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THESIS

THE EFFECTS OF END-OF-MONTH RECRUITING ON MARINE CORPS RECRUIT DEPOT ATTRITION

by

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March 2006

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The Total Force Data Warehouse provided data for over 50,000 recruits who enlisted and shipped to recruit training between October 2003 and May 2005. Of those, over 5,500 (10.62 percent) failed to complete the prescribed training. In the logit regression models, discharge was modeled against demographic variables such as age, gender, race, education level, and AFQT score, as well as variables representing the day of the month a recruit enlists (last day, last week, or last 10 days of the month). Prior research has found that DEP attrition is higher for recruits who enter the Marine Corps at the end of the month. By contrast, the data analyzed in this study show that once a Marine Corps enlistee ships to a recruit training depot, there is no statistical evidence of higher attrition rates in basic training based on the day the recruit enlisted.

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THE EFFECTS OF END-OF-MONTH RECRUITING ON MARINE CORPS RECRUIT DEPOT ATTRITION

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I. INTRODUCTION

A. PURPOSE

As the Global War on Terror continues to be fought around the globe, Marines are constantly forced to do more with less. Relating to the realm of manpower issues, this means making the most efficient use of every dollar when it comes to the recruiting and training of young men and women to become United States Marines. There are significant costs associated with recruiting applicants and getting them across the parade deck as a basic qualified Marine.

A recent study (Bruno, 2005) concluded that there is a significant relationship between the day of the month an applicant enlists and the attrition rate of Marines in the Delayed Entry Program (DEP) holding constant age, test scores, and other demographic variables. In particular, the Bruno study found that applicants who enlisted during the last week of the month exhibited higher attrition rates. Possible causes are explained in Chapter II. This research analyzes similar effects of day of month of enlistment on attrition levels at the Marine Corps Recruit Depots (MCRD). The outcome of this research is to further investigate the impact of time of enlistment on later attrition and to provide policy recommendations in order to lower MCRD attrition rates.

1. Background

In 1973, the Armed Forces began a new era that saw the end of involuntary induction of males into the military and the creation of the all-volunteer force. To assist the services to meet their annual accession requirements of new

recruits each year, the DEP was created. This program allows applicants to enlist into the military and remain in the civilian sector for up to 365 days prior to shipping to recruit training. The Marine Corp's primary use of the DEP is to allow for the even flow of recruits into the training pipeline. Applicants are not legally bound to honor their commitment while in the DEP, and those who fail to ship to MCRD are classified as DEP attrition while those who ship to MCRD, but fail to graduate, are classified as MCRD attrition.

2. Costs

To maintain the all-volunteer force, the Marine Corps spends a significant portion of their budget, over $592 million dollars in fiscal year (FY) 2005, on recruiting and advertising which equates to over 16 percent of the entire Operation and Maintenance (O & M) Budget for the Marine Corps (Department of the Navy (DoN) FY 2005 President's Budget Exhibit O-1). The recruit depots indicate that the average training cost per recruit is $14,320 (http://www.mcrdpi.usmc.mil/fact_sheet.htm). Today, it is imperative that these scarce resources are spent on only the most qualified applicants with the greatest propensity to complete entry-level training. Every time an applicant is discharged from the DEP or from recruit training, additional funding is needed to replace that individual. Over the past three fiscal years, the O & M budget has decreased over 34 percent. Funds allocated to training have increased over 9 percent, drawing scarce resources from the operating forces and administrative activities supported by the O & M account (DoN FY 2005 President's

Budget Exhibit O-1). Table 1.1 breaks out the Training and Recruiting portion of the O & M budget of the Marine Corps for FY03 through FY05.

Table 1.1 FY03 – FY05 Training and Recruiting Budget (In Thousands of Dollars)

Budget Activity 03: Training and Recruiting	FY03	FY04	FY05
Accession Training			
Recruit Training	10,985	9,844	10,539
Officer Training	425	348	351
Basic Skills and Advanced Training			
Special Skills Training	34,823	40,484	45,155
Flight Training	186	171	174
Professional Training	9,126	8,863	8972
Training Support	113,765	117,856	134,241
Recruiting and other Training and Education			
Recruiting and Advertising	114,403	113,987	113,998
Off-Duty and Voluntary Education	38,032	32,006	34,226
Junior ROTC	13,377	13,700	13,270
Base Support			
Sustainment and Modernization	81,357	79,666	68,553
Base Operating Support	117,363	153,327	162,579
Total for Budget Activity 03	533,842	570,252	592,158
Total Operation and Maintenance	5,525,445	4,608,137	3,632,115

After DoN FY 2005 President's Budget Exhibit O-1
http://navweb.secnav.navy.mil/pubbud/05pres/ommc/O1_OMMC_FY05PB

3. Research Questions

The primary research questions focus on factors affecting MCRD attrition rates and current policies. The secondary questions focus on subgroups identified in previous research as exhibiting a higher propensity to attrite from the DEP to determine if the same attrition behavior exists at the MCRDs.

- Primary Questions
  - What effect does a recruit's day of the month of enlistment have on his or her propensity to graduate recruit training?
  - Can policy changes be implemented to reduce attrition rates without adding unnecessary additional burdens to the recruiting force?
- Secondary Question
  - What are the immediate and long-term impacts on recruiting and attrition rates of proposed potential changes?

B. SCOPE AND METHODOLOGY

Although attrition is impossible to eliminate, it is crucial that we examine all possibilities that will keep it to a minimum. Prior research shows that applicants with specific attributes, who are recruited at different times of the month, have different DEP attrition behavior. The data for this thesis was extracted from the Marine Corp's Total Force Data Warehouse (TFDW) for applicants who enlisted and shipped to MCRD between October 2003 and May 2005. The data is organized for the purposes of this study to determine if those same subgroups who have been identified as exhibiting a high risk of DEP attrition also exhibit a high risk of MCRD attrition. If the risk is the same, then attrition may be reduced by implementing past recommendations. If the rates are different, then altering the recommendations may succeed in reducing attrition at both DEP and MCRD levels.

C. ORGANIZATION

Chapter II of this thesis is a literature review that examines previous research focused on attrition levels at both the DEP and the MCRDs. Chapter III discusses the data and the methodology used in creating the variables and groups that are examined using regression analysis. Chapter IV examines the regression models used to test attrition rates of groups previously identified as having high discharge rates in the DEP. Chapter V summarizes the results of this study, provides conclusions, and offers recommendations and observations based on the outcomes of the analysis.

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II. LITERATURE REVIEW

A. PREVIOUS MCRD ATTRITION STUDIES

After the abolishment of the draft, attention quickly focused on recruiting quandaries such as the available applicant population and the high costs associated with high attrition rates. Many studies have been conducted to ensure that the quantity of manpower required for accession into the Corps was met with the highest quality of applicants available.

The following chapter discusses in detail four prior studies on attrition. The first analysis was conducted by the Center for Naval Analyses (CNA) and identified variables used to screen out Marine Corps applicants with low propensities to complete 24 months of service (Sims, 1977.

The second study, a Naval Postgraduate School (NPS) thesis, compared attrition statistics between Marine Corps Recruit Depot (MCRD) Parris Island and MCRD San Diego. Additionally, the authors attempted to create profiles of Senior Drill Instructors (SDIs) who exhibited high and low attrition rates within their respective recruit platoons (Carrigan and Franz, 1982).

Another CNA analysis was reviewed for the third study. Building on earlier research (Sims, 1977), along with statistics gathered over the ensuing decade, the researchers sought to investigate variables that identified recruits with higher propensities to complete a successful

45-month tour, to achieve promotion to the rank of E-4, and reenlist at the end of their first tour (Quester, North, and Kimble, 1990).

The fourth study was a 2005 NPS thesis analyzing recruit attrition from the Marine Corps' Delayed Entry Program (DEP). This study examined variables and their interactions to each other, a case was made that different categories of applicants attrited at different rates depending on whether they were enlisted during the first three weeks of the month, or the last 10 days of the month. By identifying the characteristics of each category, the author proposed that DEP attrition could be reduced by quickly identifying those with higher attrition propensities prior to their signing enlistment papers (Bruno, 2005).

1. Sims (1977)

Profile of a Successful Marine, a report for the CNA by William Sims (1977), focused on the development of a profile that Marine Corps recruiters could employ in an effort to eliminate potentially unsuccessful recruits. Only applicant information such as age, race, education level, number of dependents, and aptitude and attitudinal test scores from the Armed Services Vocational Aptitude Battery (ASVAB) were used in the study.

Three profiles were created, labeled profile one, profile two, and profile three. The first looked at educational level (high school graduate or not), age, and an attrition composite developed from components of the ASVAB. The second profile was more conventional, examining educational level (high school graduate or not), age, and

mental aptitude as determined by raw ASVAB scores. The third profile looked at the same variables as the second group; however, educational level was broken down by level of education completed ranging from less than eight years to more than twelve.

This information was analyzed to predict attrition as well as to predict success at occupational specialty schools. Sims suggested profile three as the best overall predictor. Although profiles one and two had better predictions of attrition, they could not predict school performance. Sims also felt the attitudinal portion of the attrition composite, due to it transparent nature, could be easily altered by recruiters coaching their applicants in certain areas prior to taking the exams.

Sims' findings still hold true for today's applicants to the Marine Corps. High school graduates who enlist at an early age and have high scores on the ASVAB mental group composite typically (on average) make the most successful Marines. His findings concluded that non-high school graduates enlisting at an early age with high scores on the ASVAB mental group composite also have a propensity to be successful. Statistics showed that once the above variables were held constant, race became insignificant. Although statistically significant, having dependents was found to have little practical significance.

A problem with this era was the inability of recruiters to examine school and police records. Sims noted that attrition rates could be decreased by 4 percent if this information were readily obtainable by recruiters as they checked applicants for eligibility. This problem

no longer exists since the records are now checked before an applicant is accepted into the DEP.

His research pointed out that the attrition rate in general could easily be reduced by screening applicants more carefully according to the demographic factors he used. However, rigorous application of the screening factors would create additional problems. Such problems included significantly reducing applicant pools, and increasing recruiting costs and recruiting efforts. The study concluded that implementing policies to reduce attrition by 1 percent would reduce the applicant population by 2 percent. If reduced properly by profiling and screening, a portion of these costs will be offset by the fact that fewer recruits will be needed to reduce those who normally would have attrited.

2. Carrigan and Franz (1982)

In a Naval Postgraduate School thesis, Charles Carrigan and Joseph Franz examined recruit attrition by comparing the attrition statistics between Parris Island and San Diego MCRDs. Additionally, they attempted to construct profiles of Senior Drill Instructors with low and high attrition rates. Data was collected from both MCRDs on 38,022 male recruits entering training for the first three quarters of fiscal year (FY) 1982. It was noted that the comparison was hindered by dissimilar reporting formats and varying classification interpretation.

Parris Island reported a 12.6 percent attrition rate for the period while San Diego reported 20.3 percent for the same timeframe. Although the depots accessed roughly the same number of recruits during this interval, San Diego

had over four times the number of waivers submitted by recruiters. Based on the percentage of approved waivers, the authors concluded that the waiver process appeared to be almost automatic at the time with a 93.43 percent approval covering both MCRDs.

Attrition was sub-divided into two types: administrative and training. Administrative causes found during in-processing accounted for 38.4 percent of Parris Island's attrition and 76.7 percent of San Diego's. These causes included fraudulent enlistment and existing medical conditions, among others. San Diego had higher rates in all subcategories, but the fraudulent enlistment rate of 46.5 percent was over five times higher at Parris Island. The biggest cause of the high administrative attrition was attributed to the fact that, at the time of the study, recruiters did not have access to all school or police records and were required to take the applicant's word that there were no blemishes on the individual's record. One of the recommendations was the drafting of congressional legislation to override differing state laws barring recruiters from verifying applicant information.

Training attrition, those who survived past the moment-of-truth, was not sub-categorized. Parris Island reported a 61.6 percent training discharge rate while San Diego averaged 23.3 percent. Neither MCRD maintained records identifying the cause of the training attrite. Because of this, a significant difference (38.3 percentage points) was reported between the two MCRDs but could not be properly explained. Another recommendation from the authors was to develop uniform sub-categories for training

attrition such as physical fitness, mental, rifle range failure etc., in order to allow for future analysis of the causes of training attrition.

In attempting to create SDI profiles, the authors collected more data from the MCRDs. Although this data was similar in form between the two depots, much of it was incomplete. In an effort to add strength and stability to their statistics, the authors imposed rules requiring SDIs to have completed three full training cycles in order to be part of the observed data. This reduced the pool from 540 SDIs in the cycle to an available group of 62. Further exasperating the problem, complete data was only available for 21 of the SDIs. Partial data on six others allowed them to be added into certain categories of the profiling process. High turnover rates were identified as the leading cause of failure to complete three series as a SDI. Procedures required drill instructors (DI) completing DI school to serve as a junior DI for at least one cycle before serving as a SDI. Often, several cycles were completed as a junior DI, resulting in many DIs completing their two-year tour before they could complete three cycles as a SDI.

Using simple descriptive statistics and multiple regressions, the authors examined the effect of rank, years of service, months as a DI, age, and standing in DI school on attrition. Due to a lack of available data, there was no statistical significance found in any of the variables. The authors still contended that SDIs do play a significant role in recruit attrition.

The study offered recommendations that are now part of the recruiting process, such as Congressional legislation

permitting recruiters to obtain police and educational records prior to the applicant shipping to MCRD, uniform data collection from the two MCRDs, and in-depth data collection for MCRD training failures.

3. Quester, North, and Kimble (1990)

CNA completed another research memorandum on attrition, this time observing trends in first term attrition and analyzing the link between recruit background characteristics and Marine Corps environmental variables indicative of successful adjustment to life in the Corps.

Realizing that high school diploma graduates (HSDG) had the highest success rates, the Marine Corps spent the 1980s working to increase the proportion of accessions that were classified as HSDGs. This proportion grew from 64.4 percent in 1979 to 95.0 percent in 1989. In addition, the Marine Corps used the results from Sims (1977) to substantially increase the number of accessions scoring in the top half of the Armed Forces Qualification Test (AFQT). The proportion of those classified as AFQT category I-IIIA (top 50 percent) grew from 44.3 percent in 1979 to 68.0 percent in 1989. The combination of these two variables produces a “high quality” applicant. The percentage of this group accessed grew from only 28.9 percent in 1979 to 62.0 percent in 1989.

For their research, Quester et al. set three measures of success. The first was the completion of the Marine’s first term (45 months of active service). The second measure was completion of a first term and promotion to Corporal (E-4) by month 45 of the initial contract. The final measure looked at reenlistment beyond the first term.

Variables were chosen for the research from Marine Corps administrative records. Variables such as plans for college or holding a steady job, although important, were not used because they were only available form special surveys and not recorded in the administrative database. The variables were grouped into two categories: recruit and Marine Corps background.

Recruit background characteristics were composed of HSDG status, AFQT score, meeting height/weight standards, race, gender, region of origin, marital status, and age at entry. As found in previous studies, HSDG provided the best predictor of for successful completion. In addition, as in prior studies, higher AFQT scores once again indicated higher success rates. As expected, those who entered exceeding weight standards had lower attrition rates.

Marine Corps background variables included whether or not the recruit entered from the DEP, month of the year entered the Corps, and the program for which the recruit enlisted. Within this category, the most important predictor was whether the recruit shipped from the DEP or shipped during the month that he enlisted. This is attributed to the fact that the DEP itself serves as a place to weed out those who may attrite once shipped. Additionally, recruits have had more time to reflect on their decision and have probably received their choice of ship month and/or enlistment program, such as aviation, ground, or open contract.

The overall findings of this study concluded that the characteristics that predicted success in one category could generally be associated with predicting success in

the other categories as well. Those applicants who were HSDGs, scored in the top 50 percent on the AFQT, assessed from the DEP, and those already conforming to weight standards continue to have the highest attrition and retention rates in the Marine Corps. These findings are consistent with other studies completed prior to and since this analysis.

4. Bruno (2005)

In his Naval Postgraduate School thesis, Bruno analyzed many variables considered to affect attrition rates in the DEP based on prior research and his past involvement in the recruiting process. By interacting these variables with each other and variables associated with the day of the month enlisted, Bruno attempted to test for a phenomenon, known as the “hockey stick effect,” which tend to occur in meeting monthly recruiting goals. Simply stated, it describes the end of the month rush to meet each recruiter’s assigned goal, or mission. Just as a hockey stick is level at its base and rises sharply towards the handle, Bruno proposes that the level of work required for recruiters to achieve their mission can be measured in the same fashion.

The data, collected from TFDW for FY00 and FY01, was analyzed to discover if this end of the month drive created an applicant with higher DEP attrition rates than their peers who enlisted earlier in the month. After regressing a multitude of variables, Bruno elected to focus on age, component (active or reserve duty), the number of days between taking the ASVAB and signing the enlistment papers,

AFQT score, and whether the applicant enlisted in the first three weeks of the month or later.

The author created variables to further sub-categorize age, AFQT scores, and the number of days between the time of taking the ASVAB and enlisting. By interacting the variables against each other, he created 56 different groups into which an applicant might fall. Twenty-Five of the groups were for those who enlisted as high school seniors and thirty-one categories were for those who already graduated from high school. For each of these groups, a DEP discharge rate was determined for those who enlisted prior to the last five days of the month and for those enlisting during the last five. By looking at the attrition rates, he developed six categories (three for seniors, three for graduates). The first category exhibited lower attrition rates no matter what day of the month they enlisted. The second category showed higher rates no matter what day they enlisted. The final category experienced lower attrition rates during the first three weeks of the month but higher rates when enlisted at the end of the month, referred to as the high-risk group. In order to show the “hockey stick effect,” the author analyzed the discharge rates over the course of the last ten days. Statistics showed that the level of discharge increased as the days came closer to the end of the month deadline. Bruno proposes that recent drug usage, concealment of past police and/or medical problems, and a quick sell to individuals who are unsure about becoming a Marine are just some of the problems plaguing the end of month applicants.

The author states that past policy to lower DEP attrition was to direct recruiters to spend more time with DEP poolees. This policy, although effective, is counter-productive. Additional time spent with poolees is taken from time that could be spent pursuing better contacts. Marine recruiters already work longer hours and take less leave than recruiters in any other service in order to meet their mission (GAO report GAO/T-NSIAD-00-102, 2000). By identifying those at a higher risk of attrition, recruiters can focus their time on the select few who require the additional attention to stay motivated to ship to MCRD training. Although this would lower attrition, Bruno contends it would not have a significant impact on this high-risk category since the attrition is likely caused by recruiters deciding to accept high-risk applicants in order to meet end of the month goals.

Bruno proposes several additional policies aimed to lower the attrition of the high-risk group. One policy is barring those identified in the high-risk group from enlisting during the last five days of the month. This would prevent gambling to achieve the end of the month goal. An additional recommendation is to require additional screening of these low quality applicants by a Military Entrance Processing Station (MEPS) screening team. Those who do not pass the MEPS screening should be reviewed by the recruiting station Commanding Officer prior to the signing of enlistment paperwork. Although additional work would be required of the command group during the final week, the benefit of reduced attrition would certainly outweigh the costs.

A possible policy also mentioned by Bruno is to reduce the DEP time for low-quality applicants enlisting during the last week of the month. Bruno offers this as an option but states that without further analysis the results cannot be provided. This thesis provides further analysis of the low-quality applicant. After matching categories of recruits with Bruno's DEP categories, there was no significance in the attrition rates. It must be pointed out that this analysis is not complete due to the missing data of applicants who self-selected themselves out of the DEP program. Although the attrition rates do not show significance, it only analyzes those high-risk applicants who elected to ship to a MCRD. For a complete analysis, a prediction model would have to be created to attempt predictions of how well those who self-selected out of the DEP would have done in boot camp. That model is beyond the scope of this thesis.

III. DATA AND METHODOLOGY

A. DATA COLLECTION

The data used for this study was derived from the Marine Corp's Total Force Data Warehouse (TFDW). The data were collected on November 27, 2005, using the most up to date information posted to the master header information file. The data file contained 54,832 observations of those applicants who shipped to recruit training between October 1, 2003 and April 30, 2005. The April cutoff date was chosen to give the cohort of new recruits a full seven months to complete the 11-week training cycle. Also, extra time was given for completion of recruit training to compensate for recruit recycling due to injuries or training failures.

B. DATA SUMMARY

Initially, the data were compiled, analyzed, and validated in Microsoft Excel. Entries with critical missing fields or obviously erroneous entries were deleted. Additional fields were created in order to calculate age and the date of the month when each applicant enlisted. Only Tier one applicants (regular high school graduates, adult diploma holders, and non-graduates with at least 15 hours of college credits) and high-school seniors were included in the data set. Tier two recruits were deleted due to their relatively small numbers. After scrubbing the data, 52,199 observations remained for analysis. Table 3.1 describes the variables downloaded from TFDW as well as those created by the author for use in the multivariate regression models.

Table 3.1 Data Descriptions

Variable	Description
SSN*	=Recruit's Social Security Number
DOB*	=Recruit's Date of Birth
Age**	=Recruit's Age in years
Male**	=1 if Male; 0 otherwise
Female**	=1 if Female; 0 otherwise
Married**	=1 if Married; 0 otherwise
Single**	=1 if Single; 0 otherwise
White**	=1 if White; 0 otherwise
Black**	=1 if Black; 0 otherwise
Other**	=1 if Other; 0 otherwise
Active**	=1 if Active Duty; 0 otherwise
Reserve**	=1 if Reservist; 0 otherwise
AFQT_Score*	=Recruit's AFQT Score
Ship_Date*	=Date Recruit Shipped to MCRD
MCRD_Drop_Date*	=Date Recruit was Discharged from MCRD
Days_At_MCRD_Before_Drop**	=Days Spent at MCRD Before Discharge
MCRD_Drop_Reason*	=Reason Recruit was Discharged from MCRD
MCRD_Graduation_Date*	=Date Recruit graduated MCRD
Senior**	=1 if Enlisted as a Senior; 0 otherwise
Graduate**	=1 if Enlisted after Graduating; 0 otherwise
I**	=1 if Mental_Group I; 0 otherwise
II**	=1 if Mental_Group II; 0 otherwise
IIIA**	=1 if Mental_Group IIIA; 0 otherwise
IIIB**	=1 if Mental_Group IIIB; 0 otherwise
IV**	=1 if Mental_Group IV; 0 otherwise
Date_Of_Enlistment*	=Date Recruit Signed Enlistment Paperwork
Last_Day**	=1 if Enlisted On Last Day of Month; 0 otherwise
Last_2_Days**	=1 if Enlisted During Last 2 Days of the Month; 0 otherwise
Last_3_Days**	=1 if Enlisted During Last 3 Days of the Month; 0 otherwise
Last_4_Days**	=1 if Enlisted During Last 4 Days of the Month; 0 otherwise
Last_5_Days**	=1 if Enlisted During Last 5 Days of the Month; 0 otherwise
Last_6_Days**	=1 if Enlisted During Last 6 Days of the Month; 0 otherwise
Last_7_Days**	=1 if Enlisted During Last 7 Days of the Month; 0 otherwise
Last_8_Days**	=1 if Enlisted During Last 8 Days of the Month; 0 otherwise
Last_9_Days**	=1 if Enlisted During Last 9 Days of the Month; 0 otherwise
Last_10_Days**	=1 if Enlisted During Last 10 Days of the Month; 0 otherwise
Begin_Of_Month**	=1 if Enlisted Prior to the Last 5 Days Of the Month; 0 otherwise
Final_Week**	=1 if Enlisted During the Last 5 Days Of the Month; 0 otherwise

*Field Pulled From TFDW **Field Created by Author

Created by Author

C. DESCRIPTIVE STATISTICS

Descriptive statistics for selected variables from the data file are shown in Table 3.2. As expected, the recruit depots are inhabited by a younger, mostly male population. Over 92 percent of the sample was male and the majority of the recruits were 18 to 20 years olds. White enlistees accounted for 61.4 percent of all new recruits while Black/African-American enlistees made up 6.2 percent of the pool. At the time of enlistment, 62.2 percent were classified as graduates while 37.8 percent were high school seniors. Less than 3 percent of the recruits were married at the time they enlisted. Of the sample, 10.6 percent failed to complete recruit training and are classified as Marine Corps Recruit Depot (MCRD) attrites. High quality recruits, those scoring in the top 50 percent based on their Armed Forces Qualification Test (AFQT) score (Category I-IIIA), (and who were in Tier 1 on the educational credentials) accounted for 70.5 percent of all enlistees.

One interesting observation is that over 30 percent of the sample declined to list their race. When contacted by the author, TFDW administrators noted that this field was the default field when incorrectly left blank, even if entries such as ethnicity were filled in. This is presently being corrected and in the future will reflect a blank field or a choice by the enlistee to decline to indicate his or her race.

Another interesting observation is the number of applicants that enlisted toward the end of the month. Six percent enlisted on the last day of the month. Also, over one-quarter of all enlistees signed within the last five

days of the month, and almost one-half of the applicants enlisted within the last ten days of the month.

Table 3.2 Descriptive Statistics of Variables and Discharge Rate for Each Demographic Group

Variable	Percent of Sample (%)	Discharge Rate (%)
Age		
< 19	64.24*	8.86
< 22	85.53*	11.50
< 28	99.04*	12.63
< 36	100.0*	14.43
Gender		
MALE	92.94	9.90
FEMALE	7.06	20.11
Marital Status		
SINGLE	96.72	10.47
MARRIED	2.84	15.50
Race		
WHITE	61.41	10.62
BLACK	6.21	12.98
OTHER	2.28	8.49
DECLINED	30.10	10.29
Component		
ACTIVE	83.69	10.75
RESERVE	16.31	9.92
Mental Group (AFQT Score)		
I	6.06	9.11
II	38.66	9.49
IIIA	25.79	10.88
IIIB	28.75	12.16
IV	0.75	12.85
Day of Month Enlisted		
LAST_DAY	6.81*	11.25
LAST_5_DAYS	25.46*	10.85
LAST_10_DAYS	48.10*	10.70
Education Code		
SENIOR	37.81	9.21
GRADUATE	62.19	11.47
Attrition		
DISCHARGE	10.62	

N=52199
*Percentage is cumulative

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The quantity and percentage of discharges by level of education (high-school senior versus high-school graduate), gender and race, and day of month enlisted are listed in Table 3.3 through Table 3.6. The data show that the number and percentage of discharges is relatively proportional to the group's proportion of the sample For example, in Table 3.3, seniors account for 37.81 percent of all enlistees in the sample and make up 32.80 percent of the attrites (9.21 percent attrition rate). Graduates make up the remaining 62.19 percent while accounting for 67.20 percent of all discharges during the period (11.47 percent attrition rate)...

Table 3.3 Number and Percentage of Attrites by Education Level

Education Level	Quantity	Percentage
Senior	1818	32.80%
Graduate	3724	67.20%
Total	5542	100.00%

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Table 3.4 separates attrites by gender. Females represent 7.06 percent of the enlisted sample and 13.37 percent all attrites (20.11 percent attrition rate). Male enlistees make up 92.94 percent of recruits while accounting for 86.63 percent of all discharges during the period (9.90 percent attrition rate).

Table 3.4 Number and Percentage of Attrites by Gender

Gender	Quantity	Percentage
Female	741	13.37%
Male	4801	86.63%
Total	5542	100.00%

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Table 3.5 shows that white enlistees make up 61.41 percent of the sample and 61.40 percent of the attrites (10.62 percent attrition rate). Blacks account for 6.21 percent of all enlistees and 7.60 percent of all attriters (12.98 percent attrition rate). Those who declined to respond to race accounted for 30.10 of enlistees and 29.18 of those discharged (10.29 percent attrition rate). Asians, Hawaiians, and Native Americans were classified as other and account for 2.28 percent of the sample and combined to account for 1.77 percent of those who failed to graduate (8.49 percent attrition rate).

Table 3.5 Number and Percentage of Attrites by Race

Race	Quantity	Percentage
Native American	23	0.42%
Asian	61	1.10%
Black	421	7.60%
Hawaiian	14	0.25%
White	3403	61.40%
Declined	1617	29.18%
Unknown	3	0.05%
Total	5542	100.00%

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Table 3.6 shows that recruits who enlisted on the last day of the month accounted for 6.81 percent of the sample and 7.22 percent of the attriters (11.25 percent attrition rate). Those enlisting during the last week totaled 25.46 percent of the sample and 26.02 percent of the discharges (10.85 percent attrition rate). Recruits who enlisted during the last ten days of the month made up 48.10 percent of the sample and 48.48 percent of the discharges (10.70 percent attrition rate).

Table 3.6 Number and Percentage of Attrites by Day of Month Enlisted

Day of Month	Quantity	Percentage
Last Day	400	7.22%
Final Week	1442	26.02%
Last 10 Days	2687	48.48%
Total	5542	100.00%

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D. METHODOLOGY

To test the impact of the day of the month of enlistment on MCRD attrition, multiple regression analysis was chosen because of its ability to explicitly control for the countless factors that simultaneously affect the dependent variable (Wooldridge, 68), in this case attrition. A LOGIT model was specified using a binary dependent variable (DISCHARGE) regressed on a variable denoting which day of the month an applicant enlisted along with several demographic variables (AGE, GENDER, RACE etc).

The estimated equation is defined as:

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \ldots \hat{\beta}_k x_k$$

where $\hat{y}$ is the predicted probability of discharge, $\hat{\beta}_0$ is the intercept, $\beta_1 - \beta_x$ are parameters that measure the predicted change in the probability of discharge when an independent variable $x_1 - x_k$ increases by one unit (Wooldridge, 241).

IV. MODEL ESTIMATION

A. MODELS

To determine if recruits who enlisted at the end of the month exhibited higher Marine Corps Recruit Depot (MCRD) attrition rates than those who enlisted earlier in the month, a binary variable (DISCHARGE) was regressed on different factors that were identified in the literature review (see above) as predictors of attrition. Three versions of the model were run. The models were identical except that the variable indicating day of month enlisted varied. Table 4.1 lists the differences in each model, numbering them for easy reference. All of the control variables in the model were identical

Table 4.1 Description of Attrition Models

Model	Time of Month Variable
1	LAST_DAY (Base Model)
2	FINAL_WEEK
3	LAST_10_DAYS

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B. MODEL SPECIFICATION

For the base model (model 1), the binary discharge variable (DISCHARGE) was regressed on gender (FEMALE), education level (GRADUATE), age (AGE), Armed Forces Qualification Test (AFQT) score (AFQT_SCORE), component (ACTIVE), race indicators (BLACK, OTHER, DECLINED), and a variable identifying marital status at entry (MARRIED). In addition, a binary variable identifying time of month

enlisted was also included (LAST_DAY). The specification for model 1 is as follows:

$$\text{DISCHARGE} = \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{GRADUATE}) + \beta_3(\text{AGE}) + \beta_4(\text{AFQT\_SCORE}) + \beta_5(\text{ACTIVE}) + \beta_6(\text{BLACK}) + \beta_7(\text{OTHER}) + \beta_8(\text{DECLINED}) + \beta_9(\text{MARRIED}) + \beta_{10}(\text{LAST\_DAY})$$

where all variables are defined in table 4.2

Model 2 and model 3 have the same specification, with the exception of the end-of-the month variable. In model 2, FINAL_WEEK is used whereas in model 3 LAST_10_DAYS is used.

C. HYPOTHESIS AND DESCRIPTIVE STATISTICS

1. Hypothesis

The hypothesis of this study is:

- Ho: Recruits enlisted towards the end of the month have the same MCRD attrition rates as those recruited prior to the last ten days of the month.
- H1: MCRD attrition rates are affected by the "hockey stick effect." Recruiters, under pressure from end-of-month-goals, enlist lower quality recruits at the end of the month to meet their mission. This results in a statistically different attrition rate.

2. Variable Description

Table 4.2 describes the variables used in basic model. Variables used in the model were included because they had been found to be significant predictors of attrition in previous research.

Table 4.2 Description of Basic Predictor Variables

Variable	Description
Gender	
MALE	=1 if male; 0 otherwise
FEMALE	=Female is omitted category
Education Code	
GRADUATE	=1 if HS graduate; 0 otherwise
SENIOR	=HS senior is omitted category
Age	
AGE	=Age at enlistment (in years)
AFQT	
AFQT_SCORE	=Numeric score from the ASVAB
Component	
ACTIVE	=1 if enlisted for active duty; 0 otherwise
RESERVE	=Recruit enlisted as a reservist is omitted category
Race	
WHITE	=Recruit was white is omitted category
BLACK	=1 if recruit was black; 0 otherwise
OTHER	=1 if recruit was Asian, Pacific Islander, or Native American; 0 otherwise
DECLINED	=1 if declined to answer; 0 otherwise
Marital Status	
SINGLE	=Recruit was single is omitted category
MARRIED	=1 if recruit while married; 0 otherwise
Day Enlisted	
BEGIN_OF_MONTH	=Enlisted during first 3 weeks of the month was omitted
LAST_10_DAYS	=Enlisted during the last 10 days of the month
FINAL_WEEK	=Enlisted during the last 5 days of the month
LAST_DAY	=1 if enlisted on last day of month
Attrition	
DISCHARGE	=1 if recruit discharged before graduating MCRD; 0 otherwise

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3. Descriptive Statistics

The base model descriptive statistics are listed in Table 4.3. Each variable is listed along with its mean, and standard deviation and minimum and maximum. With the exception of AGE and AFQT_SCORE, all variables are binary

dummy variables, defined to have a value of zero if the recruit does not fit that variable and a value of one if the recruit does fit.

Table 4.3 Model 1 Descriptive Statistics

Variable	Mean	Std Dev	Min	Max
MALE	0.92940	0.25615	0	1
GRADUATE	0.62187	0.48492	0	1
AGE	19.48392	2.18728	17	35
AFQT_SCORE	61.83931	18.82231	21	99
ACTIVE	0.83687	0.36948	0	1
BLACK	0.06215	0.24142	0	1
OTHER	0.02280	0.14926	0	1
DECLINED	0.30100	0.45870	0	1
MARRIED	0.02843	0.16620	0	1
LAST_DAY	0.06814	0.25199	0	1
FINAL_WEEK	0.25460	0.43564	0	1
LAST_10_DAYS	0.48101	0.49964	0	1
DISCHARGE	0.10617	0.30806	0	1

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The means in Table 4.3 indicate that males account for 92.94 percent of the sample while graduates make up 62.18 percent of all enlistees. The average recruit is 19.48 years old and received a 61.84 AFQT score. Those who enlisted for active duty make up 83.69 percent of the population. Over 6 percent of recruits are black, while 2.28 percent are other (Asian, Pacific Islander, or Native American). Married enlistees accounted for 2.84 percent of all recruits. Of those who shipped to MCRD during the period, 6.81 percent enlisted on the final day of the month. Over 25 percent enlisted during the final week and 48.10 percent enlisted during the last ten days.

4. Hypothesized Relationships of Variables

The hypothesized relationships between MCRD attrition and the various explanatory variables are shown in Table 4.4. This section provides an explanation for the hypothesized effect of each variable.

Table 4.4 Hypothesized Relationships

Variable	Hypothesized Relationship
MALE	+
GRADUATE	+
AGE	-
AFQT_SCORE	+
ACTIVE	+
BLACK	-
OTHER	Unknown
DECLINED	Unknown
MARRIED	+
LAST_DAY	-
FINAL_WEEK	-
LAST_10_DAYS	-

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a. Gender

The variable for gender equals one if the recruit is male. Due to the military predominantly being a male environment, it is expected that female recruits will attrite at a rate higher than their male counterparts will. This hypothesis is also supported by prior research cited in the literature review. In addition, pregnancy is an added barrier for female recruits, accounting for almost 2 percent of female attrition. Attrition codes confirmed that these pregnancies did not occur after the female

shipped to MCRD. The unknown pregnancy was discovered during the medical screening, but the recruit shipped to recruit training before the disclosure was made, thus affecting the MCRD attrition rate.

b. Education Code

Variables identifying education code separate those who enlisted while still in high school from those who graduated previously. Due to high school seniors usually having more time to consider their choice and their younger age while undergoing training, it is expected that they will have a lower attrition rate than graduates.

c. Age

The AGE variable identifies the recruit's age in years at the time of enlistment. The Marine Corps is restricted from enlisting applicants who are under the age of 17 or older than 35. For a number of reasons, previous studies show that attrition rates increase with age. Part of this higher attrition may be due to physical abilities and limitations. In the past, recommendations have been made to restrict accessions of older recruits during times of surplus applicants (Quester, 1993).

d. AFQT Score

An applicant's AFQT score affects attrition in two ways. One of the Marine Corps' recruiting goals is to attract the brightest, best-qualified applicants. Recruiting smarter applicants may lower the rate of attrition. On the other hand, brighter enlistees with a

higher AFQT may have superior opportunities in the civilian sector such as better paying jobs and the prospect of college, which may increase their chances of attrition. Conversely, applicants with lower AFQT scores may have greater incentives to complete the training since they have poorer civilian opportunities, causing a positive correlation between AFQT and attrition.

e. Component Code

The variable ACTIVE is expected to be negatively associated with DISCHARGE. Applicants enlisting as a reservist may enlist only to receive money for college. Some were originally active duty enlistees who desired to drop from the Delayed Entry Program (DEP), only to be resold on the enlistment by their recruiter trying to keep mission numbers high.

f. Race

Race is captured by a set of dummy variables, indicating whether the recruit is white, black, other race, or declined to respond. The variable OTHER includes American Indians, Native Alaskans, Hawaiian and other Pacific Islanders, and Asians. Past research has shown minorities tend to have lower attrition rates. This has been attributed to the gap theory and fewer employment and educational opportunities in the civilian work force. In addition, some cultures show a stronger sense of commitment and work ethic, increasing the probability that they will successfully complete the training (Hattiangadi, Lee, and Quester, 2004).

g. Marital Status

The marital status dummy variable equals one for married recruits. Married recruits have others who depend on them and thus may have a stronger desire for employment. They may also possess an additional level of maturity over single recruits. Thus, married recruits are expected to have a lower attrition rate from the MCRD.

h. Day of the Month Enlisted

To test the hypothesis that applicants who enlist at the end of the month attrite at a higher rate, three different binary variables were created to measure the effect of enlisting towards the end of the month. LAST_DAY represents those who enlisted on the last day of the month. FINAL_WEEK corresponds to applicants enlisting during the last five days of the month, to include the last day. LAST_10_DAYS indicates the group of applicants who enlisted during the last ten days of the month, including the final week and the last day. It is expected that since such a large portion (almost half) of the population enlisted during the last third of the month the association between attrition and all three of the end-of-month variables will be positive.

D. INTERPRETING THE BASIC MODEL RESULTS

1. Evaluation

Results of estimating model 1 are listed in Table 4.5 and Table 4.6. Table 4.5 lists the parameter estimate (β) and the standard error for each β, while Table 4.6 displays odds ratios and marginal effects.

The odds ratio compares the probability of MCRD discharge rates being the same for the base case and the characteristic represented by the independent variable. A ratio of one indicates that the probability is the same. An odds ratio greater than one implies that the discharge rate probability is greater for the base case. A number less than one indicates a greater probability for the independent variable than that of the base case.

Marginal effects show the effect the independent variable has on the probability of MCRD attrition. In particular, the marginal effect provides the effect of a one unit change in the independent variable on the probability of attrition.

Statistical significance is determined by evaluating the p-value (Pr > ChiSq). Asterisks indicate variables that are statistically significant and the level of significance shown. The smaller the value, the stronger the evidence that the null hypothesis (H_o) should be rejected. Usual cutoff limits for significance are:

- p-value > 0.1 indicates some evidence against H_o.
- 0.05 < p-value ≤ 0.1 indicates greater significance against H_o.
- 0.01 < p-value ≤ 0.05 indicates moderate significance against H_o.
- 0.001 < p-value ≤ 0.01 indicates strong significance against H_o.
- p-value < 0.001 indicates very strong evidence against H_o (Jaisingh, 2000).

To summarize the results, based on the decision guidelines, the results in Tables 4.5 through 4.10 indicate that the null hypothesis cannot be rejected that the estimated coefficient for LAST_DAY, FINAL_WEEK, or LAST_10_DAYS is statistically different from zero. The results show that it cannot be concluded that the day of enlistment has a statistically significant effect on the MCRD attrition rate.

Table 4.5 Model 1 LOGIT Results (LAST_DAY)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.1636	0.1488	211.4768	<.0001
MALE	-0.8174	0.0442	341.9925	<.0001*
GRADUATE	0.1098	0.0354	9.6549	0.0019*
AGE	0.0555	0.00726	58.5229	<.0001*
AFQT_SCORE	-0.00735	0.00078	88.7405	<.0001*
ACTIVE	0.0793	0.0401	3.9116	0.048**
BLACK	0.0944	0.0564	2.7992	0.0943***
OTHER	-0.2687	0.1062	6.4046	0.0114**
DECLINED	-0.0456	0.0322	2.013	0.156
MARRIED	0.1889	0.0768	6.0439	0.014**
LAST_DAY	0.0128	0.0556	0.0527	0.8184
N=52,199		*significant at .01 level		
Chi-square=554.3975		**significant at .05 level		
DF=10 p=<.0001		***significant at .10 level		

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Estimated Logit coefficients are presented in Table 4.5 for the model that includes the LAST_DAY variable. The estimated coefficients are used to compute marginal effects, which show the effect of the independent variable on MCRD attrition. Marginal effects are displayed in Table

4.6, column 2. The variable MALE from Table 4.6 has a marginal effect of -0.0548, indicating that male recruits are 5.48 percentage points less likely to attrite from recruit training than females. The full results of Table 4.5 and 4.6 are discussed in section D.3 of this chapter.

Table 4.6 Model 1 Odds Ratio and Marginal Effects (LAST_DAY)

Effect	Odds Ratios	Marginal Effects
MALE	0.442	-0.05477
GRADUATE	1.116	0.01061
AGE	1.057	0.15007
AFQT_SCORE	0.993	-0.03508
ACTIVE	1.083	0.00757
BLACK	1.099	0.00906
OTHER	0.764	-0.02232
DECLINED	0.955	-0.00414
MARRIED	1.208	0.01882
LAST_DAY	1.013	0.00119

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The results of model 2, which exams the attrition effects of recruits who enlisted during the final week of the month, are listed in Table 4.7 and Table 4.8. The full results of both tables are discussed in section D.3 of this chapter.

Table 4.7 Model 2 LOGIT Results (FINAL_WEEK)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.1636	0.1489	211.0870	<.0001
MALE	-0.8175	0.0442	342.0743	<.0001*
GRADUATE	0.1100	0.0353	9.6763	0.0019*
AGE	0.0555	0.00726	58.5769	<.0001*
AFQT_SCORE	-0.00735	0.00078	88.8797	<.0001*
ACTIVE	0.0794	0.0401	3.9171	0.0478**
BLACK	0.0943	0.0564	2.7982	0.0944***
OTHER	-0.2688	0.1062	6.4087	0.0114**
DECLINED	-0.0457	0.0322	2.0201	0.1552
MARRIED	0.1889	0.0768	6.0427	0.0140**
FINAL_WEEK	0.00221	0.0327	0.0046	0.9461
N=52,199		*significant at .01 level		
Chi-square=554.3495		**significant at .05 level		
DF=10 p=<.0001		***significant at .10 level		

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Table 4.8 Model 2 Odds Ratios and Marginal Effects (FINAL_WEEK)

Effect	Odds Ratios	Marginal Effects
MALE	0.442	-0.05478
GRADUATE	1.116	0.01062
AGE	1.057	0.15018
AFQT_SCORE	0.993	-0.03510
ACTIVE	1.083	0.00757
BLACK	1.099	0.00905
OTHER	0.764	-0.02233
DECLINED	0.955	-0.00415
MARRIED	1.208	0.01882
FINAL_WEEK	1.002	0.00020

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The results of Model 3, which examines the attrition effects of those who enlisted during the last ten days of the month, are listed in Table 4.9 and Table 4.10. The results of both tables are discussed more fully in section D.3 of this chapter.

Table 4.9 Model 3 LOGIT Results (LAST_10_DAYS)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.1607	0.1493	209.4616	<.0001
MALE	-0.8176	0.0442	342.1511	<.0001*
GRADUATE	0.1100	0.0353	9.6885	0.0019*
AGE	0.0556	0.00726	58.6818	<.0001*
AFQT_SCORE	-0.00736	0.000780	88.0695	<.0001*
ACTIVE	0.0793	0.0401	3.9080	0.0481**
BLACK	0.0944	0.0564	2.8029	0.0941***
OTHER	-0.2690	0.1062	6.4198	0.0113**
DECLINED	-0.0459	0.0322	2.0383	0.1534
MARRIED	0.1890	0.0768	6.0456	0.0139**
LAST_10_DAYS	0.00549	0.0286	0.0367	0.8480
N=52,199		*significant at .01 level		
Chi-square=554.3975		**significant at .05 level		
DF=10 p=<.0001		***significant at .10 level		

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Table 4.10 Model 3 Odds Ratios and Marginal Effects (FINAL_WEEK)

Effect	Odds Ratios	Marginal Effects
MALE	0.441	-0.05492
GRADUATE	1.116	0.01065
AGE	1.057	0.15063
AFQT_SCORE	0.993	-0.03520
ACTIVE	1.083	0.00759
BLACK	1.099	0.00909
OTHER	0.764	-0.02240
DECLINED	0.955	-0.00417
MARRIED	1.208	0.01887
LAST_10_DAYS	0.995	0.00050

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2. Base Case Individual

The “base case” recruit establishes the baseline probability of attrition. The base line recruit is described as a single, white female who enlisted as a senior in high school. The recruit enlisted prior to the last 10 days of the month for duty in the Marine Corps Reserves. She is of average age and AFQT score as listed in Table 4.3.

3. Variable Interpretation

a. Gender

Tables 4.5, 4.7, and 4.9 indicate that, as expected, females in this study have a higher attrition rate than their male recruit counterparts. The marginal effects of all three models indicate that males are 5.48 percentage points less likely to attrite than females,

ceteris paribus. This supports the hypothesis that female recruits are more likely to attrite than male recruits.

b. Education Code

Recruits who enlisted after graduating high school are 1.06 percentage points more likely to attrite from recruit training. It may be that, after waiting in the DEP for up to a year, a recruit has had plenty of time to consider his decision whereas a graduate may enlist more hastily to get money for bills and with less time to consider all options. Once at recruit training, the graduate may second guess the decision and fall out of training.

c. Age

Not surprisingly, age was highly correlated with the discharge rate. The base case age for all three models was 19.48 years. For each additional year of age, the odds of attriting increase 15 percentage points. This supports the hypothesis that younger recruits are better suited to successfully complete recruit training than older recruits.

d. AFQT Score

AFQT also was a significant predictor of training attrites. For a one-point increase in AFQT score, the attrition rate was reduced by 3.51 percentage points. This supports the hypothesis that AFQT is a good predictor of MCRD attrition.

e. Component Code

There was some statistical significance between recruits who enlisted for duty as a reservist and those who enlisted for active duty. Active duty recruits are 0.01 percent more likely to attrite than reservists are. It may be that those enlisting for college benefits do not have other means of attending and are more committed to success to obtain that benefit. While this is of moderate statistical significance, there is not much practical importance.

f. Race

The statistical significance of the race variables differed considerably. There was no difference in attrition between the base case and those who 'declined to respond'. However, attrition rates for Black recruits had an attrition rate that was 0.01 percentage points higher than the base case and this difference was statistically significant. Those classified as "other" also showed some significance, but were 0.02 percentage points less likely to fall out of recruit training than the base case.

g. Marital Status

Being married at the time of enlistment showed some predictive power with the attrition rate 0.02 percentage points higher for single recruits. It may be that distractions from home outweigh the desire to provide for the future of their family.

h. Day of the Month Enlisted

Surprisingly, none of the variables measuring end-of-month enlistment were statistically significant predictors of attrition. Of all variables tested, those indicating end of the month of enlistment revealed the lowest significance levels.

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V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

After analyzing the effect of the day-of-month enlistment on Marine Corps Recruit Depot (MCRD) attrition, the data provide the following conclusions.

- Most importantly, the day of the month a recruit enlists was not a significant predictor of the attrition probability. This study looked at several different variables that captured the effect of the end-of-the-month of enlistment, including last day of the month, last week of the month, or last ten-days of the month. There was no evidence found to suggest any significant relationship between an end-of-the-month enlistment and MCRD attrition.
- As noted in previous studies, female recruits are almost 5.5 percentage points more likely than males to attrite from recruit training.
- Race is of statistical, but not practical, significance. Black recruits are 0.01 percentage points more likely to fail to graduate than white recruits. On the other hand, Asians, Pacific Islanders and Native Americans are 0.02 percentage points more likely to complete recruit training that white recruits.
- As expected, younger recruits are more likely to succeed at recruit training than are older recruits. For every one-year increase in a recruit’s age, the probability that a recruit

will fail to graduate from recruit training increases by 15 percentage points.

- The data show a recruit's Armed Forces Qualification Test (AFQT) score is an accurate predictor of success at recruit training. For the sample, a one-point increase in AFQT score reduced the likelihood of failing MCRD training by 3.51 percentage points.

B. CONCLUSIONS

The results of this study show that there is no statistically significant effect of the day of the month a recruit enlists and the attrition rate at recruit training. The initial purpose of this study was to provide data to extend previous research on Delayed Entry Program (DEP) attrition rates (Bruno, 2005). Bruno found that a small percentage of applicants who enlisted during the last week of the month had high DEP attrition rates.

Bruno also created many sub-groups of individuals with selected characteristics who enlisted during the last days of the month and found that many of the sub-groups had high DEP attrition risk. This thesis attempted to create the same sub-groups as in Bruno and assess their MCRD attrition risk. As in the overall results, the statistical analysis of the numerous sub-groups could find no statistically significant predictive factors based on the time of the month of enlistment. The statistical output for these subgroups is listed in the tables located in Appendix A and Appendix B.

Chapter II pointed out that one major reason this thesis found no effect of pre-service characteristics on

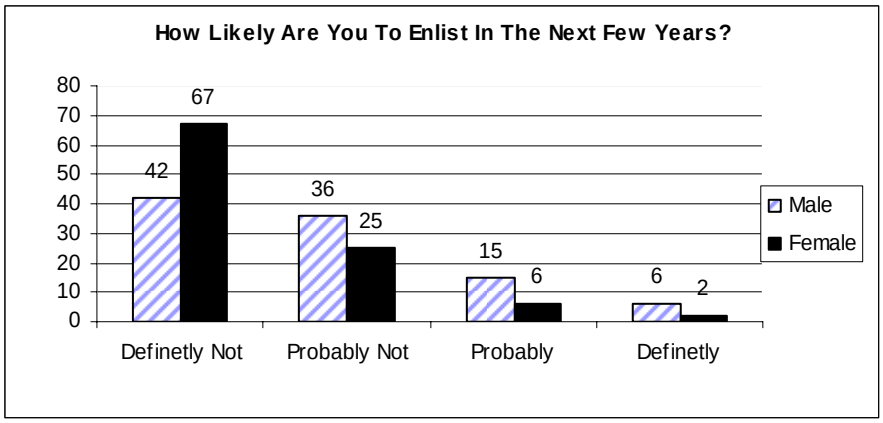
MCRD attrition is selection of individuals who leave the DEP. That is, members of an initial entry cohort who attrite from the DEP are no longer reflected in the cohort members who continue onto recruit training. The remaining group has a much stronger taste for the military than those who selected out of the DEP. Thus, their propensity to remain in the military is much higher than the average recruit who enters the Delayed Entry Pool.

The results cannot be used to support Bruno's recommendation of shipping the high-category recruits to MCRD earlier than their peers as a policy of lowering the DEP attrition rate. The data show that, although primarily used as a tool to plan for even shipment of recruits to MCRD throughout the year, the DEP also provides an effective screening mechanism. Instead of being alarmed by the high DEP attrition rates, they may be viewed as an overhead cost. Shipping the high-risk applicants early may lower DEP attrition but only at the expense of higher MCRD attrition. This will not solve anything because any increase in the MCRD attrition rate will significantly cost the Marine Corps more than an equivalent amount of DEP attrition. Bruno conservatively estimated that each applicant discharged from the DEP cost the Marine Corps over $1,200. This cost is significantly higher for MCRD attrition. Not only is the $1,200 loss still realized, but the additional costs associated with training are added as well. Those who attrite towards the end of training cost the Marine Corps in excess of $15,000 per recruit attrite.

The majority of the demographic variables examined in this study indicated the same relationships with attrition as in prior research. Women have historically attrited at

rates higher than their male counterparts. Females have a lower propensity to enlist in the military according to the 2005 Youth Poll Report, shown in Figure 5.1. According to the poll, 21 percent of male respondents indicated it was likely they would enlist, while only 8 percent of females said they would enlist (Department of Defense Youth Poll, 2005). This large difference in taste for the military may play a role in attrition rates. If some women do not consider the military as a future option, it may be that once females do enlist, they may second-guess their decision which affects their ability to successfully complete training.

Figure 5.1 Propensities to Enlist



After Department of Defense Youth Poll, June 2005

Race also was a significant predictor of the attrition rate of recruits. Black recruits attrited at a rate slightly higher than whites, while Asian, Pacific Islander, and Native American recruits performed better than both groups. While some of these effects are statistically

significant, it is doubtful that the Marine Corps would consider policy changes that would adversely affect equal opportunity for all races.

C. RECOMMENDATIONS

1. Changes to the DEP

As previously mentioned, the DEP, although not initially intended to serve as a screening mechanism, actually performs that function rather effectively. Rather than complain about high attrition rates, the Marine Corps may be best served to ensure the DEP is doing all it can to filter out applicants who may not complete recruit training.

In June 2005, the Marine Corps Recruiting Command published MCRCO 1133.1A, containing instructions for implementing a structured pool program. The command states in the mission paragraph the requirement to reduce both DEP and MCRD attrition by implementing a well-run pool program. The order is vague enough to allow each recruiting station commander to run the program as seen fit, within guidelines set by the national level. It sets requirements for check-in and check-out policies, and mandates a newsletter and minimal activities. It mandates continuous screening and a system for risk assessment for those meeting attrition profiles. In closing, the order states a desired result that DEP attrition must remain low. By requiring low DEP attrition goals, all other functions are set around that goal. The question remains, will recruiters actually screen-out applicants after working so hard to enlist them in fear of a higher rate?

To be effective, the DEP should be organized at the national level for uniformity, but allow for flexibility at the district level. A cost estimate should be conducted to determine the feasibility of adding additional recruiters to manage the program, allowing the "street recruiters" to focus on obtaining new contracts. Recruiters assigned to the DEP can perform the duties of running an enhanced DEP, mentoring and training poolees and educating parents, thereby increasing support for the poolee to succeed at MCRD training. These recruiters would objectively screen for indicators of performance, contact the enlisting recruiter when problems arise, and assist in correcting problems that allow applicants to continue in the DEP. Focusing on poolees might improve DEP attrition without adversely affecting the attrition rate at MCRD.

Adding additional recruiters does increase costs and takes away Marines from deploying units, but if it reduces attrition, the benefits may be found to outweigh the costs. An additional option is to rotate the duty by allowing recruiters to focus on new applicants for a period of time, then focusing on the DEP poolees for another period of time. This would allow a break in the stressful daily routine of most recruiters. It should be determined if this break allows recruiters a chance to re-energize their efforts, or if their recruiting rhythm is disrupted, adding additional stress when they return to their region.

2. MCRD Experiment

A second recommendation is to implement a pilot test of a recommendation from earlier research (Bruno, 2005). Bruno identified several sub-groups of applicants

exhibiting high DEP attrition rates when enlisted during the final week of the month. This thesis recreated those demographic sub-groups and found that recruits who exhibit these same characteristics have the same chance of success once they ship to MCRD. The missing, highly important piece is how those who self-selected out of the DEP would have fared had they actually shipped to recruit training.

Rather than institute a nationwide policy that could potentially have serious negative effects, recruiting command might select one recruiting district for a pilot program. Applying the filters in Bruno's thesis, those who fall into the high-risk category can be identified and shipped at a rate faster than their peers. Company commanders could closely monitor those recruits during the training process for any adverse affects. Observation would be required to ensure that if the propensity to attrite is still higher than average, that this group of recruits does not plague the pool of recruits who would normally have normal expectations of successful completion of the training.

If the attrition rates do not increase, the pilot program could be expanded to additional recruiting districts. On the other hand, if attrition rates climb, the program could be terminated before serious attrition problems arise and additional burdens are placed on MCRD.

An additional approach related to this recommendation is to study how well enlistees would do if they had not self-selected out of the DEP and instead had shipped to recruit training. Once completed, the results of this

research can be combined with the results of Bruno's study to determine if policy changes can be recommended to lower attrition.

As noted in other studies, recruiting is not projected to get any easier in the near future. To make recruiting efforts effective and efficient, the Marine Corps must do everything possible to ensure interested applicants ship to MCRD and complete their required training. Future research into why enlistees leave the DEP or attrite form recruit training would enhance the recruiting and training process.

APPENDIX A: STATISTICAL RESULTS FOR HIGH SCHOOL SENIOR RISK CATEGORIES

Tables A.1 through A.9 list the results for the sub-groups that match the demographic sub-groups created by Bruno in his Naval Postgraduate School thesis on DEP attrition. Risk Category 1 represents those enlistees who have low Delayed Entry Program (DEP) attrition rates that are not affected by day-of-the-month variables. Risk Category 3 represents enlistees that exhibit high DEP discharge rates that are not affected by day-of-the-month variables. Risk Category 2 represents enlistees who exhibit low DEP attrition rates during the first three weeks of the month but exhibit high DEP discharge rates when enlisted during the final week of the month. Tables A.1 through A.3 list the results of a sample of seniors using the variable FINAL_WEEK. Tables A.4 through A.6 list the results for seniors using the variable LAST_DAY. Tables A.7 through A.9 show the results of seniors testing the variable FINAL_10_DAYS. For a detailed breakdown of the variables associated with each risk category, see Bruno, 2005.

Table A.1 Senior Risk Categories (FINAL_WEEK)

Variable	Mean	Std Dev	Min	Max
RISK_CAT_1_FINAL_WEEK	0.1419090	0.3489656	0	1
RISK_CAT_2_BEGIN_OF_MONTH	0.0112473	0.1054581	0	1
RISK_CAT_2_FINAL_WEEK	0.0047624	0.0688473	0	1
RISK_CAT_3_BEGIN_OF_MONTH	0.3003344	0.4584150	0	1
RISK_CAT_3_FINAL_WEEK	0.0931705	0.2906786	0	1

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Table A.2 Senior Risk Categories LOGIT Results (FINAL_WEEK)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.3273	0.0373	3883.7857	<.0001
RISK_CAT_1_FINAL_WEEK	0.1056	0.0738	2.0518	0.1520
RISK_CAT_2_BEGIN_OF_MONTH	0.3077	0.2120	2.1058	0.1467
RISK_CAT_2_FINAL_WEEK	0.1991	0.3366	0.3500	0.5541
RISK_CAT_3_BEGIN_OF_MONTH	0.0651	0.0580	1.2562	0.2624
RISK_CAT_3_FINAL_WEEK	-0.00986	0.0904	0.0119	0.9131
N=19,738		*significant at .01 level		
Chi-square=12129.681		**significant at .05 level		
DF=5 p=0.4611		***significant at .10 level		

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Table A.3 Senior Risk Categories Odds Ratio Estimates and Marginal effects (FINAL_WEEK)

Effect	Odds Rates	Marginal Effect
RISK_CAT_1_FINAL_WEEK	1.111	-0.000004
RISK_CAT_2_BEGIN_OF_MONTH	1.360	0.017497
RISK_CAT_2_FINAL_WEEK	1.220	0.008932
RISK_CAT_3_BEGIN_OF_MONTH	1.067	0.005408
RISK_CAT_3_FINAL_WEEK	0.990	-0.000799

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Table A.4 Senior Risk Categories (LAST_DAY)

Variable	Mean	Std Dev	Min	Max
RISK_CAT_1_LAST_DAY	0.0342993	0.1820015	0	1
RISK_CAT_2_BEGIN_OF_MONTH	0.0112473	0.1054581	0	1
RISK_CAT_2_LAST_DAY	0.0013173	0.0362710	0	1
RISK_CAT_3_BEGIN_OF_MONTH	0.3003344	0.4584150	0	1
RISK_CAT_3_LAST_DAY	0.0225960	0.1486154	0	1

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Table A.5 Senior Risk Categories LOGIT Results (LAST_DAY)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.3161	0.0314	5453.8844	<.0001
RISK_CAT_1_LAST_DAY	0.0216	0.1369	0.0249	0.8745
RISK_CAT_2_BEGIN_OF_MONTH	0.2961	0.2111	1.9679	0.1607
RISK_CAT_2_LAST_DAY	0.8813	0.4986	3.1247	0.0771
RISK_CAT_3_BEGIN_OF_MONTH	0.0539	0.0544	0.9802	0.3221
RISK_CAT_3_LAST_DAY	0.2240	0.1546	2.0982	0.1475
N=19,738		*significant at .01 level		
Chi-square=12127.599		**significant at .05 level		
DF=5 p=0.2420		***significant at .10 level		

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Table A.6 Senior Risk Categories Odds Ratio Estimates and Marginal effects (LAST_DAY)

Effect	Odds Rates	Marginal Effect
RISK_CAT_1_LAST_DAY	1.022	0.00178
RISK_CAT_2_BEGIN_OF_MONTH	1.345	0.02732
RISK_CAT_2_LAST_DAY	2.414	0.10255
RISK_CAT_3_BEGIN_OF_MONTH	1.055	0.00450
RISK_CAT_3_LAST_DAY	1.251	0.02007

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Table A.7 Senior Risk Categories (LAST_10_DAYS)

Variable	Mean	Std Dev	Min	Max
RISK_CAT_1_LAST_10_DAYS	0.2728240	0.4454224	0	1
RISK_CAT_2_BEGIN_OF_MONTH	0.0112473	0.1054581	0	1
RISK_CAT_2_LAST_10_DAYS	0.0088155	0.0934784	0	1
RISK_CAT_3_BEGIN_OF_MONTH	0.3003344	0.4584150	0	1
RISK_CAT_3_LAST_10_DAYS	0.1847705	0.3881211	0	1

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Table A.8 Senior Risk Categories LOGIT Results (LAST_10_DAYS)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.3019	0.0413	3100.8994	<.0001
RISK_CAT_1_LAST_10_DAYS	-0.0155	0.0631	0.0600	0.8065
RISK_CAT_2_BEGIN_OF_MONTH	0.1711	0.2359	0.5262	0.4682
RISK_CAT_2_LAST_10_DAYS	0.2890	0.2586	1.2663	0.2605
RISK_CAT_3_BEGIN_OF_MONTH	0.0371	0.0590	0.3942	0.5301
RISK_CAT_3_LAST_10_DAYS	0.00856	0.0665	0.0166	0.8976
N=19,738		*significant at .01 level		
Chi-square=12130.817		**significant at .05 level		
DF=5 p=0.6225		***significant at .10 level		

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Table A.9 Senior Risk Categories Odds Ratio Estimates and Marginal effects (LAST_10_DAYS)

Effect	Odds Rates	Marginal Effect
RISK_CAT_1_LAST_10_DAYS	0.985	-0.001266
RISK_CAT_2_BEGIN_OF_MONTH	1.187	0.015178
RISK_CAT_2_LAST_10_DAYS	1.335	0.026889
RISK_CAT_3_BEGIN_OF_MONTH	1.038	0.003115
RISK_CAT_3_LAST_10_DAYS	1.009	0.000714

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APPENDIX B: STATISTICAL RESULTS FOR HIGH SCHOOL GRADUATE RISK CATEGORIES

Tables B.1 through B.9 list the results for the MCRD attrition model using the sub-groups created by Bruno to analyze DEP attrition rates of high school graduates. Risk Category 1 represents those enlistees who have low Delayed Entry Program (DEP) attrition rates that are not affected by day-of-the-month variables. Risk Category 3 represents enlistees that exhibit high DEP discharge rates that are not affected by day-of-the-month variables. Risk Category 2 represents enlistees who exhibit low DEP attrition rates during the first three weeks of the month but exhibit high DEP discharge rates when enlisted during the final week of the month. Tables B.1 through B.3 list the results of graduates testing the variable FINAL_WEEK. Tables B.4 through B.6 list the results of graduates testing the variable LAST_DAY. Tables B.7 through B.9 show the results of graduates testing the variable FINAL_10_DAYS.

Table B.1 Graduate Risk Categories (FINAL_WEEK)

Variable	Mean	Std Dev	Min	Max
RISK_CAT_1_FINAL_WEEK	0.1395521	0.3465270	0	1
RISK_CAT_2_BEGIN_OF_MONTH	0.1628416	0.3692267	0	1
RISK_CAT_2_FINAL_WEEK	0.0567450	0.2313583	0	1
RISK_CAT_3_BEGIN_OF_MONTH	0.1931857	0.3948035	0	1
RISK_CAT_3_FINAL_WEEK	0.0672191	0.2504050	0	1

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Table B.2 Graduate Risk Categories LOGIT Results (FINAL_WEEK)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.0690	0.0285	5264.0001	<.0001
RISK_CAT_1_FINAL_WEEK	0.1076	0.0548	0.1029	0.7484
RISK_CAT_2_BEGIN_OF_MONTH	0.0885	0.0509	3.0252	0.0820
RISK_CAT_2_FINAL_WEEK	0.0293	0.0784	0.1393	0.7089
RISK_CAT_3_BEGIN_OF_MONTH	-0.00043	0.0491	0.0001	0.9931
RISK_CAT_3_FINAL_WEEK	0.0988	0.0713	1.9207	0.1658
N=32,461		*significant at .01 level		
Chi-square=23125.451		**significant at .05 level		
DF=5 p=0.4544		***significant at .10 level		

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Table B.3 Graduate Risk Categories Odds Ratio Estimates and Marginal effects (FINAL_WEEK)

Effect	Odds Rates	Marginal Effect
RISK_CAT_1_FINAL_WEEK	1.018	-0.000004
RISK_CAT_2_BEGIN_OF_MONTH	1.093	0.001757
RISK_CAT_2_FINAL_WEEK	1.030	0.009114
RISK_CAT_3_BEGIN_OF_MONTH	1.000	-0.000047
RISK_CAT_3_FINAL_WEEK	1.104	0.010215

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Table B.4 Graduate Risk Categories (LAST_DAY)

Variable	Mean	Std Dev	Min	Max
RISK_CAT_1_LAST_DAY	0.0396476	0.1951328	0	1
RISK_CAT_2_BEGIN_OF_MONTH	0.1628416	0.3692267	0	1
RISK_CAT_2_LAST_DAY	0.0156495	0.1241173	0	1
RISK_CAT_3_BEGIN_OF_MONTH	0.1931857	0.3948035	0	1
RISK_CAT_3_LAST_DAY	0.0188534	0.1360092	0	1

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Table B.5 Graduate Risk Categories LOGIT Results (LAST_DAY)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.0573	0.0232	7866.1176	<.0001
RISK_CAT_1_LAST_DAY	0.0836	0.0883	0.8966	0.3437
RISK_CAT_2_BEGIN_OF_MONTH	0.0768	0.0481	2.5493	0.1103
RISK_CAT_2_LAST_DAY	-0.0718	0.1458	0.2425	0.6224
RISK_CAT_3_BEGIN_OF_MONTH	-0.0121	0.0463	0.0687	0.7933
RISK_CAT_3_LAST_DAY	0.0581	0.1269	0.2094	0.6472
N=32,461		*significant at .01 level		
Chi-square=23126.022		**significant at .05 level		
DF=5 p=0.5318		***significant at .10 level		

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Table B.6 Graduate Risk Categories Odds Ratio Estimates and Marginal effects (LAST_DAY)

Effect	Odds Rates	Marginal Effect
RISK_CAT_1_LAST_DAY	1.087	0.008669267
RISK_CAT_2_BEGIN_OF_MONTH	1.080	0.007943811
RISK_CAT_2_LAST_DAY	0.931	-0.007020497
RISK_CAT_3_BEGIN_OF_MONTH	0.988	-0.001216665
RISK_CAT_3_LAST_DAY	1.060	0.005961069

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Table B.7 Graduate Risk Categories (LAST_10_DAYS)

Variable	Mean	Std Dev	Min	Max
RISK_CAT_1_LAST_10_DAYS	0.2565540	0.4367378	0	1
RISK_CAT_2_BEGIN_OF_MONTH	0.1628416	0.3692267	0	1
RISK_CAT_2_LAST_10_DAYS	0.1073596	0.3095747	0	1
RISK_CAT_3_BEGIN_OF_MONTH	0.1931857	0.3948035	0	1
RISK_CAT_3_LAST_10_DAYS	0.1258125	0.3316431	0	1

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Table B.8 Graduate Risk Categories LOGIT Results (LAST_10_DAYS)

Variable	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	-2.0714	0.0315	4316.6317	<.0001
RISK_CAT_1_LAST_10_DAYS	0.0393	0.0465	0.7145	0.3980
RISK_CAT_2_BEGIN_OF_MONTH	0.0933	0.0524	3.1675	0.0751
RISK_CAT_2_LAST_10_DAYS	-0.00780	0.0606	0.0166	0.8975
RISK_CAT_3_BEGIN_OF_MONTH	-0.0107	0.0502	0.0454	0.8313
RISK_CAT_3_LAST_10_DAYS	0.0414	0.0565	0.5367	0.4638
N=32,461		*significant at .01 level		
Chi-square=23126.235		**significant at .05 level		
DF=5 p=0.5624		***significant at .10 level		

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Table B.9 Graduate Risk Categories Odds Ratio Estimates and Marginal effects (LAST_10_DAYS)

Effect	Odds Rates	Marginal Effect
RISK_CAT_1_LAST_10_DAYS	1.040	0.000004379
RISK_CAT_2_BEGIN_OF_MONTH	1.098	0.003974160
RISK_CAT_2_LAST_10_DAYS	0.992	0.009621919
RISK_CAT_3_BEGIN_OF_MONTH	0.989	-0.000768622
RISK_CAT_3_LAST_10_DAYS	1.042	0.004181488

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