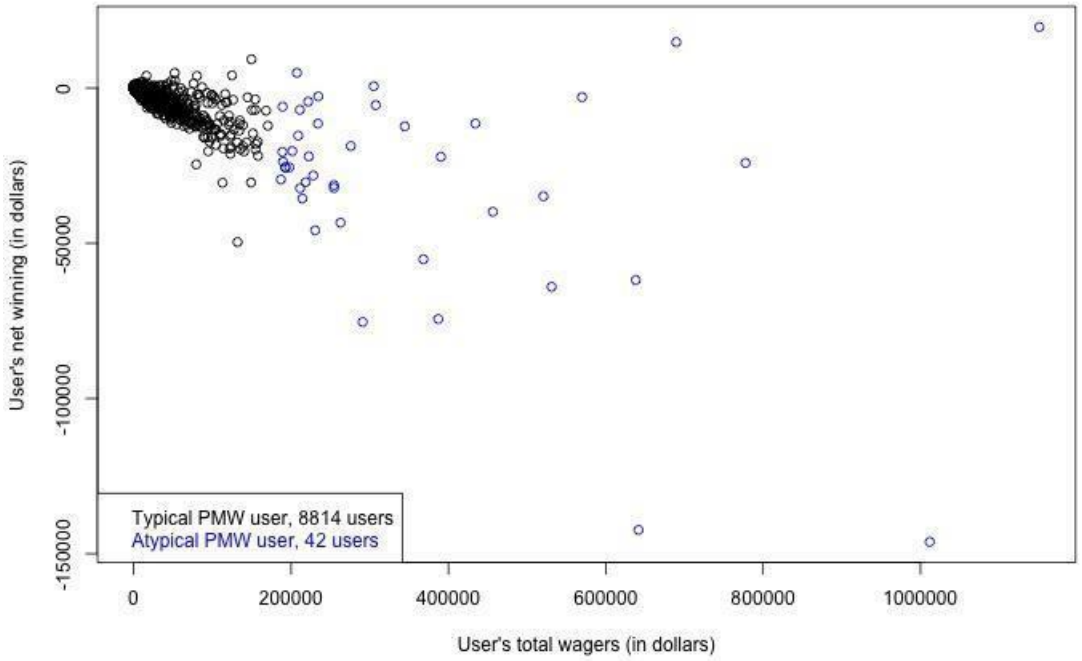
Figure 18: Scatterplot of non-users' total amounts wagered and net winnings, by subgroup.



[16] The negative values for net winnings, both here and in Figures 18 and 19, mean that cardholders lost money.

Figure 19, a scatterplot of PlayMyWay users' total amounts wagered and net winnings, illustrates the differences in the two subgroups of PlayMyWay users. Consistent with the results for the non-users, the first subgroup of PlayMyWay users, which we designated *the typical PlayMyWay users*, contains most of the PlayMyWay users (n = 8,814). The second subgroup, which we designated *the atypical PlayMyWay users*, is much smaller (n = 42). Typical PlayMyWay users wagered less money at PPC during the study period (mean = $4,575, SD = $14,007, median = $569) than atypical PlayMyWay users (mean = $358,200, SD = $227,148, median = $254,500; $p < 0.0001$). Typical PlayMyWay users also made fewer visits to PPC (mean = 6, SD = 13, median = 2) than atypical PlayMyWay users (mean = 91, SD = 54, median = 78; $p < 0.0001$). Typical PlayMyWay users also lost less money at PPC (mean = -$564, SD = $1,806, median = -$87) than atypical PlayMyWay users (mean = -$30,240, SD = $33,424, median = -$24,810; $p < 0.0001$).

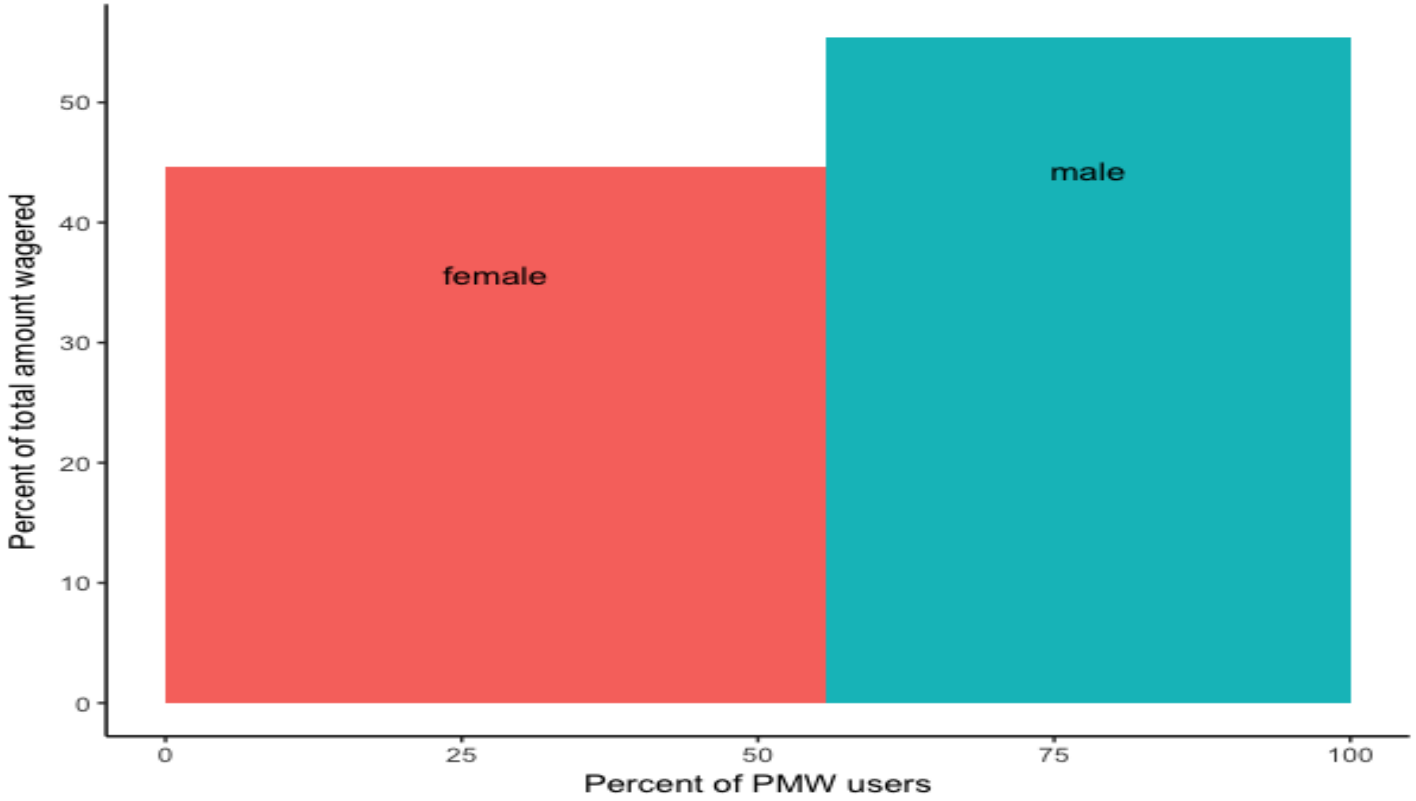
Figure 19: Scatterplot of PlayMyWay users' total amounts wagered and net winnings, by subgroup.



Gender Differences

The demographics subset contained gender information for 8,249 PlayMyWay users, more than half of who were female (4,594 females to 3,655 males, 55.7% to 44.3%). However, male PlayMyWay users contributed more than half of the total amount wagered by the PlayMyWay users over the study period (55.4% versus 44.6%). Figure 20 illustrates how the share of PlayMyWay users and share of total amount wagered varied by gender. One explanation for why males contributed a larger share of the total amount wagered despite being less than half of the PlayMyWay users is that male PlayMyWay users visited PPC more often than female PlayMyWay users. In fact, the total numbers of visits by gender were roughly equal (27,455 visits by males to 27,368 visits by females, 50.1% to 49.9%).

Figure 20: Share of PlayMyWay users and share of total amount wagered by gender.



In terms of amount wagered per day, the median female PlayMyWay user spent $31.2 more than their male counterpart, whereas the median female non-user spent $28.5 more than their male counterpart (Table 20). However, the mean amount wagered per day was larger for males than for their female counterparts among both PlayMyWay users and non-users. This likely indicates that the distribution of total amount wagered among male PlayMyWay users contained more large outliers than the corresponding distribution for non-users. The differences in the distributions also provide an explanation for why, despite being less than half of all PlayMyWay users, male PlayMyWay users have wagered more as a group than female PlayMyWay users.

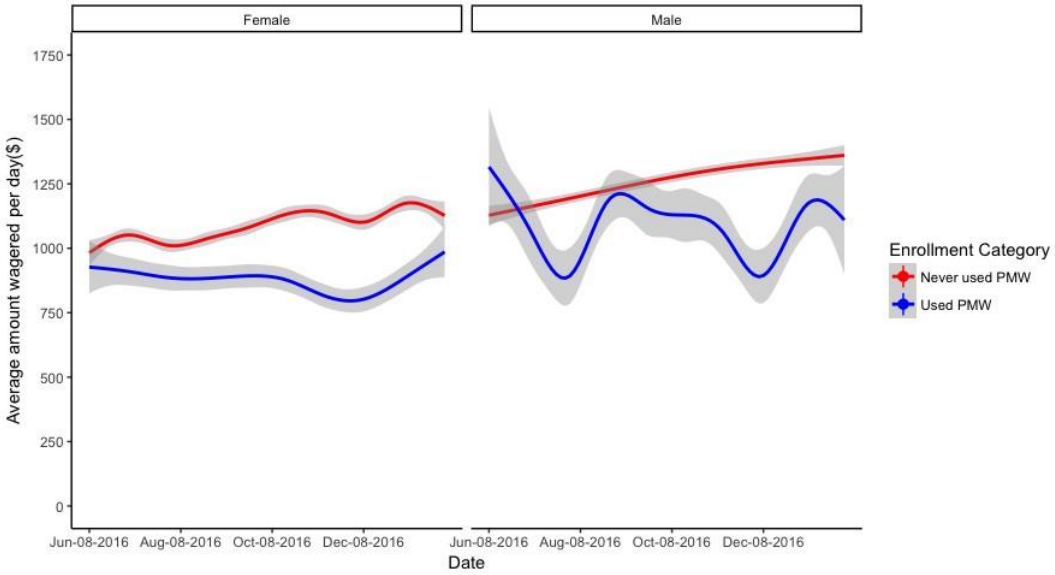
Table 20: Summary statistics of gambling activity by enrollment status and gender.

		Non-users			PlayMyWay users		
		Mean	SD	Median	Mean	SD	Median
Amount wagered per day ($)	Female	$1,082.5	$2,563.5	$499.3	$868.8	$1,786.9	$367.5
	Male	$1,254.6	$3,597.3	$470.8	$1,075.9	$2,992.8	$336.3
Amount lost per day ($)	Female	$165.6	$1,218.3	$68.8	$104.2	$278.5	$52.6
	Male	$209.7	$1,954.4	$59.4	$114.4	$498.0	$43.7

*A Kruskal-Wallis Test showed that, at the significance level of 0.01, the distributions of male and female PlayMyWay users and non-users were statistically different.

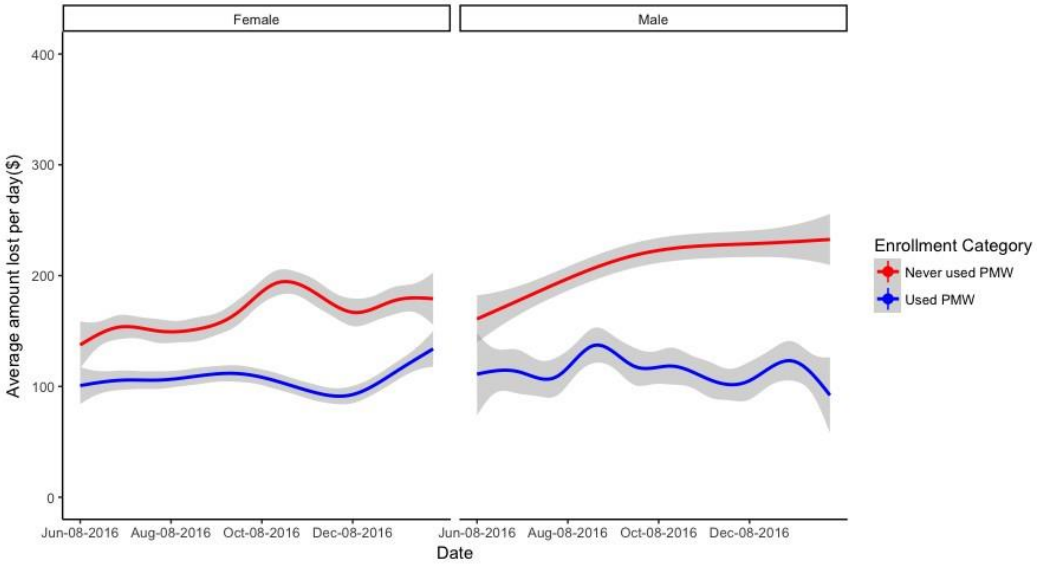
Figure 21 below illustrates the temporal trend in average amount wagered per day by gender. The graph shows that male PlayMyWay users tend to be more volatile, with their average amount wagered per day fluctuating more.

Figure 21: Average amount wagered per day over time by type of enrollment and gender.



The median female PlayMyWay user lost $8.9 more than her male counterpart, whereas the median female non-user lost $9.4 more than her male counterpart (Table 20). Just as we found for amount wagered per day, we found that the average amount lost per day was higher for male PlayMyWay users than female PlayMyWay users. Similarly, one explanation why the average amount lost for male PlayMyWay users was higher than that of female PlayMyWay users is that the distribution for males likely contains more large outliers than the distribution for female PlayMyWay users. Figure 22 below illustrates the temporal trends in average amount lost per day among males and females.

Figure 22: Average amount lost per day over time by type of enrollment and gender.



Age Differences

The average age of the Marquee Rewards cardholders was 58.3. The average ages of PlayMyWay users and non-users were 53.3 and 58.7, respectively, indicating that the PlayMyWay users tended to be slightly younger than the non-users. Among PlayMyWay users, the largest share of players was between ages 50 and 69 (43.2%), followed by 35-to-49-year-olds (22.3%). In addition to having the largest share of PlayMyWay users, the 50-to-69 age group also had the largest share of total amount wagered, contributing 51.2% of the total amount wagered by the PlayMyWay users' cohort. On the other hand, the 21-to-34 age group (15.7% of the PlayMyWay users) only contributed 5.4% of the total amount wagered (see Figure 23). Thus, older PlayMyWay users tended to visit more often and gamble more than younger PlayMyWay users. For example, 62% of the PlayMyWay users were older than 50 years old, and they accounted for 72.1% of the total amount wagered and 72.9% of the visits by PlayMyWay users.

Figure 23: Share of PlayMyWay users and share of amount wagered by age group.

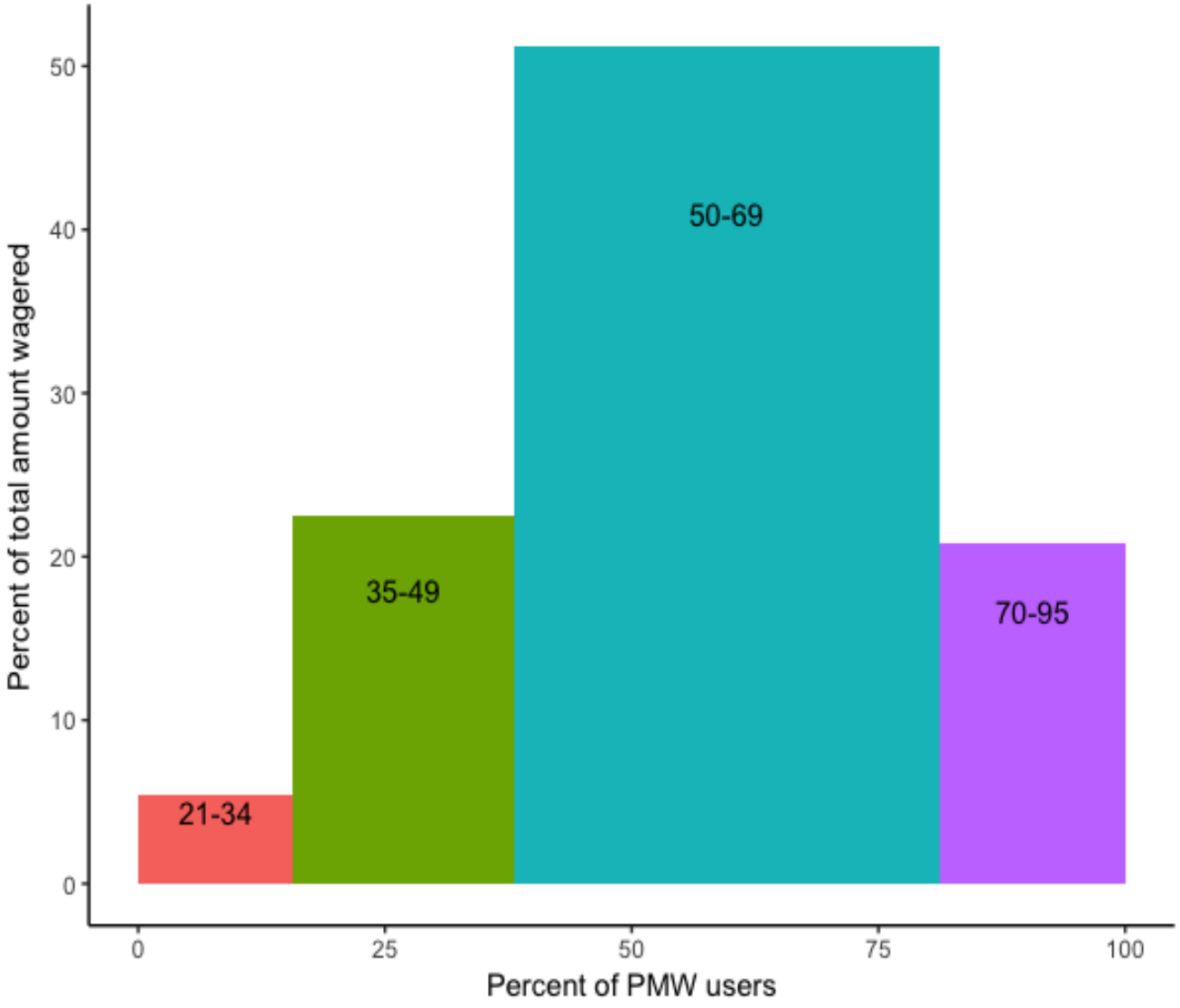


Table 21 shows that in terms of amount wagered per day, the median amount increased from one age group to the next for both PlayMyWay users and non-users. For PlayMyWay users, the median amount wagered was $196.1 for those age 21 to 34, $315.9 for those age 35 to 49, $348.0 for those age 50 to 69, and $430.5 to those age 70 to 95. The average amount wagered for PlayMyWay users and non-users, on the other hand, was highest for the 35-to-49 age group.

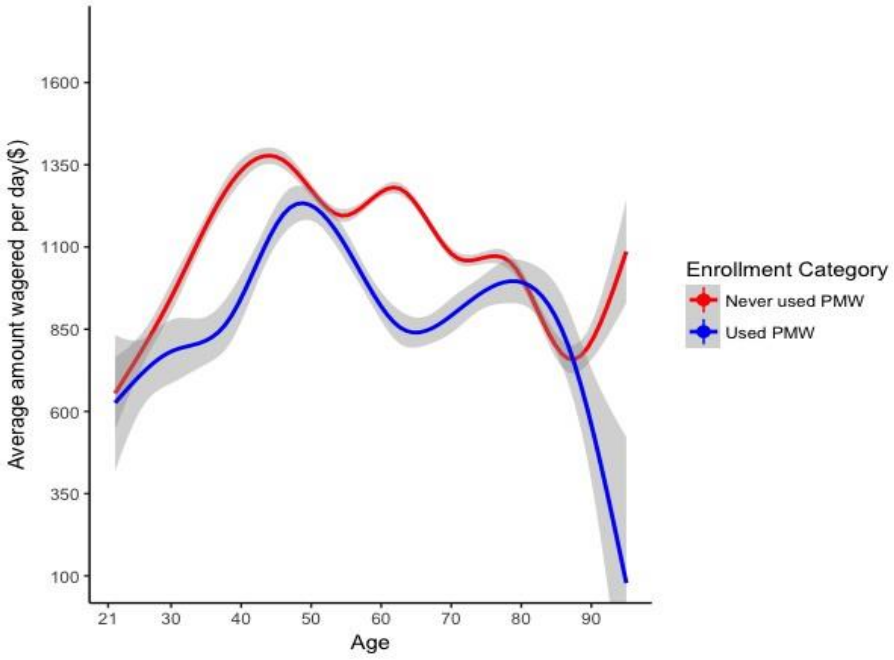
Table 21: Summary statistics of gambling activity by enrollment status and age group.

		Non-users			PlayMyWay users		
	Age Group	Mean	SD	Median	Mean	SD	Median
Amount wagered per day ($)	21-34	$901.5	$4,274.7	$235.5	$688.0	$1,743.0	$196.1
	35-49	$1,320.6	$3,598.2	$411.8	$1,112.2	$3,423.9	$315.9
	50-69	$1,205.5	$3,191.3	$507.9	$971.7	$2,336.9	$348.0
	70-95	$1,011.9	$1,957.8	$526.0	$896.8	$1,684.8	$430.5
Amount lost per day ($)	21-34	$204.4	$3,427.4	$24.7	$59.3	$261.7	$27.7
	35-49	$227.7	$1,866.0	$52.7	$101.2	$614.3	$44.1
	50-69	$190.3	$1,531.2	$67.5	$113.1	$338.6	$48.6
	70-95	$143.1	$711.7	$70.6	$118.4	$305.1	$58.6

* A Kruskal-Wallis Test showed that, at the significance level of 0.01, the distributions of PlayMyWay users and non-users of different age groups were statistically different.

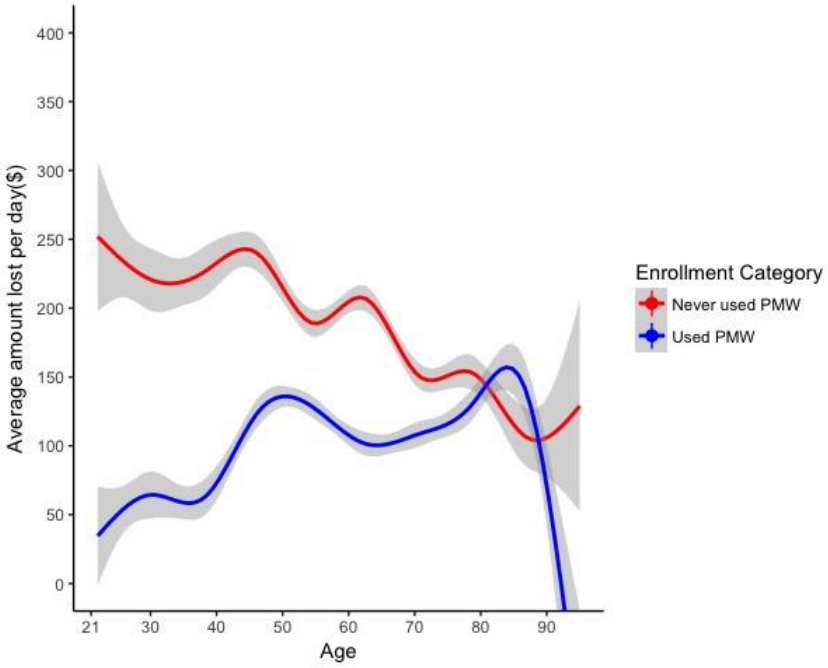
Figure 24 below illustrates the change in average amount wagered per day by age. We see that for both PlayMyWay users and non-users, amount wagered rises with age initially and then declines. Among PlayMyWay users, the average amount wagered per day appears to be highest with those who are roughly age 50, whereas for non-users the peak occurs slightly earlier among non-users in their mid-40's.

Figure 24: Average amount wagered per day over time by type of enrollment and age.



Similar to what we observed with amounts wagered, the median net losses among older PlayMyWay users and non-users tended to be higher than the median net losses among younger PlayMyWay users and non-users. For PlayMyWay users, the median amount lost was $27.7 among those age 21 to 34, $44.1 among those age 35 to 49, $48.6 among those age 50 to 69, and $58.6 among those age 70 to 95. Figure 25 below graphically illustrates the relationship between average amount lost per day and age. We see that, in general, there seems to be an increasing trend with age regarding the average amount lost per day for PlayMyWay users and a decreasing trend with age for those who never used PlayMyWay.

Figure 25: Average amount lost per day over time by type of enrollment and age.



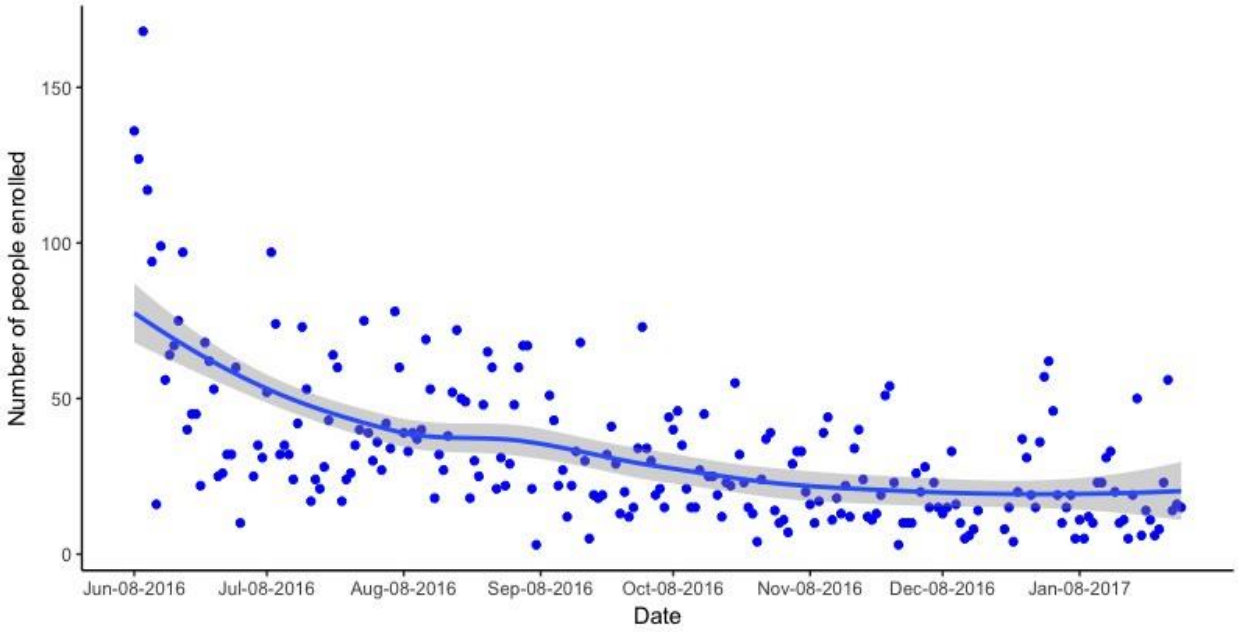
3.2.5. PlayMyWay Enrollment & Un-enrollment Trends

In this section, we report upon information from the PlayMyWay records, which included 7,507 enrolled Marquee Rewards cardholders. Using the information from these records, we report upon enrollment and un-enrollment, as well as budget-related information, including budget sizes, changes, and compliance.

Of the 7,507 users enrolled in PlayMyWay during the study period, 1,109 (14.8%) un-enrolled at least once (i.e., the erratic users and the dropouts described in Section 3.2.1.), whereas 6,398 users never un-enrolled (i.e., the stable users described in Section 3.2.1). Of the users who un-enrolled, most (79.1%) un-enrolled just once. Just under one fifth (18.2%) un-enrolled twice (i.e., un-enrolled, then re-enrolled, then un-enrolled again), and the remainder (2.6%) un-enrolled 3 or more times. Three users enrolled and un-enrolled from PlayMyWay 6 times. Combined, users generated 7,886 enrollment actions and 1,392 un-enrollment actions during the study period.

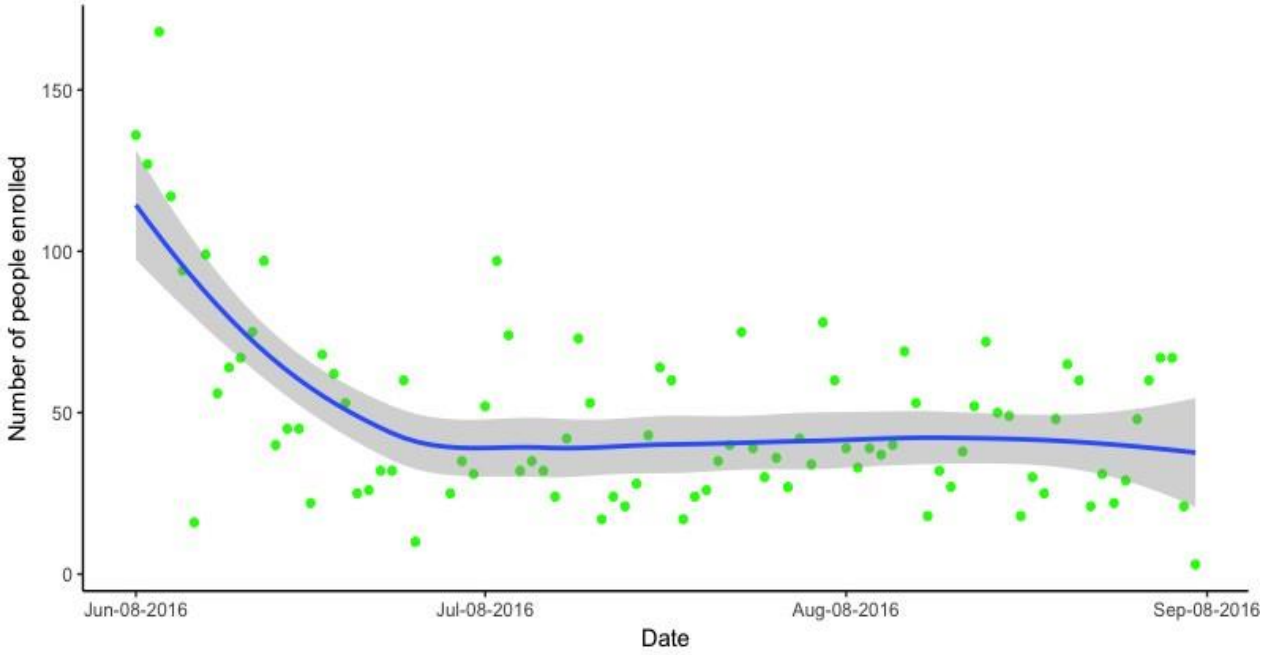
Figure 26 shows the number of people who enrolled into PlayMyWay per day from June 8, 2016 (i.e., when the program started) to January 31, 2017. The graph reveals a high rate of enrollment when the program was first unveiled, followed by a gradual plateau over time.

Figure 26: Daily number of enrollments during the study period.



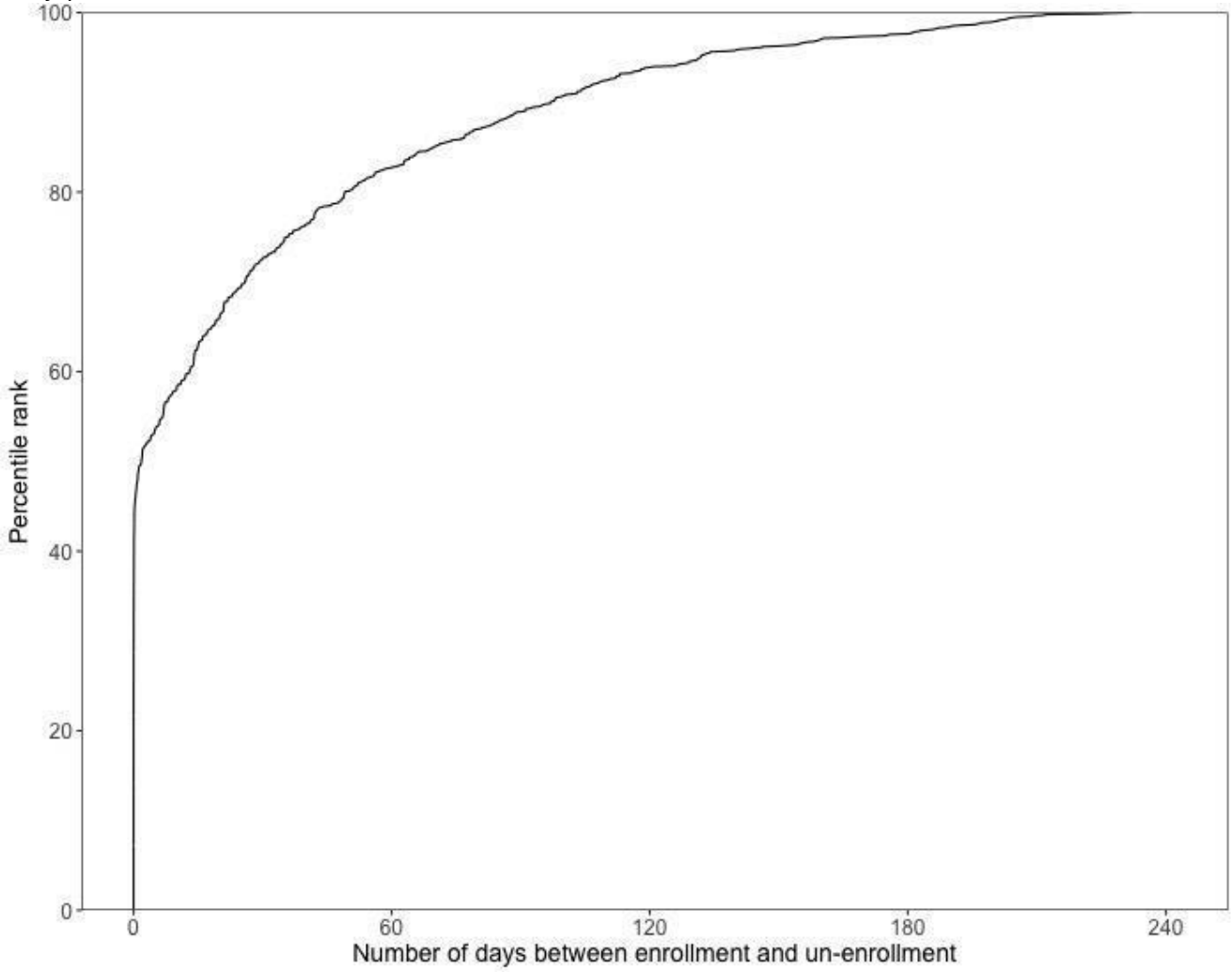
Similarly, the trajectory of enrollment for PlayMyWay users during the first 90 days (please see Figure 27) shows a peak in the initial stages (169 individuals enrolled on June 10, 2016), after which the rate at which people join plateaus at a lower level.

Figure 27: Daily number of enrollments during the first 90 days.



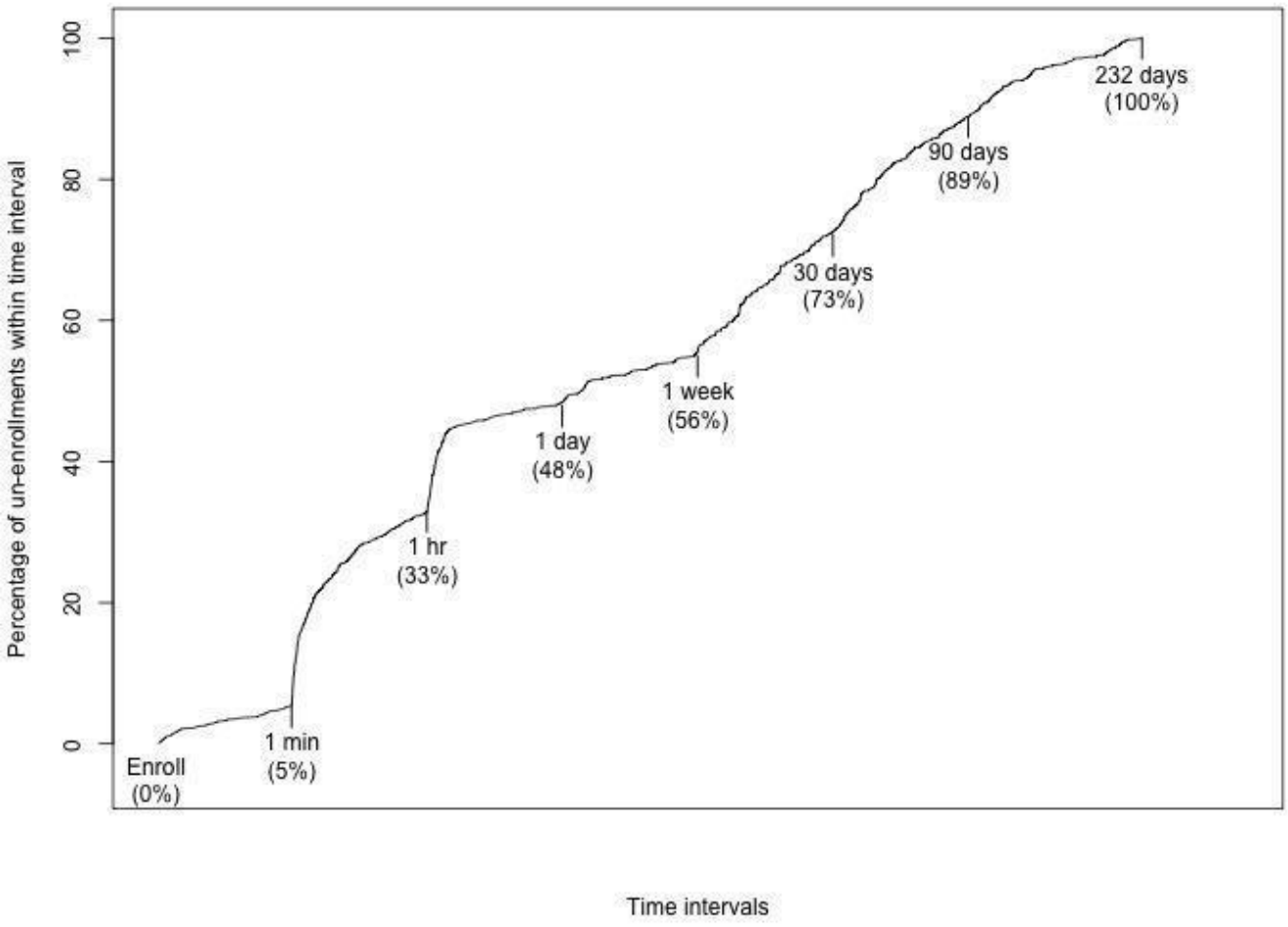
When un-enrollments occurred, they tended to happen quickly (see Figure 28 and Figure 29). As illustrated in Figure 28, for the 1,392 total un-enrollment actions, about half of them took place almost immediately. However, the rate of un-enrollment quickly slowed.

Figure 28: Percentile rankings for the number of days between enrollment and un-enrollment actions (n = 1,392) during the study period.



To further understand the distribution of un-enrollments, we broke down Figure 28 into arbitrary time periods (i.e., 1 minute, 1 hour, 1 day, 1 week, 30 days, and 90 days) and plotted the percentage of un-enrollments that occurred within each period (see Figure 29). Of the 1,392 un-enrollments recorded during the study period, five percent happened within the first minute, while a third happened within the first hour. Just under half of all un-enrollments from PlayMyWay occurred by the end of the first day. After the first day, the rate of un-enrollments slowed significantly, with just less than three quarters of un-enrollments occurring at the end of 30 days. The final un-enrollment we observed occurred just over 232 days after initial enrollment.

Figure 29: Percentage of PlayMyWay un-enrollment actions within pre-specified time periods during the study period.



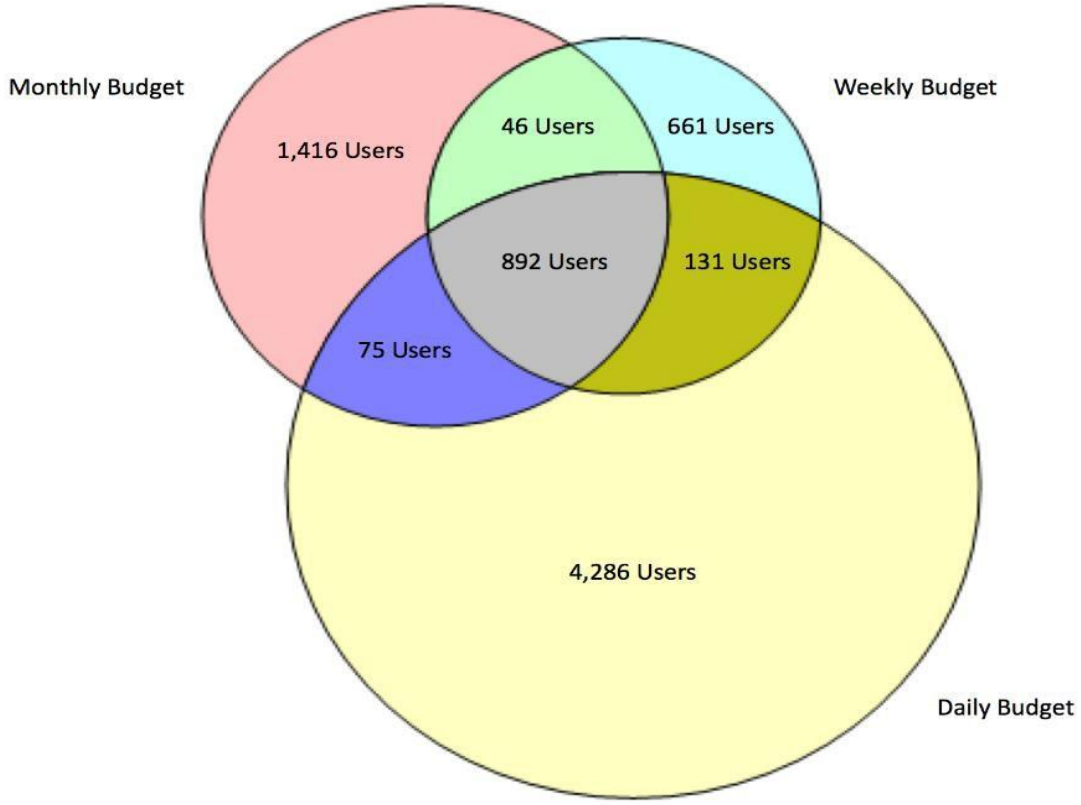
3.2.6. Budget & Notification Activity

In this section, we also report upon information from the PlayMyWay records, which included 7,507 enrolled Marquee Rewards cardholders. Using the information from these records, we examine budget types, budget changes, budget sizes, budget notification types, and budget notification compliance.

Budget Setting Characteristics

Although PlayMyWay users have the option of setting a combination of daily, weekly, and monthly budgets, most (*n* = 6,363, 84.8%) set one type of budget during the study period (see Figure 30). The majority of users (*n* = 4,286, 57.1%) only set a daily budget. The next largest group was those who only set a monthly budget (*n* = 1,416, 18.8%). A smaller number of users (*n* = 1,144, 15.2%) set a combination of budgets. Of users who set a combination of budgets, most (77.9%) set all 3 types of budgets, followed by daily and weekly budgets (11.5%), daily and monthly budgets (6.6%), and weekly and monthly budgets (4.0%). Combining users who set single budgets with users who set multiple budgets, a total of 5,384 users set daily budgets, 1,730 users set weekly budgets, and 2,429 users set monthly budgets during the study period.

Figure 30: Venn diagram for the distribution of budgets set by PlayMyWay users.



Budget Changes

Among the 7,507 PlayMyWay users in our sample, 569 (7.6%) changed their daily, weekly, or monthly budget. The results show that among those who changed their daily, weekly, or monthly budget, 487 changed their budget only once, 61 changed their budget twice, and 21 changed their budget more than twice.

Table 22: Summary of people who change budgets.

	Number of people	Share of total enrollees	Share of budget changers
Changed budget once	487	6.5%	85.6%
Changed budget twice	61	0.8%	10.7%
Changed budget more than twice	21	0.3%	3.7%
Total	**569**	**7.6%**	**100%**

This included 402 individuals who changed their daily budget (5.4% of those who enrolled), 118 who changed their weekly budget (1.6% of those who enrolled), and 142 who changed their monthly budget (1.9% of those who enrolled) (see Table 23). Some individuals changed more than one of their budgets.

Table 23: Summary of budget changes by budget type.

	Changed Daily Budget	Changed Weekly Budget	Changed Monthly Budget
Number of people	402	118	142
Share of enrollees (%)	5.4%	1.6%	1.9%
Share of budget changes (%)	60.7%	17.8%	21.5%

Among those who changed their budget, the median person took only 2 days to make the adjustment (see Table 24).

Table 24: Mean, standard deviation, and median for time between enrollment and change in budget limits.

	Mean	SD	Median
Time between enrollment and first edit (in days)	26.7	44.8	2.0
Time between enrollment and second edit (in days)	48.8	55.6	26.5

Sizes of Budgets and Budget Changes

The summary statistics for the daily, weekly, and monthly budgets set by players to keep track of their gambling behavior show a large standard deviation relative to the mean (see Table 25). As discussed in Section 2.5.4., when we see such a pattern in data, the median is a more instructive indicator than the mean. From Table 25, we see that when the 7,507 enrollees contained in the PlayMyWay budget activity records first set their budget at the time of enrollment, the median person set a daily budget of $75, a weekly budget of $200, and a monthly budget of $300. After the initial budgets are set, individuals also have the opportunity to revise their budgets.

There was a total of 699 instances of budgets being modified. Among those who made the change, the updated median estimate shows an upward revision to their budgets – we see an increase in the daily budget by 366.6% to $350, the weekly budget by 350% to $900, and the monthly budget by 233.3% to $1000.

Table 25: Summary statistics of player budgets.

At time of enrollment			
N = 7507			
	Mean	SD	Median
Per Day	$505.9	$1719.9	$75
Per Week	$1356.8	$4590.9	$200
Per Month	$3547.0	$13714.5	$300
Change of budget after enrollment			
N = 699			
	Mean	SD	Median
Per Day	$942.3	$1,924.9	$350
Per Week	$1,692.3	$2,423.7	$900
Per Month	$4,953.2	$14,339.6	$1,000

Figure 31 graphically shows the distribution of daily, weekly and monthly budgets at the time of enrollment. The graph illustrates the skewed (uneven) distribution of budgets across the spectrum. Whereas the median daily, weekly, and monthly budgets were $75, $200 and $300 respectively, the maximum values in the corresponding categories were $25,000, $50,000, and $100,000. These maximum values contributed to the higher standard deviations and means.

Figure 31: Distribution of budget at time of enrollment by type of budget.

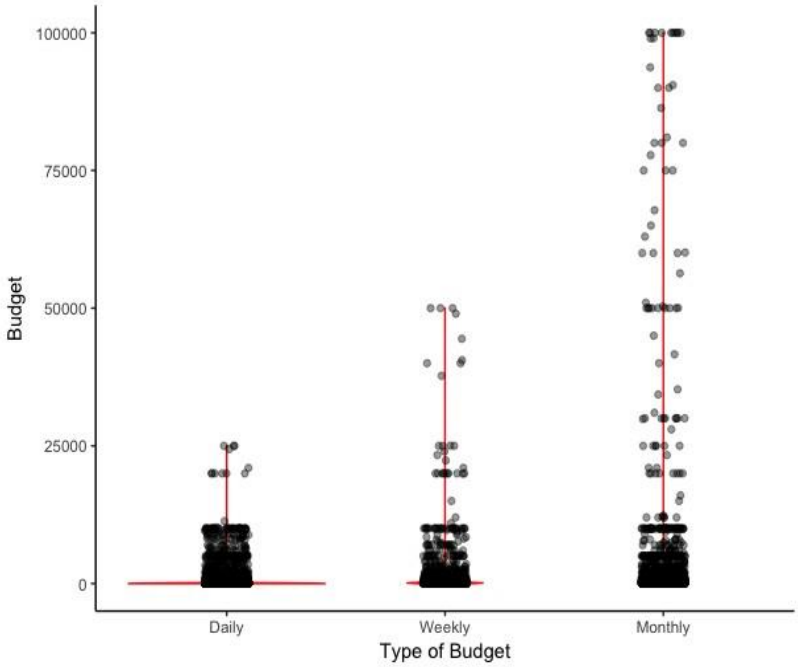
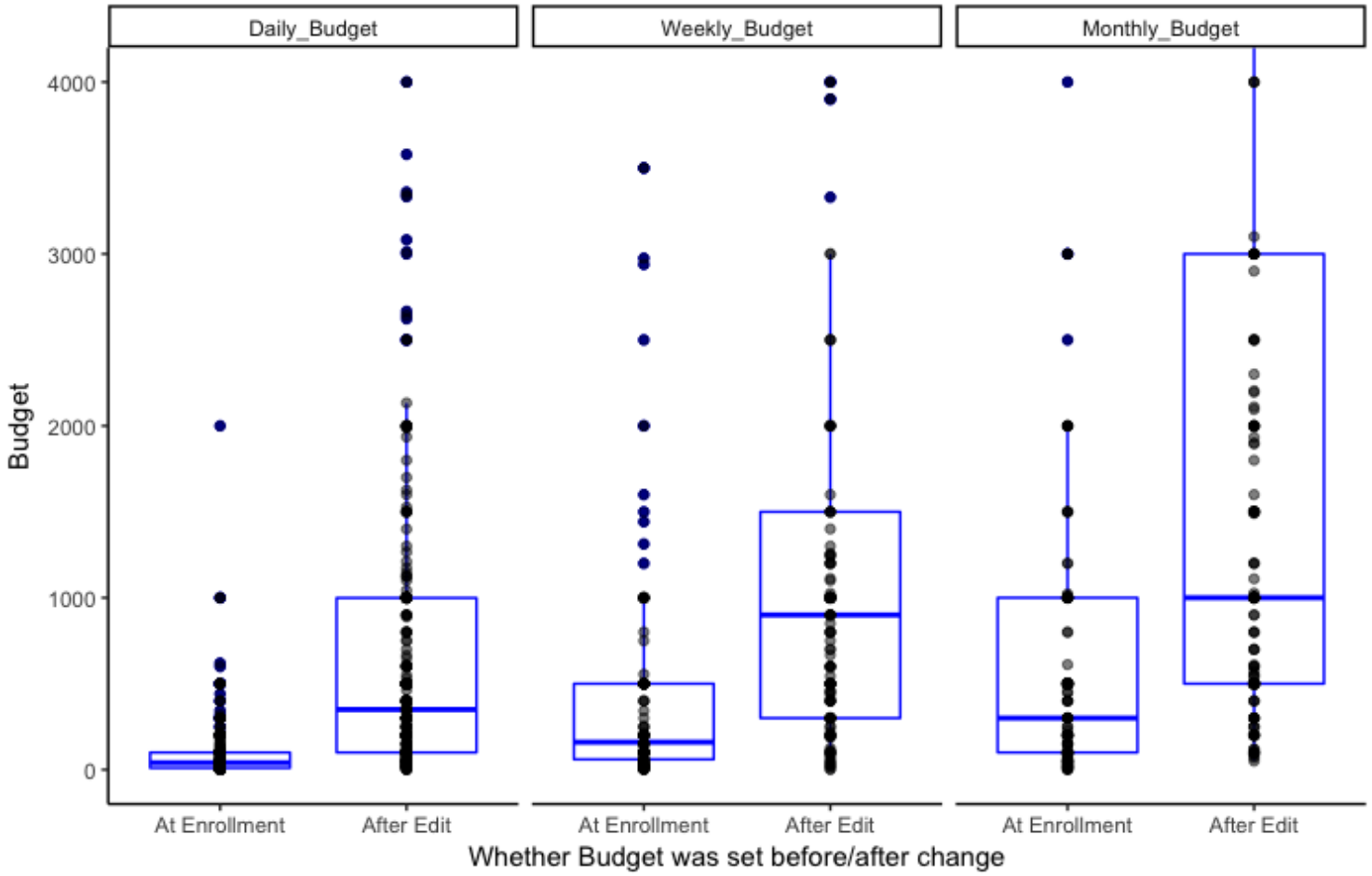


Figure 32 graphically shows the shift in distribution of budget for those who edited their budgets. The graphs show the general trend that budget changes most likely involved upward revisions.

Figure 32: Distribution of budget changes by type of budget.



Budget Notifications

As discussed earlier, players receive notifications that inform them when they approach and/or reach certain threshold values based on the budget that they set for themselves. A pertinent question, therefore, is how the budgets that the players set for themselves relate to whether they receive notification or not. To understand the relationship between budget sizes and budget notifications, we categorized PlayMyWay enrollees based on whether they received a *reached or exceeded* notification[17] – 3,265 of the enrollees received one of these types of notifications, while 4,242 did not. Table 26 below shows that those who received a reached/exceeded notification tended to have a lower budget compared to those who did not. The daily, weekly and monthly median budget of $32, $100, and $200 for those who received the reached/exceeded notifications were significantly less than the corresponding median values of $100, $300, and $500 for those who did not receive such notifications. A Kruskal-Wallis test showed that the differences between these median values were statistically significant.

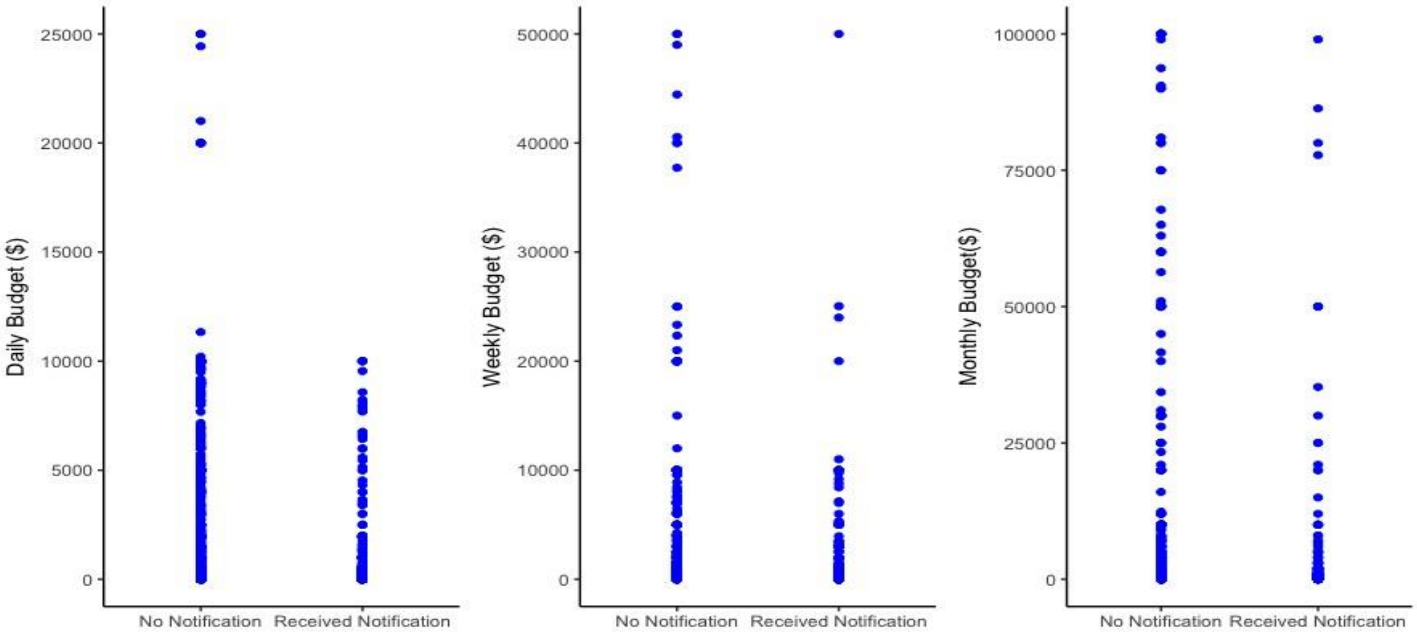
[17] Enrollees were defined as having received notification if they reached their budget (i.e. received a 100% limit reached notification), or exceeded their budget (i.e. received notification that they had exceeded budget by more than 100%).

Table 26: Summary statistics of budget by whether players received a reached/exceeded notification.

	Received a reached or exceeded notification			Never received a reached or exceeding notification		
	N = 3,265 (43.5%)			*N* = 4,242 (56.5%)		
	Mean	SD	Median	Mean	SD	Median
Daily Budget	$190.8	$824.9	$32	$747.5	$2,136.9	$100
Weekly Budget	$661.8	$2,735.5	$100	$1,759.0	$5,144.2	$300
Monthly Budget	$1,699.0	$9,009.6	$200	$4,374.0	$15,346.4	$500
* A Kruskal-Wallis Test shows that, at the significance level of 0.01, the median values for those who received notifications and those who did not were statistically different.						

Figure 33 graphically displays the budgets set by the PlayMyWay users against whether players ever received a notification or not; Figure 33 helps to visualize the distribution of budgets for these two groups. For the weekly and monthly budgets (contrary to the daily budget), the maximum budget for those who received a notification and those who didn't receive one are comparable, suggesting that there is precedence to such a high budget limit being reached.

Figure 33: Budget disaggregated by whether players received notification or not.



We also were interested in understanding how specific notification experiences were associated with budget changes and un-enrollment from PlayMyWay. To do this, we examined all possible PlayMyWay enrollments and associated notification patterns, and their relationships with budget changes and system un-enrollments.

There was a total of 7,886 enrollment *actions* (i.e., all enrollments for PlayMyWay users, including users who un-enrolled/enrolled multiple times in the available PlayMyWay records data. We categorized each of these enrollment actions into the following *budget notification classes*: (1) Never approached their budgets (*Never approached budget*); (2) approached their budgets (*Approached budget*); (3) approached and reached their budgets (*Reached budget*); or (4) approached, reached, and exceeded their budgets (*Exceeded budget*). We determined that 3,456 (i.e., 44% of all possible actions) enrollment actions never were associated with a notification. In all 1,110 enrollments were associated with an

"approaching" notification, 491 were associated with a "reached" notification, and 2,829 were associated with a notification that they "exceeded" their recorded budget.[18]

We started by looking at budget changes. Table 27 shows that changing budgets shared a partial direct relationship with budget class. Here, we used two-sample tests for equality of proportions ($\alpha = 0.05$) to test for significant differences between budget classes. The approached budget action class was eight percent more likely to involve budget changes (9.5% of the time) than the never approached budget action class (1.6% of the time) ($p < 0.01$). The reached budget action class was 3.9% more likely to change their budgets than the approaching budget action class ($p < 0.05$). However, the exceeded budget action class was not more likely to change budgets than the reached budget action class. In fact, the opposite was true ($p < 0.01$).

Table 27: PlayMyWay user budget class by the number of users who changed their budget during the study period.

	Users		Users who changed a budget		Users who did not change a budget	
Budget class	*n*	Percentage	*N*	Percentage	*N*	Percentage
Never approached budget	3,456	100%	57	1.6%	3,399	98.4%
Approached budget	1,110	100%	105	9.5%	1,005	90.5%
Reached budget	491	100%	66	13.4%	425	86.6%
Exceeded budget	2,829	100%	349	12.3%	2,480	87.7%

We then examined un-enrollments. Because our analysis of un-enrollments indicated a large amount happened quickly, we separated out *early un-enrollments* (i.e., un-enrollments that occurred within a day) from other un-enrollments. Budget action classes that involved exceeding budgets were more likely to have un-enrollments from PlayMyWay after one day than budget actions that involved approaching or never approaching budgets. After one day, budget classes that involved approaching budgets were more than twice as likely to involve un-enrollments from PlayMyWay after one day than budget action classes that never involved approaching budgets (9.1% versus 4.1%, $p < 0.01$). Budget action classes that involved reaching budgets were 3.3% more likely than budget classes involving approaching budgets to involve un-enrollments after one day ($p < 0.05$). Budget action classes involving exceeding budgets were not more likely than budget action classes involving reaching budgets to involve un-enrolling after one day ($p = 0.11$).

Budget action classes that involved never approaching budgets were far more likely to involve *early un-enrollments* (i.e., within one day) from PlayMyWay (11.9%) compared to budget actions that involved approaching budgets (6.6%, $p < 0.01$), reaching budgets (5.7%, $p < 0.01$), and exceeding budgets (5.7%, $p < 0.01$; see Table 28). Of the 539 un-enrollments observable for the never approached class, over three quarters of them (76.2%) involved un-enrolling within the first day.

[18] Recall that enrollment actions can often involve receiving "exceeded" notifications but not "reached" notifications. These are instances when, in a single spin, the user moves from being under his or her budget to being well over his or her budget. Users only receive "reached" notifications when they hit their budget exactly or are within 25% over it.

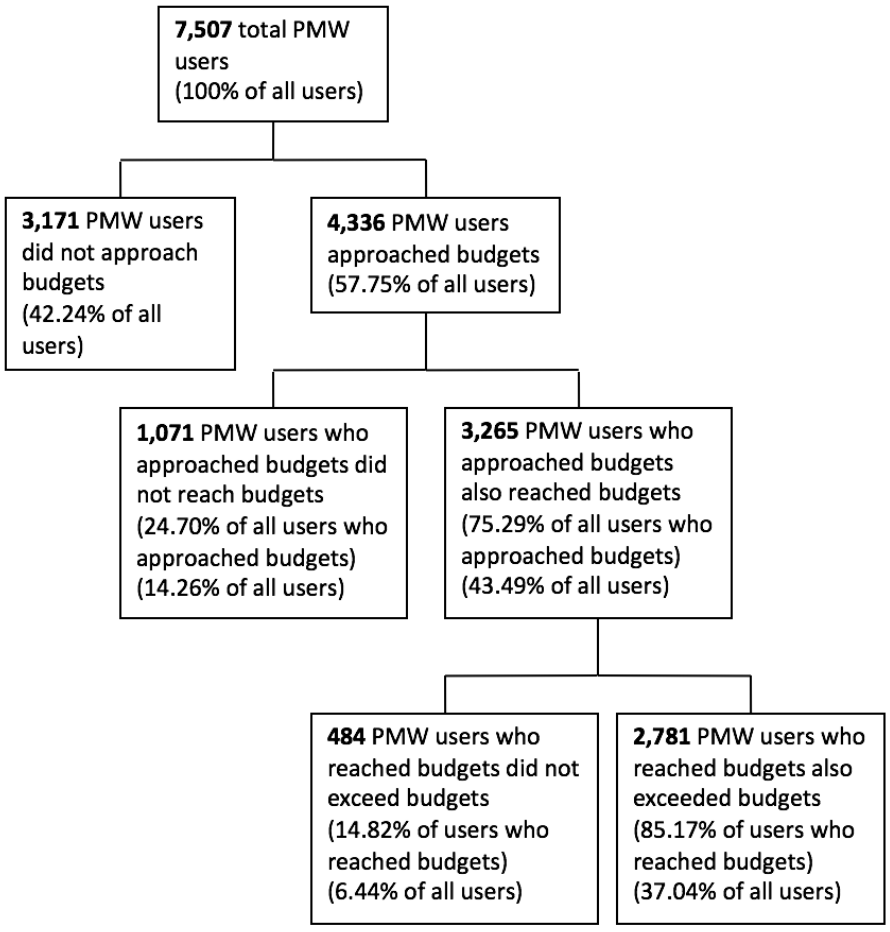
Table 28: PlayMyWay user budget class by the number of users who un-enrolled during the study period.

	Users		Users who un-enrolled within one day		Users who un-enrolled after one day		Users who did not un-enroll	
Budget class	*n*	Percentage	*n*	Percentage	*n*	Percentage	*n*	Percentage
Never approached budget	3,456	100.0%	411	11.9%	128	3.7%	2,917	84.4%
Approached budget	1,110	100.0%	73	6.6%	101	9.1%	936	84.3%
Reached budget	491	100.0%	28	5.7%	61	12.4%	402	81.9%
Exceeded budget	2,829	100.0%	162	5.7%	429	15.2%	2,238	79.1%

Budget Compliance & Non-compliance

Figure 34 provides a full consort diagram for PlayMyWay budget compliance activity. Of the 7,507 PlayMyWay users examined during the study period, about 42% never approached their budgets. Most (57%) PlayMyWay users did not reach their budget or exceed their budget (63%); however, among those users who did approach their budgets (*N* = 4,336), about 75% of these players reached their budgets and 64% reached and exceeded their budgets.

Figure 34: Consort diagram of PlayMyWay budget activity.

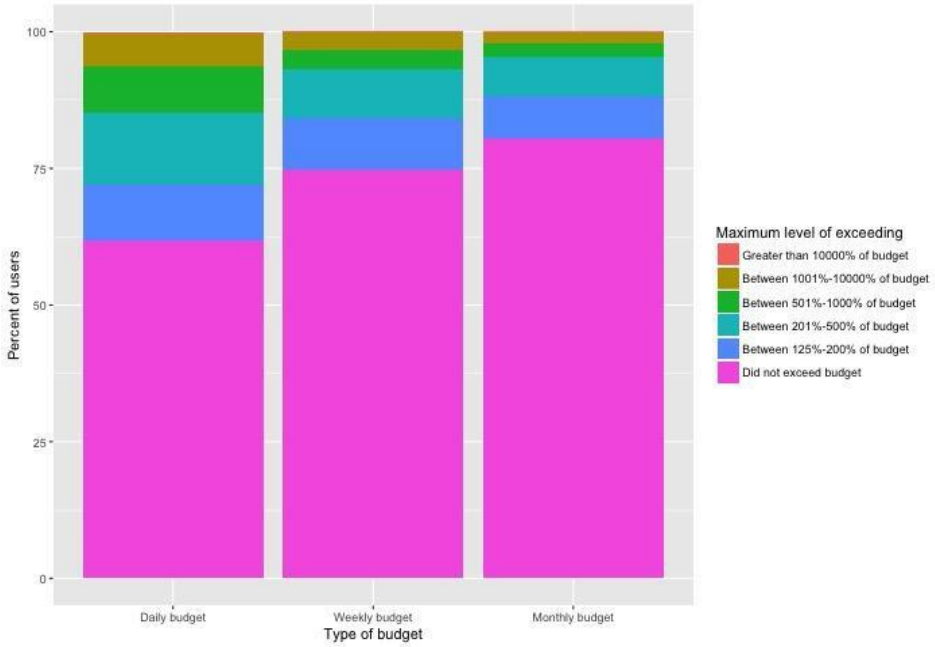


Recall that the PlayMyWay system is designed in such a way that many users receive immediate approached, reached, and exceeded notifications upon enrollment. Such immediate notifications might hold different meaning for users than other notifications. In light of this design characteristic, in Appendix C, we provide a complementary analysis which excludes budget notifications that occurred within the same day, week, or month that a user sets or changes their daily, weekly or monthly budget. In brief, this alternative consort diagram shows that most users in the filtered data (66%) did not approach budgets (i.e., did not receive any PlayMyWay budget notifications). Likewise, a smaller number of total users reached their budgets (25.7%) and exceeded their budgets (22.4%). See Appendix C for more details.

We examined factors that might be associated with budget compliance including budget type, budget size, and number of budget notifications.

Budget Type. To demonstrate how budget type relates to tendency to exceed budgets, Figure 35 shows arbitrary budget exceeding categories by the various budget types and, for each budget type, the percentage of all users who fall into each exceeding category. Of the 7,507 PlayMyWay users in our analytic sample, 5,384 users set a daily budget, 1,730 users set a weekly budget, and 2,429 set a monthly budget.[19] Of users who set and exceeded their daily budget (2,053 users), 26.5% spent a maximum of between 125% to 200% of their daily budget and over half (57.1%) spent a maximum of between 201% to 1000% percent of their daily budget. A smaller portion of users who set and exceeded their daily budget spent over 1000% of their daily budget (16.4%). In comparison, among users who set and exceeded weekly budgets (438 users) and monthly budgets (472 users), a slightly larger portion of those users spent a maximum of 200% or less (37.2% and 38.8%, respectively) of their budgets, half of them spent a maximum between 201% to 1000% (50.0% and 50.0%, respectively), and a smaller number spent a maximum of over 1000% of their respective budgets (12.8% and 11.2%, respectively). These results show that users who set daily budgets are more likely to exceed those budgets and also more likely to exceed their budgets by a greater maximum than users who set weekly and monthly budgets.

Figure 35: Type of budget by the maximum percentage exceeded.



[19] PlayMyWay users can set more than one type of budget (see Figure 30 at the beginning of Section 3.2.6), which is why the sum of all users who set daily, weekly, and/or monthly budgets in this analysis (9,543 users) is greater than the analytic sample size (7,507 users).

Budget Size. Both the likelihood of users exceeding their budget and the extent to which they exceed their budget can be partially explained by budget size. To illustrate, we report the median budgets for each of the budget exceeding categories in Table 29. For users who set daily budgets, those who did not exceed their budget set similarly sized budgets to those who modestly exceeded their budget (i.e., exceeding by a maximum of 125 to 500 percent). The users who did not exceed their daily budget and the users who modestly exceeded their daily budgets each had median daily budgets of $100.

Table 29: Level of exceeding by median[20] budget values (in dollars).

Maximum level of exceeding	Median daily budget	Median weekly budget	Median monthly budget
Greater than 10000% of budget	$1.00	$1.50	$10.00
Between 1001% and 10000% of a budget	$10.00	$20.00	$20.00
Between 501%-1000% of budget	$20.00	$40.00	$100.00
Between 201% and 500% of budget	$50.00	$100.00	$100.00
Between 125% and 200% of budget	$100.00	$150.00	$200.00
Did not exceed budget (i.e., less than 100% of any budget)	$100.00	$300.00	$500.00

For the users who set weekly or monthly budgets, those who did not exceed their budget set higher average budgets than even those who modestly exceeded their budgets. Users who did not exceed their weekly and monthly budget had median budget sizes of $300 and $500, respectively, while users who spent a maximum between 125% and 200% of their weekly and monthly budgets had median budgets of $150 and $200, respectively. Users who spent a maximum between 201% and 500% of their weekly and monthly budgets had median budgets of $100, which are, respectively, three quarters the size and half the size of the median budgets for users who spent a maximum of 125% to 200% of their budgets.

Regardless of the budget type, users who greatly exceeded their budget (i.e., spending a maximum of over 500% of a budget) had lower median budgets than both users who did not exceed their budgets and users who modestly exceeded their budgets. As an extreme example, the median budgets for users who exceeded their budget by a maximum of over 10,000% were $1.00, $1.50, and $10.00 for daily budgets, weekly budgets, and monthly budgets, respectively.

Number of Notifications. PlayMyWay users who exceeded their budgets received more exceeding notifications per day in comparison to the number of approaching/reaching notifications received per day by individuals who either approached or reached their budget. The 4,336 PlayMyWay users who approached their budgets during the study period received a median of three approaching notifications per day. Comparably, the 3,265 PlayMyWay users who reached their budget also received a median of three reaching notifications per day. Finally, the 2,781 PlayMyWay users who exceeded their budgets received a median of 10 exceeding notifications per day.

To assess the extent to which users stopped their play either before they reach their budget or once they reach their budget, we calculated the number of any additional notifications (approaching, reached, and/or exceeded) users received for the day in any instance they reached or exceeded their daily budget[21] and received an initial notification (N = 5,696 instances) (see Table 30). Users only receive additional notifications after reaching their budget if they keep gambling. For this analysis, we removed from consideration any instances where users un-enrolled from PlayMyWay or changed their

[20] Medians reflect the latest budgets set by the user during the study period. We chose the latest median budget under the assumption that it reflects the most "reasonable" budget; that is, the user has had time to experiment with different budget sizes before settling on this budget.

[21] We chose to do this analysis for daily budgets (as opposed to weekly and monthly budgets) because most PlayMyWay users set a daily budget (see Figure 30, the Venn Diagram).

budgets within the same day (*n* = 545 instances) because we were interested in budget compliance among steady PlayMyWay users. This left 5,151 instances for analysis.

Our results show that in about one in ten instances (9.5% of the time), steady users did not receive any additional notifications for that day (i.e., potentially stopped gambling). In a majority of instances (90.5%), steady users continued to receive additional notifications (i.e., continued to gamble[22]) once they were informed they hit their budget. Steady users received between 1 and 10 additional notifications in 41.4% of instances and between 11 and 100 additional notifications in 46.7% of instances. In 2.3% of instances, steady users received more than 100 additional notifications. One steady user received 554 additional notifications within the day after hitting their daily budget, the most of any we observed.

Table 30: Number of additional notifications received upon users hitting their daily budget, by number of instances.

Number of additional notifications received after hitting daily budget	Number of unique steady users	Instances	Percentage of all instances
No additional notifications	415	490	9.5%
One additional notification	287	330	6.4%
Between 2 and 10 additional notifications	1131	1804	35.0%
Between 11 and 100 additional notifications	1176	2406	46.7%
More than 100 additional notifications	104	121	2.3%
Total	3113	5151	100.0%

Because instances of hitting daily budgets are not shared equally among individual users (i.e., in Table 30, the number of instances is always greater than the number of unique users), we repeated the previous analysis for all users who hit their daily budget at least once point during the study period (*N* = 2,271) and calculated the total number of additional notifications received in all instances when they hit their daily budgets (Table 31). The results from this analysis were comparable to the results from our analysis of instances. During the study period, 8.9% of users received no additional notifications in all instances of hitting their daily budget (i.e., stopped gambling) and 91.1% of users received at least one additional notification (i.e., continued to gamble). Thirty-four percent of users received between 1 and 10 additional notifications and 46.2% of users received between 11 and 100 additional notifications. Compared to the share of instances (2.3%) a larger portion of users (10.9%) received more than 100 additional notifications amongst instances of hitting their daily budget.

[22] Because we could not link ACSC gambling data with data from the PlayMyWay server, we used additional notifications received within the day after hitting a daily budget as a proxy for continued gambling. Using this method, there could have been some instances where we were not able to capture continued gambling. If, for example, after hitting his or her daily budget, a user wins enough on the next spin that he or she drops below 50 percent of his or her daily budget, and then remains below 50 percent for the rest of the day. In this example, the user would not receive any type notification after hitting his or her daily budget and therefore we would not capture the additional gambling activity.

Table 31: Number of total additional notifications received by users in all instances of hitting their daily budget, by number of users.

Number of total additional notifications received after hitting daily budget during study period	Steady users	Percentage of all steady users
No additional notifications	203	8.9%
One additional notification	130	5.7%
Between 2 and 10 additional notifications	640	28.2%
Between 11 and 100 additional notifications	1050	46.2%
More than 100 additional notifications	248	10.9%
Total	2271	100.0%

Because many users received immediate notifications upon enrolling in PlayMyWay (which happens if the user has already exceeded one of their budgets before enrolling), we repeated the additional notification analyses excluding budget notifications that occurred within the same day, week, or month that a user sets or changes their daily, weekly or monthly budget (see Appendix C). The results of these analyses are similar to our analyses of the pre-filtered data. The only major difference was that there were slightly fewer instances of users receiving no additional notifications (8.8%) and, likewise, fewer users receiving no additional notifications in all instances of hitting daily budgets during the study period (7.4%).

4. Discussion

4.1. Purposes of this Study

The Massachusetts Gaming Commission has stated that "PlayMyWay is intended to help players make decisions about gambling, allow them to monitor and understand their playing behavior in real time, and support their decisions" (Massachusetts Gaming Commission, 2016b). The current study is the first phase of a multi-year research agenda to assess and evaluate PlayMyWay's ability to fulfill this promise and reach new goals. The primary purposes of this preliminary report therefore included (1) building an evidence-based foundation to support the development of more advanced evaluative activities, including the identification of appropriate and specific program goals, and (2) providing the Massachusetts Gaming Commission with early objective information about the rollout of this responsible gambling program. Such information will inform decision-making regarding possible programmatic changes and the likelihood of long-term use of the PlayMyWay program. In this phase of the research agenda, we analyzed gambling activity and play management activity records to provide a general picture of program subscribers and how they use the system, as well as how the system might be associated with gambling behavior. Because the use of both PPC's gambling facilities and PlayMyWay were voluntary, at this time we cannot make causal statements about PlayMyWay enrollment impact on gambling behavior (e.g., "PlayMyWay causes people to spend less each day they gamble."). Instead, the available data allowed us to describe system use aspects such as enrollment and un-enrollment, budget sizes and types, and budget-related compliance evidence. In addition, we were able to make some basic comparisons regarding gambling-related activity, including wager sizes, visitations to PPC, and win/loss experiences. Such observations provide the necessary informational foundation to commence the next phase of evaluative activities.

4.2. PlayMyWay Enrollment

As noted earlier in the introduction, other jurisdictions have reported what might be described as limited success (e.g., 1%-2%) with enrolling people into voluntary play management programs. In contrast to these experiences, Massachusetts enrolled approximately 8,856 people in PlayMyWay during the study period: 8.7% of eligible individuals (i.e., Marquee Rewards cardholders). Furthermore, about 13.5% of individuals un-enrolled from PlayMyWay during the same period. This suggests that Massachusetts has fared better than other jurisdictions in terms of reaching enrollees using a commitment

strategy not often subscribed to in other settings (i.e., incentives). Knowing the enrollment and un-enrollment rates during the study period now allows the Massachusetts Gaming Commission to set specific data-informed benchmarks about these activities (e.g., seek to maintain current enrollment rates, or increase such rates). Future studies can assess PlayMyWay's ability to reach these benchmarks.

We observed peak enrollment in PlayMyWay during its initial rollout month (June 2016), followed by a drop and plateau in the rate of enrollment through the remainder of the study period. We observed that about half (48%) of un-enrollments happened early in a subscriber's experience with PlayMyWay (i.e., within the first day of enrollment). Furthermore, we noticed that many users who un-enrolled early never received any budget notifications prior to un-enrolling. During the initial rollout phase of the program, there was a small incentive (i.e., a $5 Marquee Rewards credit redeemable at the restaurants at PPC) to users who signed up for PlayMyWay. Because many of the early un-enrollers did not receive any budget notifications before un-enrolling, it is possible that many of them enrolled in PlayMyWay to receive the free promotional incentive and had no intention to use the system. However, it is also possible that some of these un-enrollees did explore PlayMyWay (e.g., used the tracking feature) and determined that it would was not useful to them specifically. Nonetheless, a meaningful number remained enrolled; this might suggest that the incentive was an effective strategy to induce enrollment. Additional research that uses a randomized design and assesses gambler motivations is needed to verify this suggestion.

4.3. Differences by PlayMyWay Enrollment Status

As described previously, and in detail below, the available data did not provide an opportunity to link the PlayMyWay records with the Marquee Rewards gambling activity records. Therefore, it was not possible for us to tie specific PlayMyWay actions (e.g., a specific budget notification) to specific gambling actions (e.g., card removal or changes in wagering patterns). To examine how PlayMyWay might have influenced gambling behavior, we compared the gambling activities of individuals who never enrolled in PlayMyWay (i.e., non-users) with individuals who ever enrolled in PlayMyWay (i.e., PlayMyWay users). We highlight some key findings here and discuss numerous limitations of this strategy and the associated data in detail in Sections 2.3.1 and 2.4.2, and below.

We had gambling activity data available for 92,168 Marquee Rewards cardholders who never utilized PlayMyWay during the study period and gambling activity data for 8,856 Marquee Rewards cardholders who enrolled in PlayMyWay at some point during the study period. We observed that PlayMyWay users were more likely to be female and somewhat younger. An analysis of cash activity differences revealed a few important trends. PlayMyWay users had significantly more interaction (i.e., bill insertions, funds withdrawals, voucher redemptions) with slot machines and electronic table game stations than non-users, but there was no significant difference between PlayMyWay users' and non-users' interactions with video poker terminals. These findings suggest that PlayMyWay enrollment might be associated with cash activity on specific machine and game types, and by extension, may be associated with preferences for specific machines and games.

PlayMyWay enrollment might be associated with some more conservative gambling outcomes. During the study period, non-users and PlayMyWay users made similar numbers of visits to PPC. However, non-users wagered more money and lost more money, on average, than PlayMyWay users. There are several possible explanations for these findings. It is possible that PlayMyWay stimulates more responsible gambling behavior. However, it also is possible that people who are drawn to PlayMyWay already are more conservative with respect to gambling. Additional research that uses a randomized design is necessary to make a causal attribution for such an association. Other possibilities exist, but this finding suggests that it might be worthwhile to develop a plan to evaluate PlayMyWay in a way that allows for randomization, and therefore provides evidence that permits causal interpretations for gambling activity outcomes.

In some ways, PlayMyWay users looked like non-users. For both PlayMyWay users and non-users, our analysis of these natural groupings identified small groups of "atypical users" who wagered more money and made more frequent visits to PPC than "typical users." Both among the non-users and among the PlayMyWay users, atypical users also tended to have significantly greater negative net winnings (i.e., lost significantly more money) than typical users. Evidence of such

similarities suggests that general messaging about specific responsible gambling topics could be developed to address atypical users.

4.4. PlayMyWay Budget Notification Effects

We observed that 42% of all PlayMyWay users never received budget notifications. Among all PlayMyWay users, 43% reached their budget and 37% exceeded their budget. Among only PlayMyWay users who received budget notifications, 75% reached their budgets and 64% reached and exceeded their budgets.

Those who did receive notifications were more likely to un-enroll from PlayMyWay after one day and were more likely to change their budgets compared to those who did not receive a notification. This suggests that program administrators and evaluators should study the notification process and the substance of the associated messages to determine whether users experience them to be unattractive and/or off-putting and then un-enroll as a consequence.

We examined whether users complied with their budget. We could not explicitly verify compliance due to our inability to link the notifications to gambling activity; so, we considered this question by implicit verification. Specifically, we examined instances where users hit (i.e., reached or exceeded) their daily budget and if they received any additional notifications that day. Additional notifications provide evidence of continued gambling above self-imposed budgets. For those who did receive additional notifications, we counted the number of additional notifications they received. These examinations revealed that more than 9 in 10 users who reached their daily budget also received one or more additional notifications within the day. Therefore, after receiving a notification, most PlayMyWay users did not stop gambling. Many users received more than one additional notification. This means that they continued gambling after they already had reached their budget limit. These results should be interpreted with caution for several reasons. First, it is possible that some players chose to stop gambling before they reached their budgets. This analysis focused exclusively on those who did reach a budget. Second, because we were unable to link gambling activity data with PlayMyWay server data, we used the generation of additional notifications as a proxy indicator for continued gambling. Third, the absence of notifications could indicate that an individual no longer was using their Marquee Reward card, but still gambled that day. In this case, our indicator of continued gambling, and other related measures, would underestimate the percentage of users who exceeded their budgets. Notably, continuing to gamble does not necessarily indicate program failure. As stated earlier in the Executive Summary and Introduction, although a budget-related hard stop is one possible program goal, other goals are possible.

We discovered that users who exceeded their budget often received multiple notifications after the initial notice that they had reached their budget. Most users who exceeded their budget exceeded it by more than 100% (i.e., spent more than 200% of a budget), regardless of whether they set a daily, weekly or monthly budget. Exceeding budgets was related to budget size. Specifically, users who set larger budgets were less likely to exceed their budgets, whereas users who set smaller budgets were more likely to exceed their budgets. The reasons for this association are unclear and future research is necessary to determine whether the relationship is causal.

4.5. Safety, Reach, and Effectiveness

The available data compromised our ability to thoroughly evaluate the safety, effectiveness, and reach of PlayMyWay. However, this report provides information that will allow future research to address these issues in detail. For reach, we were able to report enrollment and un-enrollment rates; however, we had limited ability to report about specific gambling patterns that might predict enrollment and un-enrollment. Such information might be useful to boost player enrollment to PlayMyWay because operators could target specific messages to different types of users.

In terms of safety, one way to evaluate the program would have been to examine how patterns of gambling behavior change over time, before and after PlayMyWay enrollment. For example, we were unable to examine whether PlayMyWay enrollment inadvertently stimulates excessive and/or wildly fluctuating gambling behavior. We also were not able to

determine whether budget notifications provoke reckless gambling choices. For example, we could not assess whether PlayMyWay notifications are associated with continued gambling in order to try and recover previous losses (i.e., chasing losses).

We also had limited ability to assess effectiveness in an in-depth way. Because we did not have linked data, we could not determine whether notifications seem to be associated with responsible or irresponsible gambling choices; we could not determine whether specific types of notifications related to budget compliance. As noted above, we approximated the latter by investigating patterns of notifications over time and searching for excessive notifications. But, this strategy is imprecise compared with a strategy that would rely upon actual gambling activity patterns that occur subsequent to specific notifications. Future research should consider each of these areas more rigorously before deciding whether PlayMyWay was or is effective or ineffective.

4.6. Limitations

We encountered numerous critical data issues during the development and implementation of this study. Although we detail these issues in Appendix A, we also review them here so that readers can take this information into consideration as they read this discussion.

For this preliminary analysis, we did not have the ability to link the budget activity data in the PlayMyWay records to the Marquee Rewards betting data. This link is essential to our current and long-term study objectives. This data limitation restricted our analyses in two primary ways. First, we were not able to adequately connect a cardholder's gambling activity data with the time periods during which they were enrolled and not enrolled in PlayMyWay. This restricted our ability to examine specifically whether and how PlayMyWay affected cardholders' gambling activity. Second, we were not able to explore potential associations between specific interactions with PlayMyWay (e.g., enrolling and un-enrolling, receiving notifications) and cardholders' gambling behavior. Instead, we needed to develop proxy methods as an attempt to answer key questions.

We also discovered evidence that the gambling activity files for PlayMyWay users were missing data. During the study period, there were notable gaps of time evident in the records. In total, there was no recorded PlayMyWay gambling activity during 682 out of the 5,880 total hours in the study period (i.e., 13.7% of all hours). This possibility of missing data introduced uncertainty into our statistical calculations (e.g., number of visits, total amount wagered, net winnings) for PlayMyWay users.

We also suspect that there was a significant amount of data missing from the Marquee Rewards betting data, particularly in the gambling activity data files. We discovered, for example, that due to the design of the data pull routines created by Scientific Games, if a cardholder enrolled in PlayMyWay and remained enrolled through the end of the month and past the parameters of that month's data pull, we would not receive the non-PlayMyWay gambling activity data for days of the month before they enrolled. Furthermore, some of the cardholders had gambling activity data both in the files for PlayMyWay users and the files for non-users. We were not able to design a method that systematically could eliminate redundant records or cleanly merge the gambling activity data from the PlayMyWay users' and non-users' files. Because of these issues, for cardholders with data in both types of gambling activity files (i.e., cardholders represented by the green zone in Figure 1), we chose to limit our analyses to the data from the files for PlayMyWay users (i.e., not use these cardholders' data in the files for non-users). This decision decreased the potential impacts of missing data, removed the problem of duplicated or redundant data, and increased our confidence in the data set we were using for our analyses. However, this decision also prevented us from combining the files for PlayMyWay users and non-users to conduct aggregate analyses covering all of the cardholders in our analytic sample. This data reduction also prevented us from conducting crucial analyses assessing how gambling behavior changes before and after enrolling in PlayMyWay. Furthermore, though removing the data from the file for non-users increased our confidence about the integrity of the remaining data, there still existed the possibility of missing data. These possibilities for missing data introduced uncertainty

into the aggregate calculations (e.g., number of visits, total amount wagered, net winnings) for both PlayMyWay users and non-users.

In the PlayMyWay budget activity data, we discovered several discrepancies that required large data reductions. Specifically, we removed records with timestamps before the beginning of the study period, completely duplicated records, budget notification records that preceded enrollment records, every record for users with non-corresponding enrollment and un-enrollment records, as well as redundant records indicating when users had reached their budget. Most of these reductions were not problematic as they were simply eliminating redundant records and records that occurred before the study period. However, because some of the records we eliminated were not duplicates of other records or recorded before the beginning of the study period, their absence in our analytic data set could have affected some of the budget and enrollment analyses presented in this report.

Other limitations did not involve the available records. To illustrate, for this preliminary report, in this initial approach we did not directly survey gamblers at PPC. This precluded us from creating a dynamic measure for problematic gambling behavior that could reflect how a player's gambling behavior affected his or her lifestyle or psychological status (e.g., items asking whether players experienced financial hardships due to gambling). Because of this, we also were not able to ask players about their income and economic means, which could be used to estimate the extent to which cardholders were gambling within their resources. For cardholders who enrolled in PlayMyWay, we were not able to assess self-reported satisfaction with the PlayMyWay tool; similarly, we did not have the opportunity to explore possible associations between at-risk gambling behavior and program effectiveness.

The analyses in this report are limited to cardholders' interaction with the PlayMyWay software itself. Our current method did not include randomization to PlayMyWay and, therefore, the report analyses cannot establish a causal relationship. This report also does not include any analyses or explorations of the effects of any media referencing PlayMyWay (e.g., news articles, advertisements on the internet and elsewhere). Additionally, there are other responsible gambling tools in Massachusetts (e.g., GameSense and the voluntary self-exclusion program). At the time of the report, we do not have the data to investigate any interaction effects between PlayMyWay and these other responsible gambling tools. Consequently, any discussion of any possible interaction effects is beyond the scope of this report.

The analyses in this report also are limited to gambling activity at Plainridge Park Casino. Usage of PlayMyWay or any other responsible gambling tool might be significantly different at other facilities and casinos with different portfolios of gambling options. Specifically, other casinos might have gambling formats where implementing a voluntary budgeting system might prove difficult (e.g., live table games, poker).

4.7. Recommendations and Future Directions

Recommendations related to PlayMyWay research

Based on the above limitations, there is a clear and immediate need for the ability to link PlayMyWay data to the Marquee Rewards data, as well as a need to revise the data abstraction code to avoid data loss. We currently are working with Plainridge Park Casino and Scientific Games to create this link. With the linked data, we can understand better how PlayMyWay affects a user's gambling behavior (e.g., average amount of money lost over time) and how player gambling behavior, in turn, affects a user's experience with the PlayMyWay system (e.g., Is excessive gambling behavior associated with exceeding budgets?). We also can determine what types of playing behaviors are associated with both adoption of PlayMyWay and the successful use of it (e.g., stopping/slowing down play upon reaching budgets). With this report, the Massachusetts Gaming Commission can create clearly defined data-informed goals for PlayMyWay. Although Ladouceur et al. (2012) suggested that the purpose of pre-commitment systems (such as PlayMyWay) is to enable players to make decisions about budget expenditures in a "state of non-emotional arousal," which "once made, must be adhered to" (pg. 2),

other program goals are possible. Delineation of such goals in objective and measurable ways will assist future evaluation efforts.

As noted, the current study is one part of larger multi-year research and program development agenda. To understand more fully how the PlayMyWay system affects problematic gambling behavior, we also require more diverse measures. Specifically, we need to administer surveys to both users and non-users of PlayMyWay to identify key differences in their gambling behavior that cannot be captured by gambling behavior records alone. Integrating such survey data with actual gambling activity records and PlayMyWay records will provide new insights into the system; these insights are necessary to advance a comprehensive evaluation of PlayMyWay. In addition, survey data will allow us to identify self-described factors that might prevent individuals from enrolling in PlayMyWay.

Finally, to understand any causal effects of PlayMyWay on gambling behaviors of interest to the Massachusetts Gaming Commission, we need to consider conducting a randomized trial of PlayMyWay and/or aspects of the PlayMyWay system. The logistics of such research will be challenging. However, randomized studies will determine whether there are any causal effects between PlayMyWay enrollment and/or PlayMyWay system features and responsible gambling behaviors.

Recommendations related to PlayMyWay policy and implementation

During our analyses, we noticed specific aspects of the PlayMyWay system that might have affected the program's effectiveness. For example, the PlayMyWay notification system is designed so that it tracks budgets and sends notifications based on a player's net winnings from the beginning of the time period for which they set their budget (i.e., 6:00 a.m. that day for daily budgets, 6:00 a.m. on Sunday for weekly budgets, and 6:00 a.m. the first day of the month for monthly budgets); this design is different from a system based on the enrollment date itself. The current design can lead to immediate budget notifications that begin at the start of a user's PlayMyWay experience. We recommend that future iterations of the PlayMyWay system consider relying on budget-related tabulations that commence from enrollment, not by calendar date. This will avoid the situation wherein people sign up and immediately receive budget-related notifications. However, because we do not have a link between PlayMyWay budget notification records and the Marquee Rewards gambling activity records, we cannot say with certainty what impact immediate budget notifications upon enrollment have on outcomes like, gambling behavior.

We observed that approximately 9 in 10 players who hit (reached or exceeded) their budget continued to receive additional notifications (i.e., did not adhere to their budget). If strict budget adherence is a primary goal, then program administrators and evaluators should consider exploring potential reasons why some players might not be complying with their self-selected budgets. Player surveys could shed light on how players treat their budgets (i.e., whether they intend a budget to serve as a hard stop or an indication to slow down one's gambling). Additionally, PlayMyWay does not require players to acknowledge notifications when they appear. Because the interface for PlayMyWay is not always located on the main EGM screen (on some EGMs, the interface is located on a small screen outside the player's line of sight) it is possible that some players simply do not notice when they have reached or exceeded their budgets. Future research can determine whether differences in the location of the PlayMyWay interface are related to budget adherence rates. If so, changes to the design of PlayMyWay's interface might increase budget adherence rates.

We also observed that PlayMyWay notifications are associated with both un-enrollment and budget changes. We suggest that program administrators and evaluators revisit the notification schedule and study whether any changes might reduce these actions. Furthermore, as we stated in Section 4.4, the content and format of the messages themselves might affect un-enrollment rates. Survey research is needed to better understand how users perceive notification messaging. Finally, PlayMyWay users seem to be slightly more likely to be women and younger, though most enrollees are middle aged. In reviewing outreach efforts, program administrators might consider ways to reach more men and risk groups, such as young adults and older adults. Similarly, as we stated in Section 4.3, program administrators might consider specific messaging or other ways to tailor outreach efforts to atypical or unusually frequent patrons.

4.8. Concluding Thoughts

Readers should consider this preliminary report on the PlayMyWay system as a first step in assessing whether the system achieves its goal of promoting responsible gambling behavior. The current report summarizes the first phase of analytic activities in a broad multi-year research and development agenda for PlayMyWay. Some observations can guide the development of data-informed program goals and evaluation targets. PlayMyWay enrollment was associated with more conservative gambling behavior, such as less wagering, fewer visits, and fewer losses. However, in the absence of randomization, it is not possible to make causal attributions. About 42% of users never received any budget notifications during the study period. Among those who did, the majority reached and exceeded their budgets. Research should explore the implications of these observations. Major data limitations, including large amounts of missing data and an inability to link the data from the ACSC server with data from the PlayMyWay server, prevented us from answering many crucial and fundamental questions, such as: What type of player is the program most effective for? Do players who utilize PlayMyWay gamble more, less, or the same as they did before enrolling in PlayMyWay? Are there key differences in the gambling behavior of PlayMyWay users who reach/exceed their budget and players who never reach or exceed their budgets? Until we can answer these types of questions it is not possible to make a judgment about whether PlayMyWay is as an effective means of promoting responsible gambling. It is possible, however, to move forward with data-informed program development and evaluation plans.

Appendix A: Issues with the gambling activity data files

Issue #1: Data filters for the PlayMyWay files and non-PlayMyWay files.

As we mentioned before, the filters used to generate the two types of gambling activity files (i.e., for PlayMyWay users and for non-users) left inconsistencies and omissions in the data. According to the specifications agreed to by all parties involved (i.e., Scientific Games, Plainridge Park Casino, the Massachusetts Gaming Commission, and the Division on Addiction), the monthly files for PlayMyWay users were supposed to contain all gambling activity conducted by Marquee Rewards cardholders while they had PlayMyWay active (i.e., after un-enrollment and before any subsequent matching un-enrollment). The corresponding files for non-users, on the other hand, were supposed to contain records of all gambling activity where PlayMyWay was not active (i.e., all gambling activity for those who never enrolled, all post-un-enrollment gambling activity for those who enroll and then un-enroll). For example, consider a cardholder enrolled in PlayMyWay on October 10 at 00:00:01 and un-enrolled on October 14 at 23:59:59. The October 2016 gambling activity file should contain all records of this cardholder's play between October 10 and October 14. Conversely, the file for non-users during this period should have contained any records of this cardholder's gambling activity between October 1 and October 9 and between October 15 and October 31.

However, the design of the data abstraction filter used to generate non-PlayMyWay files[23] (i.e., for cardholders who were not enrolled in PlayMyWay) was erroneous. The routine that generated these files collected all gambling activity data for the month in question for the cardholders who were not enrolled in PlayMyWay *at the time of the data pull*. For example, when the data pull for October 2016 occurred on November 3, 2016, based on the routine used, the October file for non-users contained the data for any gambling done between October 1 and October 31 by cardholders who were not enrolled in PlayMyWay on November 3. Consider a cardholder who began October not enrolled in PlayMyWay, gambled at PPC every day from October 10 through October 14 [without PlayMyWay active], enrolled in PlayMyWay on October 17, and then remained enrolled through November 3. Because this cardholder was enrolled in PlayMyWay at the time of the data pull, the non-PlayMyWay file would not contain the data from this cardholder's sessions from October 10 to October 14. As neither the PlayMyWay file nor the non-PlayMyWay file would capture those five days, that data would simply be lost.

Alternatively, suppose that another cardholder began October enrolled in PlayMyWay, gambled on October 10 and 11 with PlayMyWay active, un-enrolled on October 12 (without gambling), gambled more with PlayMyWay inactive on October 13 and 14, and was still not enrolled when PPC personnel generated the October data files on November 3. Then the gambling activity for October 10 and 11 (while PlayMyWay was active) would be in the PlayMyWay file. Because this cardholder was not enrolled in PlayMyWay at the time of the data pull on November 3, all their October activity – including their gambling activity on October 10 and 11 while using PlayMyWay -- would be included in the non-PlayMyWay file as well. Specifically, the gambling activity for October 10 and 11 would be recorded in both files: PlayMyWay and non-PlayMyWay. Without scrutiny of both October data files, if we had included both files in the calculation of, for example, total amount wagered over the whole study period, it could have been possible to add the same October 10 and 11 gambling activity to the total twice.

Table A1 illustrates an example of how rows of data relate to each other based on the time and machine. This cardholder was enrolled in PlayMyWay on October 11, but un-enrolled before the time of the data pull on November 3. The amounts wagered and prizes won in the left table add up to the corresponding bet amounts and prizes won on the right table. Both

[23] In Section 2.3.1, we referred to files for PlayMyWay users and non-users as PlayMyWay gambling activity files and non-PlayMyWay gambling activity files, respectively. In this appendix, we will shorten these to "PlayMyWay files" and "non-PlayMyWay files."

files show that this cardholder lost $8.00 playing Slots Gold and won back $2.50 playing Crazy VidPo. “Slots Gold” and “Crazy VidPo” are fictitious game names created for this example.

Table A1: Illustration of corresponding rows of data in gambling activity data files for PlayMyWay-users and non-users.

PlayMyWay gambling activity file					Non-PlayMyWay gambling activity file			
Date/Time	Game ID	Bet	Prizes		Date/Time	Game ID	Bet	Prizes
2016-10-11 11:40:05	Slots Gold	$3.00	$0.00					
2016-10-11 11:40:20	Slots Gold	$3.00	$1.00					
2016-10-11 11:40:35	Slots Gold	$3.00	$0.00					
2016-10-11 11:40:50	Slots Gold	$3.00	$0.00					
2016-10-11 11:41:05	Slots Gold	$3.00	$2.00					
2016-10-11 11:41:20	Slots Gold	$1.00	$5.00		2016-10-11 11:41:20	Slots Gold	$16.00	$8.00
2016-10-11 12:44:00	Crazy VidPo	$0.50	$0.00					
2016-10-11 12:44:15	Crazy VidPo	$0.50	$0.00					
2016-10-11 12:44:30	Crazy VidPo	$0.50	$0.00					
2016-10-11 12:44:45	Crazy VidPo	$1.00	$6.00					
2016-10-11 12:45:00	Crazy VidPo	$1.00	$0.00					
2016-10-11 12:45:15	Crazy VidPo	$0.50	$1.00		2016-10-11 12:45:15	Crazy VidPo	$4.50	$7.00

This exact correspondence does not hold when a cardholder enrolls or un-enrolls in PlayMyWay in the middle of play. In the sequence of events in Table A2 below, a cardholder entered PPC the afternoon of October 21. The cardholder was not enrolled in PlayMyWay at first, but enrolled after six spins on a Slots Gold machine. The cardholder played another ten spins on the same machine, un-enrolled from PlayMyWay, and then ended his session. For this example, we assume that the cardholder’s net loss never exceeds 50% of any of the budgets set at enrollment, so that the PlayMyWay system will record data every three spins (see Section 2.2.3). As shown in Table A3, the data in the file for non-users contains the aggregated amount wagered and prizes won over all sixteen spins. The data in the file for PlayMyWay users covers only the ten spins post-enrollment.

Table A2: A hypothetical sequence of spins, with what the corresponding data output in the gambling activity files for PlayMyWay users and non-users.

Date/Time	Event
2016-10-21 13:14:30	Enter PPC, not enrolled in PlayMyWay
2016-10-21 13:15:00	Insert card into a Slots Gold machine
2016-10-21 13:15:15	Insert a $20.00 bill into the Slots Gold machine
2016-10-21 13:20:00	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:20:05	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:20:10	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $10.00

2016-10-21 13:20:15	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:20:20	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:20:25	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:23:30	Enroll in PlayMyWay, daily: $200, no weekly, no monthly
2016-10-21 13:23:35	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:23:40	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:23:45	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $2.00
2016-10-21 13:23:50	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:23:55	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:24:00	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:24:05	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:24:10	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $4.00
2016-10-21 13:24:15	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:24:20	One spin on a Slots Gold machine, amount bet: $1.00, amount won: $0.00
2016-10-21 13:25:30	Un-enroll from PlayMyWay
2016-10-21 13:26:00	Funds withdrawal: $20.00
2016-10-21 13:26:30	Remove card from Slots Gold machine

Table A3: Rows of data for the PlayMyWay and non-PlayMyWay gambling activity data files, based on the sequence of spins in Table A2.

PlayMyWay gambling activity data file					non-PlayMyWay gambling activity data file			
Date/Time	Game ID	Bet	Prizes		Date/Time	Game ID	Bet	Prizes
2016-10-21 13:23:45	Slots Gold	$3.00	$2.00					
2016-10-21 13:24:00	Slots Gold	$3.00	$0.00					
2016-10-21 13:24:15	Slots Gold	$3.00	$4.00					
2016-10-21 13:26:30	Slots Gold	$1.00	$0.00		2016-10-21 13:26:30	Slots Gold	$16.00	$16.00

Issue #2: Potentially missing time gaps in the PlayMyWay files.

In addition to issue #1, we also found significant time gaps in the PlayMyWay files. Specifically, there were significant blocks of time missing from the PlayMyWay files (682 hours out of 5,880 hours in the study period were missing from the data files). Some of these missing time blocks could be valid; specifically, PlayMyWay users might not have gambled during some of these hour block times. However, the missing gaps of time included whole periods of days (such as the weekends of July 3, 2016 and December 17, 2016), where there were no records of any gambling activity from PlayMyWay users. If a cardholder used PlayMyWay but only during these gaps, then we would have no indication that this cardholder ever enrolled or interacted with PlayMyWay.

In this report, we have separated our analytic sample of Marquee Rewards cardholders into three groups, based on whether their player identifiers were found in the PlayMyWay files, the non-PlayMyWay files, or both. Descriptions of the range of consequences for each group follow.

Group 1, the 6,797 cardholders with data only in the gambling activity files for PlayMyWay users: If a cardholder in this group only gambled with PlayMyWay active and not during any of the hours or days in the gaps, then the data files contain a complete record of that cardholder's gambling activity. However, if the cardholder did gamble during any of the missing time periods, then that gambling activity data would be lost. Also, it is possible for a cardholder to gamble without PlayMyWay active and then enroll in PlayMyWay later in the month. In those cases, not only would our files be missing the records for that gambling activity, but it would also be missing the fact that this cardholder gambled with PlayMyWay inactive in the first place.[24] Between the gaps in the PlayMyWay files and the potential for whole days or even weeks of gambling activity data to be lost, we are not completely confident in the accuracy of our counts of the number of visits to PPC nor are we completely confident in our aggregates for the total amount wagered or total prizes won over the study period.

Group 2, the 1,962 cardholders with data in both the PlayMyWay files and non-PlayMyWay files: The potential for both missing data and overlapping data calls into question the validity of the gambling activity data for this group. While it might have been possible to match or reconcile some of the overlapping data based on timestamps and game identifiers, it would have been a complicated process that still could not account for gambling sessions that were simply filtered out and lost. If we limit our calculations to these cardholders' PlayMyWay gambling activity data, then we are as confident in the number of days of gambling, the total amount wagered, and the total prizes won *while PlayMyWay was active* as we are with Group 1. That is, the same issues described in the previous paragraph would apply (i.e., caveats about the missing hours and days in the PlayMyWay data files, the possibility of lost sessions where PlayMyWay was inactive). However, because of the reasons listed and illustrated within this paragraph, we have very little confidence that the tallies of the total days at Plainridge Park, the total amount wagered, or total prizes won over the study period (adding together activity with PlayMyWay active and activity without PlayMyWay active) are accurate.

Group 3, the 92,168 cardholders with data only in the non-PlayMyWay files: For cardholders in this group, the best-case scenario and easiest explanation is that they never enrolled in PlayMyWay, and that every month they were on the roster of non-users. The non-PlayMyWay files would then contain all their gambling activity data over the whole study period. However, it is also possible that one or more of these cardholders used PlayMyWay, but only during the hours and days missing from the files for PlayMyWay users. In these cases, it is possible that whole months of gambling activity (with PlayMyWay active) have been lost. Without the ability to link budget activity data to gambling activity data, there is no way to verify with complete confidence that a cardholder never enrolled in PlayMyWay. Once again, we do not have complete confidence in the accuracy of cardholders' numbers of visits, total amounts wagered, and total prizes won. However, because there are fewer issues, we are more confident in the aggregates for this group than in aggregates for Group 2.

[24] An extreme example would be where a cardholder gambled extensively with PlayMyWay inactive in October 2016 and then signed up for PlayMyWay on November 2. The data pull occurred on November 3. All of October's gambling activity data would be lost.

Appendix B: Additional figures showing cash activity of Marquee Rewards cardholders

Figure B1: Venn diagram showing the numbers of cardholders who inserted bills into slot machines, electronic table games stations, and video poker terminals.

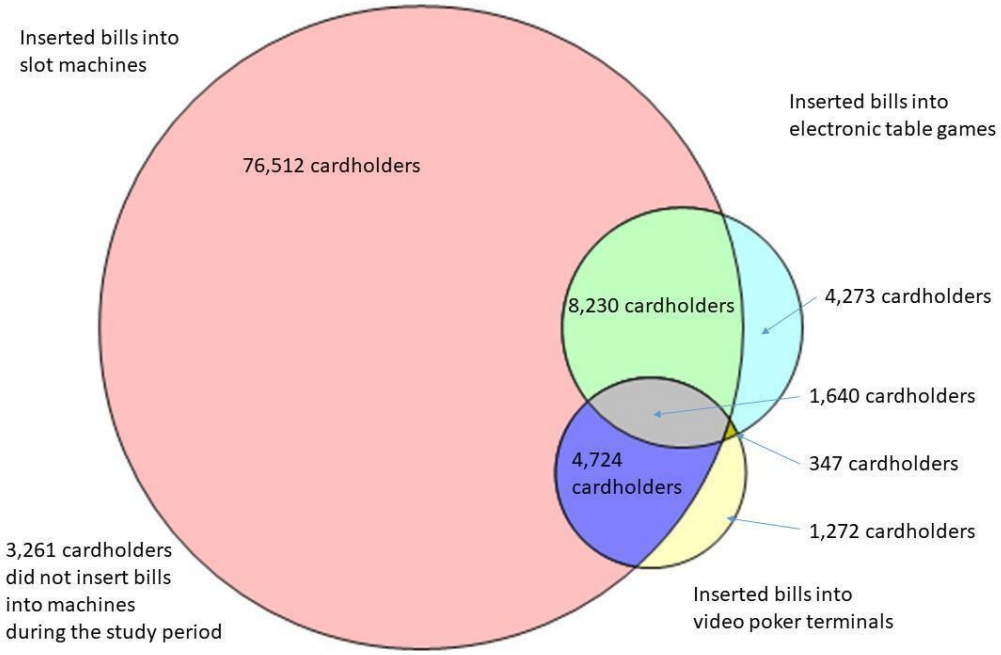


Figure B2: Venn diagram showing the numbers of cardholders who withdrew funds from slot machines, electronic table games stations, and video poker terminals.

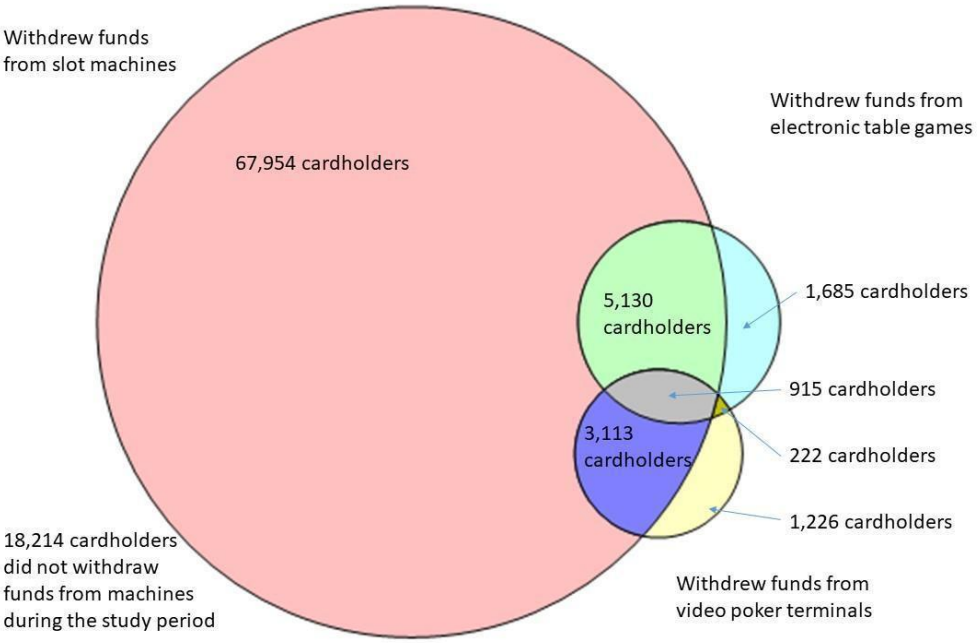
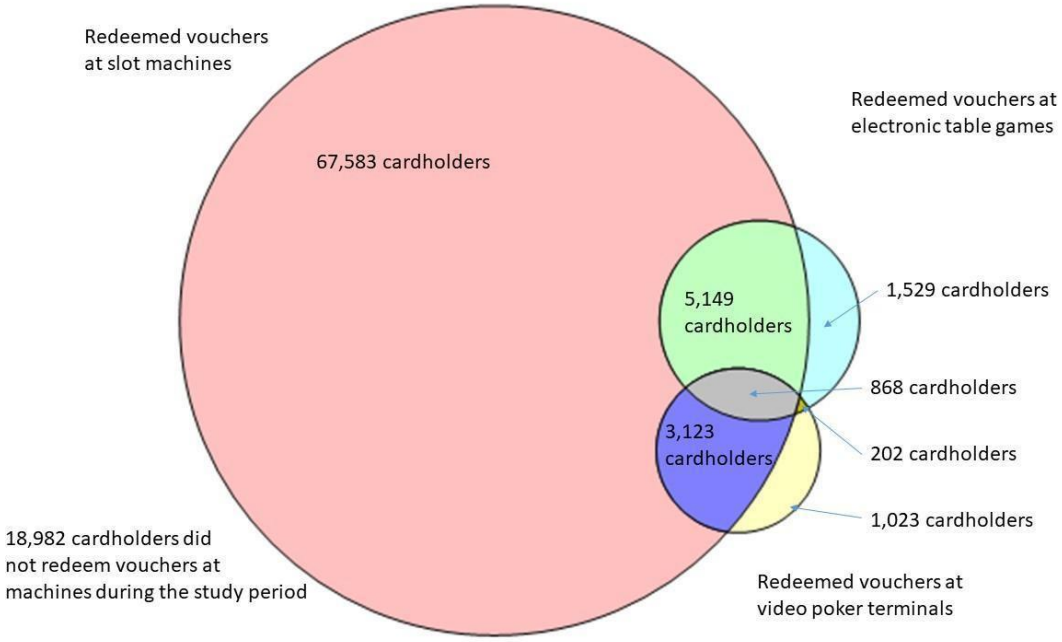


Figure B3: Venn diagram showing the numbers of cardholders who redeemed vouchers at slot machines, electronic table games stations, and video poker terminals.



Appendix C: Additional tables and figures showing results of analyses of PlayMyWay budget notifications data with budget notifications that occurred within the same day, week, or month that a user sets or changes their daily, weekly or monthly budget filtered out

Figure C1: Consort diagram of PlayMyWay budget activity, using filtered data.

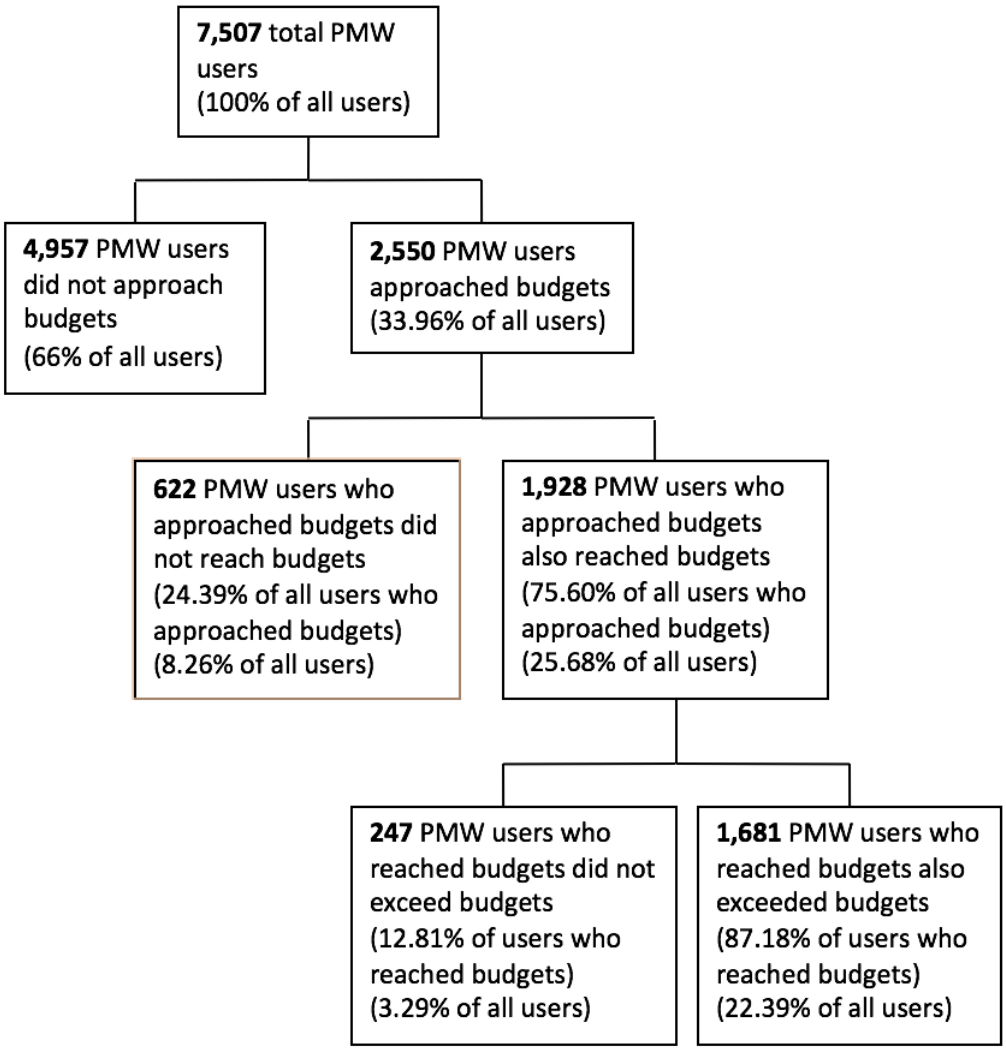


Table C1: Number of additional notifications received upon users hitting their daily budget, by number of instances, using filtered data.

Number of additional notifications received after hitting daily budget	Number of unique steady users	Instances	Percentage of all instances
No additional notifications	267	325	8.8
One additional notification	204	237	6.4
Between 2 and 10 additional notifications	737	1299	35.2
Between 11 and 100 additional notifications	708	1713	46.4
More than 100 additional notifications	100	116	3.1
Total	2016	3690	100.0

Table C2: Number of total additional notifications received by users in all instances of hitting their daily budget, by number of users, using filtered data.

Number of total additional notifications received after hitting daily budget during study period	Steady users	% of all steady users
No additional notifications	102	7.4
One additional notification	80	5.8
Between 2 and 10 additional notifications	382	27.9
Between 11 and 100 additional notifications	604	44.1
More than 100 additional notifications	202	14.7
Total	1370	100.0

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