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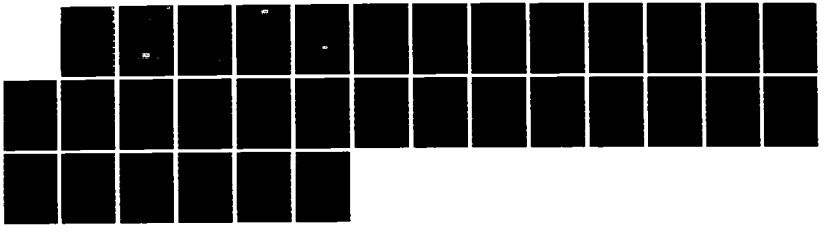

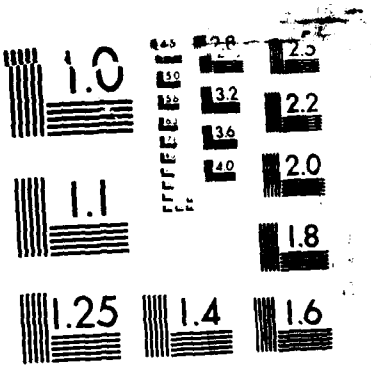

CRM 86-12 / January 1986

RESEARCH MEMORANDUM

ATTRITION FROM NAVY ENLISTMENT CONTRACTS

Aline Quester
Martha S. Murray

A Division of CNA Hudson Institute
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ATTRITION FROM NAVY ENLISTMENT CONTRACTS

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ABSTRACT

This research memorandum reports on the construction of an individual-level data set for Navy enlistment contracts for 1983 and 1984. It discusses the problems associated with these data and formalizes a contract attrition model, which is then estimated in a logistic framework.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

This paper reports on research on contract attrition for Non-Prior-Service (NPS) enlisted Navy recruits. As this attrition occurs before the recruit ever enters the active Navy, it is considerably less costly to the Navy than is later (active-duty) attrition. Still, it is meaningful to understand both the magnitude and determinants of this attrition.

While much research has been done on the determinants of Navy active-duty attrition (see [1] to [5]), virtually no research has been done on pre-active-duty (contract) attrition. Part of the explanation for the paucity of research in this area stems from the presumed low cost of such attrition. Another part, however, arises from the way the Navy organizes its data on recruit contracts: information is retained only for net contracts (gross contracts minus abrogated contracts). Even at the aggregate summary statistics level, information is not available on the number of abrogated contracts. This paper reports on the construction of individual-level data that will permit the identification of contract attrition; then it analyzes contract attrition in fiscal years 1983 and 1984.

BACKGROUND

The first formal step a potential Navy recruit makes is to sign an enlistment contract. This contract can be either to ship within a month (defined here as a Direct Ship) or to ship in a future month (defined here as Delayed Entry Program (DEP)). The details of this contract--the ship date, the prospective rating, the class-convening date (for A-school enrollees), the recruit's educational background, test scores, etc.--are then entered into the RESERVATION File of the Navy's Personalized Recruiting for Immediate and Delayed Entry (PRIDE) system.[1]

The Navy's PRIDE system keeps track of these data. It is an interactive system, designed to monitor both projected shipments and filled school seats. It consists of two types of files, RESERVATION Files and CANCELLATION Files. The RESERVATION File contains all current reservations as well as all prior confirmed shipments within the current fiscal year. (At the end of each fiscal year, the contents of the RESERVATION File and the contents of the CANCELLATION File are written into historical files. The historical RESERVATION File contains the records of all confirmed shippers for the fiscal year while the historical CANCELLATION File contains the records of all cancelled contracts; cancelled contracts can be either early versions of the contracts of recruits who shipped or they can be truly abrogated

1. For more detail on the PRIDE system, see [6].

contracts.) The format of the records in the CANCELLATION File is exactly the same as that of the RESERVATION File. Cancelled contracts from the RESERVATION File are literally written from the RESERVATION File to the CANCELLATION File.[1]

As was suggested above, entries in the PRIDE CANCELLATION File are not restricted to individuals who will not enter the Navy (although these records are clearly in the CANCELLATION File). The PRIDE system is designed so that if there is any change in the details of the original contract (a different ship date, a change in rating, a graduation from high school), the original contract record will be written to the CANCELLATION File and the new and corrected contract record will be the one found on the RESERVATION File. It is this phenomenon--that the CANCELLATION File contains records for both truly abrogated contracts and for early versions of valid contracts--that makes the measurement of contract attrition difficult.

To measure contract attrition--to separate individuals who signed contracts and shipped from individuals who signed contracts but did not ship--it was necessary to merge PRIDE RESERVATION and CANCELLATION Files and construct records of each individual's history. Let us now turn to how this was done.

CONSTRUCTION OF THE FY 1983-FY 1984 CONTRACT ATTRITION FILE

The procedure merged four files: the FY 1983 and the FY 1984 RESERVATION and CANCELLATION Files.[2] The merged files were sorted by Social Security Number (SSN) and, then, aggregated by SSN. The initial output record contained the number of records found for the SSN as well as the four most recent records for the SSN.[3] Records were thrown out if the recruit was prior service. Additionally, CANCELLATION File records were thrown out if the recruiter's SSN was zeros or blanks.

The next step involved sorting each person's individual entries by cancellation dates and creating a history of the individual's transactions. If the individual had no RESERVATION File record (no

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1. In the PRIDE RESERVATION Files, the field "Cancellation Date" will be the "Ship Date" and the field "Cancellation Code" will be either 000 or 999. In the PRIDE CANCELLATION Files, the field "Cancellation Date" will be the date the contract was cancelled and the field "Cancellation Code" will have an alphanumeric entry indicating the reason for the cancellation. The field "Cancellation Code" is, in fact, the only field that is distinctly coded for abrogated/nonabrogated contracts.
2. These CNA files are defined by confirmed shipment date (for the RESERVATION File) and CANCELLATION dates (for the CANCELLATION File).
3. Four records, except for a small number of observations, encompassed all the observations.

confirmed shipment), an attrite flag was set equal to one. The number of months between signing the initial contract (first reservation date) and abrogating the contract was the months spent in DEP (if months was greater than zero) or zero. These within-month cancellations could be for Direct Ships or for contracts written for the DEP, but were cancellations taking place within the original contract month and before the individual formally (by the definition employed in this analysis) entered the DEP.[1]

For individuals with RESERVATION File transactions (confirmed shippers) there were two possibilities: either the individual shipped on the date specified in the first contract or the individual made one or more changes, with each change producing a new record. For the computation of months between the initial contract and the final shipment date, the difference between the actual shipment date and the earliest reservation date (on the earliest CANCELLATION File record for records with CANCELLATION File transactions or the reservation date on records with only the RESERVATION File transaction) was calculated.

Age, months in DEP,[2] a flag for a change in rating, and a flag for a change in education were computed. Reservation and cancellation entries for each individual were compared to determine whether an individual's rating changed or his education field changed across his records. If there was a change, the appropriate flag was set equal to one.

Records with obviously bad data (i.e., the term of enlistment, SSN, recruit area, rating, CIVED, Armed Forces Qualification Test (AFQT), and ship date equal to zero) were removed. Records were also removed if the program code was Ready Mariner (RM) or TAR Enlisted Program (TEP), or if the age was 35 years or greater. These procedures reduced the sample from 178,117 observations to 171,328 observations.

To aid in understanding how these data were organized, some examples of individual records in the final file are given in table 1.

These records indicate some of the variety in contract histories. The first individual's record is quite straightforward: the recruit shipped after 9 months in the Delayed Entry Program: his initial

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1. For the purposes of this paper, new recruits were considered to be in the DEP if they were scheduled for shipment in a future month and did not abrogate their contract immediately.
2. If the cancellation date was zero, the age was computed by subtracting the birth date from the most recent shipping date, and the months in DEP were computed by subtracting the last reservation date from the most recent shipping date. If the cancellation date was greater than zero, the cancellation date was used in place of the shipping date.

TABLE 1

CONTRACT HISTORY EXAMPLES

Individual	Shipped (1); did not ship (0)	Number of transactions	Months between 1st reservation and ship date (cancellation date)	Rating on last transaction	Rating change from initial record
1	1	1	9	SN	No
2	1	2	4	AN	Yes
3	0	2	0	HT	No
4	1	2	2	MM	No
5	0	1	8	CE	No
6	0	2	0	AT	No
7	1	1	2	RM	No
8	0	2	7	BU	No
9	0	6	8	AD	Yes
10	1	4	2	HT	Yes

contract was unchanged (one transaction). The second individual also shipped, but two transactions were found for him. In contrast, the ninth individual did not ship, although six transactions were found for him; at least one of these transactions was a rating change.

EMPIRICAL ANALYSIS OF CONTRACT ATTRITION

Descriptive Information on Contract Attrition

Tables 2 through 5 provide overall descriptive information on attrition for the 171,328 contracts. The Delayed Entry Program was by far the most common route for recruits to enter the Navy: of the 147,521 NPS recruits who shipped in FY 1983-FY 1984, 126,734 came from the DEP and 20,743 were within-month (Direct Ships).[1]

Table 2 provides the "ship/did not ship" information by the number of distinct transactions for both DEP and within-month attrition.

There appears to be more within-month contract attrition (22.9 percent) than DEP contract attrition (12.2 percent). Within-month contract attrition, however, is difficult to either evaluate or interpret. "Within-month" means that all transactions for that SSN were within the same calendar month. It undoubtedly includes "bad data," e.g., recruiters learning the system by entering fake contracts and then writing them to the CANCELLATION File. Within-month contracts that are cancelled are never part of official records, and thus there are no incentives not to write these contracts to "learn the system." Unfortunately, there is no way to separate out the invalid within-month attrition from the valid within-month attrition data. Thus, the results for within-month attrition should probably not be believed and if interpreted, should be interpreted very cautiously.

For contracts that cross calendar months, the problem does not occur (or it should occur rarely), because if a recruiter were to write a fictitious contract in June for shipment in July (and not cancel the contract in June), the accounting system would credit the recruiter with a new contract when contract data are tabulated for June. Unlike contracts written and cancelled within the same month (which disappear from the system), contracts that remain on file at the end of the month become part of the system. Because recruiters would have to "make up" these across-month contracts if they were not genuine, there are strong incentives to be certain that contracts that remain in the system at the end of the month are genuine.

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1. These figures suggest that 14 percent of the FY 1983 through FY 1984 accessions were "Direct Ships," that is, they shipped within the month of their initial contract.

TABLE 2

CONTRACT ATTRITION BY THE NUMBER OF TRANSACTIONS

Number of entries (RESERVATION or CANCELLATION Files)	DEP				Within-month			
	Did not ship		Shipped		Did not ship		Shipped	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1	12,065	11.0	98,078	89.0	5,210	23.7	16,744	76.3
2	3,755	14.7	21,769	85.3	805	20.7	3,084	79.3
3	1,163	18.8	5,015	81.2	135	15.3	750	84.7
4	369	22.1	1,304	77.9	22	13.3	144	86.7
5+	271	32.3	568	67.7	7	25.0	21	75.0
Overall total or overall percent	17,623	12.2	126,734	87.8	6,179	22.9	20,743	77.1

TABLE 3

DEP ATTRITION BY INDIVIDUAL CHARACTERISTICS

	Did not ship		Shipped	
	Number	Percent	Number	Percent
Sex				
Male	13,740	10.8	113,285	89.2
Female	3,883	22.4	13,449	77.6
Dependents				
Yes	862	14.9	4,097	85.1
No	16,761	12.1	121,827	87.9
Education				
High school				
Diploma graduate	10,095	11.2	79,810	88.8
General education certificate (GED)	677	14.1	4,140	85.9
Not a graduate[a]	482	11.4	3,742	88.6
Probable graduate	6,369	14.0	39,042[b]	86.0
Overall total or overall percent	17,623	12.2	126,734	87.8

a. DEP period is shorter by policy.

b. These recruits' records were not changed from "probable" graduate to diploma graduates, although the expectation is that they did graduate before shipment. The records of 3,567 "probable grad" shippers were, however, changed to graduates.

TABLE 4

DEP ATTRITION BY AREA AND PROGRAM

	Did not Ship		Shipped	
	Number	Percent	Number	Percent
Recruiter area				
Area 1	3,795	13.2	25,007	86.8
Area 3	3,535	13.2	23,185	86.8
Area 4	3,288	11.3	25,751	88.7
Area 5	1,922	9.8	17,627	90.2
Area 7	2,101	12.5	14,767	87.5
Area 8	2,982	12.8	20,397	87.2
Overall total or overall percent	17,623	12.2	126,734	87.8
Program				
SG	7,390	13.7	46,541	86.3
PSI	118	9.9	1,069	90.1
AM	1,150	11.1	9,180	88.9
SF	3,652	12.2	26,336	87.8
ATP	1,462	11.2	11,540	88.8
5YO	778	15.8	4,159	84.2
AEF	1,784	10.7	14,925	89.3
NF	819	8.1	9,285	91.9
ATF	470	11.3	3,699	88.7
Overall total or overall percent	17,623	12.2	126,734	87.8

TABLE 5

DEP ATTRITION BY MONTHS IN DEP[a]

	Did not ship		Shipped	
	Number	Percent	Number	Percent
Months in DEP				
1	895	7.2	11,473	92.8
2	730	6.8	10,044	93.2
3	885	7.5	10,875	92.5
4	1,012	9.0	10,236	91.0
5	1,290	10.6	10,913	89.4
6	1,393	11.2	11,016	88.8
7	1,518	11.7	11,457	88.3
8	1,743	12.5	12,183	87.5
9	1,742	13.4	11,227	86.6
10	1,911	15.4	10,468	84.6
11	2,144	18.9	9,214	81.1
12	2,360	23.6	7,628	76.4
Overall total or overall percent	17,623	12.2	126,734	87.8

a. Some of the out-month DEP attrition may be "roll-backs"--recruits who were kept in the computer although they cancelled. There is no way to evaluate the magnitude of this problem, although CNRC does not believe it is a major problem.

Because confidence can be placed in the information for contract attrition when the contract crosses months, the discussion in this paper will focus on that attrition--specifically attrition from the DEP.[1] Table 3 breaks down the attrition by gender, dependency, and educational status. While females are almost twice as likely as males to attrite from their contracts, there are not very large differences in overall attrition probabilities by dependency or educational status.

Table 4 presents the attrition by navy recruiting area and program and table 5 reports the attrition by months in the DEP.

The Logit Equations Estimated for Contract Attrition

Recruits either abrogate their contracts or they ship. Such dichotomous decisions are appropriately estimated as probabilities, with a specification that does not allow the estimated probabilities to fall outside the zero-one range. Both logit equations (derived from logistic distributions) and probit equations (derived from normal curves) fulfill such requirements; the estimate from both equations are S-shaped curves (usually empirically equivalent) in the zero-one interval. Figure 1 illustrates such a curve, which asymtopically approaches zero at the lower end and one at the upper end of the probabilities. For this analysis the logistic distribution was selected.

The logistic equation for the probability P that an individual will attrite from his contract is:

$$P = \frac{1}{1 + e^{-BX}} ,$$

where B is a coefficient vector and X is a vector of dependent variables.

The partial derivatives or the slopes of the X variables with respect to the attrition probability clearly vary over the zero-one probability interval. (Numerically, they are equal to the coeffiecients multiplied by $(P)(1-P)$, where P is equal to the probability for which the slope is to be calculated. Note that:

$$\frac{dP}{dX} = \frac{(Be^{-BX})}{(1 + e^{-BX})} \left(\frac{1}{1 + e^{-BX}}\right) \quad \text{and} \quad 1 - P = \frac{e^{-BX}}{1 + e^{-BX}} .$$

1. The information for within-month contract attrition is also reported, but, as suggested earlier, the authors believe little confidence can be placed in its validity.

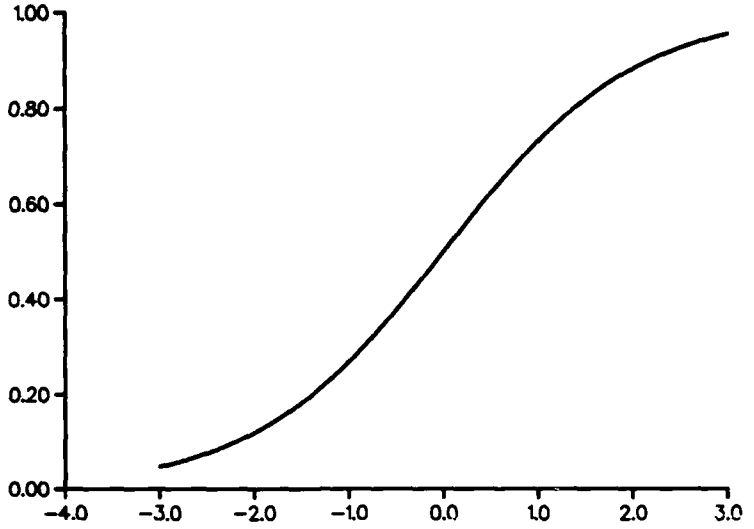

FIG. 1: EXAMPLE OF A LOGISTIC CURVE

Because the maximum likelihood estimation procedures required for the estimation of logistic equations are extremely time-consuming, a 5-percent sample of the 171,117 individuals was used in the following estimations. The 5-percent sample and the universe of 171,117 individuals have virtually identical mean values for the variables of interest in the analysis. Table 6 provides the definitions of the variables to be used in the multivariate analysis. Personal characteristics, Navy program, recruit area, months in DEP, and controls for month and the number of transactions are defined.

Most variables are self-explanatory. Probably the only variable that requires additional explanation is R, the average nationwide number of recruits in DEP per recruiter; more precisely, the definition is:

$$R = \frac{\text{Total number recruits in DEP in month}}{\text{Number of onboard recruiters in month}} .$$

TABLE 6

VARIABLE DEFINITIONS FOR CONTRACT ATTRITION

Variables	Definitions
Personal characteristics	
Male	1 if male; 0 if female.
HSDG	1 if high school diploma graduate; 0 otherwise.
GED	1 if General Education certificate; 0 otherwise.
NGRAD	1 if not high school graduate (not GED nor HSDG) and not a probable graduate (probable graduates are the category omitted from the equation); 0 otherwise.
Age (17 and 18)	1 if age at Active Duty Service Date (ADSD) is 17 or 18; 0 otherwise.
Age (21+)	1 if age at ADSD is 21 years or older; 0 otherwise.
AFQT	AFQT score, percentile.
AFQTSQ	AFQT*AFQT.
Program enlisted for	
PSI	1 if Programmed School Input on PRIDE file; 0 otherwise.
AM	1 if Active Mariner "AM" on PRIDE file; 0 otherwise.
SF	1 if GENDET for which Program Code on PRIDE file is "SF"; 0 otherwise.
ATP	1 if GENDET for which Program Code on PRIDE file is "ATP"; 0 otherwise.
5YO	1 if Program Code on PRIDE file is "5YO"; 0 otherwise.

TABLE 6 (Continued)

Variables	Definitions
AEF	1 if PRIDE file Program Code is Advanced Electronics Field "AEF"; 0 otherwise.
ATF	1 if PRIDE file Program Code is Advanced Technical Field "ATF"; 0 otherwise.
NF	1 if PRIDE file Program Code is Nuclear Field "NF"; 0 otherwise.
Area	
Area 1 - Area 8	1 if recruit comes from relevant recruiting area; 0 otherwise. Area 4 is omitted category.
R	Average number (nationwide) of recruits in DEP per recruiter. This variable is designed to measure the average attention a recruiter can give to the individuals in the DEP.
DEP months	
Months	Months in DEP.
Monthsq	(Months)(Months).
Other controls	
Months	
M2-M12	1 if the relevant month; 0 otherwise. January is the month omitted from the analysis. For the analysis of DEP, the relevant month is the shipment month; for the within-month observations, the relevant month is the month the transaction occurred.
Numrec	Number of records (PRIDE RESERVATION + CANCELLATION Files) for that recruit. Note that only one record can be a RESERVATION (confirmed shipper) record; other records must be from the CANCELLATION File.

This variable is designed to measure average differences in the time recruiters can spend with the individual recruits in the DEP. While it would clearly be superior to have an empirical measure of the number of recruits in the DEP of each individual recruit's recruiter, such a variable would have been, at best, difficult to calculate. Thus, the average DEP per recruiter is intended to serve as a proxy for the amount of energy the recruiter can devote to each recruit in his DEP; as R increases (and as a recruiter has to spread himself more thinly), it is expected that DEP attrition will increase.[1]

Table 7 provides the variable means for the analysis of contract attrition for the two groups: those who attrite in DEP and those who attrite within-month. As has been previously suggested, considerably more confidence is placed in the data for DEP attrition versus within-month attrition. Distinct differences between the means of DEP and within-month attrition include the following:

1. Within-month observations are less likely to be from the omitted educational category of probable high school graduate (less than 7 percent of observations within-month and almost 32 percent of DEP observations).

2. Within-month observations are likely to be older.

3. More within-month observations are PSI or GENDETS ("SF" or "ATP" PRIDE program codes).

4. Areas 1 and 3 are more likely to have recruits in DEP than within-month.

5. The early months of the calendar year are more likely to be within-month observations.

Table 8 provides estimates for DEP contract attrition and within-month contract attrition, respectively. For each type of attrition the logit coefficients and the slope of the conditional mean function are provided. The latter are the slope at the mean of the

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1. A very different phenomenon, that of larger DEPs bringing a recruiter more referrals and thus more contracts, needs to be balanced against this DEP attrition.

TABLE 7

VARIABLE MEANS FOR FY 1983-FY 1984 PRIDE DATA

	Observations in DEP	Observations within-month
Personal characteristics		
Male	0.878	0.857
HSDG	0.621	0.785
GED	0.036	0.080
NGRAD	0.028	0.069
Age (17 and 18)	0.386	0.333
Age (21+)	0.270	0.332
AFQT	0.606	0.602
AFQTSQ	0.409	0.402
Program enlisted for		
PSI	0.009	0.026
AM	0.073	0.070
SF	0.202	0.305
ATP	0.093	0.075
5YO	0.037	0.035
AEF	0.122	0.083
ATF	0.028	0.025
NF	0.071	0.037
Recruiter variables		
Area 1	0.202	0.196
Area 3	0.181	0.180
Area 5	0.139	0.126
Area 7	0.119	0.129
Area 8	0.159	0.160
R	0.119	0.118
DEP Months		
Month	6.514	N/A
Monthsq	54.054	N/A
Other Controls		
Months		
M2	0.079	0.090
M3	0.086	0.097
M4	0.074	0.069
M5	0.079	0.098
M6	0.089	0.087
M7	0.096	0.092
M8	0.098	0.082

TABLE 7 (Continued)

	Observations in DEP	Observations within-month
M9	0.084	0.085
M10	0.071	0.064
M11	0.092	0.087
M12	0.068	0.068
NUMREC	1.312	1.252

NOTE: The omitted educational category is "probable graduate"; the omitted age group is 19-20 years of age; the omitted Navy enlistment program is School Guarantee (SG); the omitted recruiting area is Area 4; and and the omitted month is January (M1).

TABLE 8

LOGIT EQUATIONS FOR CONTRACT ATTRITION
(FY 1983 through FY 1984)

Variables	Contract attrition (from DEP)			Contract attrition (within-month)		
	Logit coefficient[a]		Slope of conditional mean function[b]	Logit coefficient[a]		Slope of conditional mean function[b]
Personal characteristics						
Male	-0.820	(-8.03)	-0.087**	0.125	(0.58)	0.023
HSDG	-0.371	(-3.39)	-0.038**	-2.933	(-9.06)	-0.536**
GED	0.265	(1.25)	0.028	-3.316	(-7.79)	-0.606**
NGRAD	0.281	(1.227)	0.030	-4.035	(-8.41)	-0.738**
Age (17+18)	-0.429	(-4.25)	-0.045**	0.593	(2.98)	0.108**
Age (21+)	0.086	(0.88)	0.009	0.802	(4.45)	0.147**
AFQT	0.0045	(0.38)	0.0004	-0.039	(-1.70)	-0.007*
AFQTSQ	-0.0004	(-0.43)	-0.00004	0.004	(2.15)	0.001**
Program enlisted for						
PSI	-0.218	(-0.44)	-0.023	-1.818	(-2.36)	-0.332**
AM	-0.189	(-1.23)	-0.020	-0.153	(-0.51)	-0.028
SF	0.126	(1.17)	0.013	-0.547	(-2.74)	-0.100**
ATP	-0.074	(-0.48)	-0.008	-0.053	(-0.18)	-0.010
5YO	-0.243	(-1.27)	-0.026	0.945	(2.77)	0.173**
AEF	-0.575	(-4.03)	-0.061**	0.161	(0.61)	0.029
ATF	-0.169	(-0.69)	-0.018	-0.453	(-0.96)	-0.083
NF	-0.187	(-0.98)	-0.020	-0.075	(-0.19)	-0.014

TABLE 8 (Continued)

Variables	Contract attrition (from DEP)			Contract attrition (within-month)		
	Logit coefficient[a]		Slope of conditional mean function[b]	Logit coefficient[a]		Slope of conditional mean function[b]
Recruiter variables						
Area 1	0.217	(1.88)	0.023*	0.218	(0.94)	0.040
Area 3	0.148	(1.23)	0.016	0.137	(0.58)	0.025
Area 5	-0.247	(-1.77)	-0.026*	0.355	(1.39)	0.065
Area 7	0.090	(0.66)	0.009	0.167	(0.658)	0.031
Area 8	-0.021	(-0.17)	-0.002	-0.092	(-0.37)	-0.017
R	0.103	(1.67)	0.011*	0.149	(1.21)	0.027
DEP months						
Month	0.210	(4.93)	0.022**	N/A		N/A
Monthsq	-0.006	(-2.198)	0.001**	N/A		N/A
Month/year controls						
M2	0.181	(0.99)	0.019	-0.112	(-0.32)	-0.020
M3	-0.202	(-1.03)	-0.021	-0.349	(-0.97)	-0.064
M4	-0.054	(-0.28)	-0.006	0.022	(0.06)	0.004
M5	0.317	(1.79)	0.033*	-0.368	(-1.05)	-0.067
M6	0.156	(0.88)	0.016	0.090	(0.26)	0.016
M7	0.177	(1.01)	0.019	-0.373	(-1.06)	-0.068
M8	0.019	(0.10)	0.002	-0.040	(-0.12)	-0.007
M9	0.038	(0.20)	0.004	-0.003	(-0.01)	-0.001
M10	-0.417	(-0.188)	-0.044*	0.169	(0.438)	0.031

TABLE 8 (Continued)

Variables	Contract attrition (from DEP)			Contract attrition (within-month)		
	Logit coefficient[a]		Slope of conditional mean function[b]	Logit coefficient[a]		Slope of conditional mean function[b]
M11	-0.260	(-1.32)	-0.027	-0.441	(-1.18)	-0.081
M12	0.089	(0.45)	0.009	-0.267	(-0.69)	-0.049
Constant	-3.915	(-4.61)	-0.412**	0.844	(0.52)	0.154

SUMMARY STATISTICS

	Contract attrition (from DEP)	Contract attrition (within-month)
Mean of dependent variable	0.1199	0.2408
Number of observations	7,207	1,354
Chi square	385.7**	255.3**

a. t statistics are in parentheses. The slope at the mean is the logit coefficient multiplied by $(p)(1-p)$, where p is the mean attrition probability.
b. Two (one) asterisks indicates the slope (or for the chi-square value equation) is distinctly different from zero at the 1 percent (5-percent) level.

relevant variable (holding all other variables constant at their mean values).[1]

An F test for the chi-square summary statistic indicates that the overall explanatory power of the equation is statistically significant at the 1-percent level; however, neither of the attrition equations exhibits the powerful discrimination between attriters and nonattriters that equations do that estimate active-duty attrition. This result is perhaps not surprising. Young adults are distinguished by changing their minds; predicting which young adults will change their minds is difficult. Because the "cost" of attriting after entering the Navy is undoubtedly larger for the recruit than the "cost" of abrogating an enlistment contract before enlistment, it is not surprising that it is more difficult to estimate contract attrition precisely than it is to estimate active-duty attrition.

Still, the equations suggest some distinctions between individuals who are more likely (or less likely) to attrite from their contracts. Females are considerably more likely to abrogate their contracts. Potential recruits least likely to abrogate their contracts are young male recruits (17-18 years) who are high school diploma graduates. Holding constant other characteristics, the Navy Enlistment Program does not appear to make much difference. Only the AEF field is statistically different (and negatively so) from School Guarantee Program (the omitted program category). Area 1 has slightly higher contract attrition (Area 5 slightly less) than the area omitted from the analysis, Area 4. In months in which each recruiter has, on average, more recruits in the DEP, attrition is also higher. Only May (more attrition) and October (less attrition) are statistically different from the omitted shipment month, January.

A SCREEN[2] TABLE FOR DEP CONTRACT SURVIVAL: NPS MALES

Initial research on active-duty survival done at CNA established SCREEN scores for Navy recruits. These scores calculated the probability that recruits, given AFQT scores, education, and age, would survive the initial year of their first enlistment term. Because the last calibration of SCREEN scores was done with the fiscal 1977 recruit cohort, work is ongoing at CNA to validate the SCREEN scores with the survival experience of more recent recruit cohorts.

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1. To find the slope of the estimated relationship at other values, the logit coefficients must be multiplied by $p(1-p)$, where p is the attrition probability at which it is desired to calculate the slope. Table 8 provides the slope at the average attrition probability observed in the data (e.g., $p = 0.1199$ for DEP equation and $p = 0.2408$ for within-month equation).
2. Success chances for recruits entering the Navy.

A conceptually similar score can, however, be established for contract survival. Here the score is the probability that a recruit, given his characteristics, will not abrogate his contract. Table 9 presents such probabilities. Table 10 presents the current SCREEN table used by CNRC for NPS Males; potential recruits with scores under 70 are not admitted into the Navy.

As table 9 indicates, younger recruits and recruits that are HSDGs are less likely to abrogate their contracts. Additionally, the probability of abrogating a contract is related to AFQT category (rising through III-U and then falling).

What is most striking about table 9, however, is not the differences in the probabilities of contract abrogation (although they are present) but the similarities in contract attrition across these very strong discriminators for active-duty attrition. In short, contract attrition probabilities, except for gender differences, are not nearly as sharply delineated across recruit characteristics as are active-duty attrition probabilities. Survival probabilities range between 91.8 percent to 87.2 percent for contract survival and between 93 percent and 70 percent for active-duty 1-year survival for the same set of characteristics (contrast tables 9 and 10).

As suggested earlier, the results should not be terribly surprising. Given the lower costs to recruits to abrogating contracts (versus attriting from active duty), it was expectd that contract attrition would be considerably more random and less differentiated by recruit characteristics.

SUMMARY

Because Navy recruit data are not maintained in a way that facilitates the collection of recruit contract attrition data, the magnitude of this attrition had not been known. This research memorandum documents contract attrition for the FY 1983-FY 1984 recruit cohorts. Additionally, it estimates a logistic equation to explain recruit contract attrition probabilities.

Overall contract attrition from DEP is slightly more than 12 percent. Although demographic characteristics differentiate attrition probabilities in the directions expected by casual observation, their discriminatory power, except for gender, is not very large: probabilities range from slightly over 8 to slightly over 13 percent for male NPS recruits. These results are sharply different from the results for active-duty attrition, which show sharp differences in active-duty attrition for the same sets of demographic characteristics used here to explain contract-attrition probability.

TABLE 9

CONTRACT SURVIVAL ATTRITION PROBABILITIES:
NPS MALES IN THE DEP[a]

AFQT score	Age	Attrition probabilities (percent) HSDG	GED	Neither HSDG nor GED
MG1 (96 = AFQT)	17-18	91.8	89.8	89.8
	19-20	90.5	88.2	88.2
	21+	90.3	88.0	88.0
MG2 (78 = AFQT)	17-18	91.4	89.4	89.4
	19-20	90.1	87.7	87.7
	21+	89.8	87.4	87.5
MG3U (55 = AFQT)	17-18	91.2	89.1	89.1
	19-20	89.8	87.4	87.4
	21+	89.6	87.2	87.2
MG3L (39 = AFQT)	17-18	91.3	89.2	89.2
	19-20	89.9	87.5	87.5
	21+	89.7	87.2	87.3
MG4 (15 = AFQT)	17-18	91.7	89.7	89.7
	19-20	80.4	88.1	88.1
	21+	90.2	87.8	87.9

a. The female attrition for each category is approximately double that of the male attrition probability.

TABLE 10

SUCCESS CHANCES FOR RECRUITS ENTERING THE NAVY (SCREEN)

AFQT score	Age	Education level: High school diploma graduate[a]	Education level: GED/CPT home study course[a]	Education level: Neither	
95-100	17-19	93	85	77	
	20+	90	82	74	
67-94	17-19	91	83	76	
	20+	88	79	71	
38-66	17-19	88	80	73	Minimum SCREEN
	20+	84	75	67	eligibility
19-37	17-19	83	75	68	
	20+	78	70	62	
17-18	17-19	75	68	62	
	20+	69	61	56	

a. As defined in paragraph 1-I-7a.

SOURCE: Navy Recruiting Manual.

REFERENCES

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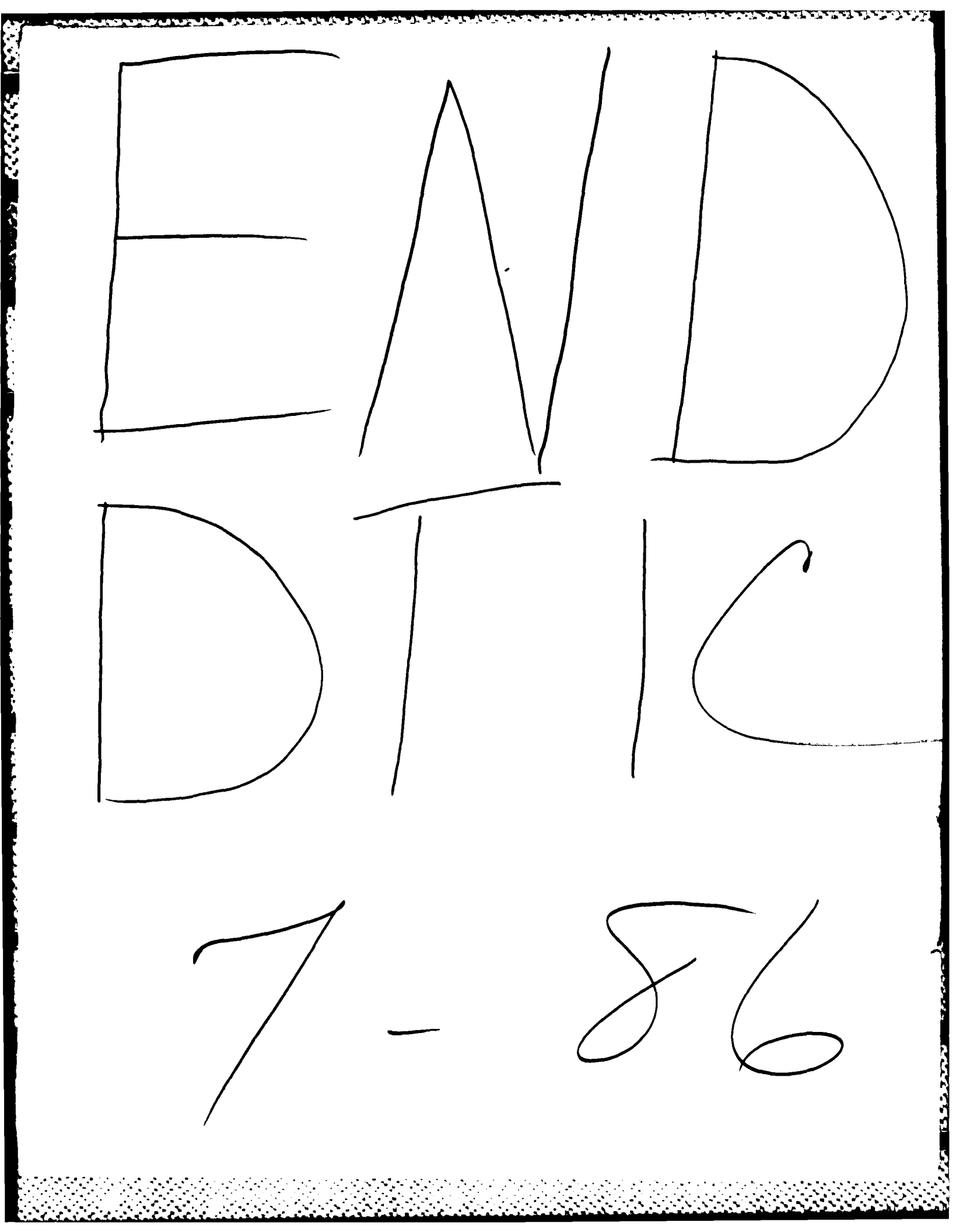
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