Research Note 84-98

THE EFFECT OF TOUR LENGTH AND TERM OF ENLISTMENT ON ATTRITION IN USAREUR

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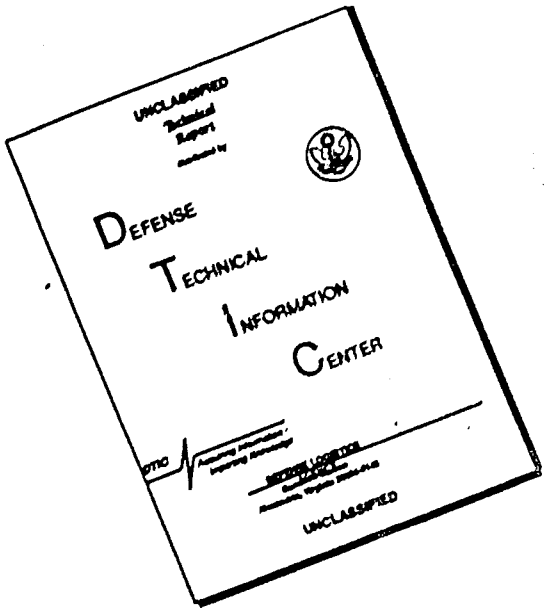

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The objectives of this research were to examine: (1) the relationship between tour length and attrition rates and (2) the relationship between term of enlistment and attrition in the US Army-Europe (USAREUR) A sample of 41,991 first-year enlisted personnel who arrived in USAREUR from May 1979 through May 1980 were used as subjects. The report presents the relationship of the individual variables with attrition using contingency tables and regression analysis.

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ERRATA

The term "loss type" used in the Figure titles, Table of Contents, and Appendices B and C should be replaced by "attrition rate."

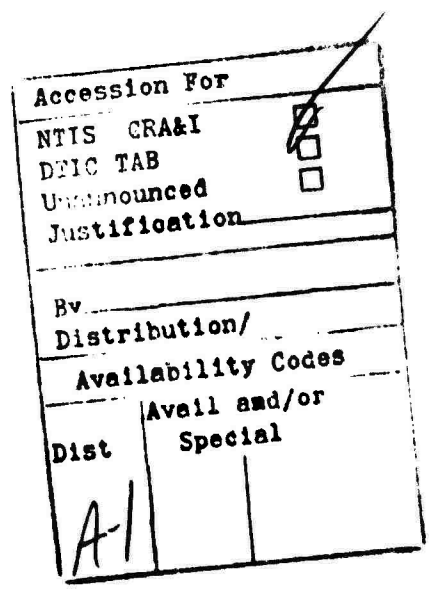

Table of Contents

List of Figures

List of Figures
(Continued)

List of Tables

EXECUTIVE SUMMARY

Problem

Attrition, or the failure of personnel to complete assigned tours or terms of service, is one of the primary reasons the Army has difficulty maintaining a state of combat readiness among its personnel. This problem is particularly acute among junior enlisted personnel who have exhibited attrition rates of 30% and more for their initial obligated term of service. In addition to reducing unit readiness, attrition contributes to higher costs because of the additional recruiting and training of new personnel, and because of additional transportation costs required to send them to distant assignments. The Army has responded with a substantial amount of research and many specific programs and policies designed to reduce attrition among first-term enlisted personnel Two programs with a potential impact on attrition are the 2-year enlistment option and the 18-month tour in USAREUR.

The 18-month tour has as a specific objective the reduction of attrition, while short terms were designed primarily to help sagging enlistments and were expected to have only an indirect effect on attrition (the 2-year enlistees were to be sent to USAREUR with the automatic consequence of a short tour). The hypothesis that shorter stays in USAREUR would reduce attrition was based on some empirical evidence (a previous ARI study found a positive correlation between tour length and attrition rate) and the belief that the prospect of a shorter stay in an unpleasant environment (USAREUR) would induce less unacceptable (to the Army) behavior. The latter expectation was also partially based on evidence which suggested that some attriting soldiers deliberately sought ways to be thrown out of the Army when faced with long tours.

Somewhat prior to the implementation of the 18-month tour in USAREUR and at about the same time the 2-year enlistment experiment was being put into effect, ARI initiated a large-scale longitudinal research effort to study the relationship of tour length and term of service to attrition rates in USAREUR. This report provides results of that study to the limits of current data maturity.

Objectives

The specific objectives of this study are to examine the relationship of tour length and term of enlistment to attrition in USAREUR. In the report, two types of attrition are examined: "negative attrition," which is attrition caused by some performance failure of the individual SM; and "neutral attrition," which is attrition that cannot be specifically attributed to performance but could still be related to being stationed in USAREUR.

Methodology

The study uses a population of 41,991 first-year enlisted personnel who arrived in USAREUR from May, 1979 through May, 1980. All information on these subjects was obtained from USAREUR personnel transaction files (arrival time, departure time, and individual characteristics) and DA MILPERCEN Enlisted Master Files (reason for leaving USAREUR or discharge).

The analysis examines the relationship of individual variables with the attrition criteria (negative attrition, neutral attrition, and attrition pattern) using contingency tables and regression analysis. The predictor variables include the two of primary interest--tour length and term of service--and ten other socio-demographic and military characteristics which serve as moderators. These variables are education level, gender, age, race, ethnicity, marital status, number of dependents, mental aptitude, military occupational specialty, and grade. All moderator variables were measured upon arrival in USAREUR.

Results

Results indicate that the losses for the 13th through the 18th month occur at about the same rate as during the first year, but that during the next 6 months there is a substantial slowdown in loss rates. Also, the ratio of neutral to negative losses remains approximately the same in all periods.

The basic pattern of negative losses across terms of service is an inverted-V. The highest negative attrition rates occur for 3-year enlistees. Two-year enlistees have a somewhat lower rate, and 4-year enlistees have the lowest rate of all. The pattern is the same in all three cohorts, indicating that there is little or no change in the relationship between the first and second years of USAREUR service. There are only very small differences across terms of service for neutral losses, i.e., term of service seems to have less effect on neutral loss rates than on negative loss rates.

The basic pattern of negative losses across tour-length categories is a moderate U-shaped curve. The lowest loss rates occur among those with 19-24 month tours, with higher rates for both shorter and longer tours. These results show the hypothesized positive relationship between tour length and attrition rate only for categories with greater than 18-month tours, and, given the concentration of subjects in the 24-month subgroup, the results suggest that particular tour length as being most appropriate if attrition rates were the only assignment factor.

Neutral attrition differences across tour length categories are very small and suggest an inverted rather than upright U-shaped curve.

Several individual moderator variables seemed to make important independent contributions to differences in attrition rates. Specifically, men had higher negative but lower neutral attrition rates than women, married SM and those with dependents had higher attrition rates than those who were not married or had no dependents, blacks had a somewhat lower negative attrition

rate than nonblacks, 17-year-olds and those 21 or older had higher attrition rates than those 18-20 years old, high school graduates had lower negative attrition rates than nongraduates, mental aptitude was generally negatively related to negative attrition, those with a combat MOS were more likely to attrite (negatively) than noncombat SM, and grade (on arrival in USAREUR) was strongly negatively related to negative attrition rates.

Analyses of the effects of moderator variables on the relationship between tour length and attrition rates revealed different patterns for different subgroups (such as black, non-graduate, combat vs. nonblack, graduate, non-combat soldiers), with those subgroups showing either the dominant U-shaped or positive relationship being those with the higher overall attrition rates, while subgroups showing either negative or inverted-U patterns tended to have lower overall rates. The principal exception to this was that black, graduate, combat soldiers showed both low attrition rates and a positive relationship between attrition rate and tour length.

Analyses of relationships between term of service (2,3, or 4 year enlistments) and attrition rates, as noted above, revealed higher rates for 3-year enlistees than for either of the other two. As with tour length, this pattern varied from one sub-group to another, with the principal deviation from the dominant pattern characterizing lower mental category (category IV) soldiers. Among these soldiers, the highest attrition rates were shown by the 2-year enlistees.

Conclusion

The basic objectives in this study were to identify any relationship between attrition rates and attrition patterns, on the one hand, and term of service and tour length, on the other. There was little relationship between either of the two major predictor variables and attrition pattern (stay). The relationship between attrition rates and tour length or term of service was more complex.

The moderate U-shaped curve which characterized the relationship of tour length and attrition rate seemed to be composed of two separate parts. The left arm of the U was made up of individuals with short tours, 18 months, and exhibits a somewhat higher attrition rate than the next shortest tour-length category, but slightly less than the longer tour categories. However, upon closer analysis it was found that a majority of the higher loss rates in the short tour could be accounted for by a select set of individuals who were more likely to be black, nongraduates, in aptitude category IV, and in the combat arms. With the exception of blacks, these subgroups had higher attrition rates in other tour-length categories as well. Thus, variations in these and other variables accounted for more of the attrition rate variance than tour length. However, there was some consistent pattern in the remaining three tour-length categories, i.e., tour length did account for some of the variance on its own. The pattern which resulted showed that shorter tour lengths, down to 19 months, are associated with lower attrition rates. Other things being equal, assigning SM to a shorter tour could reduce their probability for attrition, although not by very much (perhaps 2 or 3 percentage

points). The efficacy of a policy which does reduce tour length in USAREUR, even if it is selectively done by excluding, say, married SM, is unclear because the cost-benefit of such an action has not been calculated. Using this data set, for example, would require the analysis of mature tour-length cohorts to determine results such as the average length of time served in USAREUR and the cost of providing replacements, before the full impact of tour-length differences could be determined. The present analysis has shown the potential for a positive effect.

The results for term of service are more problematic. Two-year enlistees were to have special characteristics, high school graduation and higher aptitude classification, and be assigned to the combat arms. Data in this report show that these requirements were not fully realized, but that when they were, 2-year enlistees did have lower attrition rates than those with longer enlistments. Interactions between term of enlistment and other variables revealed very complicated patterns whose relevance for the use of shorter enlistments to achieve attrition-related objectives is questionable.

1. INTRODUCTION

1.1 Problem

Attrition, or the failure of personnel to complete assigned tours or terms of service, is one of the primary reasons the Army has difficulty maintaining a state of combat readiness among its personnel. This problem is particularly acute among junior enlisted personnel, who have exhibited attrition rates of 30% and more for their initial obligated term of service during the past few years. In addition to reducing unit readiness, attrition contributes to higher costs because of the additional recruiting and training of new personnel, and because of the additional transportation costs required to send them to distant assignments. The Army has responded to this problem with a substantial amount of research and many specific programs and policies designed to reduce attrition rates among first term enlisted personnel. Two programs with a potential impact on attrition are the 2-year enlistment option and the 18-month tour in USAREUR.

The two-year enlistment option was an experimental program designed to increase the number of highly qualified enlistees and to fill personnel requirements in USAREUR. In its initial conception, 10,000 of 12,000 2-year enlistees were designated for a short tour in USAREUR. Thus, while it was not the primary objective of this program to improve attrition rates in USAREUR, its effect would theoretically have been to reduce the number of USAREUR losses. The theoretical logic of this assertion rests on the attrition among first-term enlistees. The 2-year enlistees would be sent to USAREUR for about 18 months, while the typical tour for 3-year enlistees was approximately 30 months. The experimental program was initiated in January, 1979 and the first 2-year enlistees began appearing in USAREUR in about May, 1979.

The 18-month tour was a more direct attempt to affect attrition outcomes by reducing the tour of all first-term 3-year unaccompanied enlistees arriving in USAREUR. In effecting this policy the Army made the assumption of the impact of short tours more explicit. Voluntary 18-month tours were implemented in April, 1980 and they were made compulsory in October, 1980.

The belief that short tours would reduce attrition rested on the assumption that the prospect of a long stay in USAREUR produced an independent negative effect on first term enlisted personnel. The long tour prospect might drive Service Members (SM) to deliberately seek ways to curtail their stay, and/or the long stay under adversely perceived conditions might lead to negative behavior which would cause the Army to initiate early curtailment. This reasoning was supported by results from at least one published study whose results were available at the time tour length decisions were being made.[1]/ The study showed both that SM with shorter tours had lower attrition rates and that many individuals deliberately sought to leave USAREUR by the commission of unacceptable behavior, e.g., using drugs, etc.

The research results presented in this report are designed to present further evidence on the question of whether shorter planned stays (in USAREUR or the Army) have any effect on attrition rates in USAREUR.

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[1]/ J.A. Whittenberg and N. Dahlinger, USAREUR Tour Length. Alexandria, VA: US Army Research Institute for the Behavioral and Social Sciences, 1978. Report is currently under review prior to public release.

1.2 Objectives

The initiation of major personnel programs, such as the 2-year enlistment experiment and the 18-month tour in USAREUR, imply a careful evaluation of results. At about the midpoint of the several decision processes involved in the initiation of these programs, just before the start of the 2-year enlistment experiment and before the beginning of the 18-month tour option (i.e., late in calendar year 1978), ARI began developing a study to examine the impact of short tours on the performance, specifically attrition, of first term enlisted personnel in USAREUR. The results of this study are reported here.[1]/

The initial objectives of this study were to provide specific information on the impact of short tours on attrition in a USAREUR context. It was designed to verify and expand the results of the earlier ARI study of the relationship of tour length and attrition. The initiation of the 2-year enlistement experiment provided an additional opportunity to examine enlistment terms in a USAREUR context. Thus, the specific objectives of the study are: (1) to examine the relationship of tour length and attrition in USAREUR; and (2) to examine the relationship of term of enlistment and attrition in USAREUR.

This research was designed with the limited objectives of providing information which would serve as a basis for making future policy decisions and as a partial test of one internal effect of shorter enlistments. For these reasons the analysis will focus on three attrition dimensions; actual losses due to adverse administrative actions, neutral attrition , and the pattern of loss. The first dimension focuses on the conventional interest in whether individuals are able to complete their obligations and what factors intervene to increase

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[1]/ An earlier report provided results in data which had matured during the first year of the study. See Richard J. Orend, Evaluation of the Short Tour in USAREUR, Alexandria, Va.: HumRRO, April 1982.

the likelihood of a performance failure. The second dimension expands the traditional focus to include losses which are not normally associated with poor performance, but which may be the result of adverse conditions, such as long tours or being in USAREUR. Included in this group are pregnancy losses. Examination of the third dimension provides a more detailed analysis of the occurrence of attrition to permit: (1) the identification of data which would be useful in determining the average amount of time served by individuals in various enlistment and tour categories (data which would be necessary for a cost/benefit analysis); and (2) the identification of patterns which could suggest how enlistment and tour length impact attrition processes.

In the next section the design and methodology of the study will be described and in the following section results will be reported.

2. METHODOLOGY

2.1 Approach

Our evaluation of the impact of tour length and term of service on attrition was designed to use data already available on automated records. Thus, the general model used to conduct the evaluation was as follows:

1. Identify first-term enlisted personnel arriving in USAREUR;
2. Trace the movement of those individuals through their stay in USAREUR;
3. Determine reasons (ETC, PCS, administrative action, etc.) for leaving USAREUR; and
4. Determine if term of enlistment and tour length are important predictors of attrition.

These four steps are described in greater detail in the procedures sections which follow.

2.2 Sample

The sample used of this report includes all enlisted personnel in their first year of service who entered USAREUR from 1 May 1979 through 31 May 1980, N=41,991. These individuals were identified as they entered USAREUR, each month, from TAPERS transaction files maintained by the First Personnel Command in USAREUR. The files are estimated, by PERSCOM, to be 95% to 98% accurate in their identification of all incoming first-term enlisted personnel. Thus, our sample represents a population cohort for the period covered.

2.3 Data

Two types of information were collected. The first includes personnel actions and movements during the reference time frame and the second includes individual characteristics of members of the cohort.

2.3.1 Analysis: For each cohort member we determined arrival and loss dates (to and from USAREUR), by month, and calculated length of stay. "Stay" is used as the criterion variable in the analysis of attrition patterns. In addition, for those individuals who left USAREUR prior to their expected tour rotation date, we determined the reason for leaving the command. Reasons were divided into three types: (1) regular ETS or PCS movements; (2) administrative loss due to special circumstances, like medical or hardship discharge due to fraudulent enlistment, and pregnancy; and (3) administrative loss due to some type of inadequate performance. The last category, termed negative attrition, includes all factors normally associated with adverse attrition, such as AWOL, Courts Martial, unsuitability, drugs, homosexuality, etc., and defines the group whose performance is of greater interest in this study. Because of the potential impact of tour length and term of service, as well as the potential effect of serving in USAREUR, the second category, neutral attrition, will be examined also. The identification of negative and neutral attrition is made on the bais of the Separation Program Designator (SPD), which was added to our cohort data set by matching USAREUR losses to subsequent Enlisted Master File (EMF) updates.[1]/

The attrition categories were developed using the following steps:

(a) All incoming personnel were identified by SSN and name as they entered USAREUR (the entry cohort).

(b) As individuals in the entry cohort left USAREUR they were again flagged and their length of stay was determined.

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[1]/ USAREUR records often do not contain this information so the EMF matching procedure was necessary to complete the data set. Using EMF also resulted in 3- to 6-month delays in the completion of individual records due to the lag in updating the more permanent records. The matching procedure was completed by DA MILPERCEN using Social Security Numbers provided from our cohort list of USAREUR losses.

(c) The SSN of all cohort personnel leaving USAREUR, during the timeframe of the study, was transmitted to DA MILPERCEN, where the reason for leaving USAREUR was determined.

(d) Reasons were then categorized, as described above, for analysis.

2.3.2 Cohort Members: The second type of data collected for this analysis were individual characteristics describing all cohort members. The two key predictor variables were term of enlistment and tour length. Term of enlistment is divided into three categories -- 2-year, 3-year, and 4 or more years -- for purposes of this analysis. Table 2.1 shows distribution of cohort members on this variable.

Table 2.1

Distribution of Term of Enlistment

	Number	Percent
2-year	1468	3.5
3-year	27739	66.7
4 or more years	12401	29.8
Total	41608	100.0
Missing	383	

While the 2-year enlistees constitute only 3.5% of the cohort, their total N of over 1450 provides a sufficient sample to complete the desired analyses.

Table 2.2 presents the distribution for tour length divided into five categories.

Table 2.2

Distribution of Tour Length

	Number	Percent
Up to 17 months[1]/	457	1.10
18 months	430	1.10
19-24 months	14533	36.41
25-30 months	6780	17.01
31-48 months[2]/	17657	44.30
Total	39857	99.95
Missing	2134	

The "short tour" category, 18 months, is again quite small, but sufficient for most analyses. Many of the 2-year enlistees are serving 19- or 20-month tours. The 18-month cutoff point was used because it was the limit of the short tour policy in USAREUR. As subsequent analysis will show, the 18 month and 19-24 month tour attrition rates provide some of the most noticeable differences across categories.

For about 5% (N=2134) of the cohort there were no tour length data available at the beginning of their USAREUR tours. Because one of the factors hypothesized to affect attrition is expected stay (tour length), we did not include these individuals in the analysis of this variable.[3]/

The remaining variables used in this analysis are socio-demographic and military characteristics. These variables were selected because they are widely

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[1]/While tours of less than 17 months are not "legitimate", a small percentage were still shown.

[2]/Most of these tours (over 90%) were from 31 to 33 months. A small proportion (about 7%) were clustered at 35-36 months.

[3]/They are included in other analyses where data was present, but the number of missing cases is small enough that significant distortion in the results are unlikely.

used in other attrition research where they have been shown to correlate with negative attrition. Because we were interested in isolating the effect of enlistment term and tour length on attrition, they were included as control variables. In the results section (Section 3) they are discussed in terms of their individual contribution to attrition rates and attrition pattern(s) as well.

The variables included in this analysis are as follows:

1. Education level
2. Gender
3. Age (at arrival in USAREUR)
4. Ethnicity
5. Race
6. Maritial status (at arrival in USAREUR)
7. Number of dependents (at arrival in USAREUR)
8. Mental aptitude (category) level
9. PMOS
10. Grade (at arrival in USAREUR)

Continuous variables, e.g., age, education (in years), number of dependents, mental aptitude, and grade, are categorized for contingency analysis and left in their original form for multivariate analyses. Categorical variables, e.g., gender, ethnicity, race, marital status, and PMOS, are grouped according to major category and, in some instances, taking into account total N in each category.[1]/ PMOS is categorized two ways: (1) by general groups -- combat arms, combat service, and combat service support; and (2) by Career

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[1]/In multivariate analyses categorical variables are treated as "dummy variables" as described in Nie, Norman, et al., Statistical Package for the Social Sciences, New York: McGraw-Hill, 1975. pp 373 - 382.

Management Field (CMF). Data on CMF are presented depending on the number of cases appearing in each group for this cohort. Distributions of cohort members for each of these variables are presented in Appendix A. Analytic categories are presented in these tables also.

2.4 Analysis

2.4.1 Analytic Problems: Several of the variables, e.g., marital status, ethnicity, and gender, have highly skewed distributions (one of the categories is very small). This is true for the primary criterion variables, negative and neutral attrition, as well. Among predictor variables, this situation limits the potential for predicting criterion outcomes because of small variance. Among criterion variables, prediction is difficult because of what Meehl and Rosen (1955) have called the "base rate" problem.[1]/ These conditions limit the usefulness of multivariate techniques for explaining differences in outcome performance, although they have been used in this study to examine the relative importance of predictor variables. There is no similar limitation when examining the stay criterion (although the limited variance is still a problem for predictors). The reader should consider these problems in attempting to interpret results.

2.4.2 The Analytic Samples: The analysis reported here focuses on three overlapping cohorts. The first cohort uses the entire research cohort of 41,991 individuals and deals with the first year of the USAREUR tour. Individuals who entered USAREUR in May, 1979 are evaluated as of May, 1980. Those who are still in USAREUR after one year are considered successful (regardless of any subsequent action) and are categorized as negative or neutral attrites. The analysis looks for differences on predictor variables across criterion categories. Arrivals during each subsequent month are treated in the same way

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1/Meehl, Paul E. and Rosen, Albert, "Antecedent Probability and the Efficiency of Psychometric Signs, Patterns or Cutting Scores," Psychological Bulletin, 52,3 (1955), pp 194-216.

so that the aggregate analysis examines a one-year cohort, each of whose members has had a opportunity to remain in USAREUR for the same length of time.[1]/

The second cohort is created using the same procedure except that an 18-month cutoff point is used. Thus, we examine SM who have had an equal opportunity to remain in USAREUR for at least 18 months. Because of the longer maturity time, a smaller cohort was available at the time analyses were conducted. The 18-month cohort consists of the 28,104 individuals who arrived in USAREUR from May 1979 through December, 1979. This group is, then, a subset of those used in the one-year analysis, but it includes an analysis of the additional losses which occurred during the thirteenth through eighteenth months of the USAREUR tour (as well as those which occurred during the first twelve months).

The third cohort is a smaller subset of individuals who have had an opportunity to remain in USAREUR for up to two years (the 24-month cohort). The cohort consists of the 5484 first year enlisted SM who arrived in USAREUR in May and June, 1979. Because of the smaller N, analysis of this cohort will be much more limited. With the passage of time (maturing of the data) it will be possible to expand the data base and extend the analysis to include a larger 2-year cohort and generate a 30-month cohort.

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[1]/Arrival date is not relevant in this analysis. Seasonal differences are therefore ignored here, although they could be of some significance, and further analysis along the dimension might be warranted. The earlier report (Orend 1982) using these data examined only May 1979 through December 1979 arrivals (also using a one-year cutoff point). Preliminary analyses for the present report showed some substantial differences between the earlier cohort and the remainder of the total sample (those who arrived in USAREUR from January 1980 through May 1980) on predictor variables like education level and aptitude category. The proportion of nongraduates was 31.4 in the former cohort and 42.5 in the latter, and neutral category IV's constitued 42.2% of the former cohort and 49.8% of the latter. There were also differences in the key predictor variables, when 2.5% had 2-year tours in the former cohort and 4.0% had 2-year tours in the latter. (Short tours showed simular differences.) Whether differences were short term fluctuations, changes in recruiting results, or due to some other factors was undetermined in the context of the present study. As described above, the two cohorts were combined for the present analysis.

Figure 2.1 provides a graphic representation of the three cohorts examined in this report. For each of the cohorts the last possible loss date - June, 1981 - is about six months short of the point at which the type of loss for those who left USAREUR could reasonably be expected to appear on EMF records. Thus, analyses were delayed until this "maturing" process had occurred, and took place in January/February, 1982. Additional analysis could be conducted as the data set further matures and loss type information becomes available.

2.4.3 Analysis of Attrition: Two approaches were used in the analysis of attrition. The first is a contingency analysis of the relationship between attrition and each of the predictor variables or multiples of relevant predictors. Analyses of this type are conducted for each of the cohorts, although the depth of the analysis (number of control variables) is limited by the size of the cohort. In all cases, controlled contingency analyses are arranged so that the control variables further explicate the relationship between major time variables (tour length, term of service) and the criteria (loss type or stay). These analyses provide the most direct and interpretable results of the impact of specific predictors and an identification of potential gain, in reduced or increased attrition, which might be obtained by changing certain assignment policies, e.g., tour length or enlistment term.

The second approach uses multivariate analysis to identify the relative contribution of each predictor variable. Stepwise multiple regression analysis was the technique applied to this analysis.[1]/ The regression analysis also provides a total explained variance result, however, this outcome is limited by the factors described in 2.4.1. In other words, a very low proportion of the total variance is accounted for. Attrition results are presented in Section 3.

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[1]/Multivariate analysis of data for the earlier report included discriminant function analysis. The results of this analysis were not appreciably different from parallel regression analysis so they were not used in the current analysis plan.

Figure 2.1

SAMPLE MATURITY

Possible Loss Dates

Arrival	N	6/79	7/79	8/79	9/79	10/79	11/79	12/79	1/80	2/80	3/80	4/80	5/80	6/80	7/80	8/80	9/80	10/80	11/80	12/80	1/81	2/81	3/81	4/81	5/81	6/81
5/79	2,665												12						18						24	
6/79	2,819													12						18						24
7/79	3,614														12						18					
8/79	3,301															12						18				
9/79	3,392																12						18			
10/79	4,281																	12						18		
11/79	4,139																		12						18	
12/79	3,691	(Subtotal: 28,104)																		12						18
1/80	4,576																				12					
2/80	2,821																					12				
3/80	2,477																						12			
4/80	1,913																							12		
5/80	2,180																								12	
Total	41,991																			Total Losses as of 12/80: 5,941						
Losses		4	10	103	127	145	192	217	374	229	791	832	335	128	-	489	538	135	764	528	584	502	704	536		

2.4.4 Analysis of Attrition Pattern: The same dual approach is followed in analyzing attrition patterns. The overall attrition pattern is presented and individual predictors are examined. Regression analysis is used to determine the relative contribution of each predictor and the overall explained variance. These results are presented in Section 4.

3. RESULTS: TYPE OF ATTRITION

3.1 The Use of Term of Enlistment and Tour Length as Primary Predictors

The selection of term of enlistment and USAREUR tour length as the primary predictors was, as discussed in Section 1, a function of specific real and contemplated programs designed to reduce attrition (among other objectives). The logic of the argument used to support the use of these factors provides a kind of theory about what is expected to happen when the policies are put into effect. A very brief review of this argument is useful prior to examining results.

Earlier research[1/] suggested that the prospect of a long stay in an unpleasant environment was a significant contributor to the performance of young enlisted SM. Specifically, coming to Europe and finding both economic and cultural difficulties, as well as separation from family and friends, created many negative attitudes toward staying in the Army. The prospect of having to endure these conditions for 30 to 36 months made them even more unbearable. For some individuals, this situation would lead to behavior unacceptable to the Army (poor job performance, social problems, drug usage, AWOL, etc.) as an unconscious reaction.[2/] For others, it would lead to a conscious decision to take action designed to get themselves out of the environment (and the Army) prior to the completion of their obligated tour. In both instances it was thought that time to be served made an independent contribution to the resultant behavior. The prospect of staying for three years was more negative than the prospect of staying for a shorter period. The earlier research provided some empirical evidence which supported this argument.

[1/] Whittenberg, J.A. and Dahlinger, N., op. cit.

[2/] Contributed to by a variety of other factors as well.

The appropriate response to these findings seemed to be shorter tours in USAREUR. The appropriate response to the argument extended to the entire Army would be shorter enlistments. The enlistment policy was initiated as an "experimental" program in January, 1979 (at about the same time this research project began). The short-tour policy (18 months for 3-year unaccompanied enlistees) in USAREUR was initiated in April, 1980 as an option and not until October, 1980 as a requirement. Our data includes some SM who have either short tours, short enlistments, or both characteristics. Thus, we are able to compare the effects of these major predictors across the full range of tour and enlistment alternatives.

The previous analyses of these data used slightly more than half (28,104) of the total cohort to examine the first year in USAREUR and focused on the impact of tour length. The results of these analyses were generally supportive of the idea that shorter tours may have a positive impact on attrition rates, but not necessarily the tour length prescribed in current policy and not for all population subgroups. Based on an analysis of negative attrition for the first year of service in USAREUR, an 18-month tour does not reduce attrition below rates for SM in the next two longer tour-length categories (19 to 24 months and 25 to 30 months). More detailed analysis of the attrition rates within each tour-length category showed that the higher rates for short-tour SM were not uniformly applicable across all types of people. Blacks with combat arms MOS, those who did not graduate from high school, and mental category IV individuals were much more likely to attrite under short-tour conditions than were other types of individuals. These findings suggest that there could be an assignment factor in the high attrition rate for SM with short tours. Individuals with a 19- to 24-month tour (most of whom were at the high end of that category) were, on the average, the least likely to attrite during their first year in USAREUR. Those with 25- to 30-month tours were somewhat more likely to

attrite, and those with 31 or more months to serve in USAREUR had the highest attrition rates. These results suggest that when other factors are controlled a 24-month tour may be the most efficient when the objective is to minimize first-year negative attrition. Results described in this report will expand on these findings.

3.2 Attrition Outcome Analysis

Attrition analysis described here was designed to identify factors which distinguish between those SM who were successfully completing their USAREUR assignments and those who were discharged during that tour or as a result of actions taken during that tour, including both negative and neutral attrition. The overall loss rates for each cohort are shown in Table 3.1.

Table 3.1

Attrition Rates for Each Cohort

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Negative Attrition	6.2%	9.3%	10.7%
Neutral Attrition	1.0%	1.5%	1.7%
Total Attrition	7.2%	10.8%	12.4%

Overall losses after 12 months are 7.2%, of which 6.3% are negative.[1/] There is an increase of about 50% by the end of 18 months for both loss types, and a

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[1/] Attrition rates may be somewhat higher (by about 10% of the illustrated rates) than shown because of a problem in identifying the disposition of some losses. Of the total losses identified from USAREUR data sources (TAPERS loss files), about 10% were either not matched (by SSN) to the EMF or were not coded as having left USAREUR in the EMF. Thus, there was no way to determine the type of loss. We assume that data errors of this type are randomly distributed across loss types. About half of all USAREUR losses are positive losses, either reassignment or ETS. Therefore, the data problems should make only about a .5 percentage point difference in overall negative and neutral loss rates presented in Table 3.1.

much smaller increase by the end of two years. Neutral attrition increases at a somewhat slower rate than negative attrition during the final 6-month period.

In this report we will first examine the relationship of attrition to individual variables relevant to the programs designed to reduce attrition, namely, tour length and term of service. This analysis will be extended to include other socio-demographics and military characteristics which will be used as control variables. The objective of this analysis is to determine if these factors influence the relationship of tour length and term of service with attrition rates.[1/] The multivariate analysis will be described in the following subsection.

3.2.1 Individual Variables - Term of Service. Figure 3.1 shows the level of attrition for each enlistment period. Two types of information are presented here: (1) the relationship of attrition to term of service; and (2) changes in that relationship for different cohorts. For negative attrition, the relationship is clear and constant. Three-year enlistees are somewhat more likely to attrite than 2-year enlistees and even more likely to attrite than 4-year enlistees. In addition, the difference is relatively constant (as measured by the extent to which the lines are parallel) across cohorts. As will be shown in later analysis, the higher mental and educational standards required for the 2-year enlistee seem to have a positive impact on attrition rates. Four-year enlistees are the most stable category.

[1/] Because it was not possible to set up an "experiment" to test the effect of tour length and term of service, it will be extremely difficult to establish causal relationships. For the most part, we have no knowledge of how individuals came to be assigned to different tour and enlistment terms. Nor could we control for other factors which might have intervened in this process. However, relationship (correlation) is a prerequisite of all causal relationships and we can establish its presence in the available data. The absence of a relationship does not rule out causality, however, since it may be hidden by suppressor variables which are not part of our analysis. The components of the major variable relationships are examined in some detail in the extended contingency analysis.

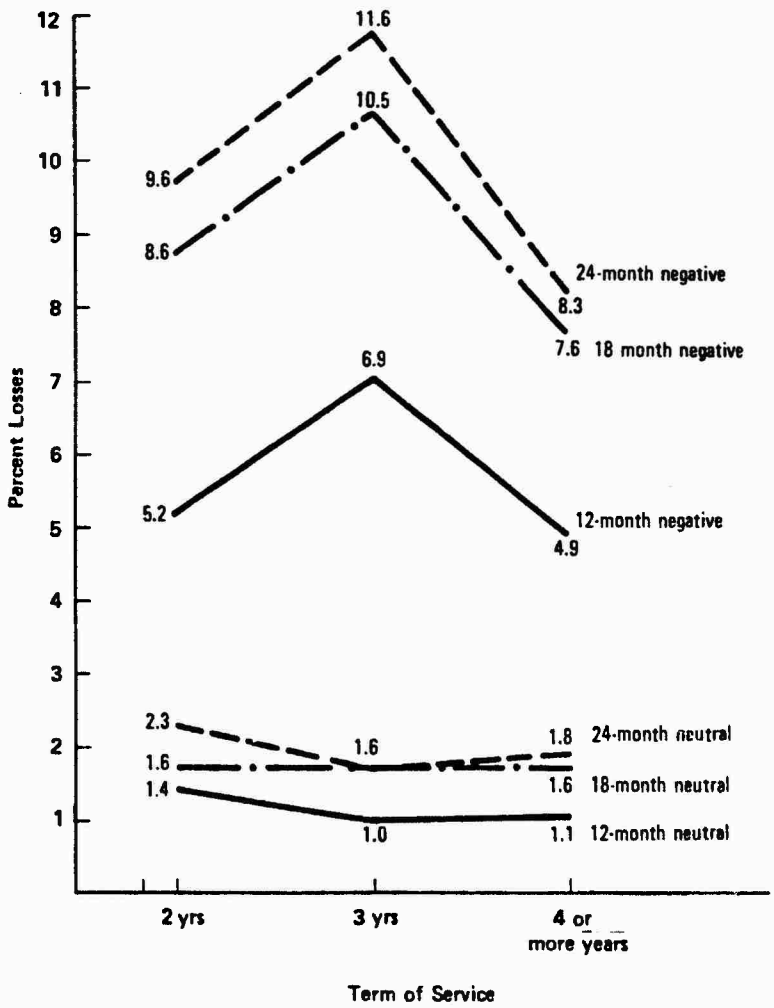

Figure 3-1. Loss Type by Term of Service (For Each Cohort)

Part of the difficulty in interpreting any set of differences is in determining how much difference is important. The difference between 3-year and 4-year enlistees is from 2 to about 3 percentage points. While this difference seems relatively small, it could make a substantial difference in the amount of training and travel costs necessary to support troops in USAREUR. Similarly, the higher attrition rates for 3-year enlistees may not be as important when compared to a shorter average length of service of 2-year enlistees.[1/] Any final interpretation of the differences, then, must be left to the policy-maker who has additional information which can be used to refine the basic data presented here.

Differences for neutral attrition across enlistment categories are very small, although there is more difference across cohorts (the lines are not parallel). The low rates of neutral losses make differences more difficult to interpret because Ns are also much smaller. It is interesting to speculate, however, on why 2-year enlistees lose such a large proportion (about one-third) of their neutral attrites during the latter part of their tours, while those with longer enlistments lose very few during this period.

3.2.2 Individual Variables - Tour Length. The expected impact of shorter tour lengths was to reduce attrition. Results presented in Figure 3.2 indicate that this expectation may be only parcially fulfilled. For negative attrition, there is a steadily decreasing attrition rate as tour length gets shorter, but not for the 12- to 18-month tour. This relationship applies to 12- and 18-month cohorts almost equally. The parallel lines indicate little difference between the effect of tour length on the first 12 months in USAREUR and the next 6 months. The 24-month cohort shows substantial differences among individuals in the two middle tour-length categories. The additional 6 months in

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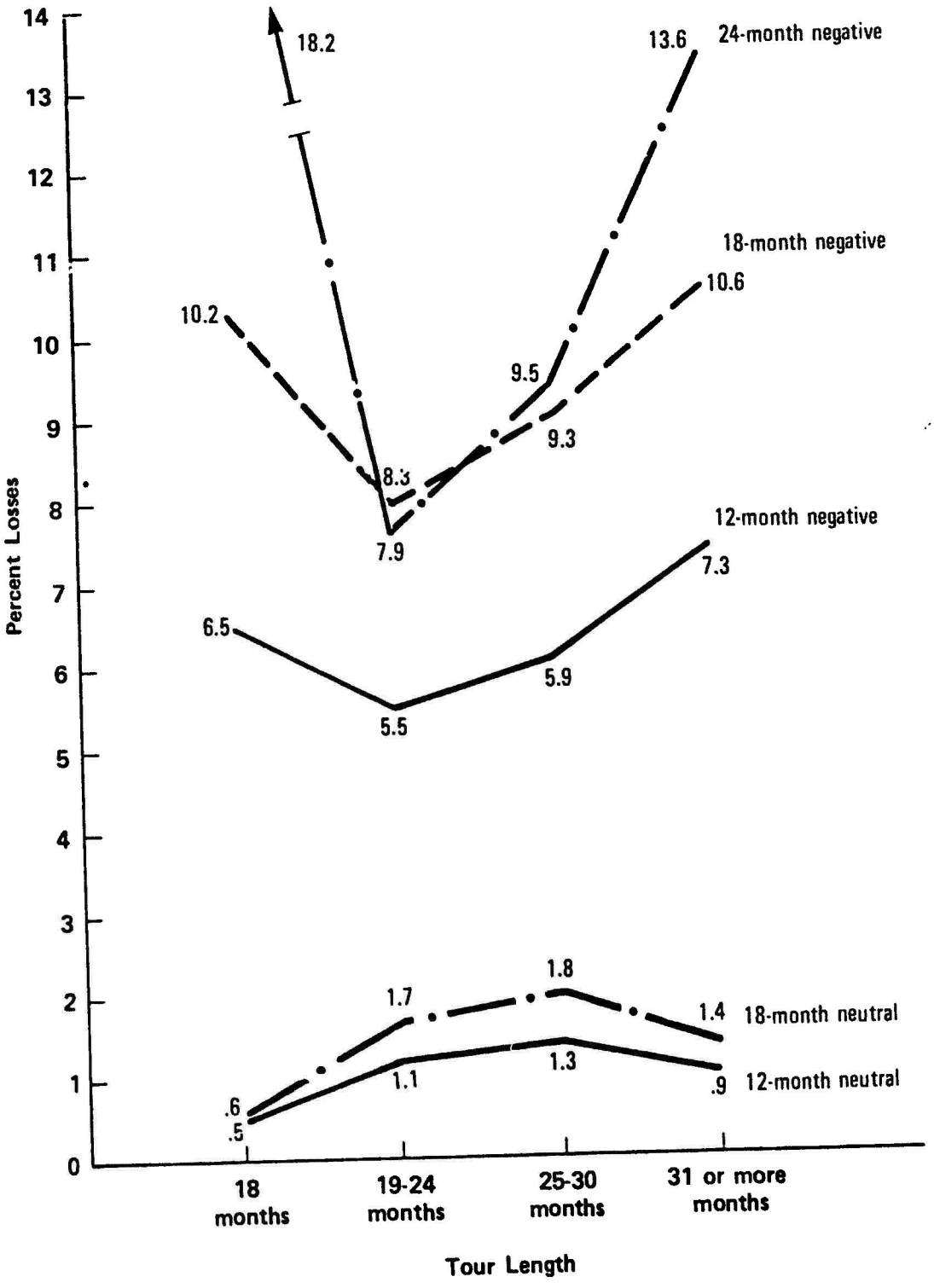
[1/] Assuming that such a difference in average length of service actually exists.



* Neutral 24-month cohort
Losses are not plotted because the N is too small.

Figure 3-2. **Loss Type by Tour Length (For Each Cohort)***

USAREUR has the apparent effect of greatly reducing loss rates among those with 19-to 30-month tours, while higher rates among short-tour and long-tour SM are not diminished. This means that the U-shaped function is more pronounced. The reader should keep in mind, however, that the 24-month cohort is much smaller than the others and that subsequent analysis of a larger cohort could modify results somewhat.[1/]

Final interpretation of these results must await examination of the interaction of tour length with other variables, but at this point the relationship of tour length and negative attrition suggests: in all three cohorts, a longer tour results in higher attrition except among those SM with an 18-month tour. This relationship is relatively constant for the first 18 months and then becomes more pronounced during the 19th through 24th months. The exception is in the 12-month cohort where those with 18-month tours are slightly less likely to attrite than those with long tours.

Results for neutral losses are somewhat different. The U-shaped function no longer appears; in fact, there is a slight inverted U, with a small positive correlation between tour length and attrition rate except for long tours (31+ months) where the rate is slightly down. In the case of neutral attrition, short tours show the desired relationship. However, differences are very small and it is not clear how important they could be in terms of policy considerations. This is especially true when the two types of losses are combined, thus reducing the strength of the realtionship demonstrated for negative attrition.

[1/] The reader has probably already noted a discrepancy between 12- to 18-month tours and losses during the 19th to 24th month in USAREUR, after the time when normal rotation should have occurred for these SM. There are several possible explanations for the discrepancy: (1) there may be a much greater tendency to extend these short tours; (2) data inaccuracies could have more impact on the rare 12- to 17-month tours; (3) the original information on tour length (obtained from TAPERS files) could have artificially inflated the number of very short tours; and (4) the N for this group is very small, resulting in an apparent impact, because of the relative presentation of the data, which far exceeds the real importance of a handful of aberrant cases.

In the detailed analyses described below, some of the other variables which contribute to the attrition rates at each term-of-service and tour-length category are sorted out. These analyses reveal that other variables account for much of the difference in attrition rates across tour-length and term-of-service categories. Prior to pursuing the analysis of interaction effects, however, the individual relationships of moderator and criterion variables will be described.

3.2.3 Individual Variables - Demographic and Individual Characteristics. A total of seven socio-demographic, one cognitive, and two Army-generated variables were identified at the time cohort members entered USAREUR. These variables include most of the major individual [1/] factors which prior research has shown to be related to attrition. They are: education level, age, gender, ethnicity, race, marital status, number of dependents, mental aptitude category, military occupational speciality groups (MOS), and grade. Each will be discussed in turn.

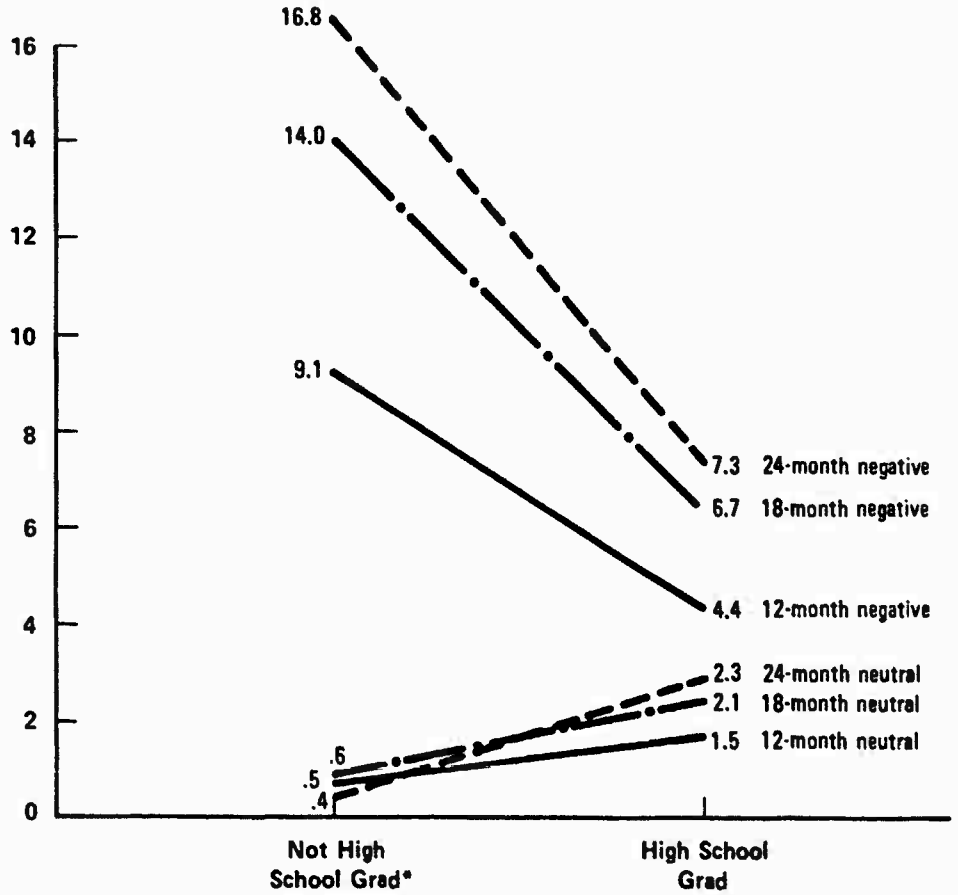
Education. As a result of a study of 66,000 Navy recruits, Lockman (1976) maintained that educational level was the best single predictor of attrition with attrites having lower educational levels than those recruits remaining in the service. In a study conducted with Marine Corps recruits (Sims, 1977), educational level, considered in conjunction with age and ASVAB scores, was found to be a significant predictor of attrition within the first 14 months of duty. In numerous other studies on attrition conducted in all four military services, educational level was related to failure to complete tours with non-high school graduates having significantly higher rates of early discharge (Goodstadt & Yedlin, 1980; Nogami. 1981; Owen et al., 1980; Mobley, Hand, Baher, & Meglino; Guthrie, et al., 1978; Guinn et al., 1977; Greenberg & McConeghy, 1977). Matthews (1977) found that high school graduates in Marine recruit training were less likely to desert or to attrite than were non-graduates.

The negative relationship between educational level and negative attrition is verified again in all three of our cohorts (Figure 3.3). SM who did not graduate from high school (including those with GED equivalent) are more likely to attrite at each stage (during the first 12 months, during the next 6 months, and during the last 6 months--19-24 months--for which we currently have data available). The increasing gradient of each of the cohort lines is evidence of the increasing change. Nongraduates attrite faster than graduates at all stages of the first 2 years of their USAREUR tours.

Almost the opposite relationship exists for neutral attrition. As Figure 3.3 shows, high school graduates are lost at more than three times the rate of nongraduates and the rate increases during the 13th through 18th months.[1/] These differences are much smaller than those shown for negative attrition; and if the two types of attrition were combined, the nongraduates would still be far more likely to attrite. However, the differences do pose an interesting dilemma for policymakers, if high school graduation were to be used as a criterion for assignment to a USAREUR tour.

Age. In predicting early attrition of military personnel, age has been determined to be a significant predictor in studies conducted in all four military services (Sims, 1977; Owen, Bussey & Whittenburg, 1980; Matthews, 1977). Younger enlistees are more likely to attrite, with 17 - 18 year olds comprising the highest risk group (Guthrie, Lakota & Matlock, 1978; Manning & Ingraham, 1981; Guinn, Wilbourn & Kantor, 1977; Orend, 1982). The lowest attrition risk age groups include 19-21 year olds (Plag, Goffman & Phelan, 1970; Smith & Kendall, 1980) with first term enlistees 21 years or older having higher attrition rates (Matthews, 1977; Lockman, 1975).

[1/] As opposed to organizational and structural factors, and not including other cognitive and psychological characteristics which the Army currently does not include in its automated data files.



* Includes GED graduates

Figure 3-3. Loss Type by Education Level

In the present study, there is a strong relationship between age and negative attrition, while there is almost no relationship between age and neutral attrition (Figure 3.4). Most of the relationship between age and negative attrition can be accounted for by the very high loss rates for 17-year-olds at each stage for the first 2 years of their USAREUR tour. At the other end of the age spectrum, those who are 21 or older have a slightly higher probability of attriting than 18-through 20-year-olds during the first 18 months of their tours. The 24-month cohort shows a more linear trend.

Gender. Other differences in rates of attrition have been found to be related to gender (Ross & Nogami, 1981; Martin, 1977; Mobley, Youngblood, Meglino & Moore, 1980) determined that females attrite at a consistently higher rate than males. However, more recent research has found that attrition rate by gender differs according to MOS and that female attrition depends more on whether the MOS is a traditional or non-traditional female MOS (Nogami, 1981). There are significant differences in reasons for attriting based on gender with more females attriting for family-related causes or for pregnancy and fewer for performance and disciplinary reasons. There are higher rates of male attrition for Training Discharge Program (TDP), Early Discharge Program (EDP), medical and adverse causes (Nogami, 1981; Orend, 1982; Manning & Ingraham, 1981).

In the present study, the results show a unique relationship, among the variables we have used, between gender and the two types of attrition. Men are substantially more likely to attrite for negative reasons than women (Figure 3.5). Women, on the other hand, are more likely to attrite for

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1/ The 24-month cohort, although shown in the Figure, has a very small N for this analysis and the results depicted are expected to change as more data become available.

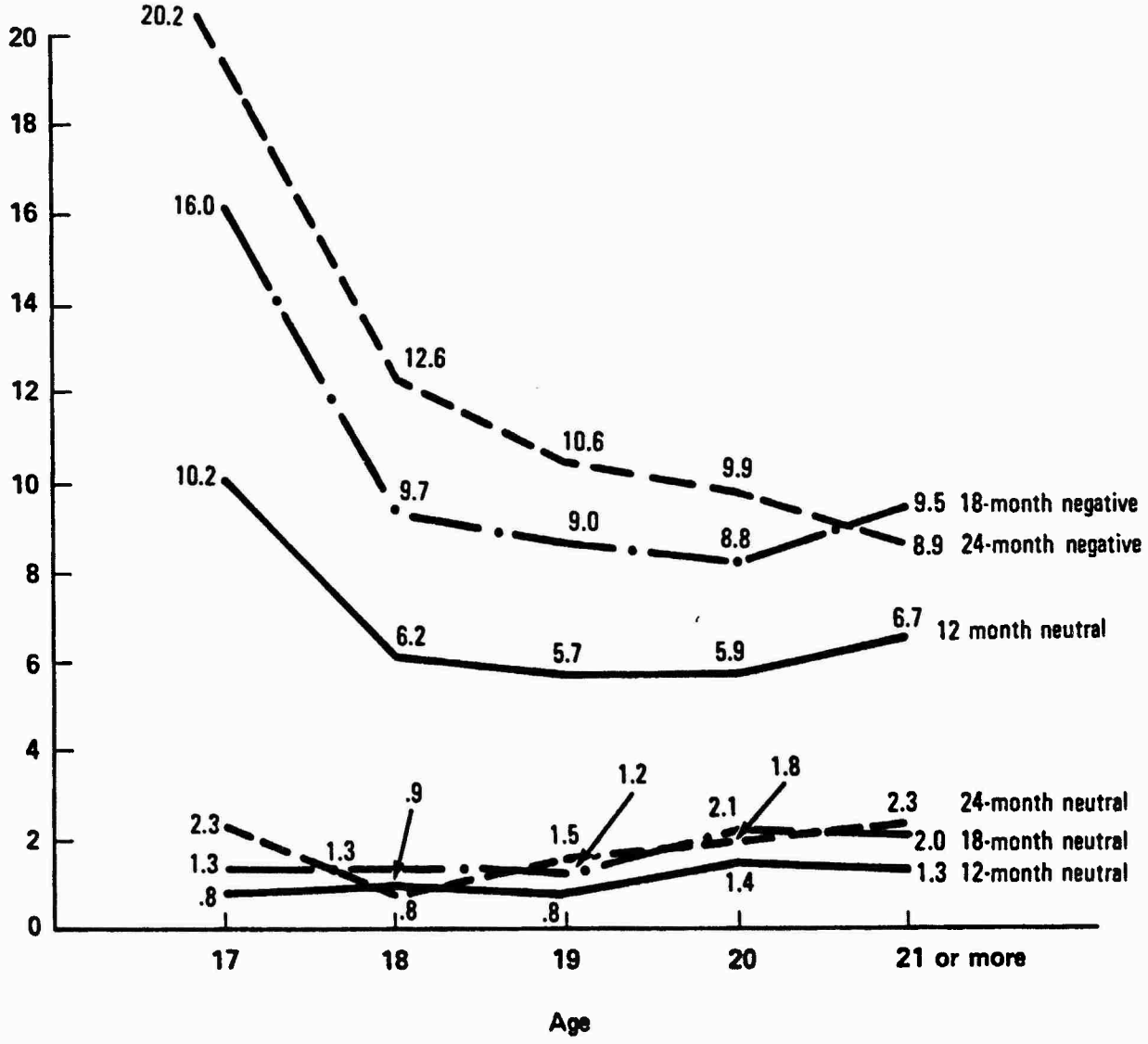

Figure 3-4. Loss Rate by Age

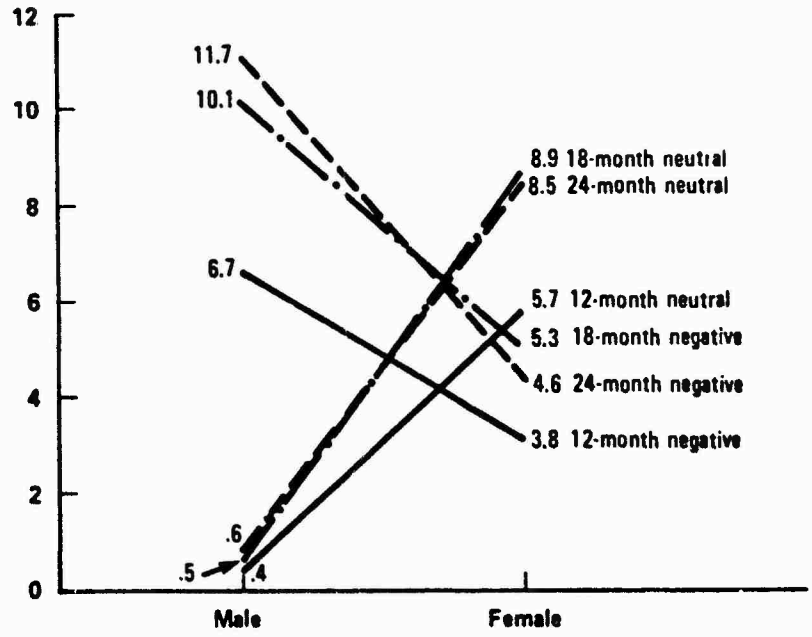

Figure 3-5. Loss Rate by Gender

neutral reasons than for negative reasons. These relationships are true for all three cohorts. Pregnancy is, of course, the major factor in the difference. If pregnancy were considered a negative reason for attrition, the negative attrition rate for women would be higher than that of men, at least in the 12-month cohort. This Figure also demonstrates that men, on the average, have very low neutral attrition rates, even after two years in USAREUR. Women account for about half of this type of loss, despite comprising only about one-eighth of the cohorts (see Table A.1). If earlier reported findings about a conscious effort to be dismissed from the Army are true, these results suggest that women may use pregnancy as a major route to this end, while men are restricted to more conventional means (drug use, etc.). From the Army's perspective, there is little difference in the effect of the alternative routes. From the individual's perspective, the stigma of a lower-grade discharge which might be associated with negative attrition could be a problem in civilian life.

Race. The race of individual recruits has been found to correlate with attrition, reenlistment and military career intentions (Matthews, 1977; Allen, 1981; Lindsay & Causey, 1969; Quigley & Wilburn, 1969). The findings usually indicate that Caucasians are more likely to attrite than non-whites (Nogami, 1981; Smith & Kendall, 1980; Matthews, 1977). However, minorities receive more less-than-honorable discharges related to disciplinary actions (Guthrie et al., 1978; Manning & Ingraham, 1981).

Ethnicity (Figure 3.6) and race (Figure 3.7) have very similar impacts on attrition rates. In both cases, minorities (Hispanics[1/] and blacks) have lower negative attrition rates than majorities (non-Hispanics and nonblacks).

[1/] Hispanics include SM coded as being Mexican-Americans, Puerto Ricans, or Cuban-Americans.

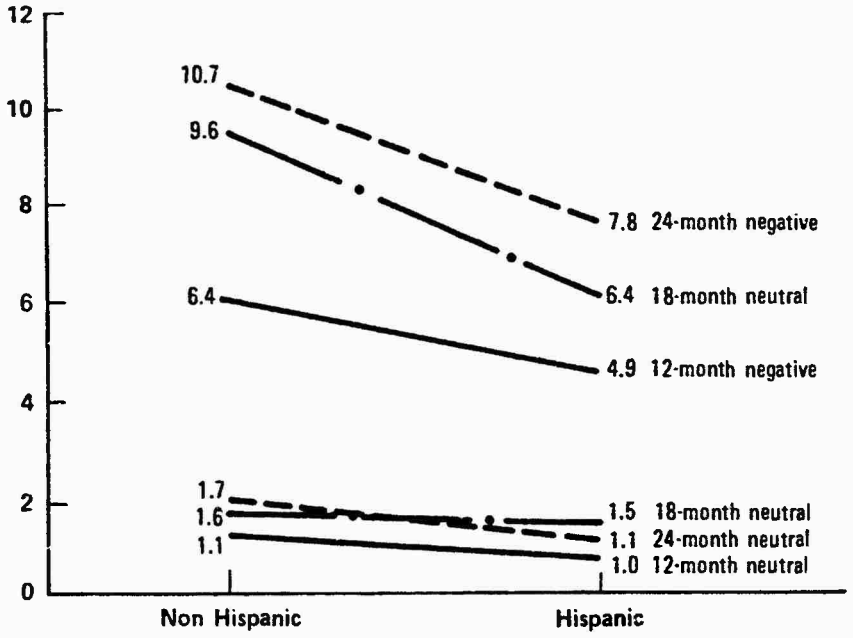

Figure 3-6. Loss Type by Ethnicity

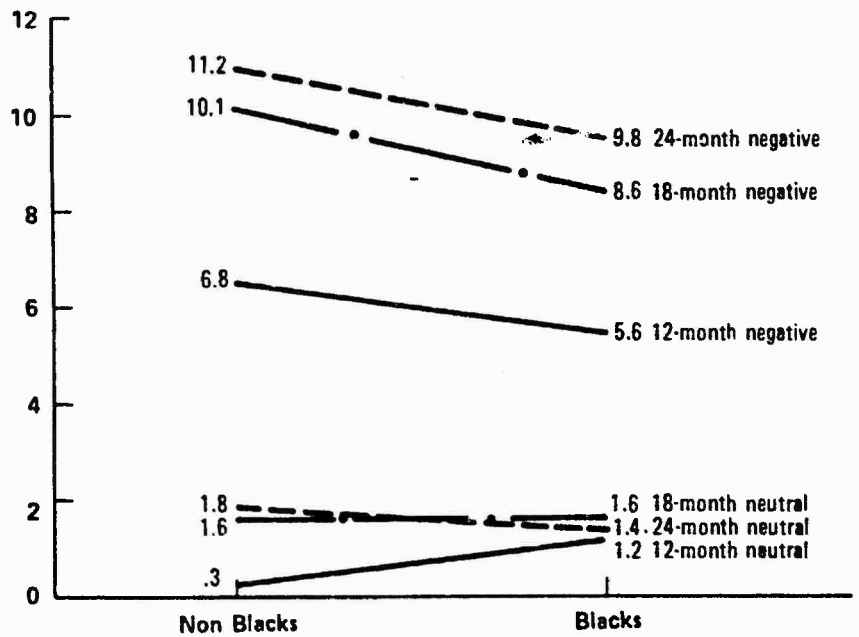

Figure 3-7. Loss Type by Race

The negative attrition rates for blacks are slightly higher than those for Hispanics. The relationships hold in each cohort, and the nearly parallel lines indicate that they are true for each significant time period covered in these data, although there is a slight tendency for Hispanics to be more stable (i.e., have a lower increasing rate of attrition) after the first year in USAREUR. Since blacks and nonblacks have very close to exactly parallel patterns, it can be concluded that the white SM population accounts for most of the increasing function after the first year.

Differences on neutral attrition are very small (from 0 to .2 percentage points) across all groups.[2/] Increases from the 12-month to the 18-month cohort are also very uniform. Thus, Hispanics and blacks show virtually no difference from whites or each other in this type of attrition.

Marital Status. Another demographic variable of interest in accounting for attrition is marital status. Although Bauer, Miller, Thomas and Dodd (1975) found no significant difference in marital status between TDP dischargees and non-dischargees, other studies of attrition in all services have found that first term enlistees who are engaged or married upon entry into the service are more attrition prone (Owen et al., 1980; Mobley et al., 1979; Orend, 1982) and that personnel with additional dependents are more likely to attrite early in their tour (Smith & Kendall, 1980; Guthrie et al., 1978).

Because they are highly correlated (Pearson's r = .76), it was expected that status and number of dependents would behave similarly with regard to attrition rates. The results support this expectation with negative attrition rates for both married SM and those with dependents that are very close in both the 12-month and 18-month cohorts (Figure 3.8 and Figure 3.9). While those with dependents and married SM have a tendency toward higher attrition

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[2/] Because of the small N, the 24-month cohort figures may be less reliable.

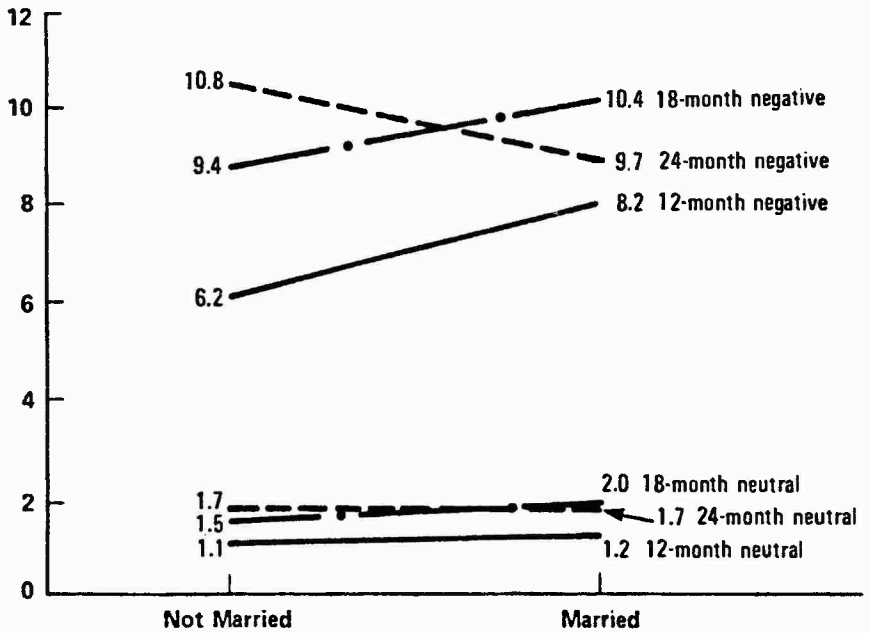


Figure 3-8. **Loss Type by Marital Status**

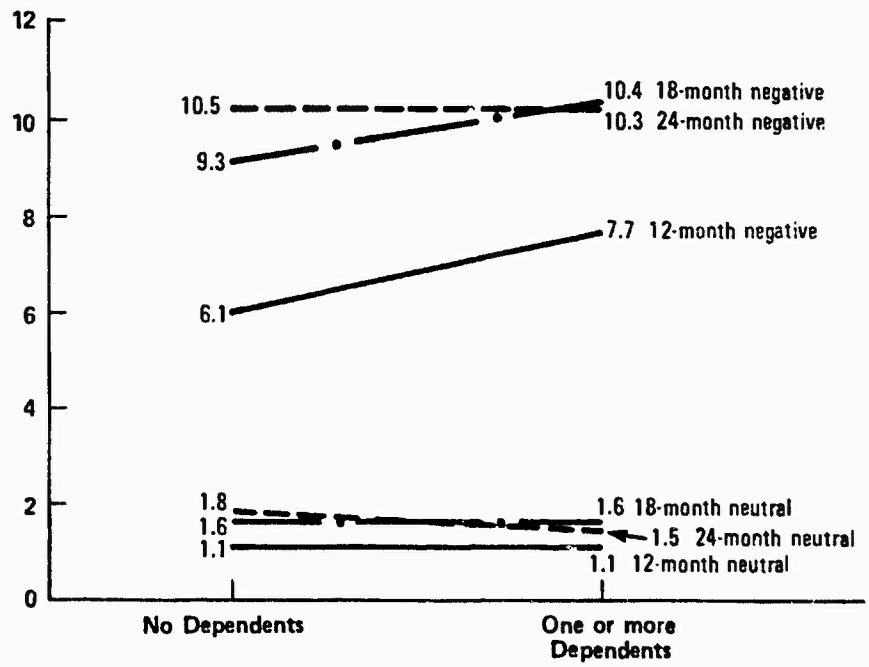


Figure 3-9. **Loss Type by Number of Dependents**

rates--by 1.1% to 2.1%--the difference decreases, slightly, from the 12-month to the 18-month cohort. This means that there is a slight decrease in the relative rate of negative attrition during the 13- to 18-month timeframe for these groups. The change is not large enough to reverse the overall trend of lower rates among those who are unencumbered by family. Neutral attrition rates follow a similar pattern except that married SM show a greater increase during the 13- to 18-month time period than any other group.

The smaller 24-month cohort results reverse some of the patterns described above. They show unmarried, no-dependent SM with equal or higher attrition rates, of both types, after 24 months in USAREUR. We are again left in the position of choosing between interpreting these results or attributing them to the size of the sample and waiting for the data to mature before drawing conclusions about the 19- to 24-month period. Because this cohort represents only 2 months from a 13-month overall cohort and because we have already presented distribution figures which suggest the possibility of some seasonality in the major predictor variables, our inclination is to present these differences without discussion until more mature data are available.

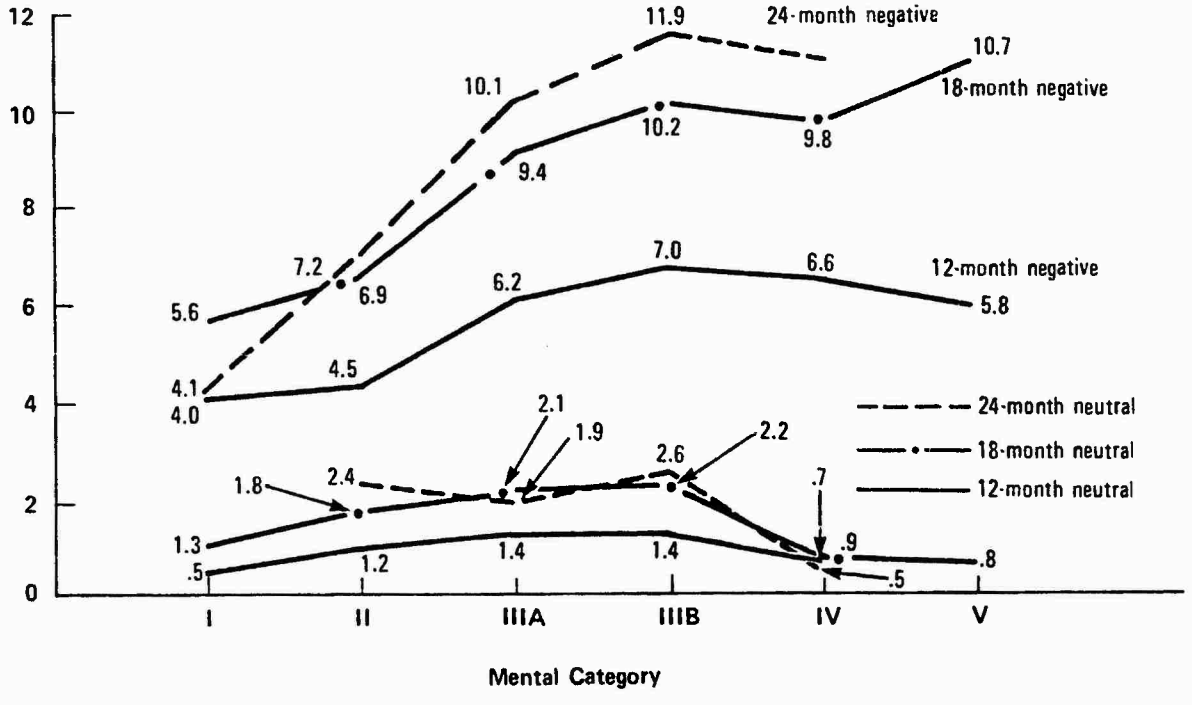
Aptitude. The final individual characteristic examined is mental aptitude category. Aptitude has been found to be related to attrition and retention in all four military services. Sims (1977) and Matthews (1977) in studies of the Marine Corps determined that aptitude either by itself or in combination with other variables, (e.g., educational lever and age) is a significant correlate of attrition. In addition, Guinn (1977) found a combination of aptitude and certain biographical variables to account for 26% of

the variance in reenlistment decisions. For Marine recruits (Mobley et al., 1978) and for Army recruits (Owen et al., 1980; Lockman, 1976). AFQT scores were significant predictors of attrition with higher rates of attrition for Category III and IV than for Category I and II (Nogami, 1981), while Naval personnel who were discharged early were found to be in the higher mental group categories (Guthrie et al., 1978; Smith & Kendall, 1980). Corey (1971) determined that Category IV (AFQT 30th percentile or below) military personnel had higher retention rates for certain occupational ratings indicating that matching job requirements with aptitude might increase retention for all levels.

In the current study, the highest attrition rates (of both types) occur among SM in category IIIB, just on the down side of average (Figure 3.10). For negative attrition, the next highest rate is among category IV individuals. SM in the highest two categories (i.e., the smartest groups) have the lowest attrition rates. These findings again correspond with the results of earlier research in this area. As with most of the previously reported results from the present data, the 12-month and 18-month cohorts have roughly parallel lines, indicating that the relationship is similar for the first 12- and the next 6-month time periods. The major exception is among cateogry V individuals, who seem to have a more difficult time during the 13th through 18th month than other groups.[1/] Neutral attrition follows a similar pattern except that category IV attrition is lower than any category except I.

Military Occupational Speciality. The job content or military occupational specialty (MOS) of recruits in all services affects both attrition and retention. In a longitudinal study, choice of career field and MOS

[1/] However, the number of individuals in this category is, again, small.



Figrue 3-10. **Loss Type by Mental Category**

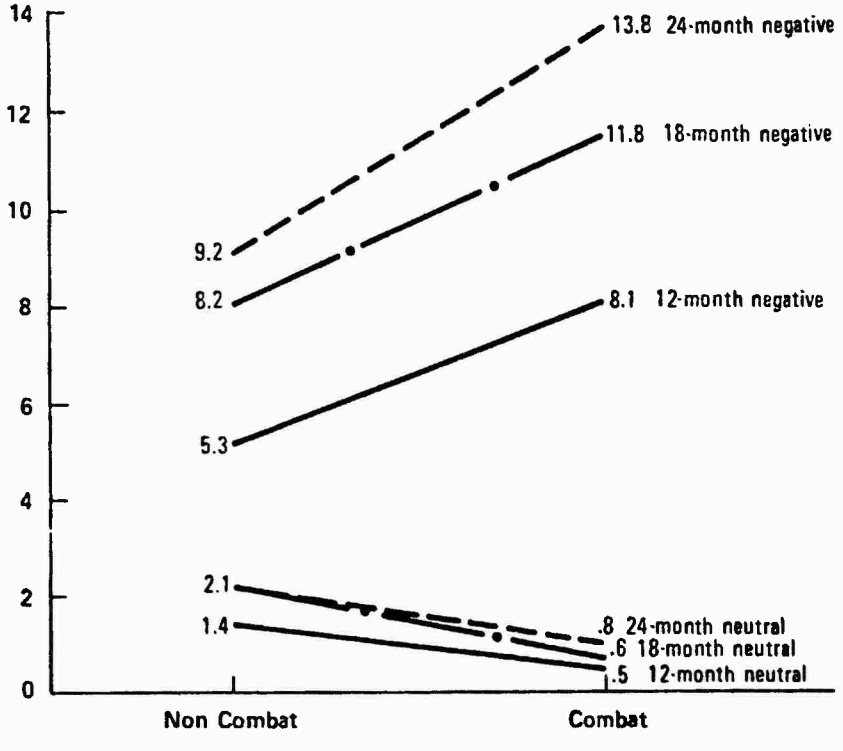


Figure 3-11. **Loss Type by MOS Category**

mismatch were examined to determine their role in attrition. The resulting MOS data were linked with career progression and attrition (Owen et al., 1980). Type of MOS has been found to be highly predictive of female attrition in the Army, with females having a significantly higher attrition rate in non-traditional female MOSs, e.g., 71D - 28.4% higher attrition rate, but with much lower attrition rate than males in other MOSs, e.g., 91R - 21.9% more male attrition (Nogami, 1981). Smith and Kendall (1980) found job assignment to be associated with the probability of attrition of Naval personnel as well.

Figure 3.11 presents results from the first of the basic military variables, Military Occupational Speciality (MOS). In this analysis we examine MOS in two ways: (1) in terms of a dichotomy between combat and noncombat MOS; and (2) in terms of Career Management Fields (CMF), which is a more refined look at Army occupations. Our data are based on assigned MOS at arrival in USAREUR and do not take into account any subsequent changes. In Figure 3.11, MOS are examined as a dichotomy.

The results of this analysis show that SM with combat MOS have higher negative attrition rates than those in combat support or service support MOS. This relationship is constant for all three cohorts. There is, however, a slight tendency for an increasing difference between the MOS categories as the stay progresses. Thus, SM in the combat arms are even more likely to attrite than noncombat SM during the 13th through 24th months than they were during the first 12 months. These results suggest that shorter tours may be better (in terms of attrition rates) for those in the combat arms.

Results for neutral attrition run in the opposite direction. Combat personnel are less likely to attrite for neutral reasons than noncombat personnel. A large part of this difference may be explained by the fact that there are no

women in the combat MOS. Our earlier results showed that women had much higher neutral attrition rates than men. Since women are concentrated in the noncombat MOS, the difference between combat and noncombat rates can easily be accounted for by this difference in the distribution of gender across MOS categories. Similarly, at least part of the difference in negative attrition, i.e., lower noncombat rates, can be explained by the presence of women. This means that the differences among men across MOS categories are not quite as large as Figure 3.11 shows.

MOS differences are further broken down in Figure 3.12, which shows negative loss rates for the 12-month and 18-month cohorts for each CMF.[1/] This Figure demonstrates a substantial variance within MOS categories, as well as across categories. Some combat MOS CMF have high rates (e.g., 11 and 13), while others have relatively low rates (e.g., 16 and 19). Similarly, some of the larger noncombat CMF (e.g., 64 and 94) have high rates, while others (e.g., 71 and 51) have lower rates. It is probably possible to develop reasonable arguments for higher or lower rates for each of the CMF described in the Figure. However, the small number of individuals in many of the CMF makes the type of analysis we are pursuing here difficult; therefore, subsequent contingency analysis will use only a limited number of the larger CMF. We shall also refrain from presenting ad hoc explanations of why particular CMF might have a higher or lower attrition rate.

The second military characteristic variable used in our analysis is grade at the time of entry into USAREUR. Used in this way, grade may reflect two things: time in service and/or performance. Since relatively few SM will

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[1/] Titles for each CMF are presented on the page following the Figure. Also, neutral attrition rates and the 24-month cohort are not shown because the large number of categories makes cell values too small to be reliable.

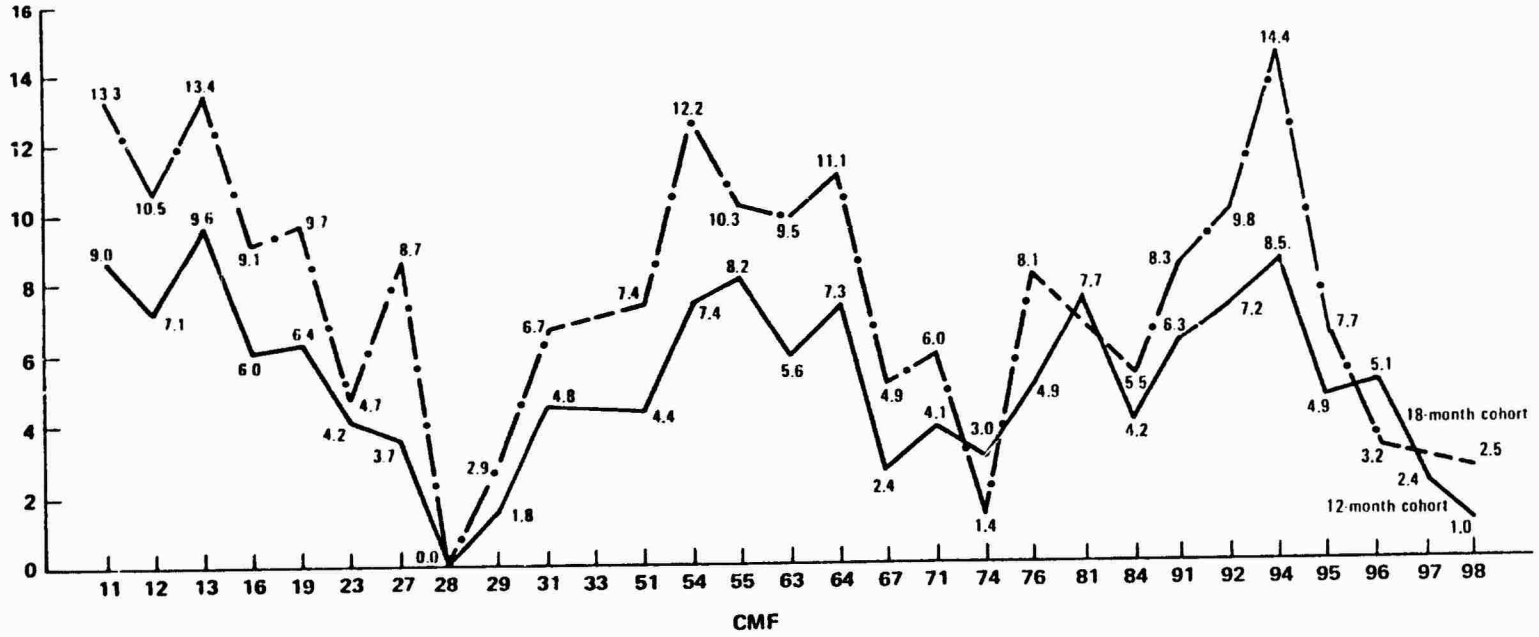

Figure 3-12. Negative Loss by CMF

have "lost a stripe" during their first few months of service,[1] we assume that higher grade means longer service (by up to 6 months) or, in a small number of cases, superior performance (fast promotion).

Results of this analyis are presented in Figure 3.13. The Figure shows that grade and negative attrition rates are inversely related, with the highest attrition occurring among E-1s and the lowest among E-3s. The relationship is relatively stable for the 12-month and 18-month cohorts, but the 24-month cohort shows some difference among E-2s and E-3s. A less characteristic pattern emerges for neutral attrition. On this variable E-1s have the lowest rates, while E-3s have the highest. The rates are so high, especially for the 18-month and 24-month cohorts, that they suggest an assignment bias which holds females out for later assignment to USAREUR than males (only females exhibit neutral attrition at rates higher than 2%).[2]

In summary, we have found that both tour length and term of service have apparent direct relationships with negative attrition rates. In both cases the relationship is curvilinear, with tour length showing a slight U-shaped function and terms of service an inverted-U function. However, in both instances the category which creates the nonlinear relationship, short tour (18 months) and 2-year enlistments, is substantially smaller (in number) or different in composition (2-year enlistees were supposed to be combat, high school graduates, and mental category III-A or above) than the remaining categories used in the

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[1] Keep in mind that our cohort includes only those with one year or less active duty in USAREUR.

[2] It would be reasonable to examine the interaction of gender and grade, as well as a variety of other socio-demographic characteristics, to determine their relative effect on attrition. However, the objective of the report is to identify the relationship of attrition to tour length and term of service, so we will confine our detailed contingency analysis to that objective and leave to others the more detailed examination of what we are defining as moderator variables.

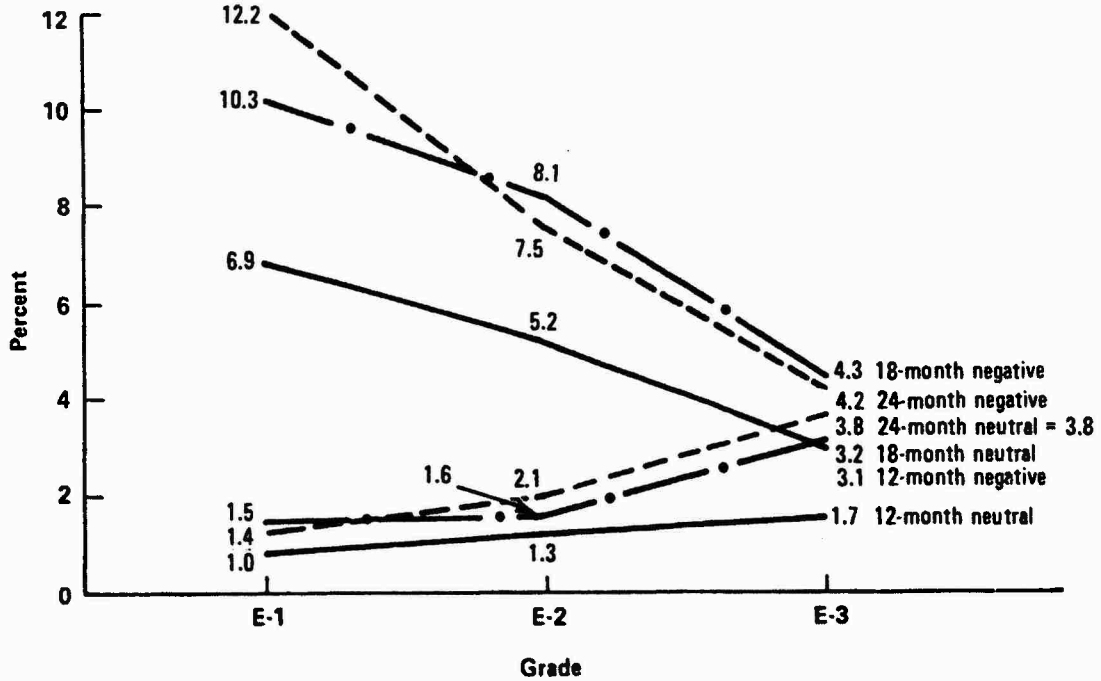

Figure 3-13. **Loss Type by Grade**

analysis. Taking these conditions into account led to a tentative conclusion that term of service (or the use of a 2-year enlistment) had an indeterminate impact on attrition and that tour length was related to attrition, but that an 18-month tour was not necessarily an optimal solution. Prior to examining the interaction of tour length and term of service with available moderator variables, we examined the individual relationship of each moderator with the two attrition criteria. These analyses showed that each moderator had some relationship to negative attrition, but that for several, the relationship was very weak. Those with a weak relationship were number of dependents, marital status and race. For four others, the relationship was stronger. One of these was gender and, while it is important to understand gender differences, the impact of this variable is marginal because males outnumber females in our cohort (7 to 1) by such a large margin. The other three--age, education and grade--showed the largest differences in attrition rates across categories. Seventeen-year-olds were much more likely to attrite, as were nongraduates and E-1s. As a group, these variables suggest inexperience as a possible major contributing construct. For the remainder of the moderator variables, differences were somewhat less extreme, although still possibly important.

The analysis of neutral attrition produced much less striking results. The major predictor of differences in neutral losses was gender, where women were much more likely to appear than men. It appears that the use of separation procedures with less derogatory implications is more common to females. The single largest contributor to this difference is pregnancy. Other variables, including tour length and term of service, were much less likely to predict neutral attrition rates.

The change in attrition rates over time in command was generally very stable. Using the graphic of parallel lines as an indicator of change, we found very few variables where there was a noticeable difference in the

relationship of predictor and criterion variables when predicting the first 12-month stay and the next 6 months (the 12- and 18-month cohorts). The differences in predicting 19- to 24-month losses were larger, but the smaller size of the 24-month cohort and the possible effects of seasonality (all members of the 24-month cohort entered USAREUR during May and June, 1979) make these results less reliable. Education level showed the strongest cross-cohort relationship with nongraduates more likely to incur negative losses during the 13- to 18-month timeframe than high school graduates. Hispanics and married SM had a somewhat smaller tendency to attrite during the 13- to 18-month timeframe; however, both of these groups are only small proportions of the total cohort.

In the next phase of our analysis we will examine the interaction of moderator and primary predictor variables in the prediction of attrition. This approach is used to determine if there are specific population subgroups on which the effects of term of service and tour length vary. Given the results of the first phase of the analysis, a particular focus point will be the apparently aberrant 2-year enlistees and short-tour SM.

3.2.4 The Impact of Socio-demographic Variables on the Tour Length by Attrition Relationship. In the following analysis, socio-demographic and military characteristic variables will be controlled in order to provide a more detailed look at the effect of tour length on negative attrition. Neutral attrition will not be included in this analysis because the number of SM in each of the loss categories, in two- and three-way controlled cross tabulations, is too small. The question being asked in this analysis is: Does tour length affect individuals with different characteristics on the same variables in the same way?[1/]

[1/] In discussing the interactions of tour length and other variables, we will often refer to the U-shaped function as the basic, uncontrolled, relationship between tour-length categories and attrition. This term describes the situation in which 12- to 18-month-tour SM have the highest attrition rates, 19- to 24-month-tour SM have the lowest rate, 25- to 30-month-tour SM have a slightly higher rate than the 19- to 24-month group, and 31- or more month-tour SM have a higher rate than the previous tour groups, but not as high as the short-tour SM.

3.2.4.1 Controlling for a Single Variable.

Age: Age provides a good example of how the effect of tour length may operate differently in different subgroups. The three graphs in Figure 3.14 show the relationship of tour length and attrition rates for each age category in each of the cohorts.[1/] In both the 12-month and 18-month cohorts, the U-function varies greatly. Seventeen-year-olds have the most pronounced U-function (12-month cohort), as well as the highest attrition rates in every tour-length category. Those 21 or older have more moderate attrition rates, but the pattern is the same. In the remaining groups, the middle-age groups, the pattern is somewhat modified. In all three of these groups, the short-tour SM do not have the highest attrition rate (both 12-month and 18-month cohorts). In these age categories, the U-shaped result largely disappears; however, the pattern which does emerge is not generally the linear positive correlation suggested by earlier research and sought in the policy changes. What is clear is that the major contributors to the U-shaped curve are 17-year-olds and those 21 or older. In addition, the effect of age on the tour by attrition relationship is very similar for the first 12 months in USAREUR and the next 6 months.

Gender: Males are more likely to attrite and more likely to have higher attrition when on a short tour. In fact, there is literally no recorded negative attrition among females who have 12- to 18-month tours (Figure 3.15). A mediating factor in interpreting these results is the small N (65) in the 12-month cohort for women in this category.

[1/] The reader will notice that some of the lines, in this and other Figures, do not extend to all categories. Because of the tendency of results based on small Ns to be somewhat distorted, only those cells with an N of 40 or more will be plotted. This will be true for all of the Figures presented in the remainder of the report, except as specifically noted.

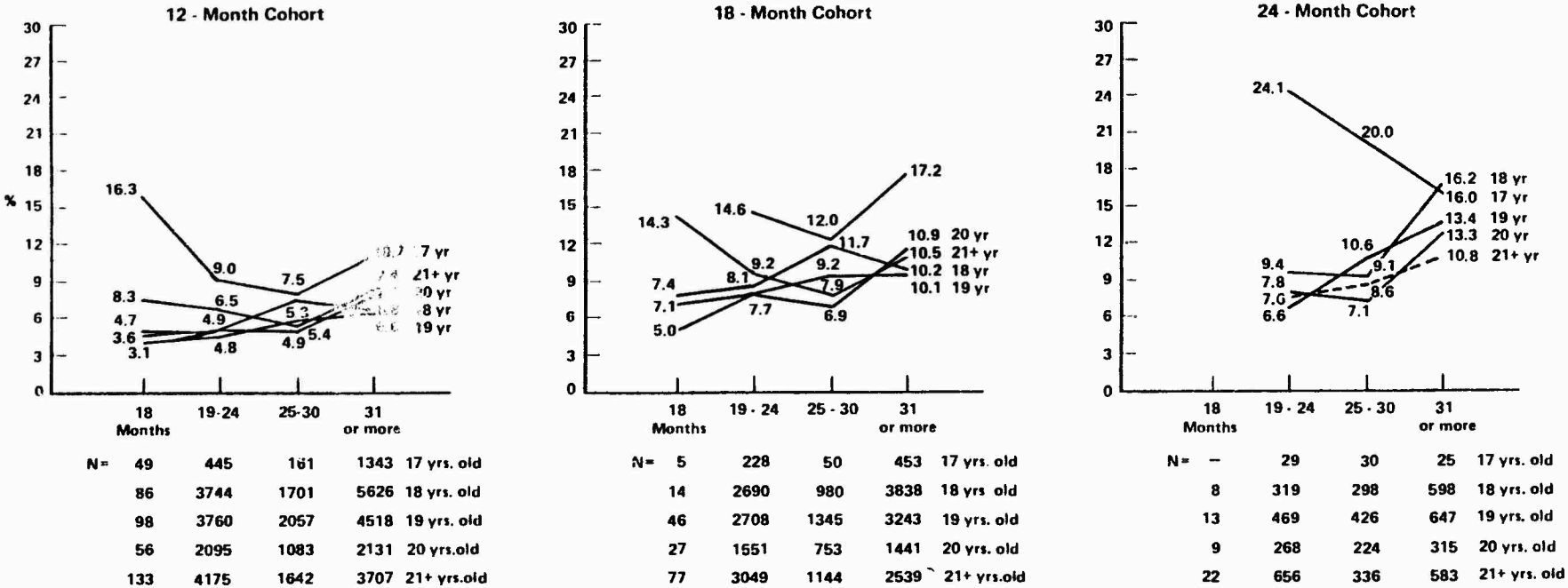

Figure 3.14. Loss Type by Tour Length Controlling for Age

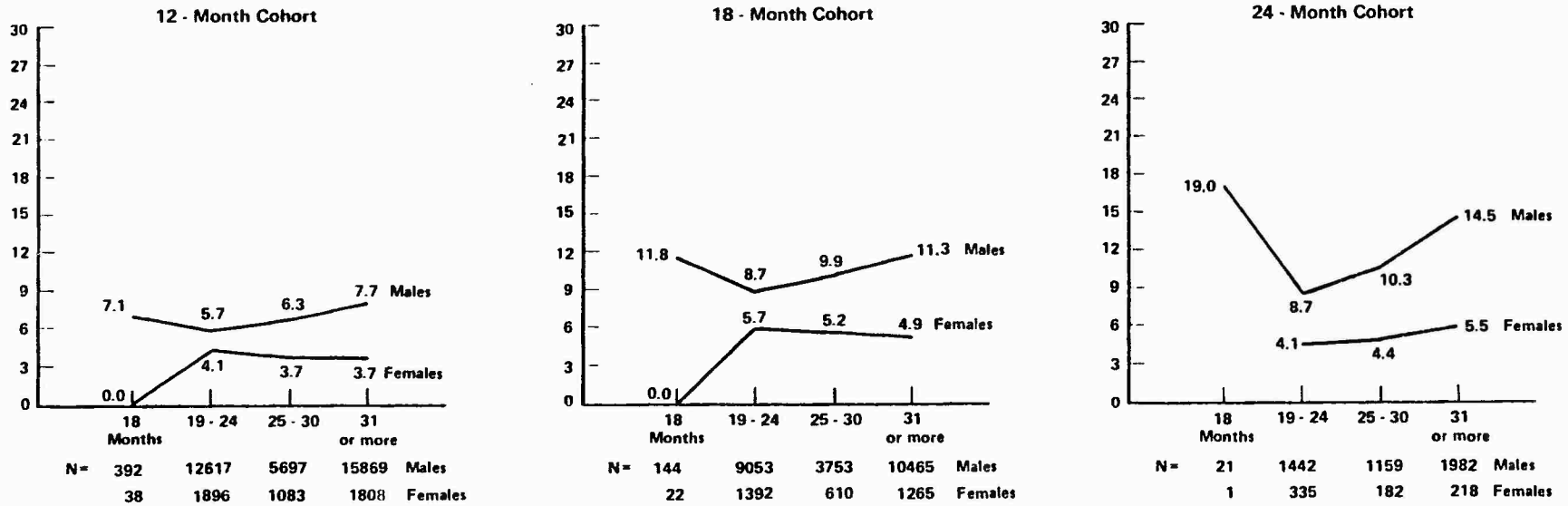

Figure 3.15. Loss Type by Tour Length Controlling for Gender

Education Level: As previously described, nongraduates have a higher overall attrition rate than graduates. In Figure 3.16 we find very interesting results about the interaction of education level and tour length. For the 12-month cohort there is only a slight difference in the relationship of tour length to each of the education categories (with nongraduates being somewhat more likely to have higher short-tour loss rates). For the 18-month cohort, the effect of short tours appears to be much stronger. Based on these data it is possible to conclude the nongraduates with short tours are especially more likely to attrite during the 13- through 18-month timeframe of their USAREUR tours.[1/] Results for the 24-month cohort show the opposite trend, but the number of short-tour SM in both education categories is less than 30.

Race: There is a definite race by tour-length interaction (Figure 3.17). In both the 12-month and 18-month cohorts, blacks who have short tours have significantly higher attrition rates than all other blacks and than nonblacks with short tours. This pattern is consistant for the first year and the 13- to 18-month periods. It is less clear, however, why being black and having a short tour should cause substantially different attrition rates, especially since blacks generally have lower attrition rates than nonblacks. Subsequent analysis, in which the interaction of race with other characteristics is examined, will provide some clues which suggest the role of assignment policies in these results.

[1/] In the previous report (Orend, op. cit.) on these data, a strong education by tour-length interaction was described for a 12-month cohort. This cohort included the same individuals (N = 28,104) who now comprise the 18-month cohort, with attrition results updated. Thus, the trend in this particular cohort shows the interaction for both the first 12 months (see Figure 3.9 of the previous report) and for 13 to 18 months. A "seasonality" of results (between those who arrived from January 1980 through May 1980) was reported. It is possible that at least part of the interaction effect reported in Figure 3.16 is the result of that seasonality, i.e., the effect of nongraduation is smaller than the data for the 18-month cohort suggests. Only an analysis of the full year cycle at the 18-month maturity point can resolve this potential discrepancy.

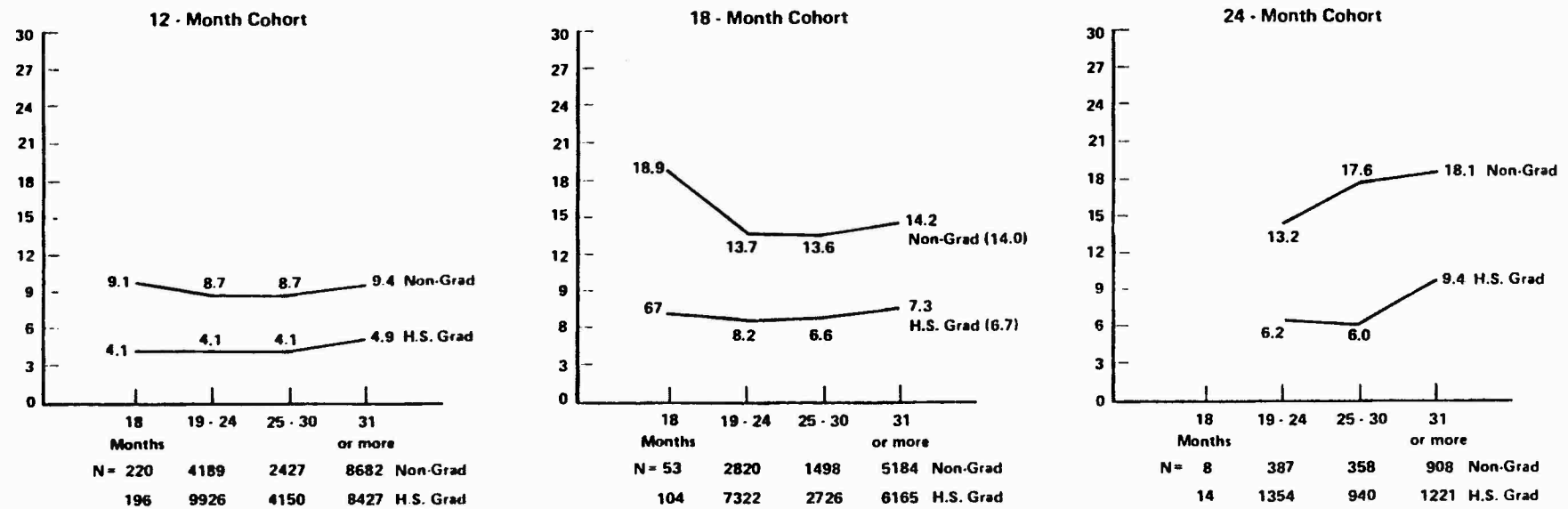

Figure 3.16. Loss Type by Tour Length Controlling for Education Level

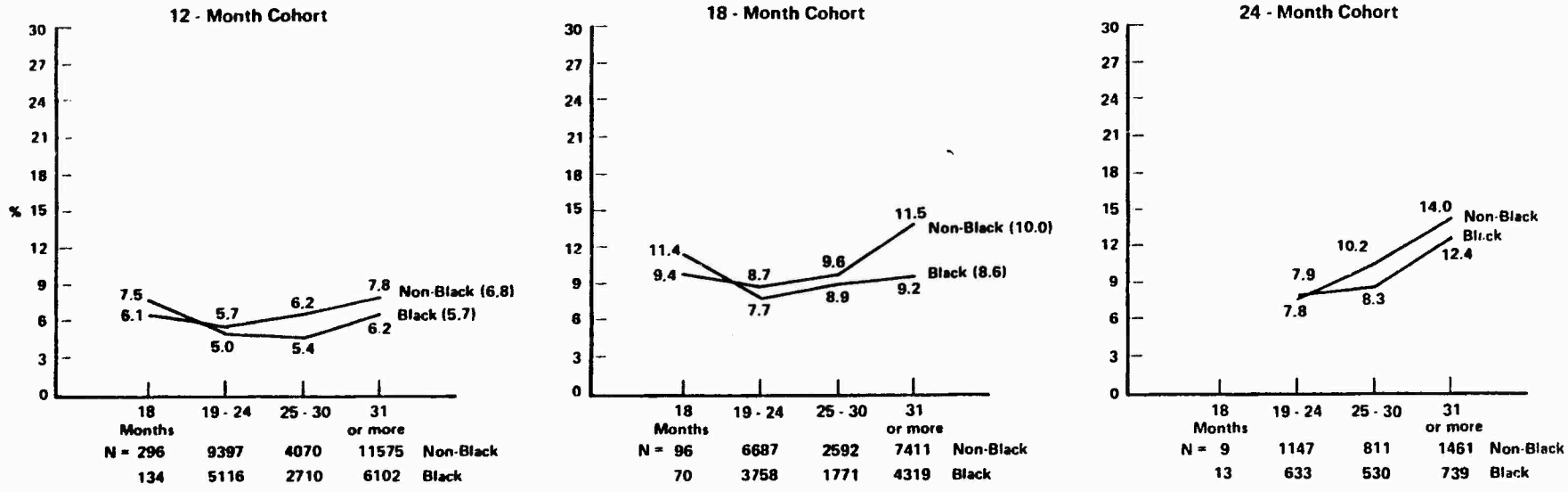

Figure 3.17. Loss Type by Tour Length Controlling for Race

Ethnicity: Hispanics have a lower overall attrition rate and seem to be less affected by tour length (Figure 3.18). The highest rate for Hispanics occurs among those with the longest tours, but the lowest rate is for those with the second longest tour length. Non-Hispanics (including blacks) have patterns closer to the overall U-shaped function.[1/]

Marital Status and Number of Dependents: Because they are highly correlated and results of the interactions are very similar, they will be discussed together (although separate Figures will be used to depict the data) (Figure 3.19 and Figure 3.20). Those with dependents and/or who are married are more likely to attrite under short-tour conditions than those with no dependents or who are not married. This difference applies to the 19- to 24-month-tour category, as well as to the 12- to 18-month category. Thus, the dependents/married SM are the only groups examined so far who have lower attrition for longer tours. One possible explanation for this difference is that shorter-tour married SM are less likely to be accompanied (either initially or later in the tour) than longer-tour married personnel.

There is also a difference across cohorts whereby both married SM and those with dependents seem less likely to attrite (relative to those without dependents) during the 13- to 18-month timeframe than during the first year in USAREUR. There is apparently a settling period which may reduce the pressure to leave the command. Although differences between those who are married/with dependents and those who have no such encumbrances are substantial, especially during the first 12 months, the overall impact of these differences is small because these individuals comprise less than fifteen percent of the total cohort.

Aptitude: An examination of the interaction of aptitude category and tour length provides further clarification of the sources of the U-shaped curve.

[1/] The small proportion of Hispanics in these cohorts makes this outcome a mathematical necessity. As we have seen already, blacks and 17-year-olds account for a large portion of the higher rates among short-tour SM.

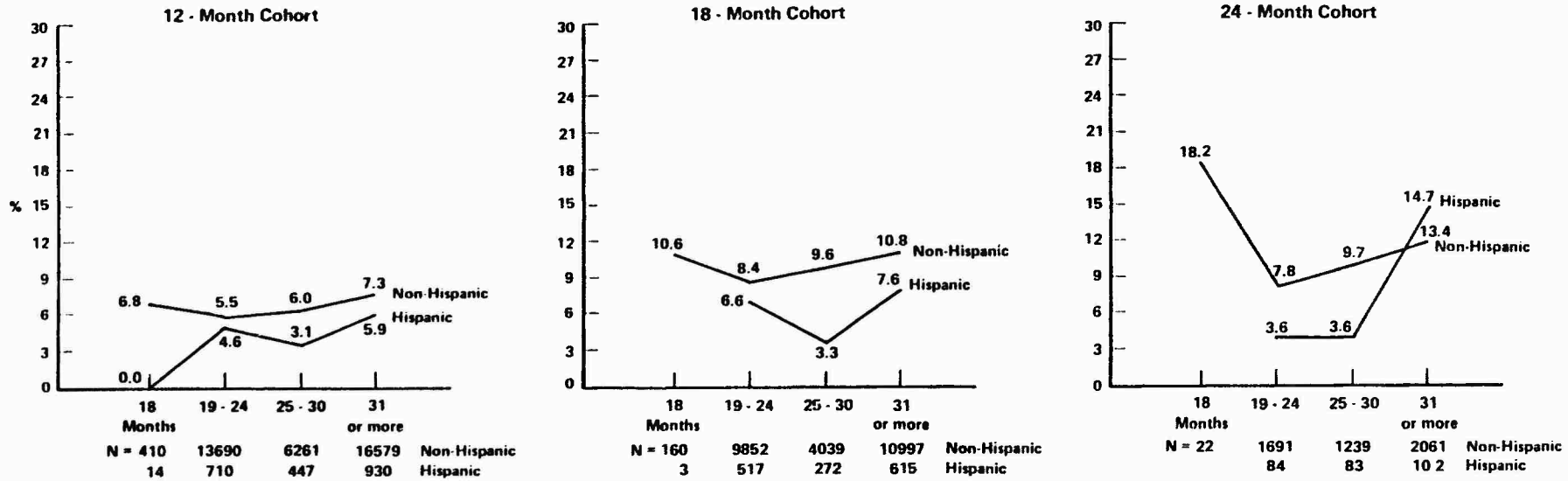

Figure 3.18. Loss Type by Tour Length Controlling for Ethnicity

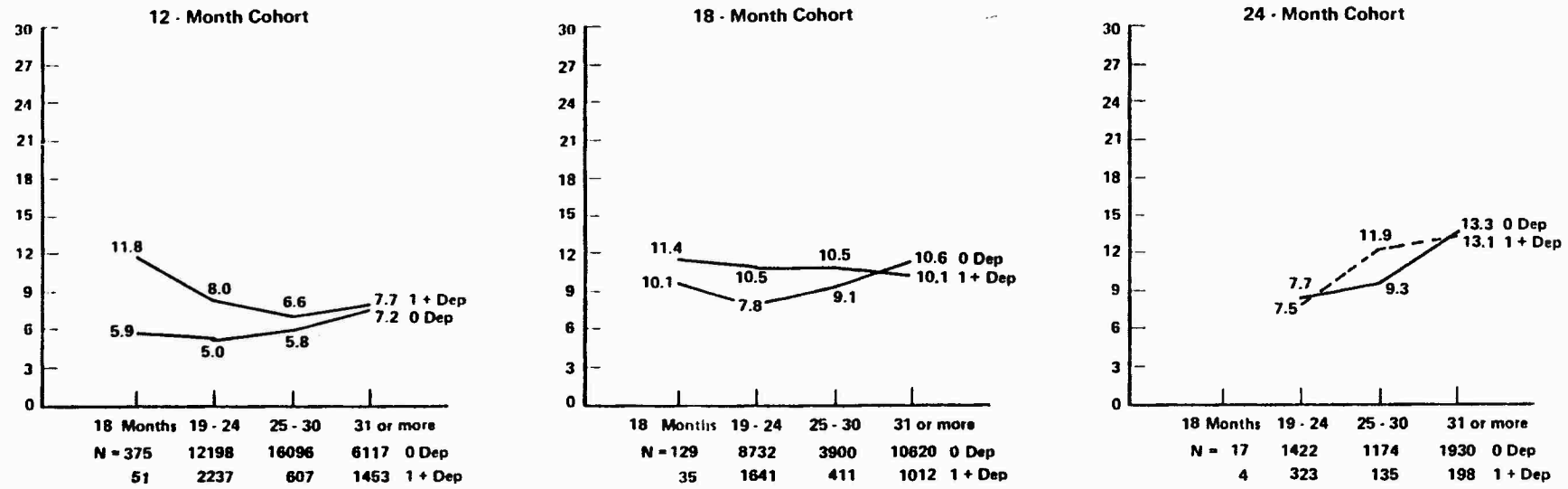

Figure 3.19. Loss Type by Tour Length Controlling for Number of Dependents

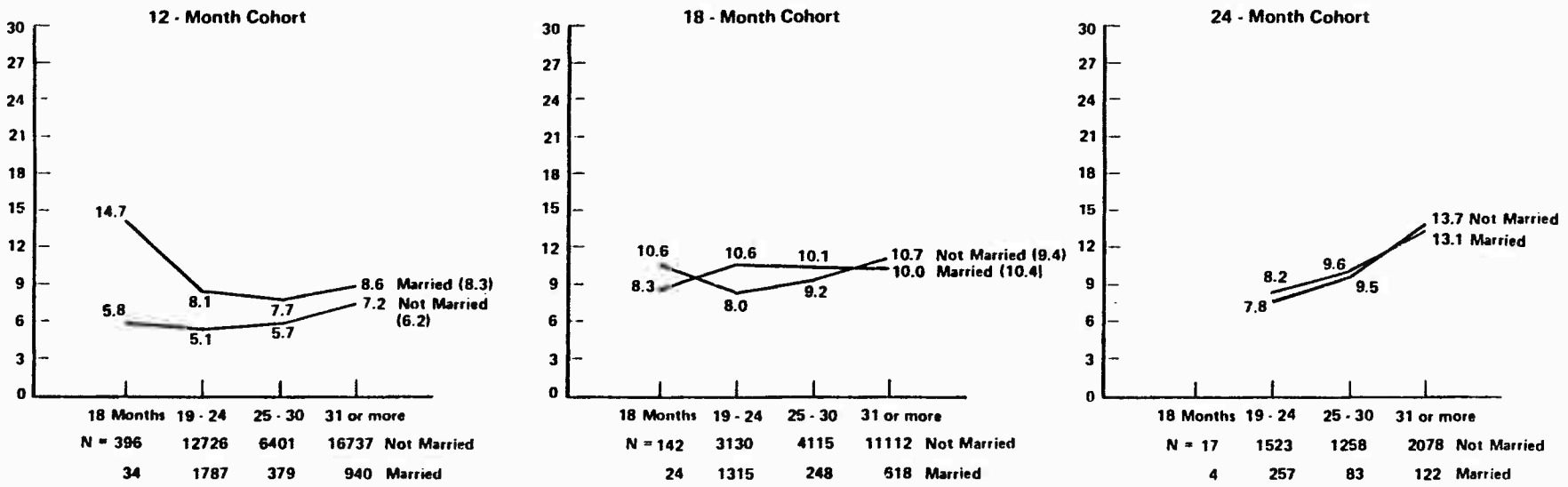

Figure 3.20. Loss Type by Tour Length Controlling for Marital Status

As Figure 3.21 shows, some aptitude groups reflect the curve to the extreme, while others do not. Category IV individuals, for example, have th most pronounced U-shaped curve across four tour-length categories. They are major contributors to the high loss rates for short-tour personnel. Category III-B subjects, on the other hand, exhibit the U-curve only in the 18-month cohort. Apparently, short-tour influences, whatever they might be, do not reach this group disproportionately until after their first year in USAREUR. Category III-A individuals have the opposite pattern. They have a straight linear function for both the 12-month and 18-month cohorts. This means that negative attrition slows down substantially for this group during the 13- to 18-month period. Aptitude category II subjects are much like category III-A subjects.

MOS: In the 12- and 18-month cohorts, the pattern of MOS categories across tour-length categories varies somewhat (Figure 3.22). Those with combat MOS have a moderate U-shaped pattern in both cohorts. Non-combat servicemembers have lower attrition with shorter tours in the 12-month cohort, but a distinctly higher rate among short tour subjects from the 13th to 18th month. Along with education level, aptitude, and race, MOS category seems to provide the greatest potential for further examination of the roots of the U-shaped curve. Other variables which show differences across tour-length categories are either too unevenly distributed, like gender, marital status, and ethnicity, or somewhat ambiguous, like grade (to be discussed below).

MOS was disaggregated into Career Management Fields (CMF) and attrition across tour-length categories for some of the largest of these is shown in Figure 3.23. [1/] In the 12-month cohort, curves for three of the major combat CMF (11, 12 and 13) show the expected pattern, while CMF 19 does not. CMF 16

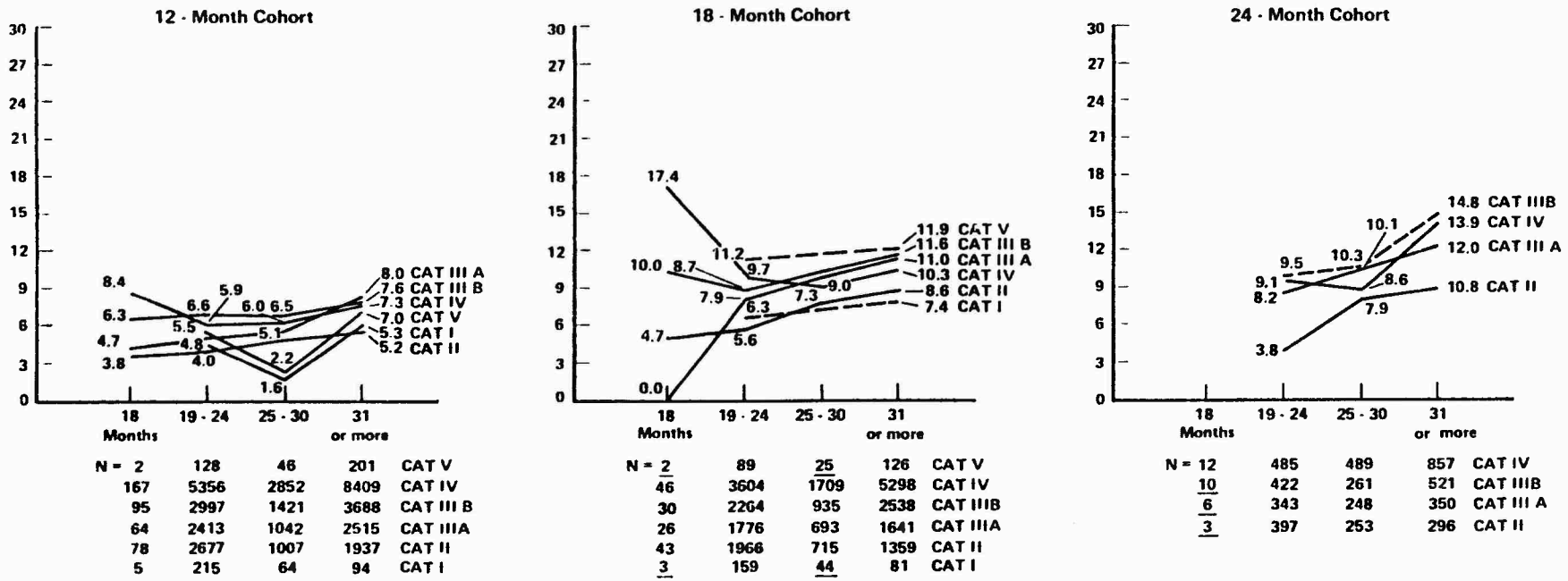

Figure 3.21. Loss Type by Tour Length Controlling for Aptitude Category

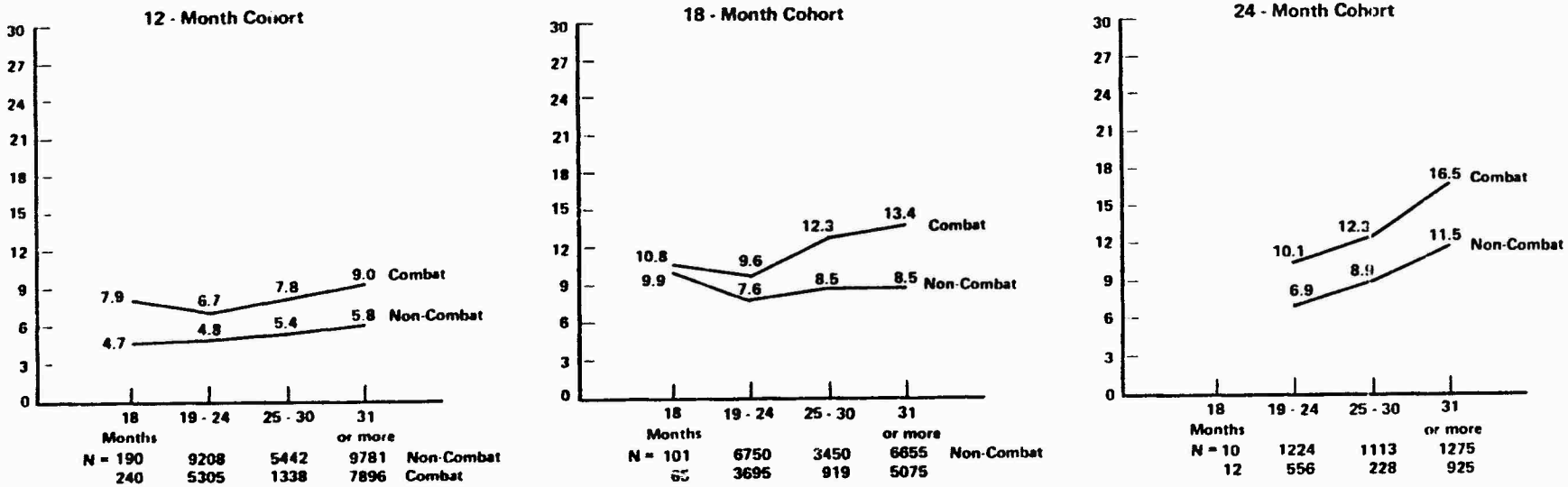

Figure 3.22. Loss Type by Tour Length Controlling for MOS Category

(Air Defense Artillery) comes closest to a linear positive relationship, while CMF 71 (Administration) shows almost no tour-length related interactions across the three longer tour-length categories.[2/] The 24-month cohort provides an interesting contrast (Figure 3.23-3). Summing across all CMF, the 19- to 24-month category has the lowest attrition rate. Variation occurs in the middle category, which may be slightly above or below the longest tour category, but never below the shortest tour-length category shown. These results suggest that for all CMF considered, a short tour (i.e., 19 to 24 months)[3/] results in lower negative attrition than a longer tour over the first two years. For the 12-month cohort, patterns for the various CMF have much larger ranges across the three longer tour lengths, with attrition rates at the 19- to 24-month category often higher than those for the 31+ category. The 18-month cohort (Figure 3.23-2) has a similar pattern, although there are several exceptions. Over the longer haul, 24 months, the effect of CMF seems to even out and the earlier inverted-U function that appears for many CMF begins to flatten out.[4/]

Grade: The final variable considered in this analysis is grade. Figure 3.24 shows differences for each grade across tour length. E-3s and a small group of E-4s clearly have the lowest attrition rates in all cohorts, but show

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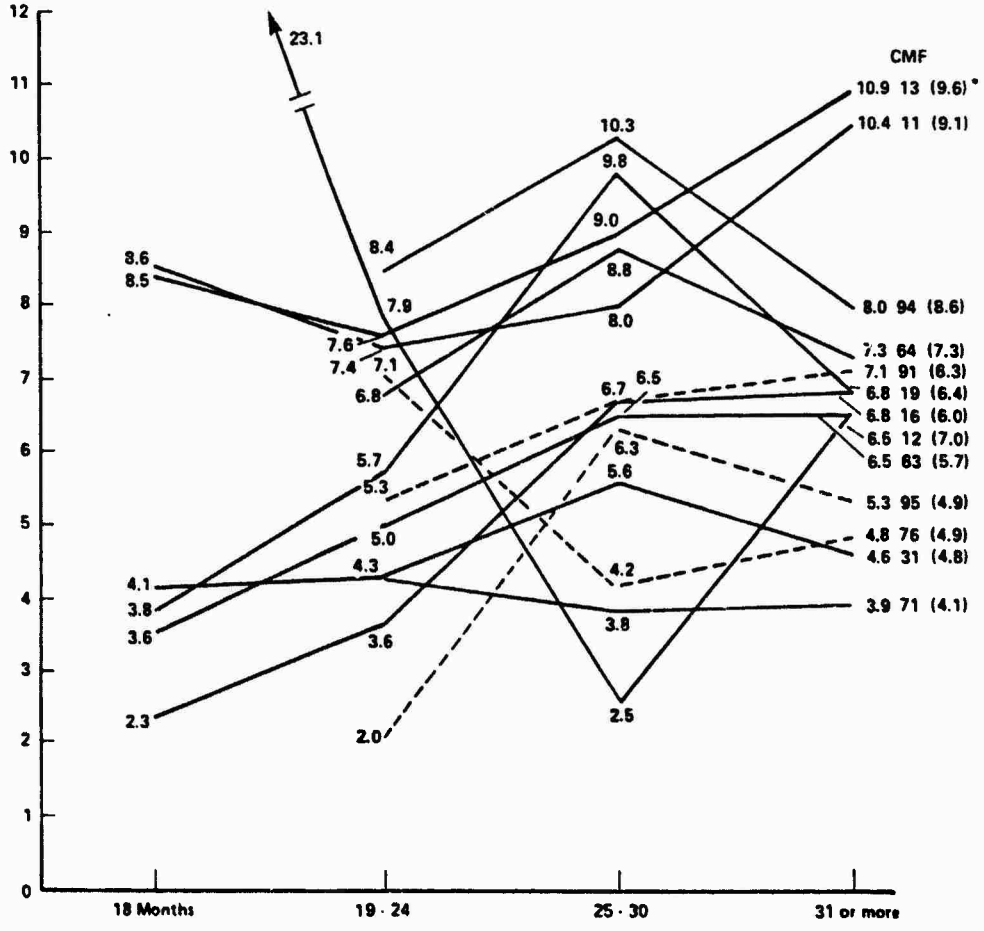
[1/] It will be noted that the 18-month and 24-month cohorts contain no short-tour entries. This is because Ns are too small.

[2/] There were only eleven 18-month tour servicemembers in this CMF so that group has been excluded.

[3/] Keep in mind that about 80% of the group had a 24-month rather than a 19- to 23-month tour.

[4/] There is not immediately evident explanation for why those in the middle tour length group (25-30 months) should have a higher attrition rate in only some of the CMFs.



*Numbers in ( ) represent average rates for the CMF

Figure 3.23-1 Loss Type by Tour Length Controlling for CMF: 12 - Month Cohort

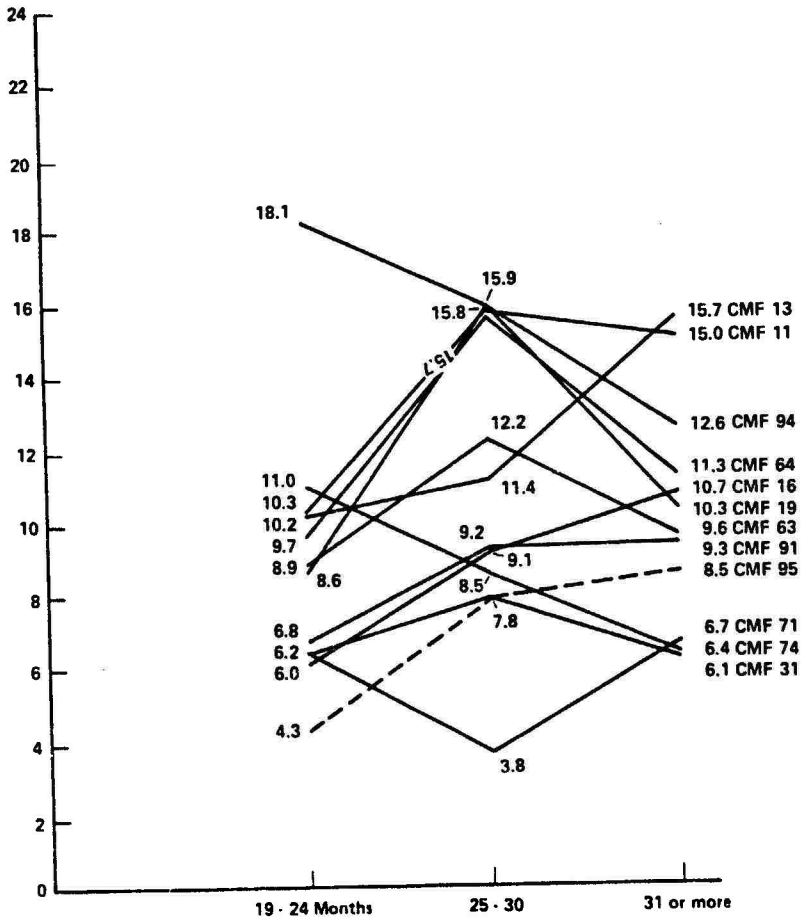


Figure 3.23.-2 Loss Type by Tour Length Controlling for CMF: 18 - Month Cohort

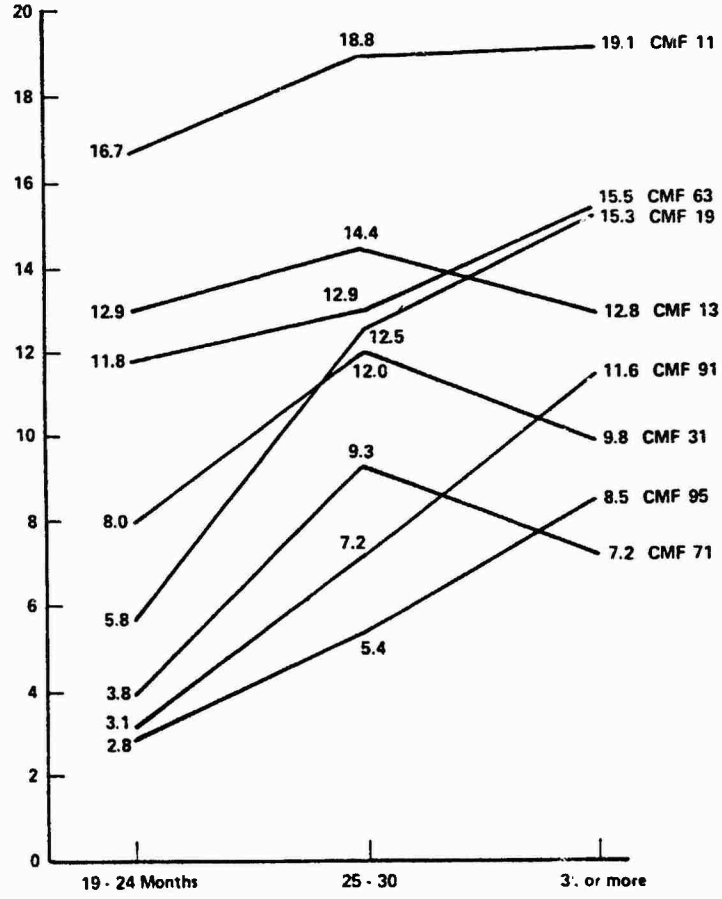


Figure 3.23-3 Loss Type by Tour Length Controlling for CMF: 24 - Month Cohort

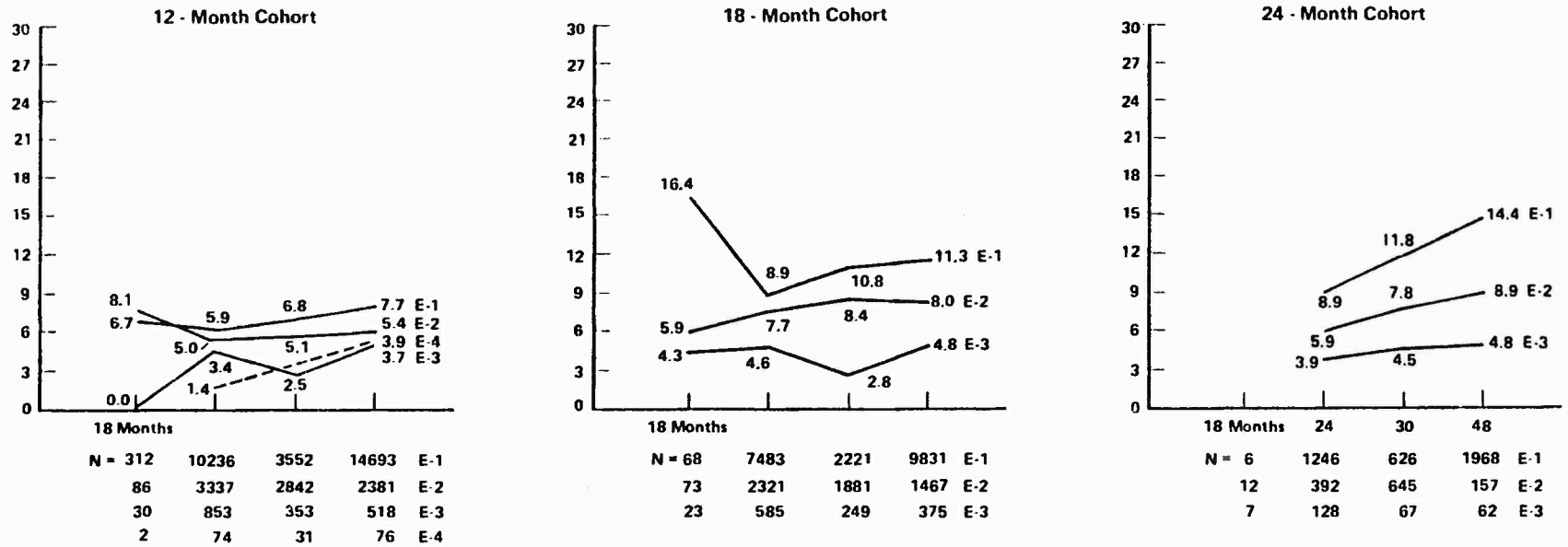


Figure 3.24. Loss Type by Tour Length Controlling for Grade

a mixed result in terms of the expected effect of tour length. E-1s and E-2s both contribute to higher attrition in the shortest tour in the 12 month cohort, but E-2s seem to be largely responsible in the 18-month cohort. E-1s have the highest overall attrition rate (in all cohorts), but are least affected by differences in tour length. As stated previously, the difference among these grades is largely time in service. The high attrition rate among short-tour E-2s is difficult to explain in terms of this factor. It is possible that special assignment factors could be involved in this difference. Individuals sent to USAREUR for short tours to fill short-term readiness requirements may be more likely to be in the E-2 category and may also be more likely to attrite.

Summary: All of the intervening variables used in the foregoing analysis show some interaction with tour length in the prediction of negative attrition. Several, like ethnicity, marital status, number of dependents, and gender, show distinct differences, but the minorities who create these differences (women, Hispanics, married SM, and SM with dependents) represent only a small proportion of the total cohort. For two other variables, age and grade, there are also significant differences, but the pattern is less clear. Finally, four variables provide both clear distinctions and a relevant contribution (in terms of category distributions) to understanding the U-shaped curve that represents the attrition by tour-length relationship. These variables are race, education level, MOS category, and aptitude level. It is these four variables that will be the focus of the next analysis stages.

The interaction of moderator variables and the primary predictor, tour length, occurs most often for those individuals with short (13 to 18 months) tours. In each case the primary difference is between those who have very high attrition rates in the short-tour situation and those who have average or low rates. For example, 17-year-olds, men, blacks, non-Hispanics, combat MOS holders, nongraduates, E-2s, those with dependents, and those who are married

all have much higher attrition when they have short tours than individuals in other categories. These individuals, then, account for the upward swing of attrition rates for individuals with short tours. With some exceptions, the relationship of tour length, starting at 19 months, and attrition is moderately positive, i.e, as tour length increases, so does the attrition rate. The differences are often from one to three percentage points, however, and the impact of modifying policy to reduce attrition losses (if that is what would result) must certainly be guided by the average total time spent in USAREUR or the Army.

3.2.4.2 Controlling for Multiple Variables. In the following analysis, the relationship of tour length and attrition rate is examined while controlling for four moderator variables simultaneously. The control variables are aptitude, race, education level, and MOS category.[1/] Because of small Ns, some data points are empty. The 18-month cohort was used to maximize the timeframe included; however, this means that the short-tour (18 month) category is not represented in this analysis. The results are presented in four Figures (Figure 3.25 through Figure 3.28), each representing one aptitude category. These categories are category IV, category III-B, category III-A, and category II, respectively.[2/]

Figure 3.25 shows attrition rates across tour-length categories for each of the eight subgroups in aptitude category IV. It is probably easiest to look at the various lines in pairs in order to provide meaningful interpretations. For example, for those in aptitude category IV, combat arms/nongraduates (regardless of race) have by far the highest attrition rates--almost 16%. Their loss rates for shorter tours are particularly high, over 20% for 19- to 24-month tours. Black and

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[1/] Intermediate steps in the analysis controlled for two variables at a time. These analyses had the advantage of larger cell size so more of the small categories could be examined. They have the disadvantage of leaving unanswered questions about key interactions. For the interested reader, results from these analyses are provided in Appendix B. The figures there use the same format used in previous Figures.

[2/] Categories I and V are left out because they contain too few subjects.

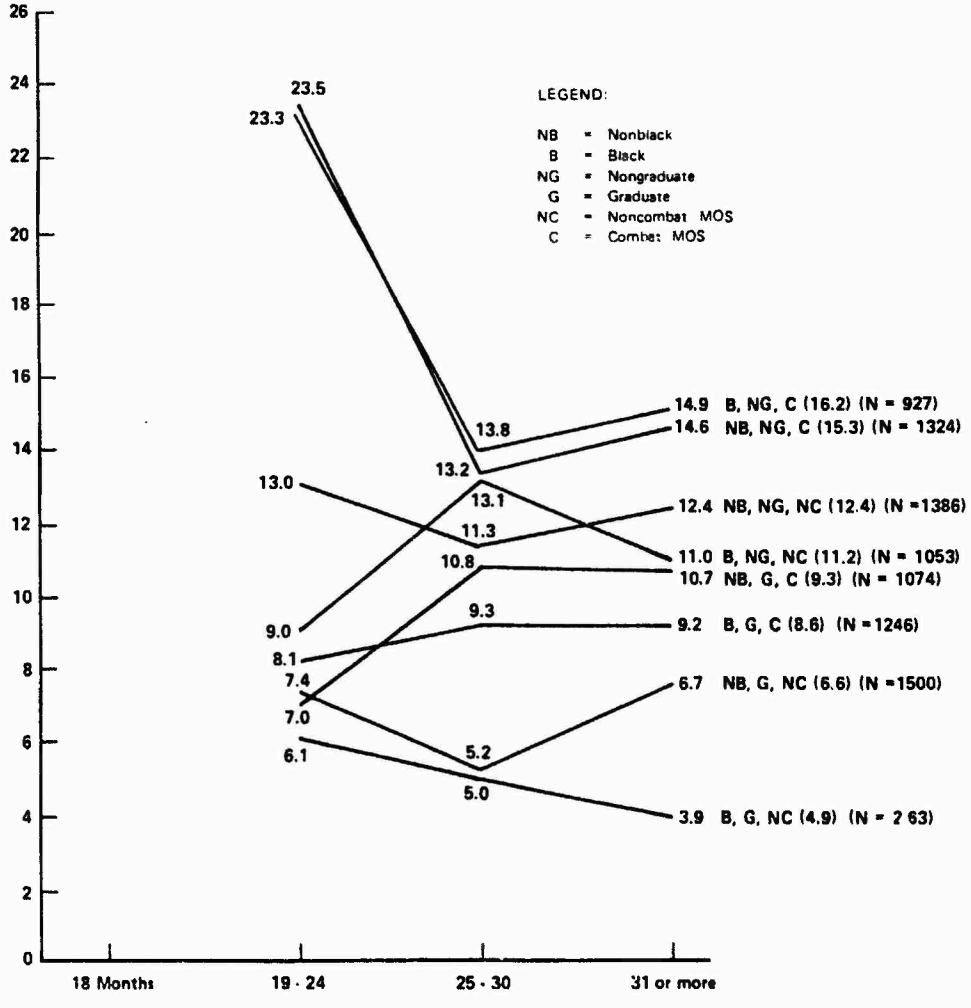

Figure 3.25. Attrition Rate by Tour Length Controlling for Race, Education, MOS Category and Aptitude Category IV

nonblack nongraduates who are not in the combat arms have a lower overall attrition rate (just under 12%) and slightly more stability across tour-length categories (although the rate for blacks in the noncombat, nongraduate, short-tour category is 19%). Clearly, the major dividing factor for Category IV SM is high school graduation. High school graduates are represented in the bottom four lines on the Figure (lower attrition rates), while nongraduates are represented on the top four lines. In addition, graduates, at least those with noncombat MOS, do not have a sharply increasing attrition rate when assigned to short tours.[1/] Across all four aptitude categories (Figure 3.25 through Figure 3.28), those with the lowest attrition rates are high school graduates with noncombat MOS. Blacks and nonblacks trade off for the distinction of having the lowest overall rate. These groups (graduate, noncombat) also have the most stable results across tour-length categories--tour length tells us very little about the attrition rate of these individuals.

Figure 3.26 shows results for aptitude category III-B. In this group, several of the patterns which appeared in the previous Figure are not repeated. While nonblack, nongraduate, combat MOS SM have the highest overall attrition rate of any group (18.8% during the first 18 months), blacks attrite at only half that rate. Both blacks and nonblacks (nongraduate, combat) have the same V-shaped pattern for the three longer tour lengths that was exhibited in aptitude category IV. For these subgroups, a 25- to 30-month tour is the most efficient attrition deterring condition.

Nongraduate, noncombat SM (both black and nonblack) again occupy the second most attrition-prone position, however at slightly higher overall rates than those in aptitude category IV. However, race seems to be a factor for

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[1/] Graduates in the combat arms (without controlling for aptitude category or race) have sharply lower attrition rates when in either of the shorter tour groups (Figure B.3). Combat blacks have a much higher rate in the 18-month tour group (Figure B.5).

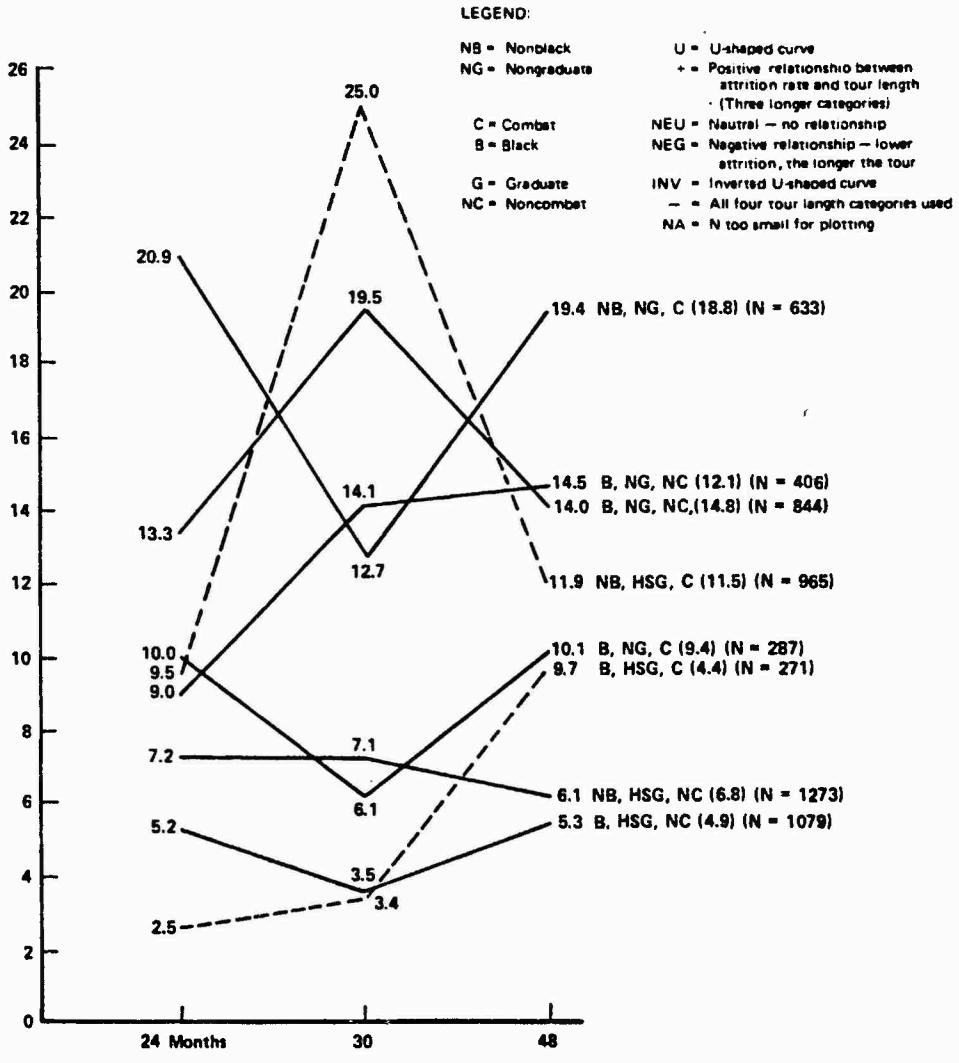

Figure 3.26. Attrition Rate by Tour Length Controlling for Race, Education, MOS Category and Aptitude Category III-B

those in the combat arms. Black high school graduates in the combat arms attrite at a rate less than half of the rate for nonblack high school graduates in the combat arms. Even black nongraduates in the combat arms attrite at a lower rate (2.1 percentage points) than nonblacks who have graduated.

Only two of the subgroups in category III-B exhibit or come close to exhibiting the expected positive correlation between attrition rate and tour length. Black graduates in the combat arms and black nongraduates with support MOS are these groups. Among category IV subjects the former group came close to their pattern, while nonblack graduates in the combat arms were also close. In all four subgroups, however, there are insufficient data to analyze the shortest tours.

Among aptitude category III-A subjects there are three subgroups who exhibit the expected pattern, nongraduate and graduate combat blacks (the latter being the most consistently positive subgroup across all aptitude categories) and noncombat, nongraduate nonblacks (Figure 3.27). Combat, nongraduate blacks, however, is the group most likely to attrite. In this regard they replace combat, nonblack, nongraduates who had the highest attrition probability among category III-Bs.

Among aptitude category II SM, only six of the eight possible subgroups are large enough to plot (Figure 3.28). Missing are the two black combat subgroups. For the remaining subgroups, combat, nonblack, nongraduates have the highest attrition rate and nonblack, noncombat, nongraduates are second. Only one subgroup has the expected pattern for the three longer tour-length categories, nonblack, noncombat, graduates; and even in this subgroup, the short-tour SM again have a higher attrition rate, thus creating the characteristic U-shaped curve.

Summary: The multivariate contingency analysis supports two types of detailed examination of the data. The first is in pinpointing subgroups which

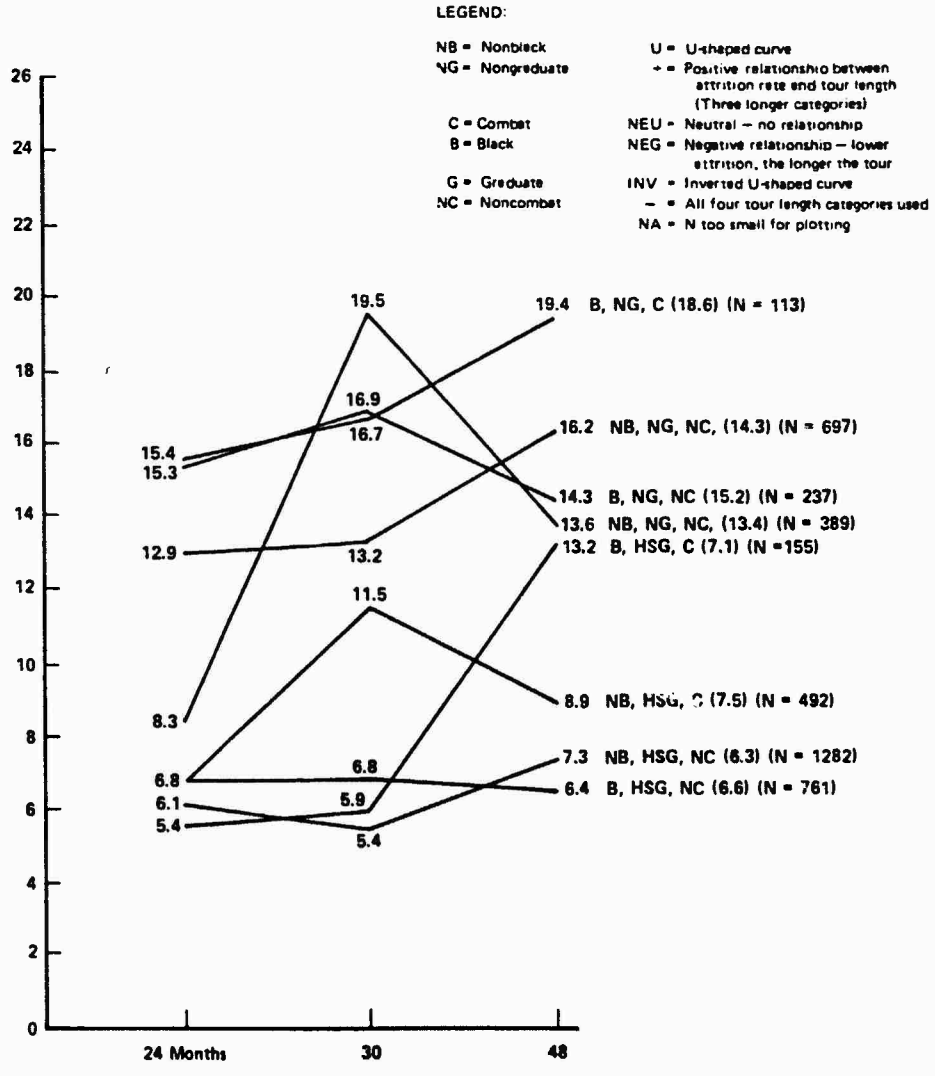

Figure 3.27. Attrition Rate by Tour Length Controlling for Race, Education, MOS Category and Aptitude Category III-A

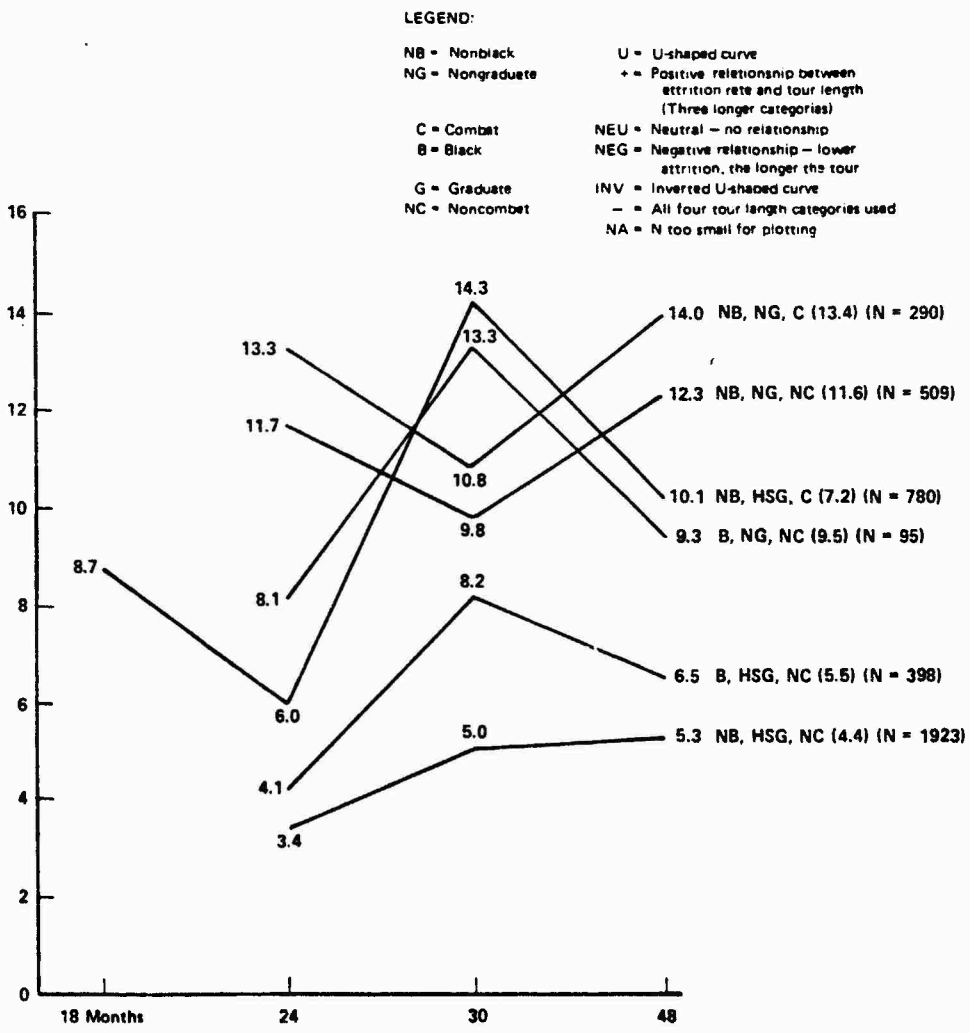

Figure 3.28. Attrition Rate by Tour Length Controlling for Race, Education, MOS Category and Aptitude Category II

make the largest contribution to higher attrition rates and the second is to identify subgroups which contribute to the underlying pattern of attrition across tour-length categories. The first area is summarized in Table 3.2.

Table 3.2

Attrition Rates for Subgroups on Four Individual Characteristics
(Aptitude, Race, Education, and MOS Category)
18-Month Cohort

	Aptitude Category			
	IV	III-B	III-A	II
NB, NG, C	15.5%	18.9%	13.3%	13.4%
B, NG, C	16.1%	9.2%	18.0%	-
NB, NG, NC	12.4%	14.8%	14.3%	11.4%
B, NG, NC	10.8%	12.2%	15.2%	9.5%
NB, G, C	9.3%	11.5%	7.6%	7.0%
B, G, C	8.7%	4.5%	7.2%	-
NB, G, NC	6.7%	6.8%	6.4%	4.5%
B, G, NC	4.9%	4.8%	6.6%	5.6%

NB = Nonblack
B = Black
NG = Nongraduate
G = Graduate
NC = Noncombat MOS
C = Combat MOS

From this Table it can be concluded: (1) that aptitude makes an uneven contribution to the explanation of attrition rates, with the only consistent result being generally lower loss rates among category II subjects; (2) that race provides an uneven indicator also, with blacks somewhat lower in a majority of subgroups, but substantially higher in others (especially in category III-A; (3) that nongraduates have higher attrition rates than graduates almost regardless

of other factors (compare the top four rows to the bottom four rows); and (4) that, other factors being equal, those in the combat arms generally attrite at a higher rate than those in noncombat MOS. Though there are some exceptions, these findings support the results originally identified in the single variable analysis, i.e., there is very little washout through interaction.

Of thirty subgroups examined in this analysis, only eight exhibited the expected positive relationship between tour length and attrition rate across the three longer tour-length groups and none showed it for all four tour-length groups (Figure 3.29). Only one group, black combat graduates, consistently showed the positive relationship across mental categories (excluding category II where there was insufficient data). In only one aptitude category (III-A) were there as many as three subgroups which showed a positive relationship. Among the subgroups with the lowest overall attrition rates, black and nonblack, noncombat graduates, two subgroups had a negative relationship between attrition and tour length, three showed virtually no trend, and one had an inverted U-shaped curve. Thus, the U-shaped function resulted largely from groups with higher attrition rates, especially combat nongraduates.

3.2.5 The Impact of Socio-demographic Variables on the Term of Service by Attrition Relationship. The second primary predictor variable in our analysis is term of service. In Figure 3.1 we saw the basic relationship between term of service and attrition for negative and neutral loss types in the three cohorts. These results showed little relationship between term and neutral attrition. For negative attrition there is an inverted-V curve, with SM in 3-years terms having higher negative attrition than either 2-year or 4-year enlistees. Between 2-year and 4-year enlistees, those with the longer term are slightly less likely to attrite. In this section we examine the interaction of term of service and socio-demographic characteristics on negative attrition. The analysis plan follows the pattern used in the analysis of tour length.

	Aptitude Category			
	IV	III B	III A	II
NB, NG, C	U	U	INV	U
B, NG, C	U	U	+	NA
NB, NG, NC	U	+	+	U
B, NG, NC	U	INV	NEG	INV
NV, G, C	+	INV	INV	INV
B, G, C	+	+	+	NA
NB, G, NC	NEU	NEG	U	+
B, G, NC	NEG	NEU	NEU	INV

LEGEND:

NB = Nonbleck
NG = Nongreduete
C = Combat
B = Bleck
G = Greduete
NC = Noncombat

U = U-shaped curve
+ = Positive reletionship between ettrition rete end tour length (Three longer categories)
NEU = Neutrel — no reletionship
NEG = Negative relationship — lower ettrition, the longer the tour
INV = Inverted U-shaped curve
— = All four tour length categories used
NA = N too small for plotting

Figure 3.29. Relationship of Attrition Rate to Tour Length for each Subgroup

3.2.5.1 Controlling for a Single Variable.

Age: Each cohort shows some age by term-of-service interaction (Figure 3.30). The major digressions from the basic inverted-V curve are as follows: (1) 17-year-olds stand alone in the high level of attrition and, for the 12- and 18-month cohorts, the lack of differences between 3-year and 4-year enlistees;[1/] (2) SM, 20 and older, have a higher attrition rate when they have 2-year terms than in either the 3- or 4-year categories (for both the 12- and 18-month cohorts), thus forming a moderate negative relationship between term and attrition rate; and (3) the remaining two groups, 18- and 19-year-olds, exhibit the dominant pattern, with lowest attrition rates among 2-year enlistees and the highest rates among 3-year enlistees. Except for 17-year-olds and the differences in the 2-year category, attrition rates are very similar across age groups and cohorts for 3- and 4-year enlistees.

Gender: Females show very little variation in loss rates across terms for the 12- and 18-month cohorts, while males exhibit the general pattern (Figure 3.31). For females, these results are very similar to the tour-length results, with the exception of 12- to 18-month tours, and suggest that the previously described time factor is of little consequence for negative attrition.[2/]

Education: There is a strong interaction between education level and term in the prediction of attrition. High school graduates have a very moderate inverted-V pattern for all three cohorts (Figure 3.32). Nongraduates, on the other hand, have a definite negative linear relationship--as term increases, attrition decreases. This relationship is true for all three cohorts, although

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[1/] In the 24-month cohort, the pattern for 17-year-olds is actually the opposite of the general pattern, but the N is small enough to make reliability a question if data were generalized to the entire study cohort.

[2/] Analysis of neutral attrition, which is higher than negative attrition among women and has not been included in the present, could produce different results.

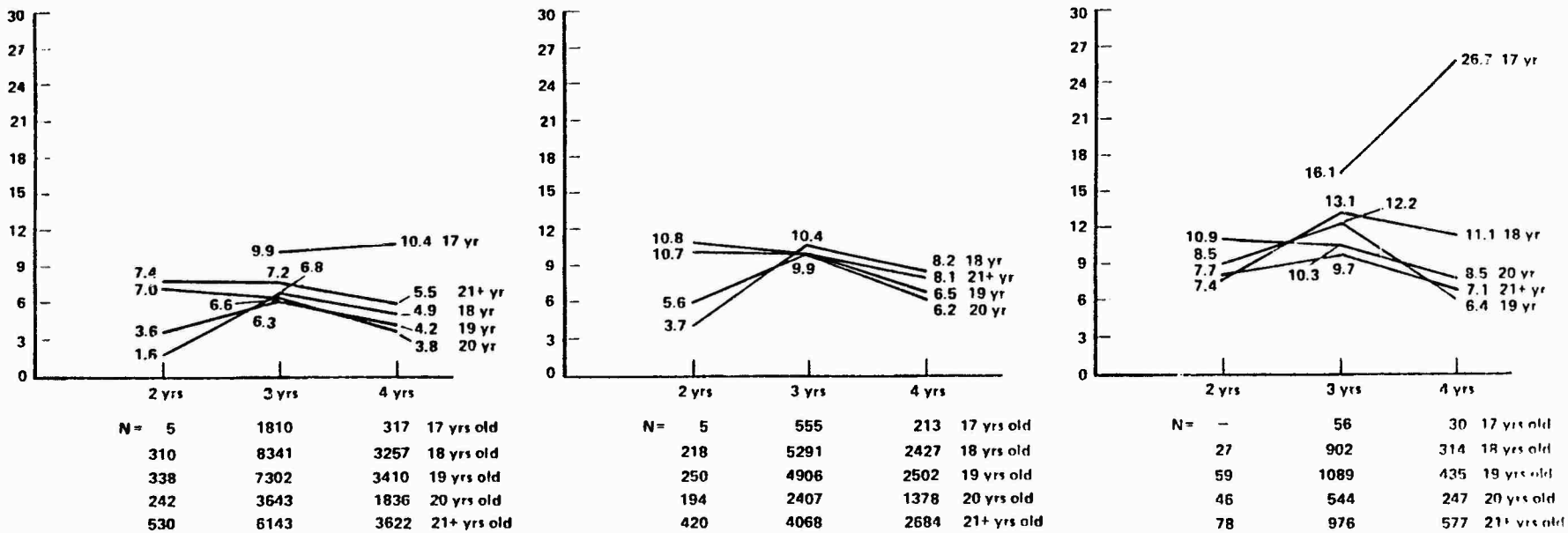


Figure 3.30. Loss Type by Term of Service Controlling for Age

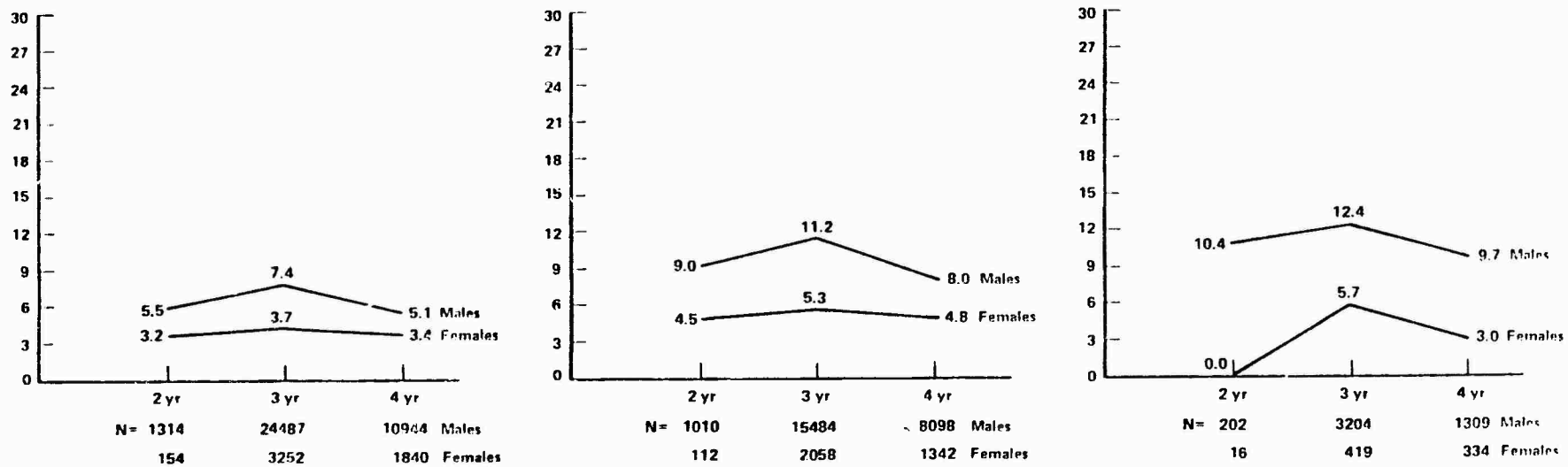


Figure 3.31. Loss Type by Term of Service Controlling for Gender

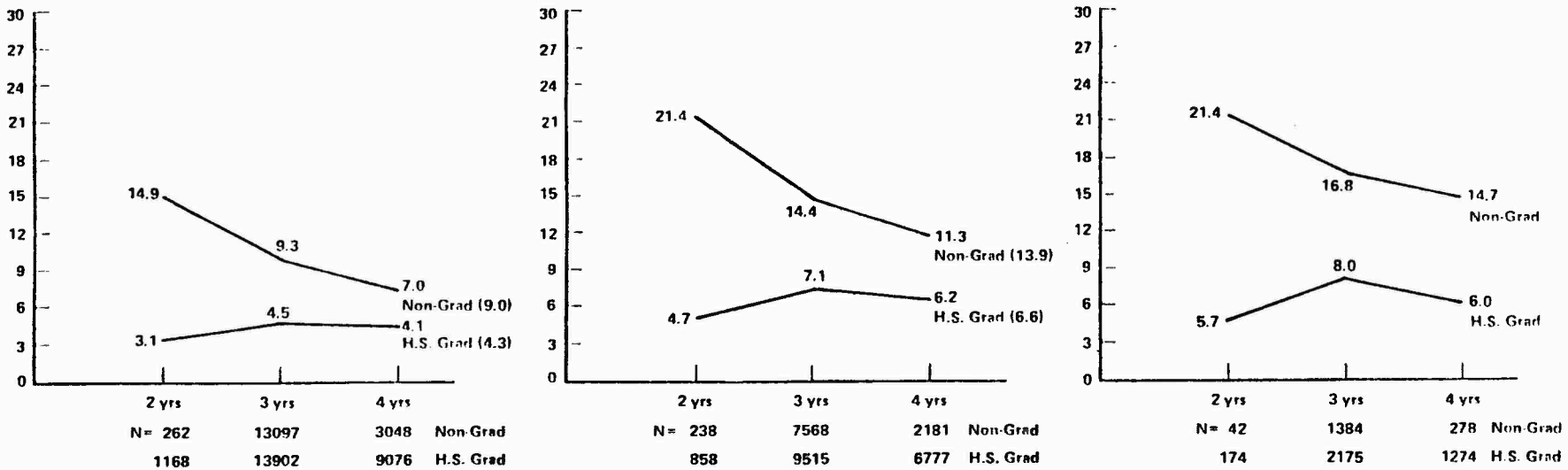


Figure 3.32. Loss Type by Term of Service Controlling for Education Level

it may be less extreme in the 24-month cohort (which shows the same 2-year term attrition rate, 21.4%, as the 18-month cohort). While an argument can be made for the level of commitment expressed by 4-year enlistees (thus, lower attrition rates), it is less clear why 2-year nongraduates should attrite at a rate so much higher than graduates (over 16 percentage points or more than 5 times as likely in the 18-month cohort).

Race: Race shows an interesting variation on the education results. Nonblacks exhibit the dominant inverted-V pattern and attrite at a higher rate than blacks, except for 2-year enlistees (Figure 3.33). Among 2-year enlistees, blacks attrite at a much higher rate (more than 3 to 1) than nonblacks. Since the earlier analysis of tour length showed that most black subgroups attrite at a lower rate than nonblacks, these results suggest a highly specialized subgroup, probably closely paralleling the combat, nongraduate, category IVs described previously.

Ethnicity: In those categories for which there is sufficient data, the results for the two ethnic subgroups (Hispanics and non-Hispanics) are essentially the same, i.e., there is no ethnicity by term interaction (Figure 3.34).

Marital Status and Number of Dependents: Figure 3.35 and Figure 3.36 show results for marital status and number of dependents. As has been the pattern in these data, the results for these two variables are very similar. The subgroups most likely to attrite, those who are married or have dependents, are even more likely to become losses if they are 2-year enlistees. The effect of separation is again the most feasible explanation for this difference (in the absence of other assignment information).

Aptitude: In all three cohorts, the subgroup with the most aberrant pattern is aptitude category IV (Figure 3.27). Other categories show patterns close to the inverted-V which dominates the entire sample. Category IV subjects have very high attrition rates among 2-year enlistees (16.6% in the

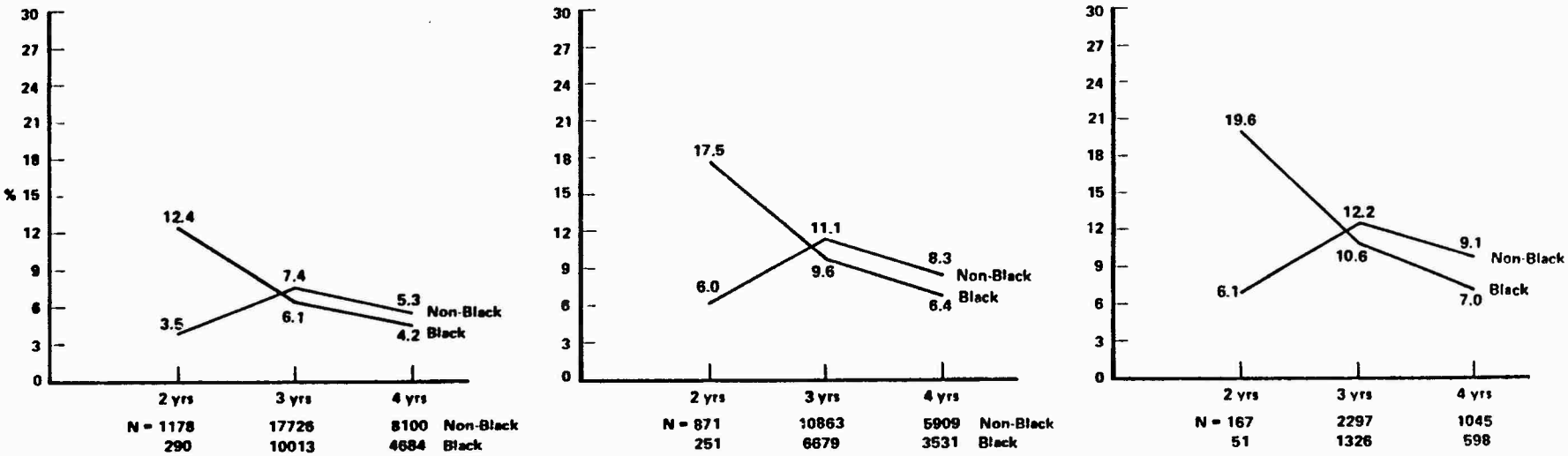


Figure 3.33. Loss Type by Term of Service Controlling for Race

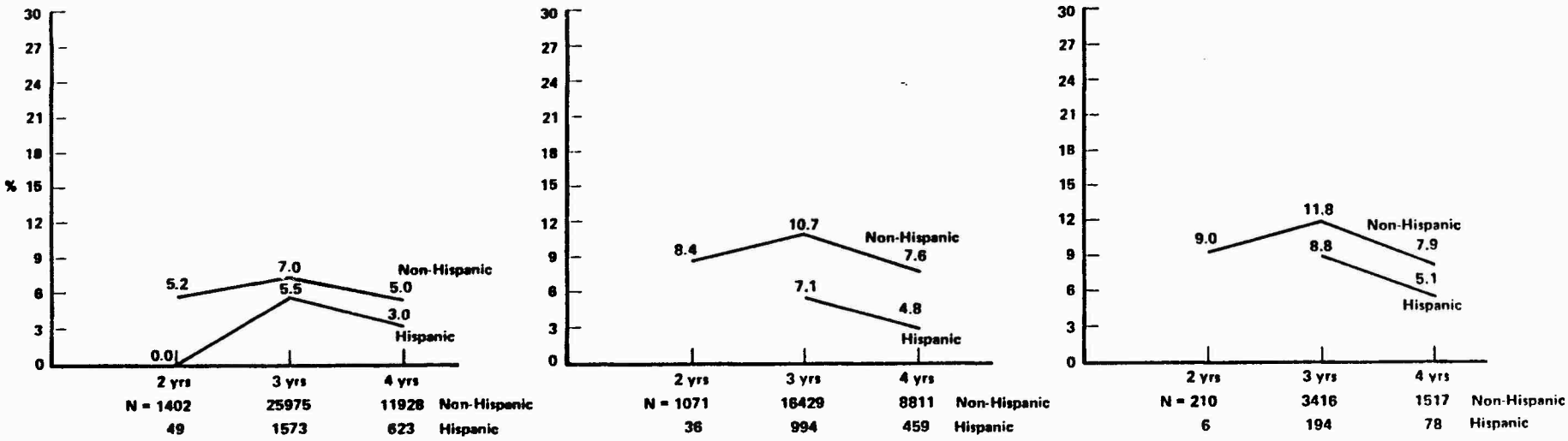
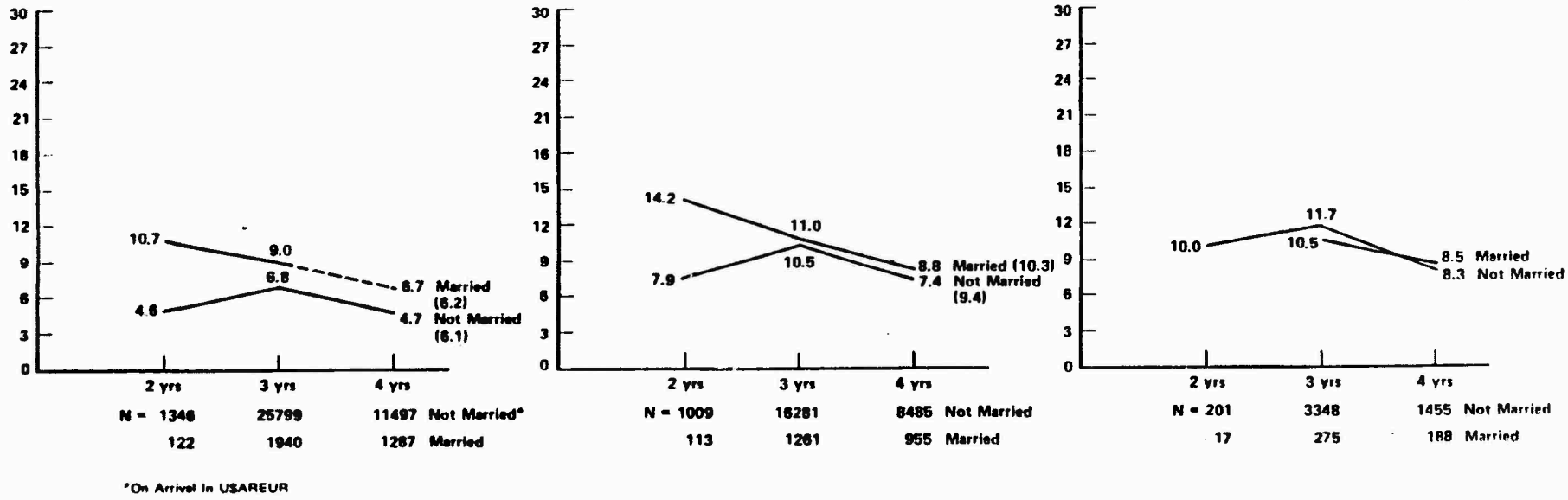


Figure 3.34. Loss Type by Term of Service Controlling for Ethnicity



*On Arrival in USAREUR

Figure 3.35. Loss Type by Term of Service Controlling for Marital Status

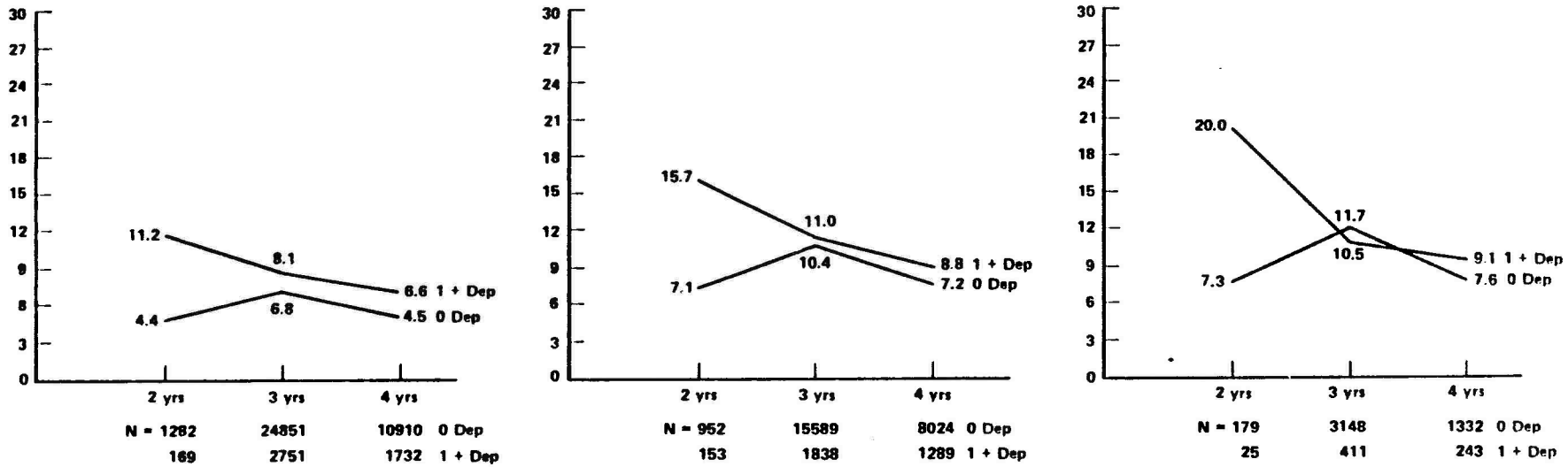


Figure 3.36. Loss Type by Term of Service Controlling for Number of Dependents

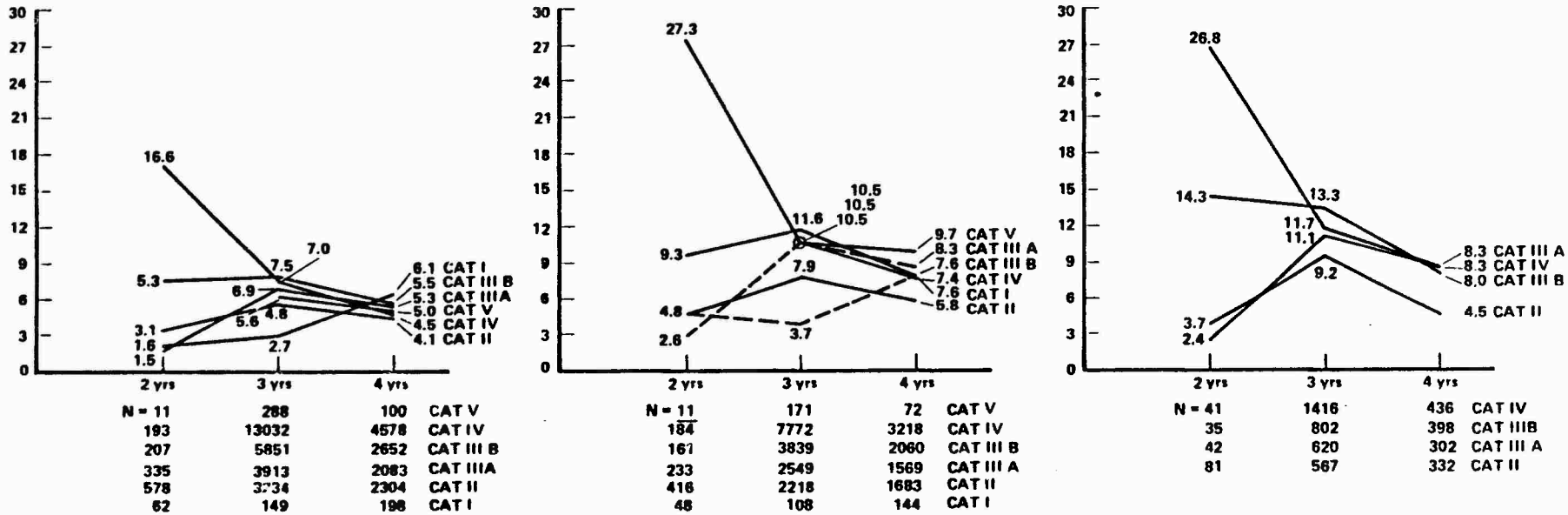


Figure 3.37. Loss Type by Term of Service Controlling for Aptitude Category

12-month cohort and 22.3% in the 18-month cohort). Since the 2-year enlistment experiment was not supposed to include category IV (or nongraduate) participants, we can only assume that these individuals were included because they were originally tested prior to the norming adjustment of the ASVAB or through some kind of waiver. The results of the aptitude and education-level analyses clearly show the appropriateness of excluding apparently less-qualified individuals on the basis of an attrition criterion in the 2-year enlistment program. For the other enlistment categories, however, this relationship is much less striking, at least across aptitude categories.

As has been true through most of our analysis of term of service, the differential effects of predictors across time periods, the first 12 months versus the next 6 months, has been very small. Apparently, these variables do not produce different reactions at different stages of the USAREUR tour.

MOS: While combat soldiers generally attrite at a higher rate than noncombat soldiers, they also do it in a somewhat different pattern. The combat soldiers are much closer to the overall pattern, inverted-V, than the noncombat individuals who show very little difference across enlistment terms (Figure 3.38). Thus, most of the higher attrition rate among 3-year enlistees is attributable to those in the combat arms. Two- and four-year enlistees are very similar (a maximum of one percentage point difference) rates across the two MOS categories in both the 12-month and 18-month cohorts.

MOS is broken down by CMF in Figure 3.39. These results show that some patterns within the combat and noncombat areas are not consistent. In the combat arms, for example, CMF 11 (Infantry) shows the dominant inverted-V pattern, while CMF 12 (Combat Engineers) has the negative relationship. CMF 63 (Mechanical Maintenance) also has a negative relationship, while other noncombat CMF show the dominant pattern. The majority, however, do have an inverted-V pattern for both cohorts (where sufficient data are available).

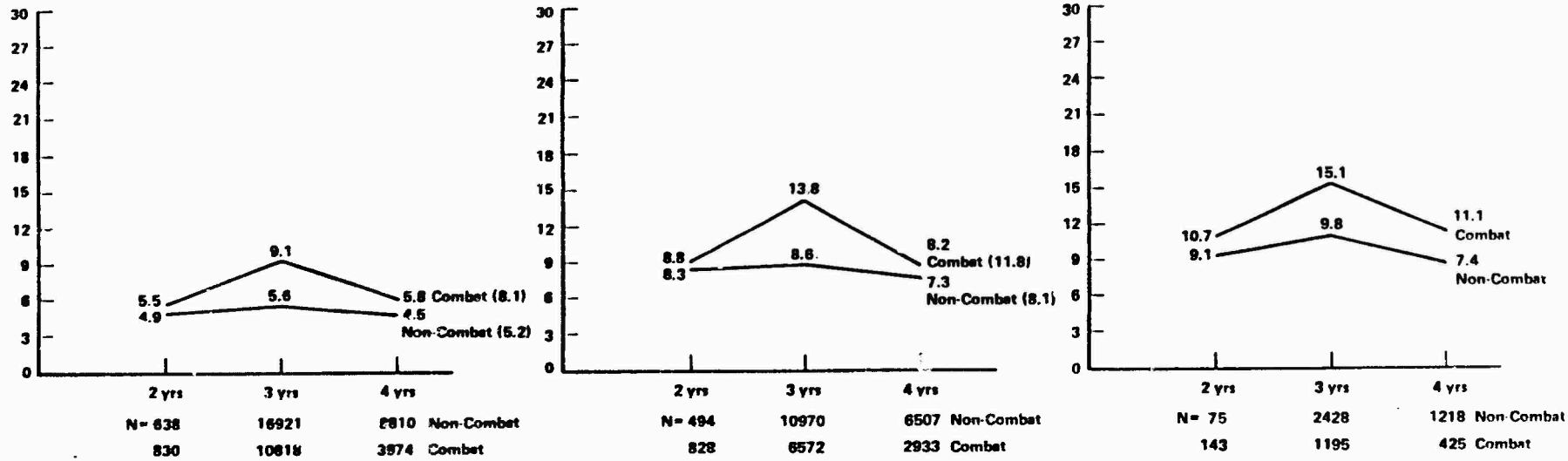


Figure 3.38. Loss Type by Term of Service Controlling for MOS Category

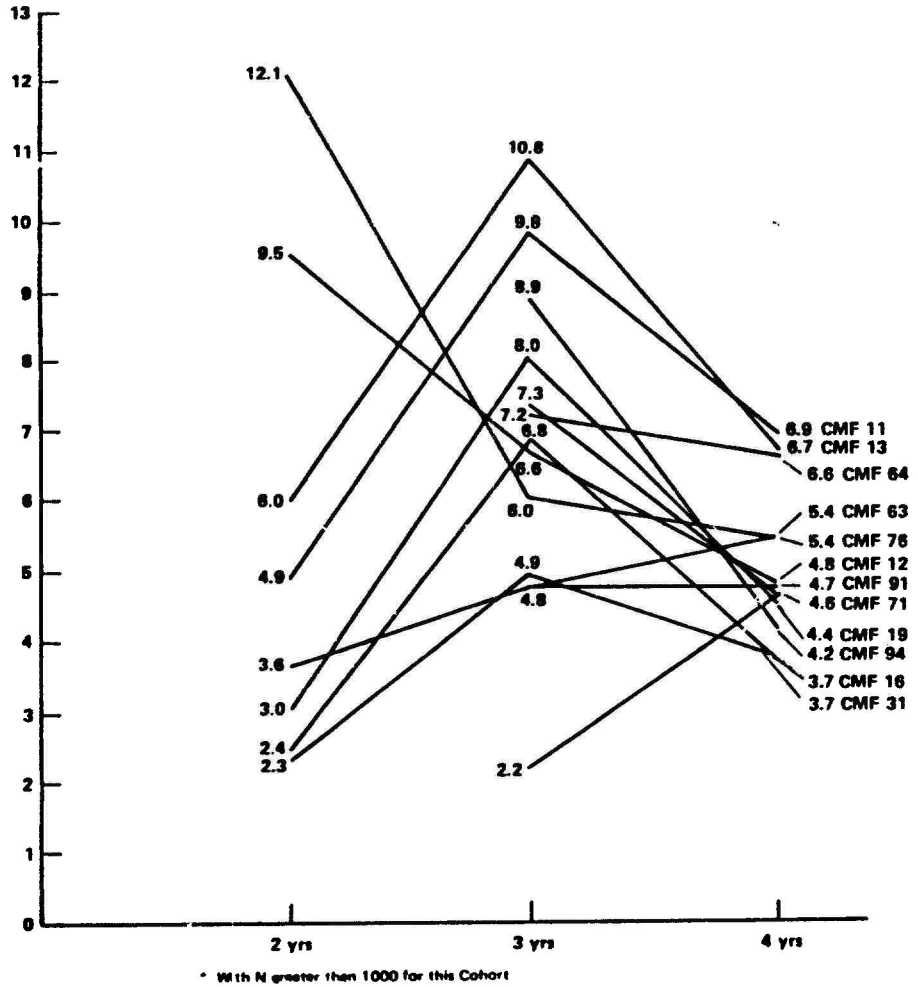


Figure 3.39. Loss Type by Term of Service Controlling for CMF* (Part 1)

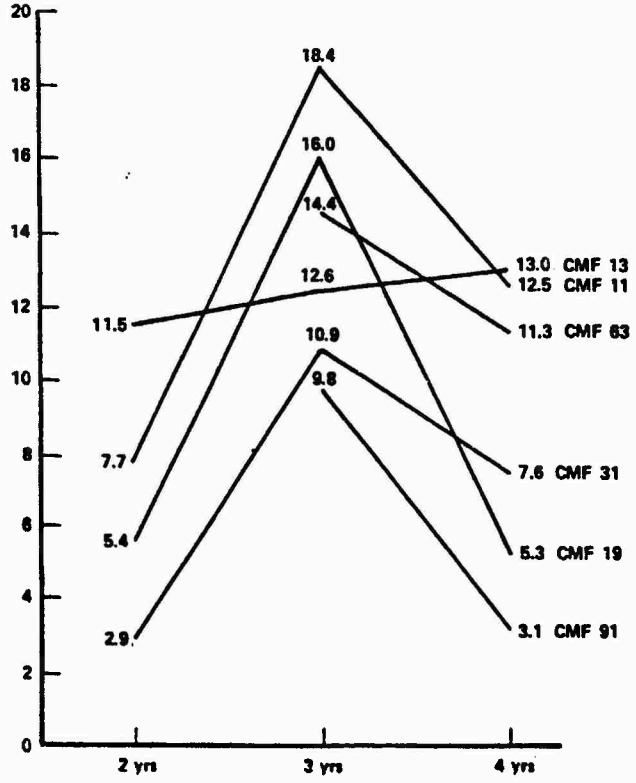


Figure 3.39. Loss Type by Term of Service Controlling for CMF (Part 2)

Grade: The final variable included in our analysis is grade. The interaction of grade and term is similar to the results for grade by tour length, i.e., E-3s show the least variance across terms, E-1s exhibit the dominant pattern, and E-2s show a deviation from the pattern among 2-year enlistees (Figure 3.40). There is little difference between 12-month and 18-month cohorts in terms of the shape of the various curves. These data, when compared to the results of Figure 3.24 (Attrition Rate by Tour Length), show that short-tour, short-term enlistees who have spent some time in the Army before coming to USAREUR have the highest probability of attriting, but they do not suggest why this should be so.

Summary: The preceding analysis described the relationship of term of service and attrition rate while controlling for each of the other moderator variables. As was the case in our discussion of tour length, there were numerous significant interactions, i.e., the term by attrition relatoinship was not consistent across moderator variable categories. There were also fewer differences across cohorts, indicating that the pattern of relationships was generally the same for the first 12 months and the next 6 months in USAREUR.

The major important moderator differences were similar to those found in our discussion of tour length. Aptitude, race, education, and MOS had important interactions with term. The interaction pattern was the same in all cases--one or more moderator categories displayed a significant difference from the basic inverted-V pattern among 2-year enlistees. In these data, category IVs, blacks and nongraduates had much higher attrition rates in the 2-year enlistent status than in the 3- or 4-year enlistment status. Individuals with a noncombat MOS were less likely to show any attrition rate by term relationship (i.e., close to a straight line) than were combat soldiers (who showed the dominant pattern).

Other variables, like marital status, age, number of dependents, and grade, show similar differences--generally one category with a higher attrition rate

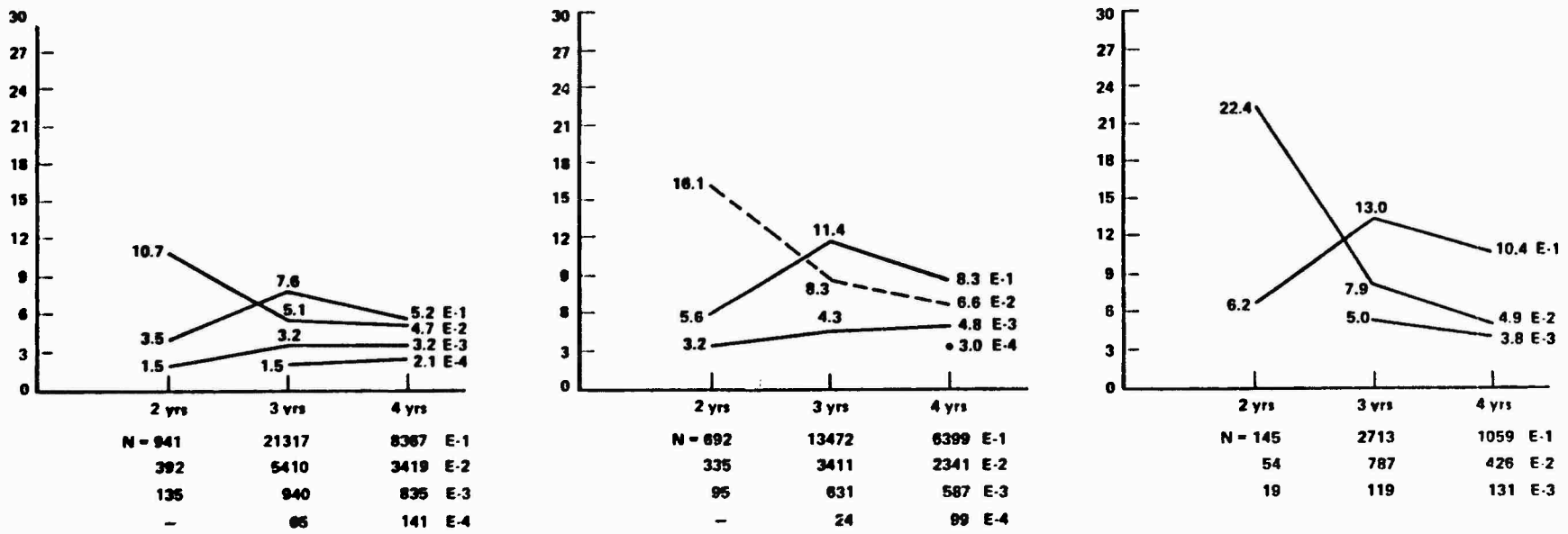


Figure 3.40. Loss Type by Term of Service Controlling for Grade

in the 2-year enlistment category--but again represent only small proportions of the total cohort population. Among these variables, the aberrant 2-year enlistees include those 20 years old or older (plus the 17-year-olds who were completely out of the pattern), SM who are married or have dependents, and E-2s. Ethnicity showed little interaction with term and females had almost no variance in attrition across term categories (thereby creating a different interaction pattern).

In the next analyses we shall again attempt to specify particular contributors to the attrition by term relationship by controlling four major factors: race, education, aptitude, and MOS--simultaneously.

3.2.5.2 Controlling for Multiple Variables. In this analysis, the relationship of term of service and attrition rate is examined while controlling for four moderator variables simultaneously. The control variables are the same as those used in the tour-length analysis--aptitude, race, education level, and MOS category.[1/] The 18-month cohort forms the basis for these analyses, also. Results are presented in four Figures (Figure 3.41 through Figure 3.44), each of which represents all possible sub-groups within one aptitude category.

Even a cursory examination of these four Figures reveals that most of the deviation from the inverted-V pattern which characterizes the term of service by attrition-rate relationship comes from aptitude category IV subgroups.[2/]

[1/] Appendix C contains intermediate results controlling for two variables at a time.

[2/] Small Ns mean that for many of the subgroups it was not possible to complete the curve for the 2-year enlistees. This means that it is possible that 2-year enlistees in other aptitude categories could exhibit a pattern similar to those in category IV. Our analysis controlling for aptitude and education, for example, shows that nongraduates in category III-B also have a higher attrition among 2-year enlisttes (Figure C.2). So, too, do blacks who are category III-B (Figure C.4). Other subgroups, however, are more likely to exhibit the dominant pattern. Thus, despite the small cell sizes and incomplete patterns, it appears that concluding that category IV subjects contribute the most to deviations is not inconsistent with actual results.

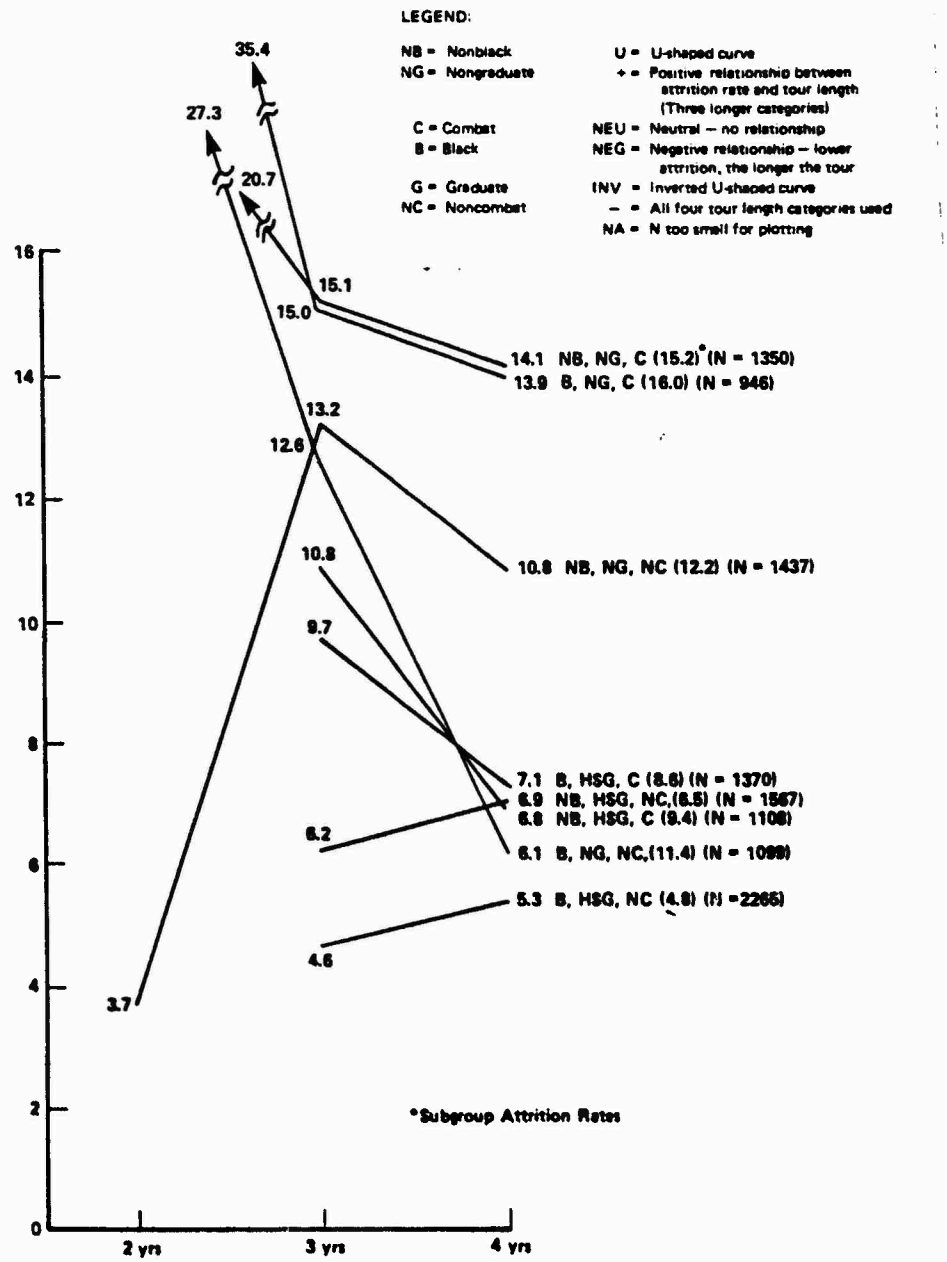


Figure 3.41. Loss Rate by Term of Service Controlling for Race, Education, MOS and Aptitude Category IV

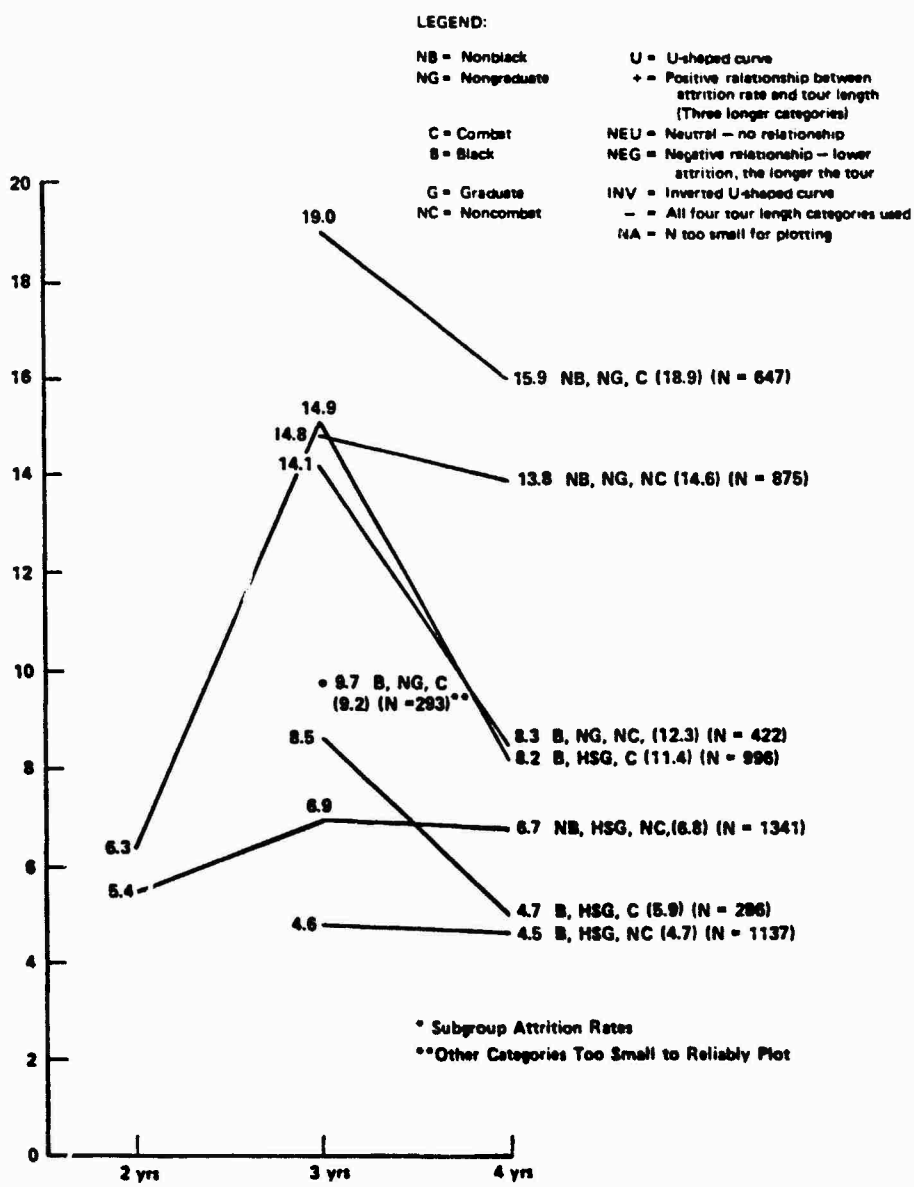
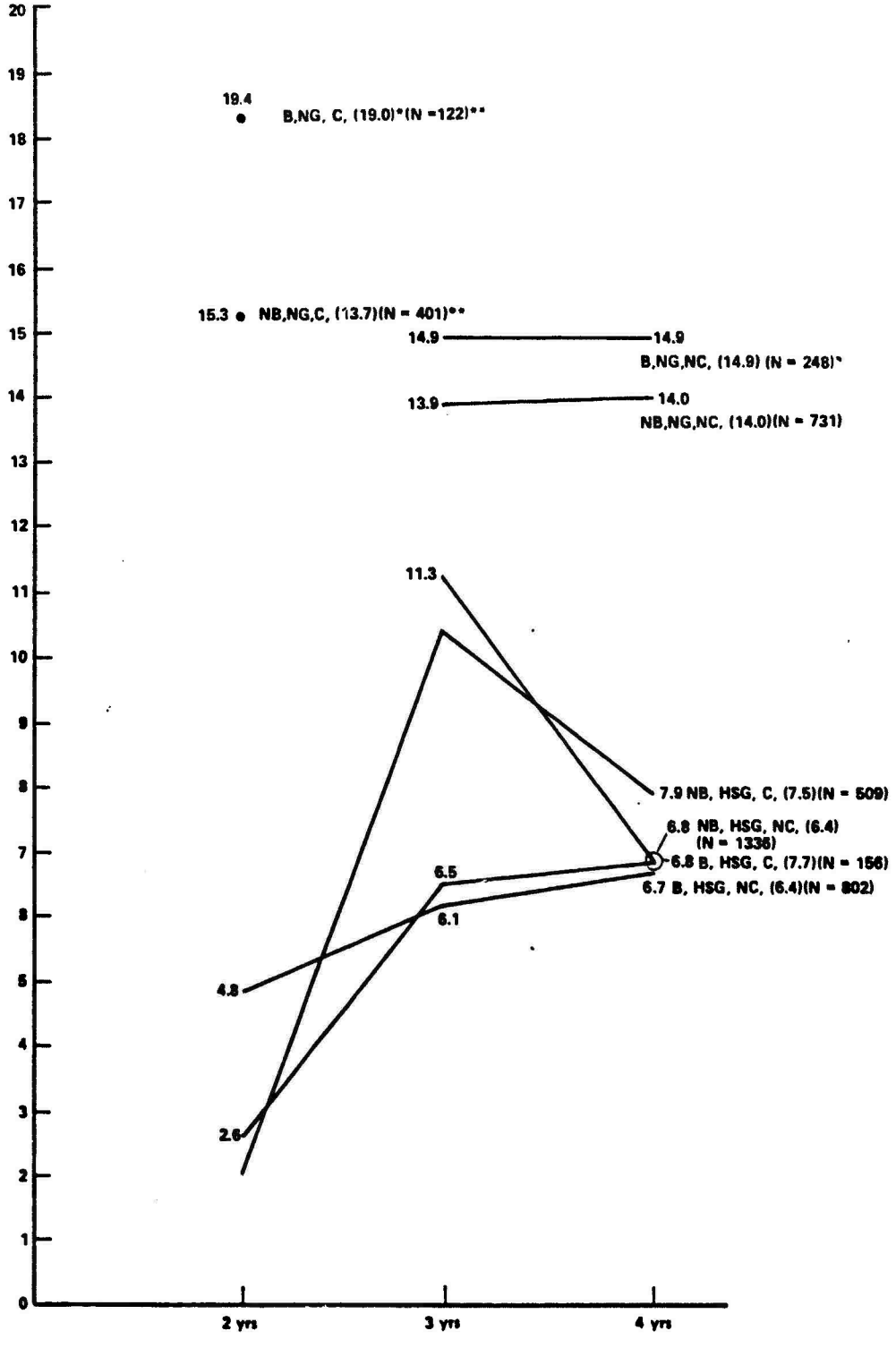


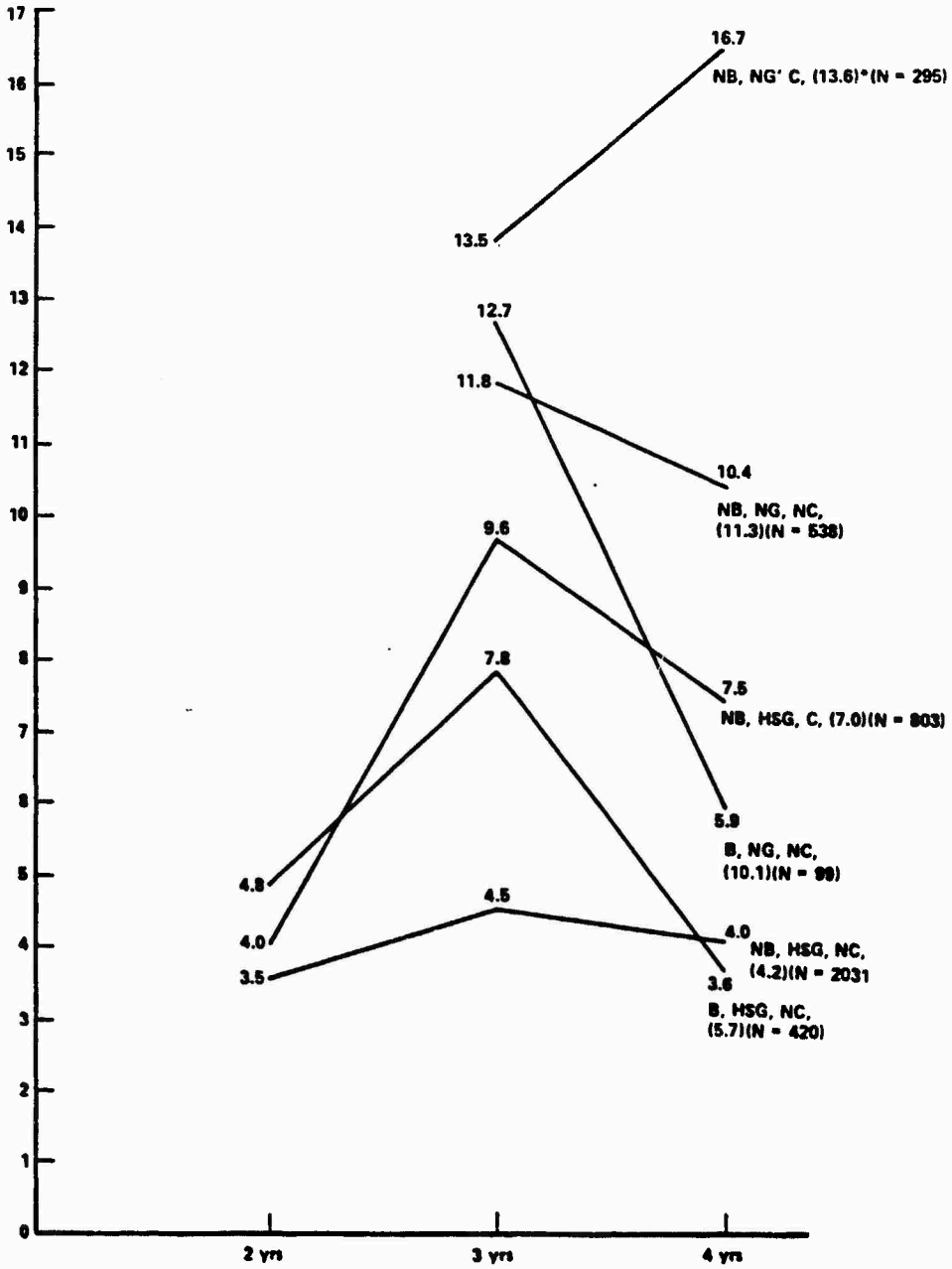
Figure 3.42. Loss Rate by Term of Service Controlling for Race, Education, MOS and Aptitude Category III-B



* Subgroup attrition rate

** Other categories too small to reliably plot.

Figure 3.43. Loss Rate by Term of Service Controlling for Race, Education, MOS and Aptitude Category III-A



* Subgroup attrition rates

Figure 3.44. Loss Rate by Term of Service Controlling for Race, Education, MOS and Aptitude Category II

In particular, nongraduates in the combat arms and black, noncombat, nongraduates all exhibit steep increases in attrition in the 2-year enlistment subgroup. A second major pattern revealed in these Figures is that, with the exception of category II, noncombat high school graduates are much less likely to have lower attrition rates as 4-year enlistees, i.e., 4-year enlistee attrition is higher than 3-year enlistee attrition in these subgroups. Thus, the apparent dedication or stability exhibited by those taking a longer enlistment is less evident for high school graduates in noncombat MOS than it is for almost all other groups. However, these groups still have the lowest overall negative attrition rates. One other small group of noncombat SM, category III-A nongraduates, also exhibits this pattern, but at a much higher overall attrition rate (14.3% compared to 6.4% among graduates in category III-A). Only one subgroup shows a markedly higher attrition rate among 4-year enlistees, nonblack, combat, nongraduates in aptitude category II. Here the difference is 3.2 percentage points, but again this subgroup has the highest overall attrition rate of any in category II. Differences across other subgroups are not systematic.

3.2.6 Multivariate Analysis. In order to determine the relative importance of predictor variables and the amount of accountable variance in the criterion variable, regression analysis was applied. This analysis was conducted with full realization of the small base-rate problem[1/] and minimal variance in several of the dichotomous variables. The results, of course, reflect these limitations.

A stepwise multiple regression model was used with the order of inclusion of independent variables determined by statistical inclusion criteria and, in

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[1/] Meehl, Paul E., and Rosen, Albert, "Antecedent Probability and the Efficiency of Psychometric Signs, Patterns or Cutting Scores," Psychological Bulletin, 52, 3 (1955), pp. 194-216.

separate runs, hierarchically.[1/] The latter technique was used to examine the independent impact of the predictor variables of primary interest in this report, term of service and tour length. The dependent variables for these regressions were negative attrition rate and neutral attrition rate. Statistical problems are, of course, more severe for the latter variable because variance is smaller.

Two general outcomes can be reported. First, as expected, no variable accounted for very much of the total variance and the total "explained" variance was very low. Table 1 in Appendix D shows the Pearson product-moment correlation coefficients for attrition rates with each of the predictor variables. For negative attrition there is no correlation higher than .14, education in the 24-month cohort, and most are below .05. The effect of low variance can be seen in the increasing correlations across the three cohorts. As the attrition rates increase, for the longer term cohorts, so do correlation coefficients.

With one exception, gender, the correlation coefficients with neutral criteria are somewhat lower than they were with negative attrition. Gender, or the difference between males and females, produces a high coefficient of .224, in the 18-month cohort, and is a strong enough predictor to raise total explained variance (R^2) for the neutral attrition regressions to a higher level than for the negative attrition regressions. Table 3.3 shows R^2 for each of six regression analyses. The highest total explained variance is only 5.1% for the 18-month cohort, neutral attrition. The total explained variance for negative attrition never reaches 3%.

[1/] Nie, Norman, et al, Statistical Package for the Social Sciences, New York: McGraw-Hill, 1975, Chapter 21.

Table 3.3

Explained Variance (R^2)
for Each Cohort Using Stepwise Regression Analysis*/

	Negative Attrition	Neutral Attrition
12-Month Cohort	.012	.029
18-Month Cohort	.0175	.051
24-Month Cohort	.028	.049

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*/Predictor Variables:
Tour Length
Term of Service
Age
Gender
Race
Number of Dependents
Ethnicity
Aptitude
MOS
Rank
Education
Marital Status

The second general outcome concerns the relative power of each predictor variable. Six summary Tables in Appendix D--D.2 through D.7--show regression results for negative and neutral attrition for each of the three cohorts. Because other cohort results are very similar, our discussion will focus only on the 18-month cohort (Table D.3). Education is the most powerful predictor, but it accounts for only about 1% of the total attrition rate variance. Term of service and tour length are well down the list, although the former is "statistically significant." In the hierarchical regression analyses, these two predictors were each placed first in the inclusion order; and while term of service was again statistically significant, neither accounted for more than .13% of the total variance.

The single best predictor of neutral attrition is gender, which accounts for just over 5% of the variance (Table D.6). All of the remaining predictors combined add less than 1% more explained variance. These results reflect the findings already reported in the contingency analysis.

Our contingency analysis showed that the low level of explained variance, which is at least partly due to the methodological problems described above, does not mean that effective policy intervention, based on assignment strategies, is not possible. Feasible policy changes, however, would be unlikely to result in more than a marginal change in negative attrition rates. This is true, among other reasons, because variables which are most easily manipulated, e.g., assignment based on marital status, number of dependents, age, and gender, as well as the time-related predictors (tour length and grade), are usually unevenly distributed, meaning that a change in small deviating subgroups will produce little overall change in the attrition rate.

3.3 The Pattern of Negative and Neutral Attrition

The foregoing analysis focused on identifying the differences between individuals who attrite and those who do not. Beyond having occurred during the first 2 years of USAREUR service, no distinction was made among those who left soon after arrival in USAREUR and those who left later during that 2-year timeframe. In this section we examine differences in departure or loss time. We refer to this examination as attrition pattern analysis.

The primary focus of the pattern analysis will be on the first 18 months in USAREUR, although we will also take a brief look at the 24-month pattern. Because only attrition losses are considered in this analysis--nonlosses are still in the command--detail will be substantially reduced. We will examine the basic loss pattern and examine the effect of each of the independent variables separately. Using control variables is not feasible. The combined effect of all predictors will be examined in a regression analysis. Both

negative and neutral attrition will be described in the basic analysis and in the regressions, but neutral attrition will not be included in the individual predictor analysis (again because of the small N).

3.3.1 The Pattern of Attrition in USAREUR. Figure 3.45 shows the percent of negative attrition which occurred in each month for the 18-month cohort. The curve is roughly bimodal, with the highest losses occurring during the sixth through the ninth months (about 40% of the total) and a smaller hump occurring in the fifteenth through the seventeenth months (about 18%). Figure 3.46 shows the distribution of neutral losses for the same timeframe. There is a roughly bimodal distribution for these losses, also, but the curve is much more uneven. The rough correspondence of these two curves suggests common factors in operation, but the similarity could be the result of structural, organizational, individual, or other systematic nonevident reasons, as well as spurious.[1/] Some of these factors, those having to do with time and some individual characteristics, will be examined in the following paragraphs.

Using the smaller cohort, a 23-month stay pattern was plotted. This pattern is shown in Figure 3.47, and it also reveals a bimodal distribution. Interestingly, the distribution is stretched out over the duration of cohort stay limits, rather than being restricted to the months which characterized the 18-month cohort. Thus, the second, smaller mode occurs during the eighteenth through twentieth months rather than during the fourteenth through the seventeenth. This result is especially surprising when one realizes that the loss rate during the extended time period--19 to 23 months after arrival--is generally much lower than during the 13- through 18-month period. Again, the possibility that this small cohort is not representative of the entire study cohort seems like the best explanation for observed differences.

[1/] A larger number of neutral loss cases, for example, could even out the curve or eliminate the marginally bimodal distribution.

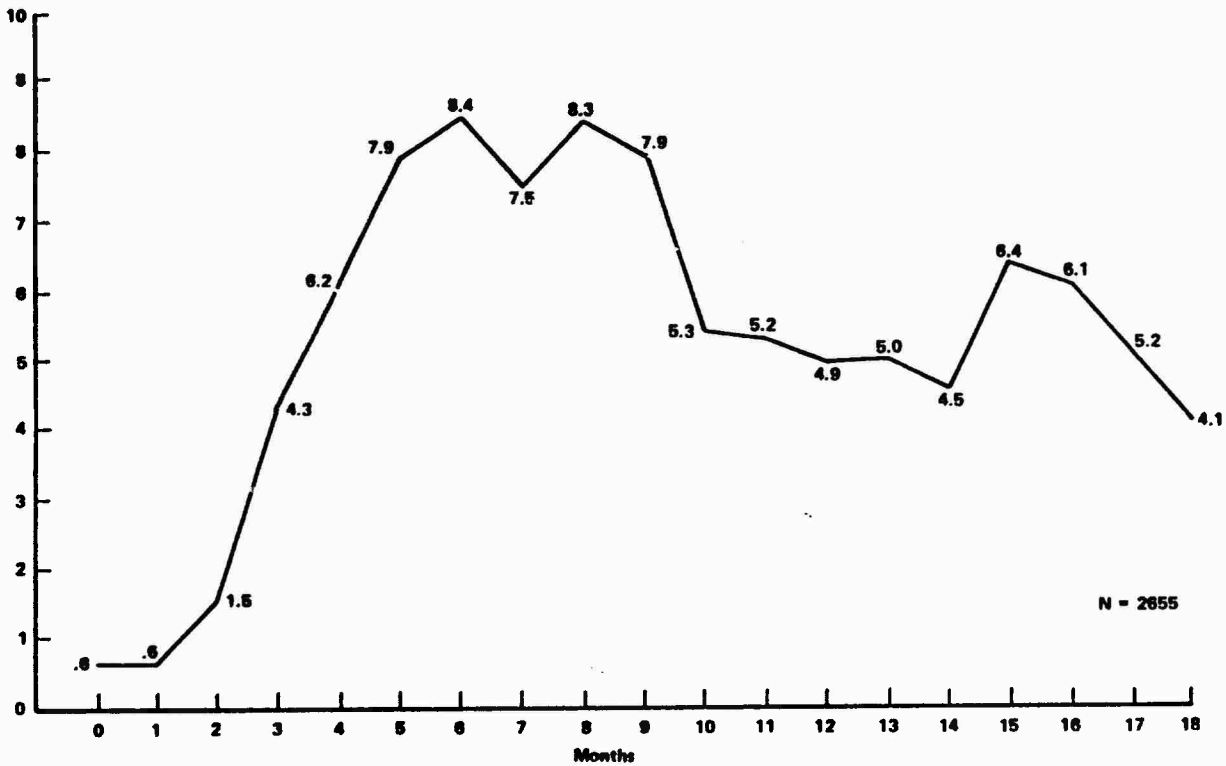

Figure 3.45. Negative Stay by Month (18-Month Cohort)

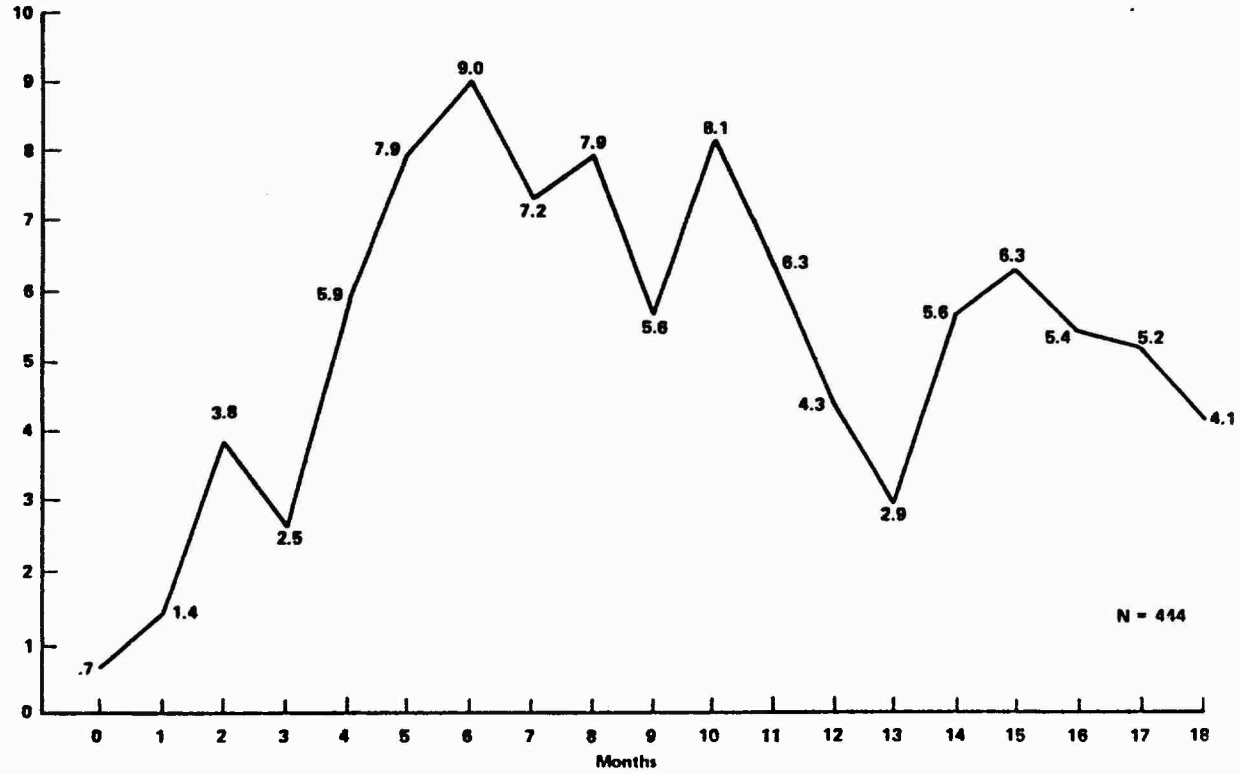

Figure 3.46. Neutral Stay by Month
(18-Month Cohort)

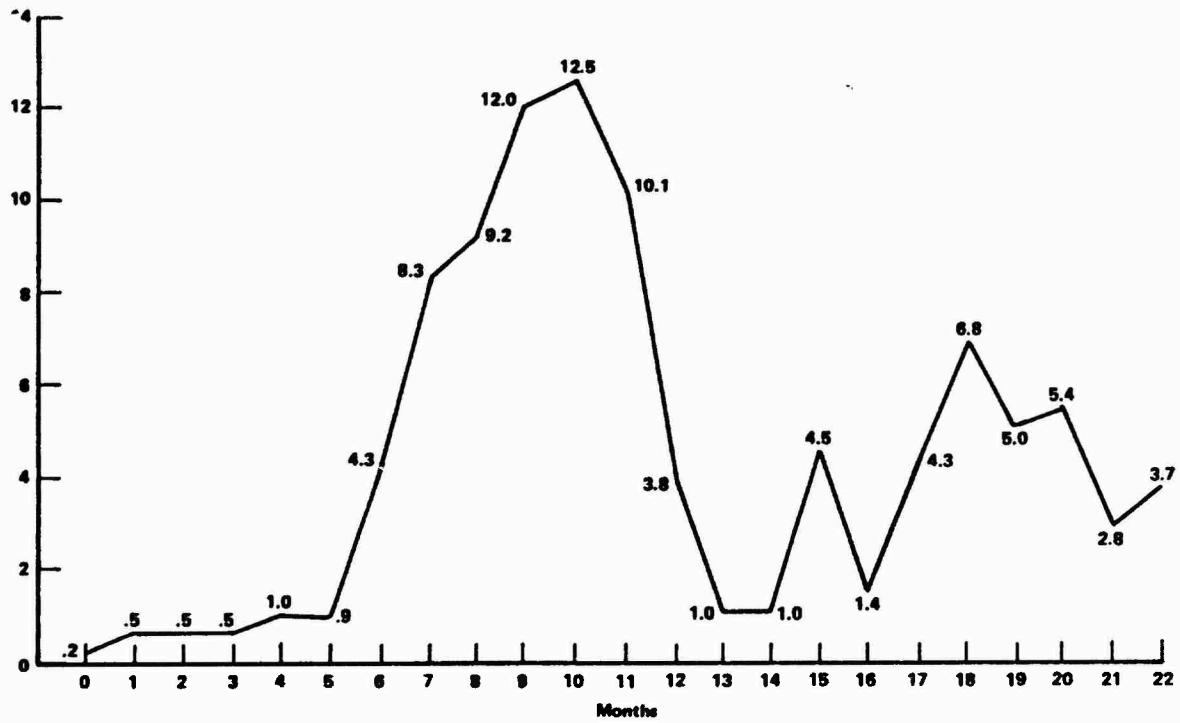

Figure 3.47. Negative Stay by Month
(24-Month Cohort)

3.3.2 Individual Predictors of Stay. In these analyses we are seeking to identify any variance in the overall pattern which is associated with the predictor variables used throughout the report. The special interest is in the relationship of stay to term of service and tour length. The analysis seeks to determine whether any of the predictor categories show different attrition patterns. Only negative attrition patterns will be used.

Term of Service: Attrition patterns for each enlistment subgroup (2-year, 3-year, and 4-year enlistees) are shown in Figure 3.48. While there are some large individual month variations, especially for the 2-year enlistees, the overall patterns for these three categories are not significantly different (X^2 = 36.69; significance = .4369). Thus, while term of service may tell us a little about if attrition will occur, it does not tell us when it will occur.

Tour Length: The previously discussed theoretical and empirical literature hypothesized a relationship between tour length and attrition rates, the longer the tour, the higher the attrition. This argument could also be extended to length of stay. Those with longer tours might last longer because of an initial expectation of having to stay longer. However, the argument might also be turned around. The thought of a very long stay in a negative environment could precipitate actions leading to earlier withdrawal from that environment. The results, minus individuals in the very short (18 months) tour, indicate that SM with 24-month tours are somewhat more likely to leave early (49.9% by the end of the eighth month) than either the 25- through 30-month category (41.9%) or the 31 or more month category (43.6%). Figure 3.49 shows these results. The 25- through 30-month category is more likely to have late attrition. The first result suggests that it is the relative amount of the tour served which is the dominant factor in stay (for these categories). However, the second result contradicts this interpretation; the longest tour category should have had the highest rate tour losses but does not.

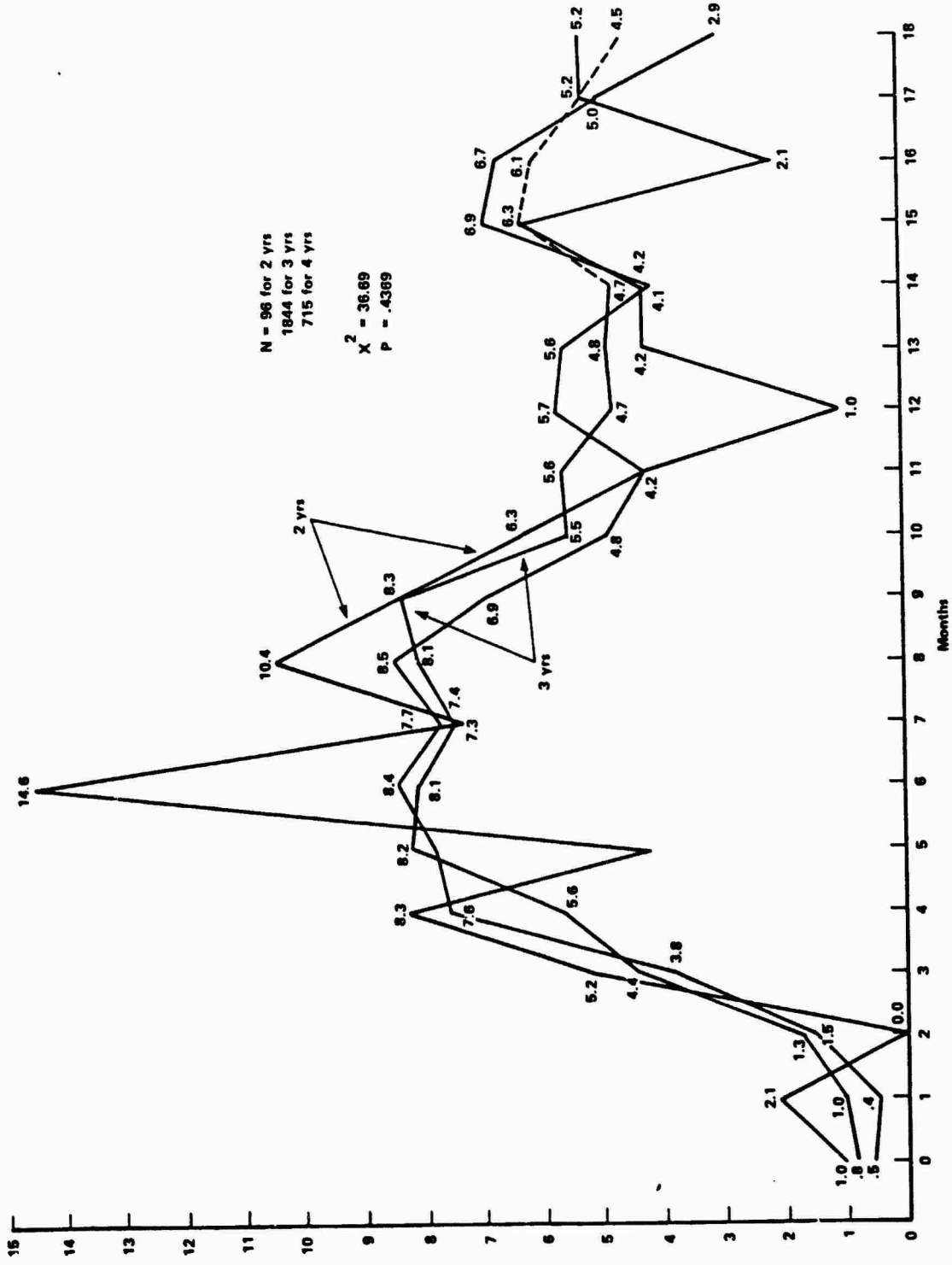

Figure 3.48. Negative Stay by Term of Service Group (18-Month Cohort)

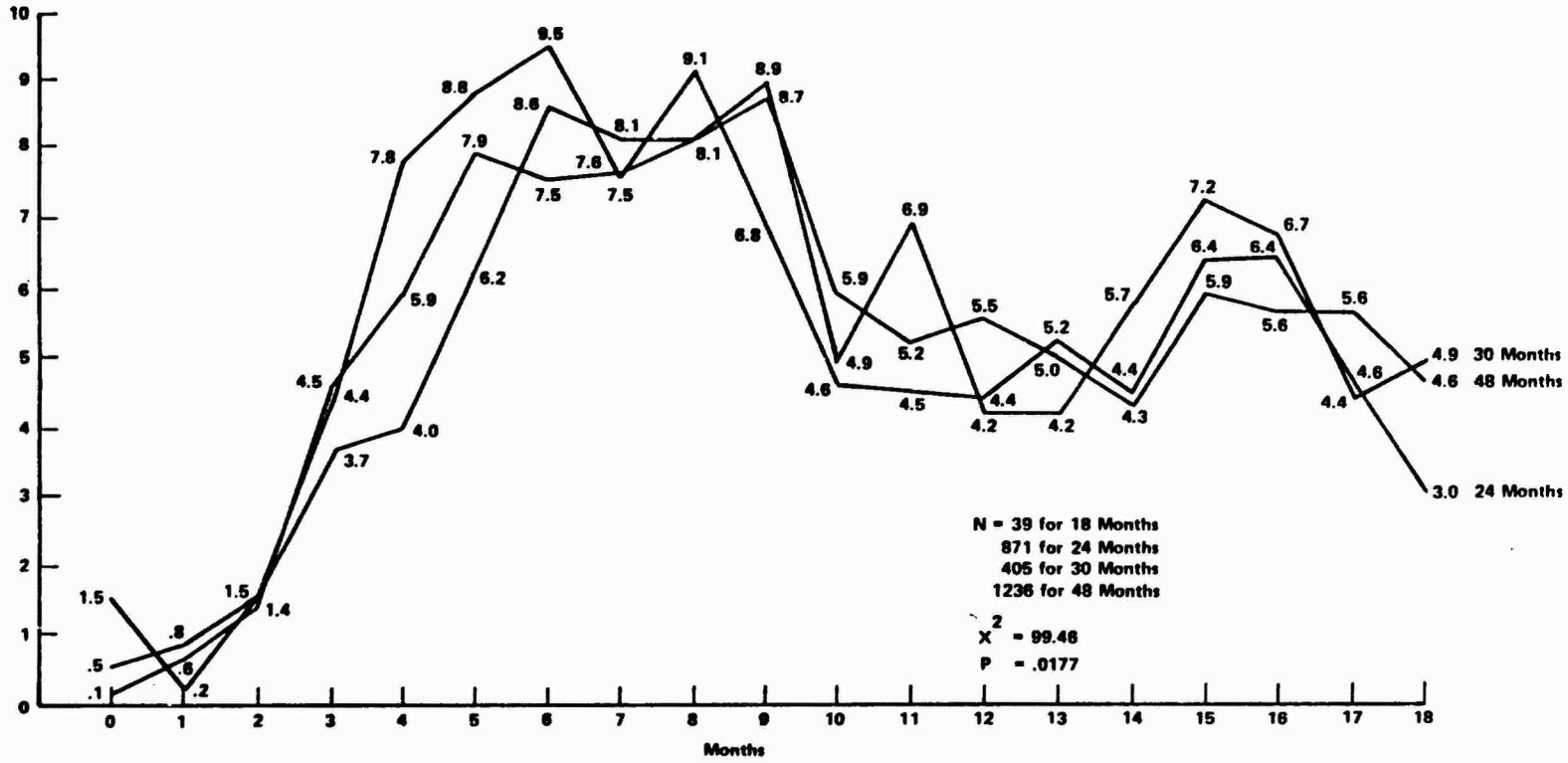

Figure 4.49. Negative Stay by Month
For Each Tour Length Group
(18-Month Cohort)

Thus, these results suggest one or more intervening factors, perhaps an interaction between tour length and type of assignment, which could account for the observed differences. The reader should also bear in mind that the average stays for each category do not differ by more than a few weeks. This suggests that the policy implications for the effect of tour length on stay may be negligible.

Other Socio-demographic and Military Characteristics: Of those characteristics considered in the earlier analysis, only two--number of dependents and marital status--show significant categorical differences in attrition pattern. Figure 3.50 presents results for number of dependents.[1/] There is a tendency for those with dependents to attrite more frequently during the first half of the 18-month observation period than those without dependents. Over 63% of those who attrited by the end of the ninth month are soldiers with dependents while only about 52% of those who left early were soldiers without dependents. A similar pattern applies to married versus unmarried SM.

Among the remaining predictor variables, there are no significant differences. Thus, most attrition pattern variation remains unexplained. This outcome is confirmed in the multivariate analysis in which length of stay is used as a high variance dependent variable in a multiple regression analysis. In this regression, using all available predictor variables, less than 2% of the total variance is "explained." (See Table D.8.) Other factors, possibly related to unit differences in tolerance of substandard performance and command attitudes toward the elimination of poor performers, may be more likely avenues for explaining attrition patterns.

Summary: Our analysis of stay has done little to improve our understanding of why some individuals attrite early in their tours and some later. We

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[1/] Results for marital will not be presented because they closely parallel those for number of dependents.

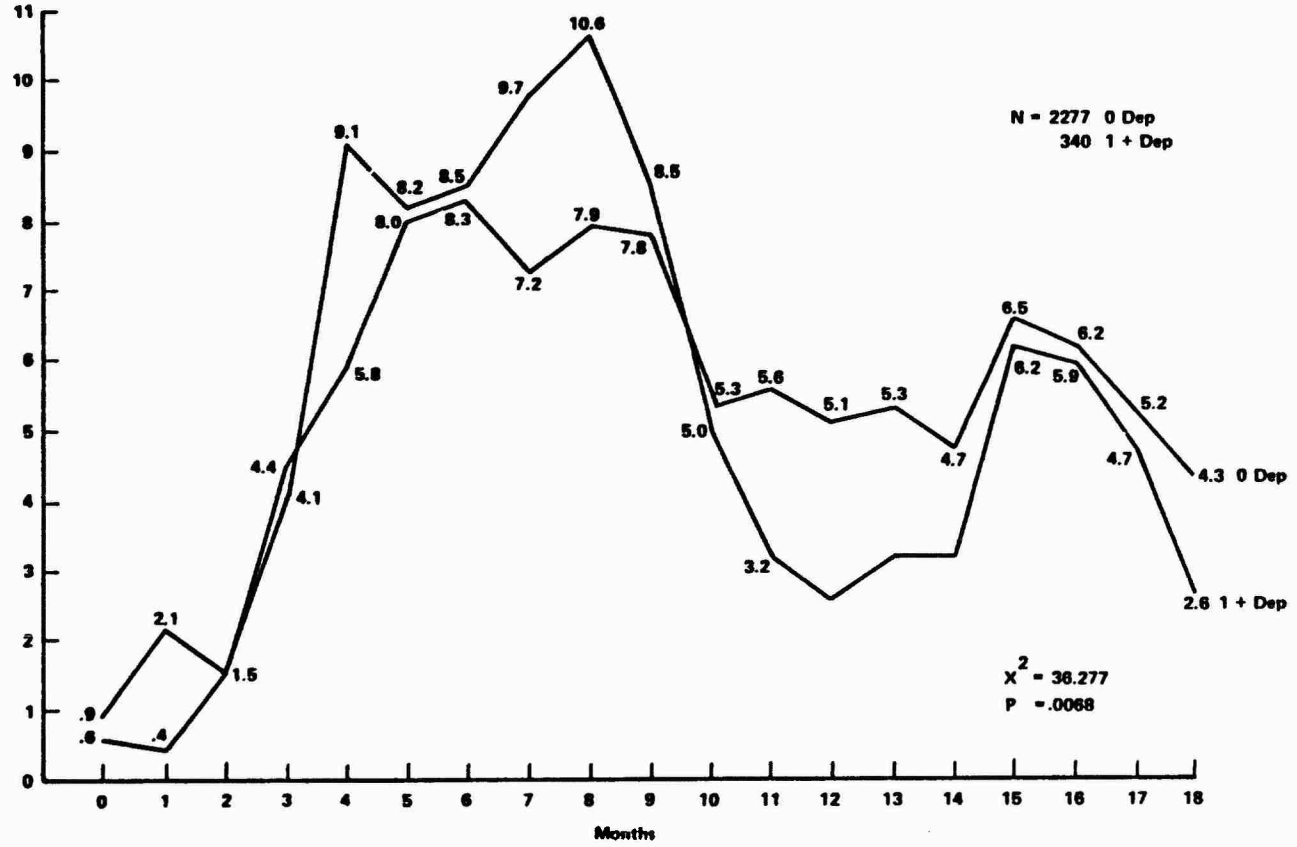


Figure 3.50. Negative Stay by Number of Dependents

have learned that there is a definite bimodal pattern to the losses, with a majority of the attrition occurring during the fifth through the ninth months. However, the variables used in this analysis tell us very little about differences in stay. In particular, term of service and tour length are not useful indicators of when losses will occur, with the minor exception of somewhat earlier losses among those with 19- through 24-month tours. It is possible that separating individuals lost in the two modes would provide more helpful results. The first, larger, mode may contain those individuals bound for failure and differences within this mode represent small variations in tolerance and the efficiency of units processing the paperwork. The second mode occurs after a full year of USAREUR service has been completed and would seem to represent a different type of individual. Unfortunately, these data do not suggest how these individuals differ from the first wave losses.

Appendix A

Distributions of Socio-Demographic and Military Characteristics Variables

Table A.1

Distribution of Gender

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Males	87.5%	87.5%	86.0%
Women	12.5%	12.5%	14.0%
Total N	41,991	28,104	5,484

Table A.2

Distribution of Grade at Time of Arrival in USAREUR

	12-Month Cohort	18-Month Cohort	24-Month Cohort
E-1	73.0%	73.2%	71.5%
E-2	22.0%	21.7%	23.1%
E-3	4.6%	4.7%	4.9%
E-4	0.5%	0.4%	0.5%
Total N	41,965	28,086	5,481
Missing	26	18	3

Table A.3

Distribution of Race

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Black	35.7%	37.2%	36.4%
White	58.1%	57.0%	57.6%
Other	.9%	1.0%	1.5%
Unknown	4.7%	4.2%	3.8%
Total N	41,756	27,940	5,422
Missing	235	164	62

Table A.4

Distribution of Age at Time of Arrival in USAREUR

	12-Month Cohort	18-Month Cohort	24-Month Cohort
17	5.2%	2.8%	1.6%
18	29.0%	28.8%	23.1%
19	26.9%	27.8%	29.4%
20	13.9%	14.5%	15.6%
21 or Older	25.0%	26.1%	30.3%
Total N	41,107	27,518	5,381
Missing	889	586	103

Table A.5

Distribution of Marital Status at Time of Arrival in USAREUR

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Married	9.2%	91.7%	91.2%
Not Married	8.0%	8.3%	8.8%
Total N	41,355	27,618	5,384
Missing	636	486	100

Table A.6

Distribution of Number of Dependents at Time of Arrival in USAREUR[1]/

	12-Month Cohort	18-Month Cohort	24-Month Cohort
None	88.2%	88.2%	87.3%
One	4.4%	4.6%	5.3%
Two	2.6%	2.8%	3.5%
Three or More	4.1%	4.4%	3.9%
Total N	41,695	27,954	5,338
Missing	296	250	146

1/ Not necessarily accompanying dependents.

Table A.7

Distribution of Education Level

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Nongraduates	35.1%	31.4%	26.8%
High School Graduates	64.9%	68.6%	73.2%
Total N	40,553	27,137	5,327
Missing	1,438	967	157

Table A.8

Distribution of Ethnicity

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Latino, Hispanic	5.4%	5.4%	5.1%
Non-Hispanic	94.6%	94.6%	94.9%
Total N	41,550	27,800	5,421
Missing	441	304	63

Table A.9

Distribution of Aptitude Level

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Mental Category I	1.0%	1.1%	1.4%
Mental Category II	15.4%	15.4%	18.9%
Mental Category IIIA	15.9%	15.5%	18.6%
Mental Category IIIB	21.9%	21.6%	23.8%
Mental Category IV	44.8%	39.8%	36.5%
Mental Category V	1.0%	0.9%	0.8%
Total N	39,768	26,456	5,190
Missing	2,223	1,648	294

Table A.10

Distribution of MOS Category

	12-Month Cohort	18-Month Cohort	24-Month Cohort
Service Support	28.9%	31.0%	31.9%
Combat Service	33.9%	32.9%	35.9%
Combat	37.2%	36.1%	32.2%
Total N	41,991	28,104	5,484
Missing	0	0	0

Table A.11

Distribution of Career Management Fields

CMF's	12-Month Cohort	18-Month Cohort	24-Month Cohort
11 Infantry	10.8%	11.1%	11.0%
12 Combat Engineering	3.3%	3.0%	2.7%
13 Field Artillery	9.7%	9.5%	7.9%
16 Air Defense Artillery	3.6%	3.2%	3.5%
19 Armor	8.2%	8.2%	6.7%
23 Air Defense Missile Maintenance	0.8%	0.8%	0.9%
27 Ballistic/Land Combat (LC) Missile & Light Air Defense (LAD) Weapons Systems Maintenance	0.6%	0.7%	1.3%
28 Aviation Communications-Electronics (C-E)	0.2%	0.2%	0.4%
29 C-E Maintenance	1.2%	1.3%	1.5%
31 C-E Operations	11.3%	10.9%	12.1%
33 EW/Intercept Systems Maintenance	* [1]	* [1]	* [1]
51 General Engineering	2.2%	2.6%	3.3%
54 Chemical	0.8%	0.8%	1.7%
55 Ammunition	0.5%	0.6%	0.8%
63 Mechanical Maintenance	10.9%	11.2%	9.4%
64 Transportation	5.1%	4.6%	3.7%
67 Aviation Maintenance	0.2%	1.7%	2.7%
71 Administration	4.6%	5.1%	6.2%
74 Automated Data Processing	2.4%	0.3%	0.2%
76 Supply and Service	5.7%	5.1%	5.1%
81 Topographic Engineering	0.1%	0.1%	0.2%
84 Public Affairs and Audio Visual	0.3%	0.5%	0.6%
91 Medical	4.2%	5.0%	6.1%
92 Petroleum	0.6%	0.6%	0.7%
94 Food Service	3.2%	3.2%	2.6%
95 Law Enforcement	4.5%	4.8%	5.9%
96 Military Intelligence	0.2%	0.2%	0.4%
97 Band	0.1%	* [1]	0.1%
98 EW/Cryptologic Operations	4.8%	0.4%	0.7%
N	41,991	28,104	5,484

[1]/Less than 0.1%

Appendix B

Loss Type by Tour Length

Controlling for Two Variables

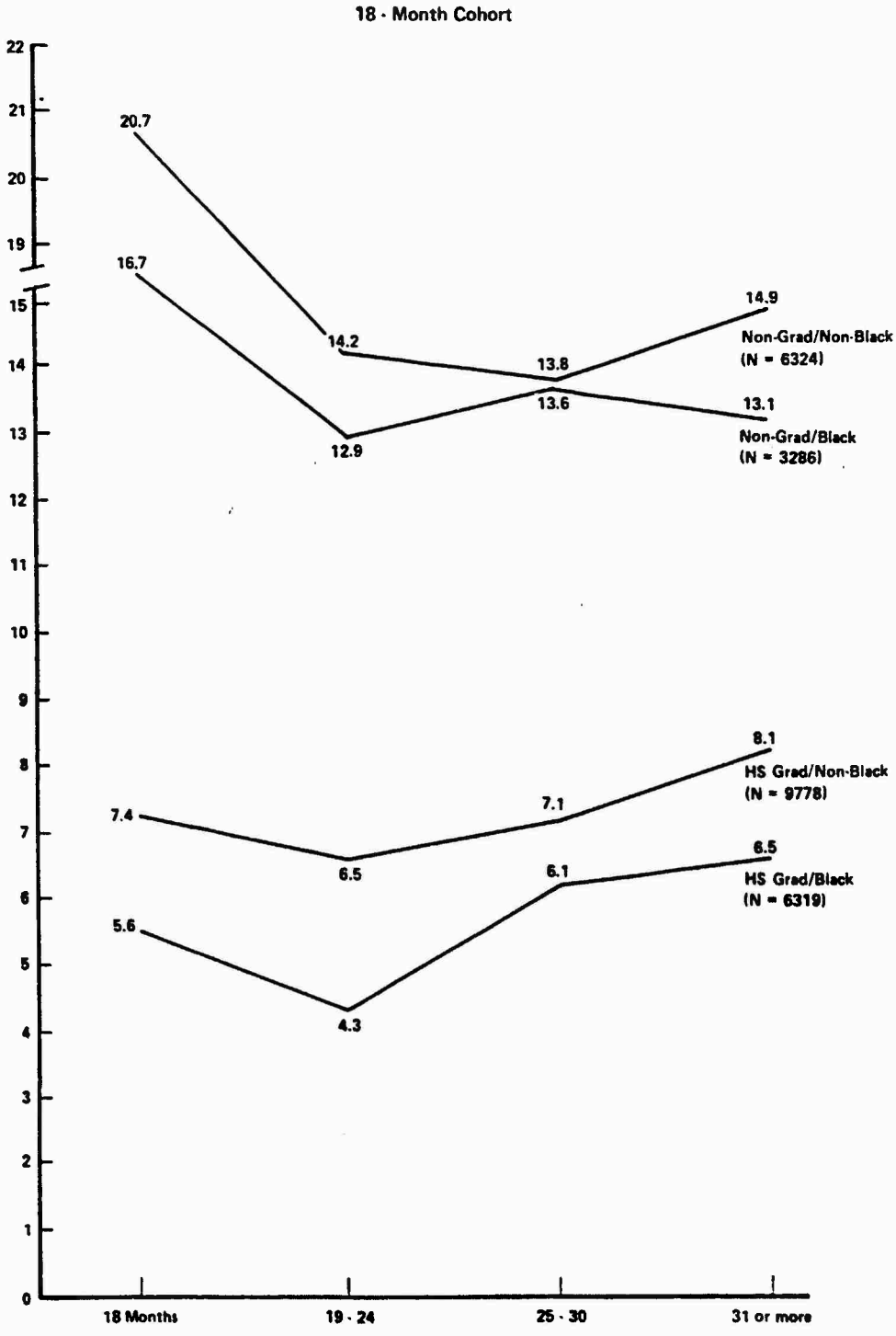
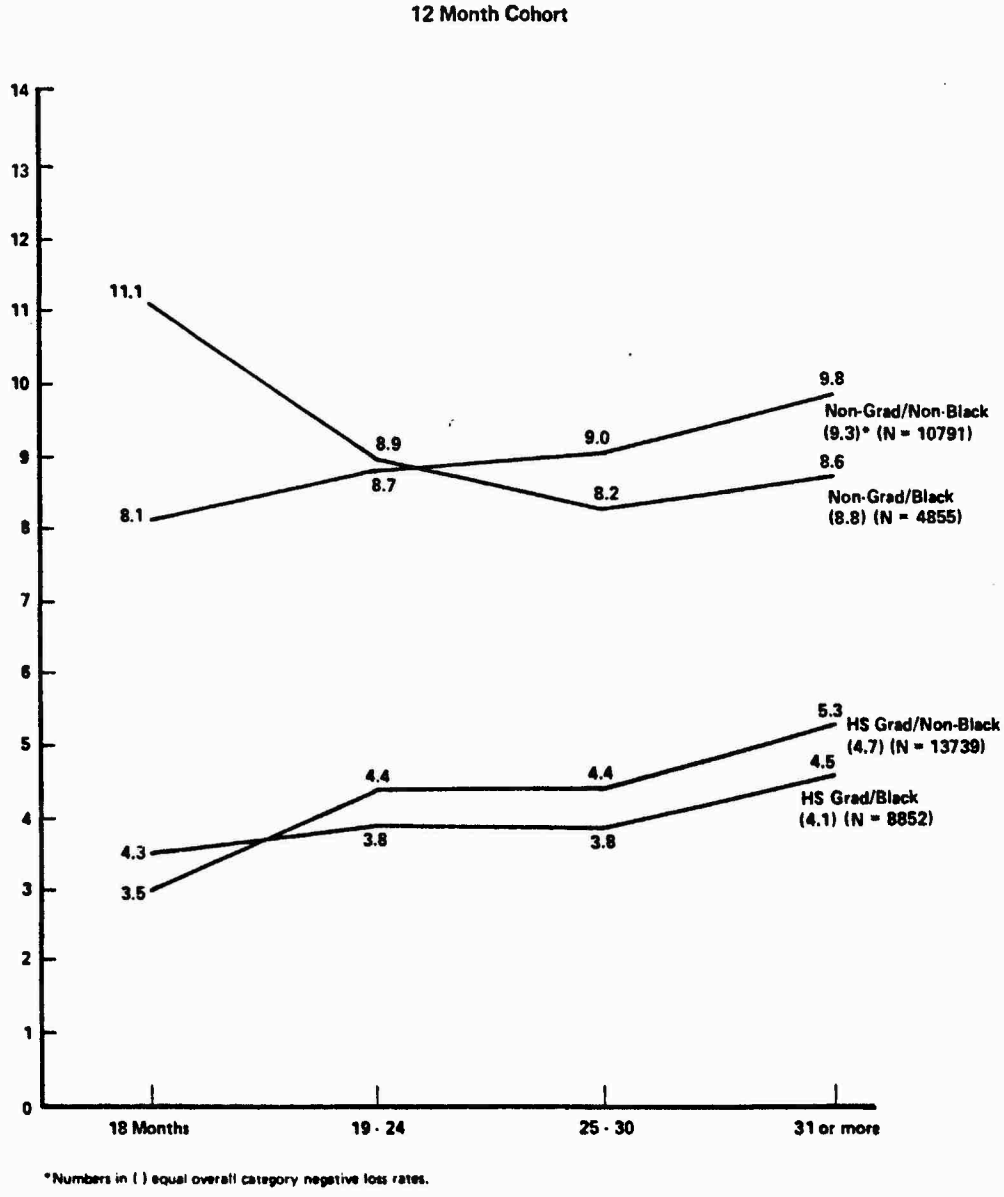


Figure 8.1. Loss Type by Tour Length Controlling for Education and Race (Part 1)



*Numbers in ( ) equal overall category negative loss rates.

Figure B.1. Loss Type by Tour Length Controlling for Education and Race (Part 2)

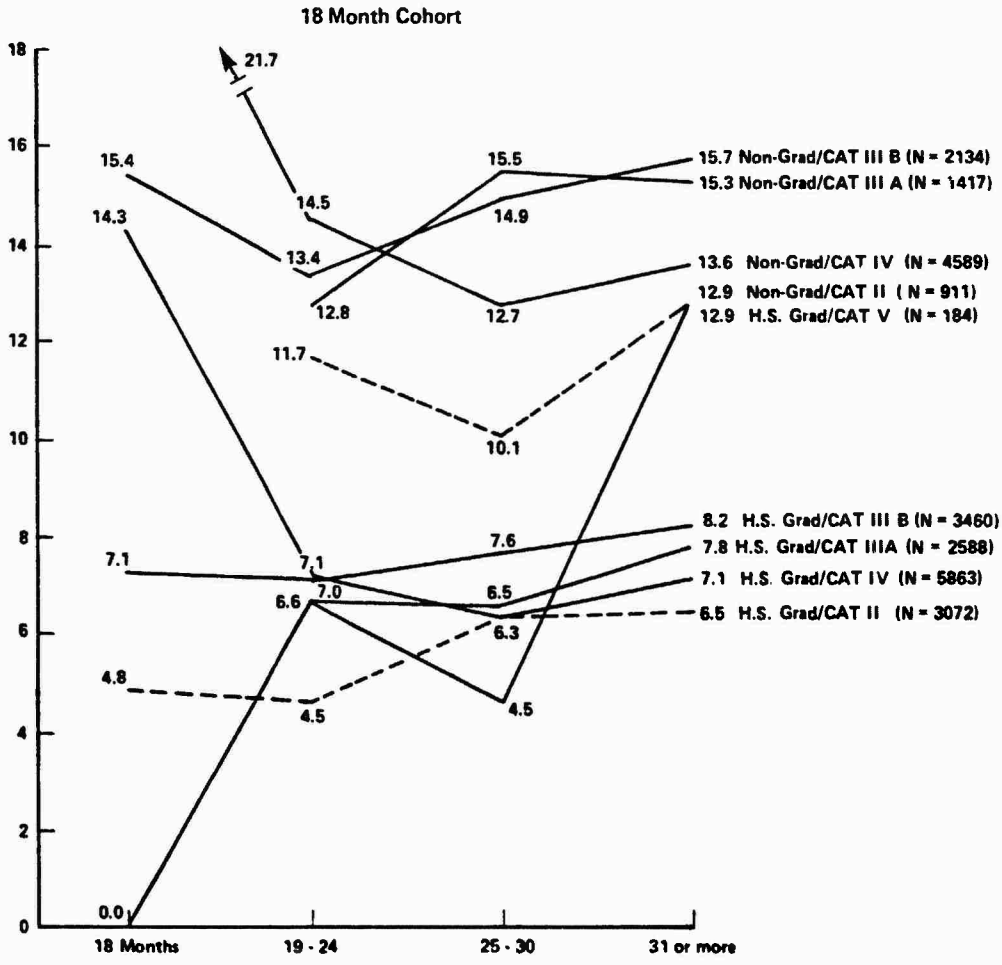
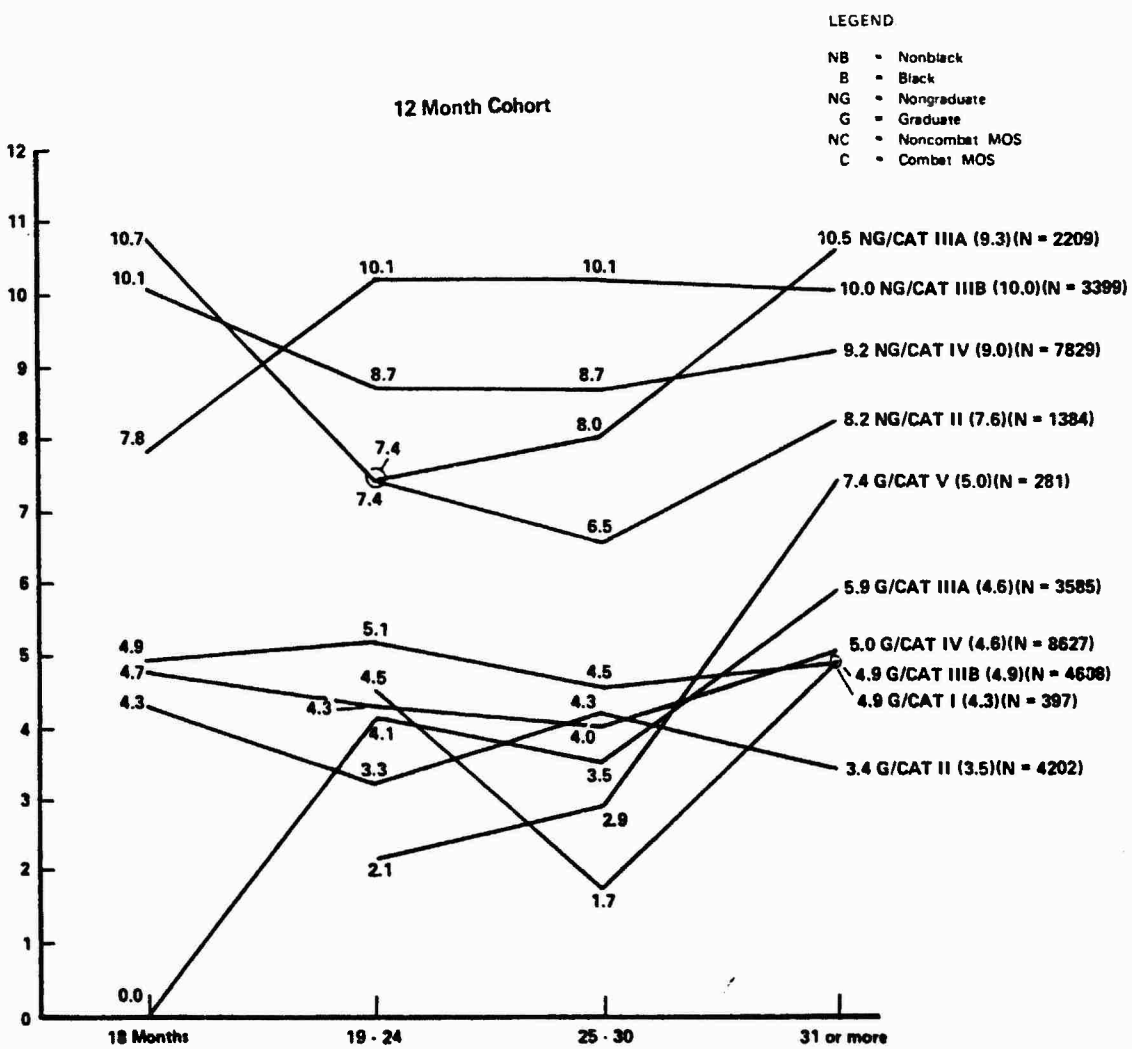


Figure B.2. Loss Type by Tour Length Controlling for Race and MOS Category (Part 1)



*Numbers in ( ) equal overall category negative loss rates.

Figure B.2. Loss Type by Tour Length Controlling for Education and Aptitude (Part 2)

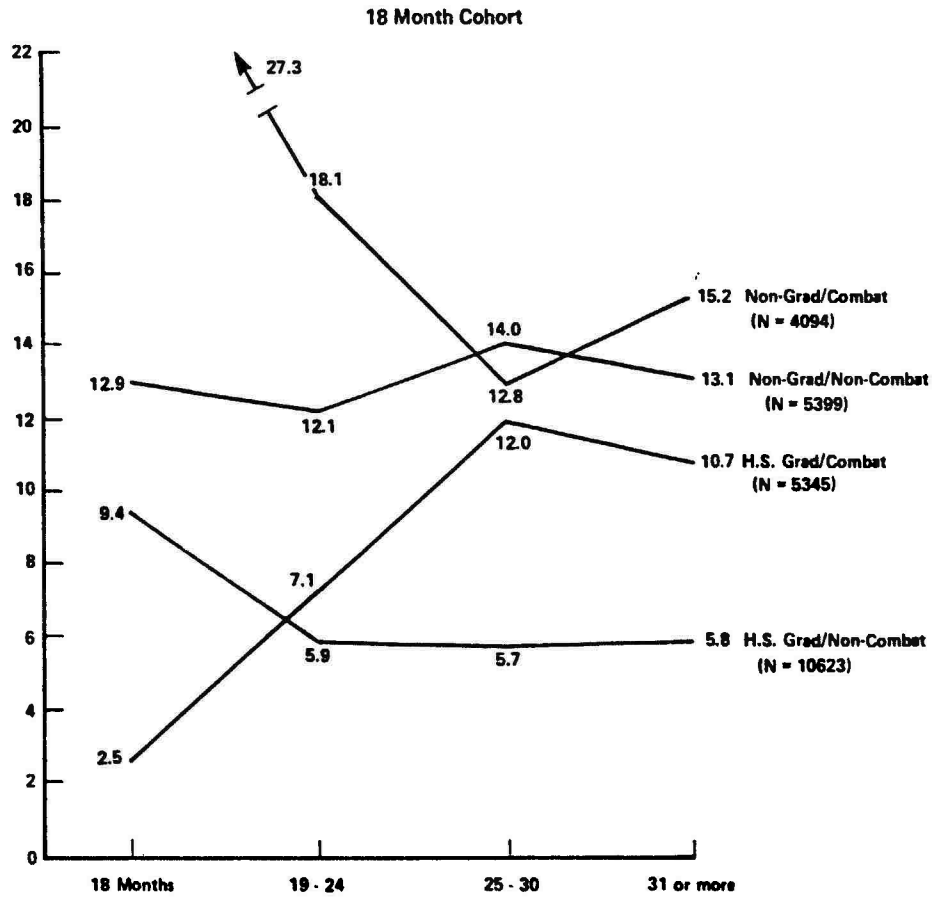
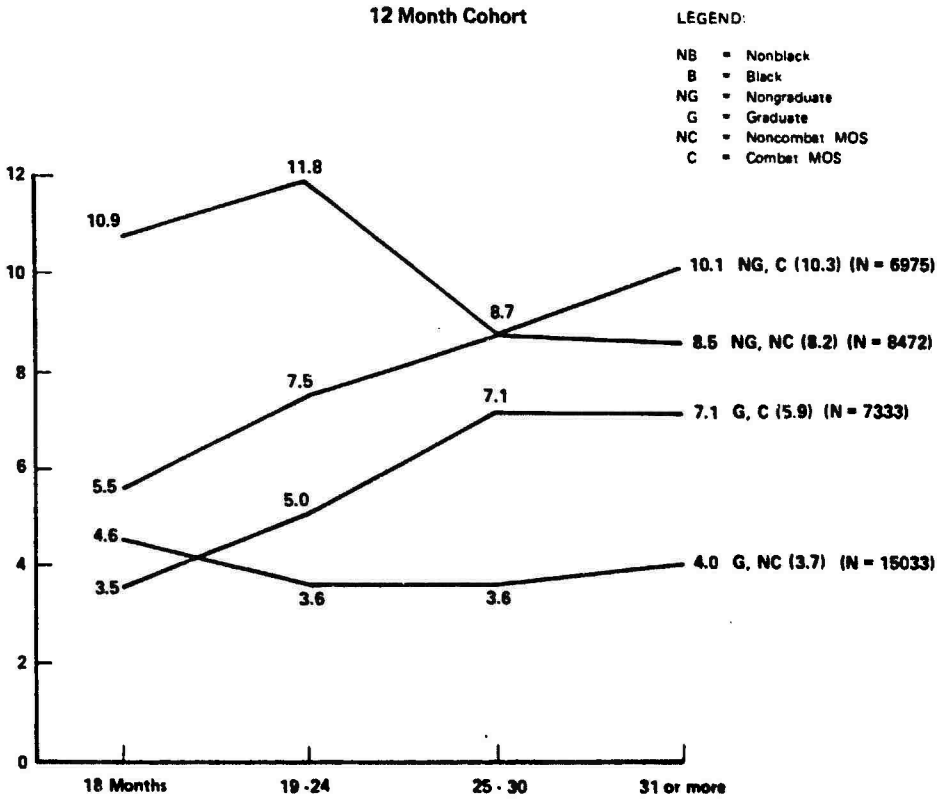
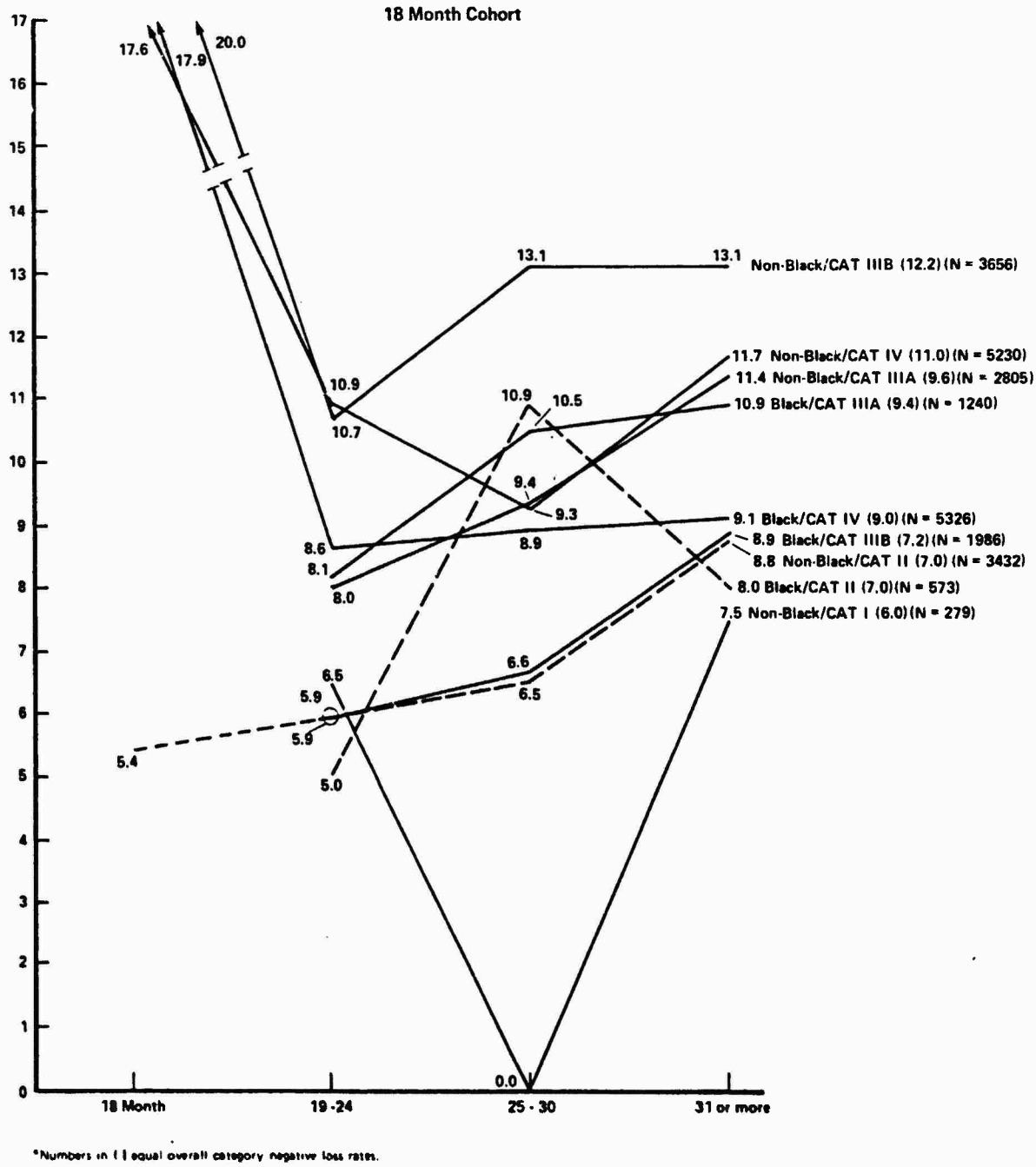


Figure 8.3. Loss Type by Tour Length Controlling for Education and MOS Group (Part 1)



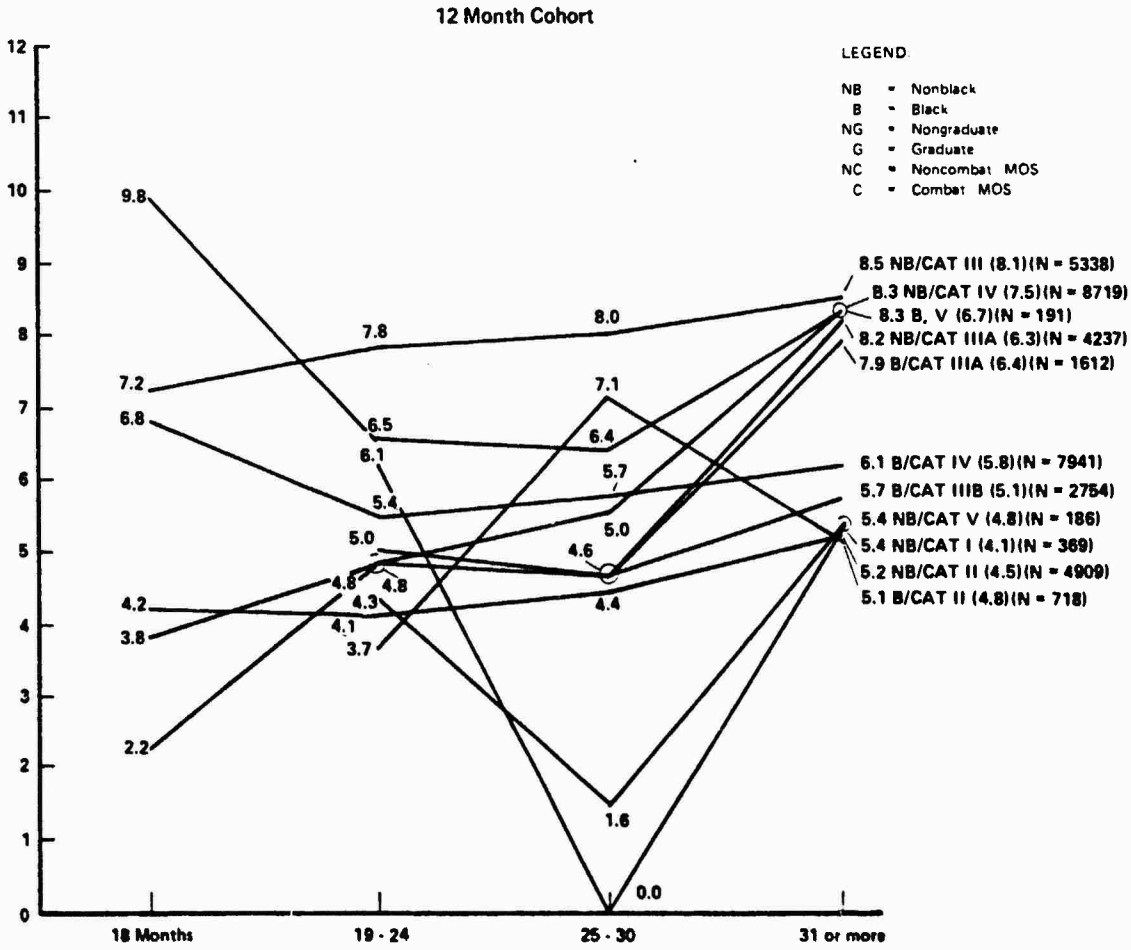
*Numbers in ( ) equal overall category negative loss rates.

Figure 8.3. Loss Type by Tour Length Controlling for Education and MOS Group (Part 2)



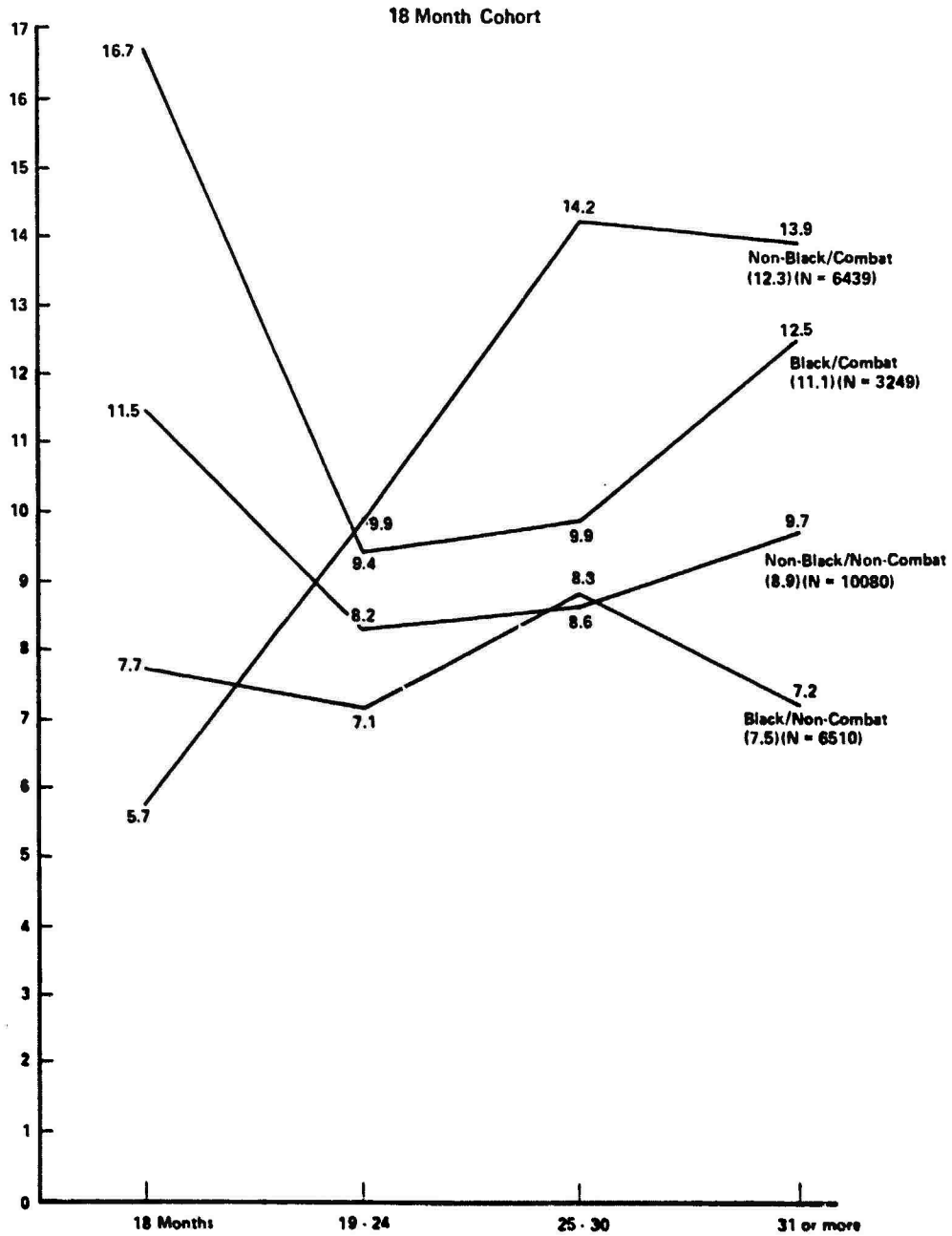
*Numbers in ( ) equal overall category negative loss rates.

Figure 8.4. Loss Type by Tour Length Controlling for Race and Aptitude Category (Part 1)



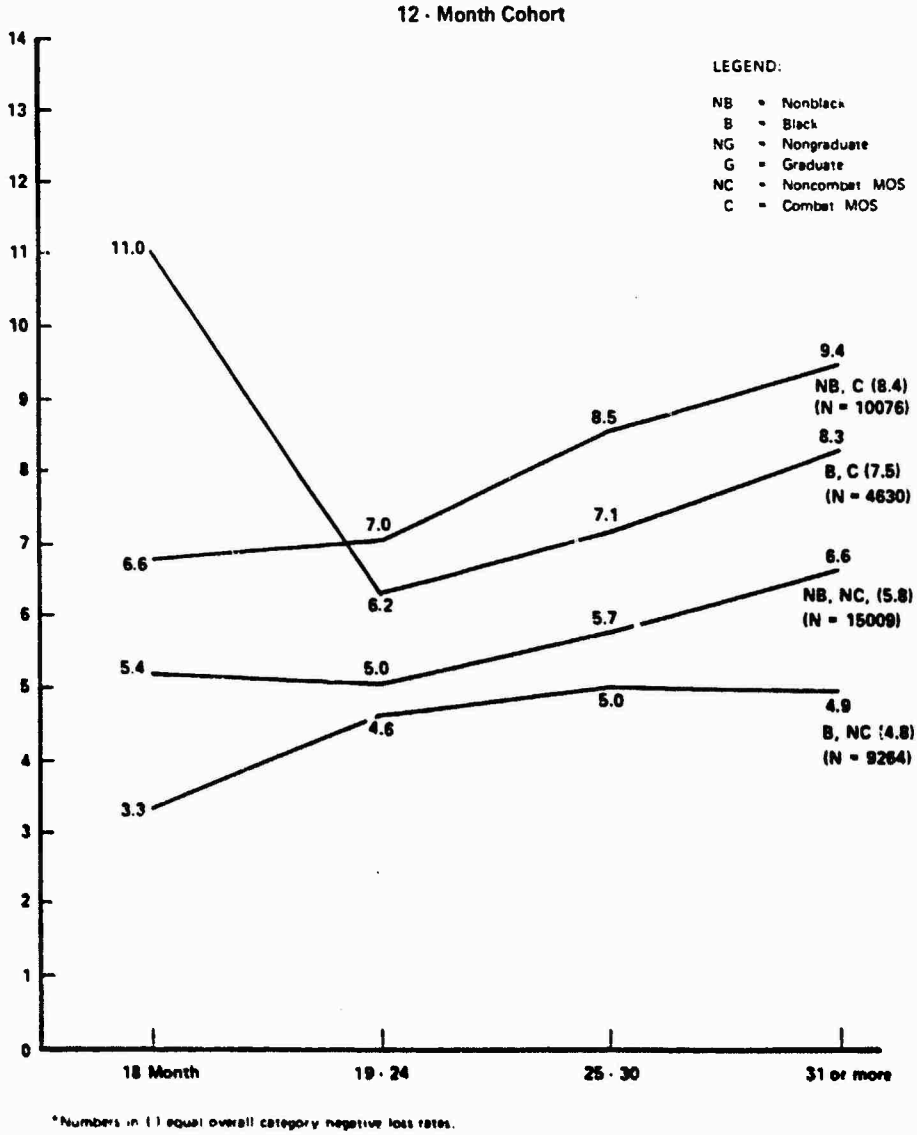
*Numbers in ( ) equal overall category negative loss rates.

Figure 8.4. Loss Type by Tour Length Controlling for Race and Aptitude Category (Part 2)



*Numbers in ( ) equal overall category negative loss rates.

Figure B.5. Loss Type by Tour Length Controlling for Race and MOS Group (Part 1)



*Numbers in ( ) equal overall category negative loss rates.

Figure 8.5. Loss Type by Tour Length Controlling for Race and MOS Category (Part 2)

Appendix C

Loss Type by Term of Service

Controlling for Two Variables

18 Months

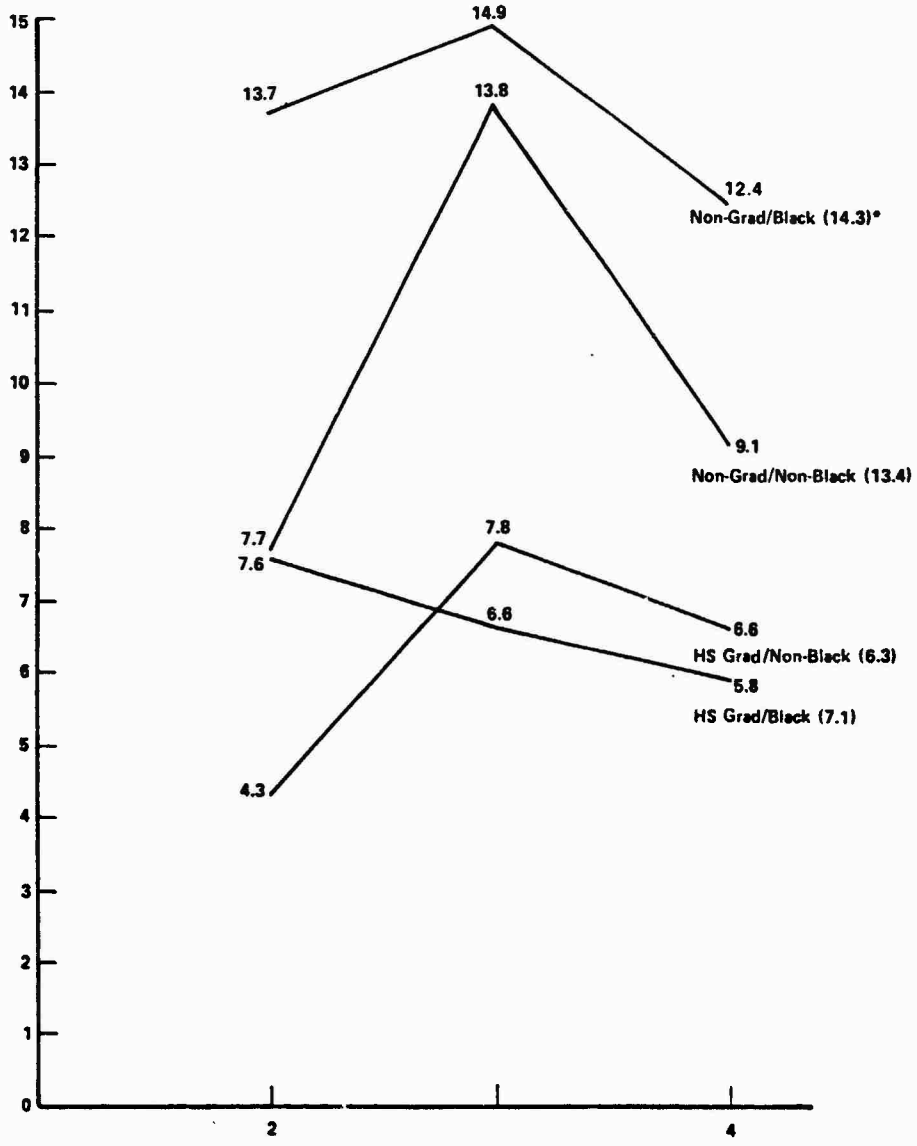


Figure C.1. Loss Type by Term of Service Controlling for Education and Race (Part 1)

12 Months

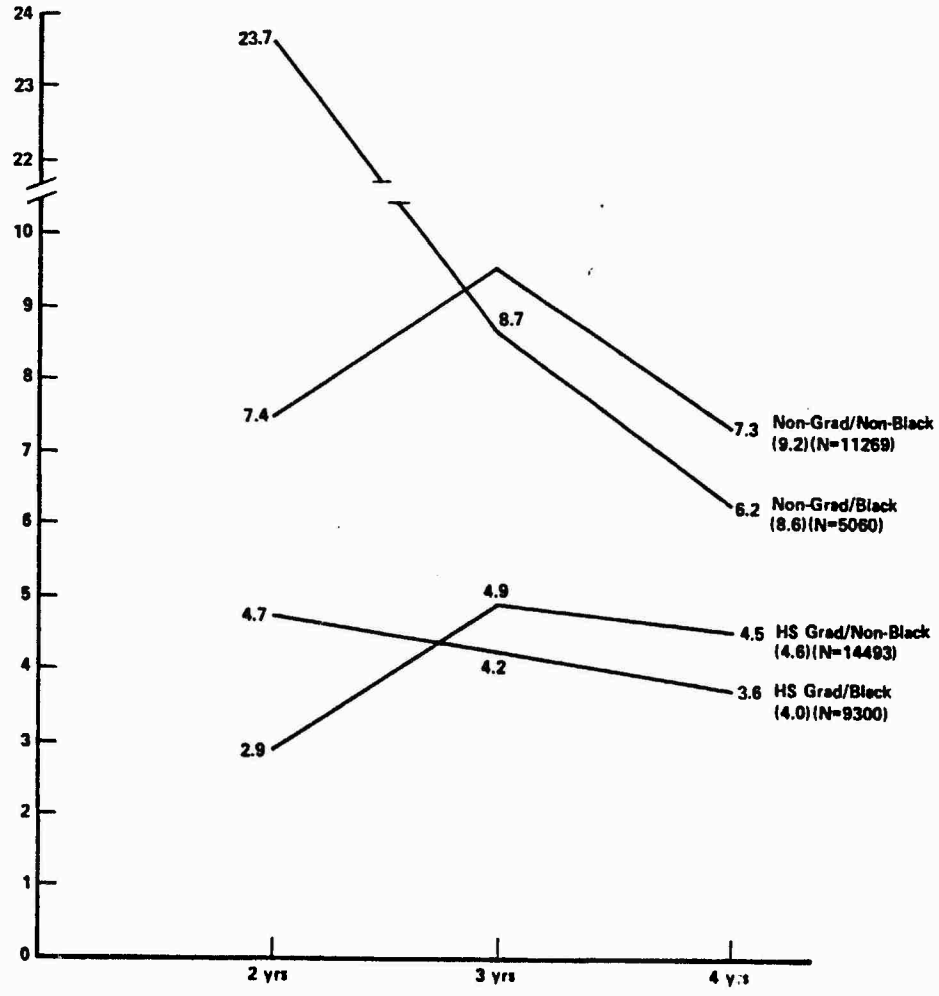


Figure C.1. Loss Type by Term of Service Controlling for Education and Race (Part 2)

18 Months

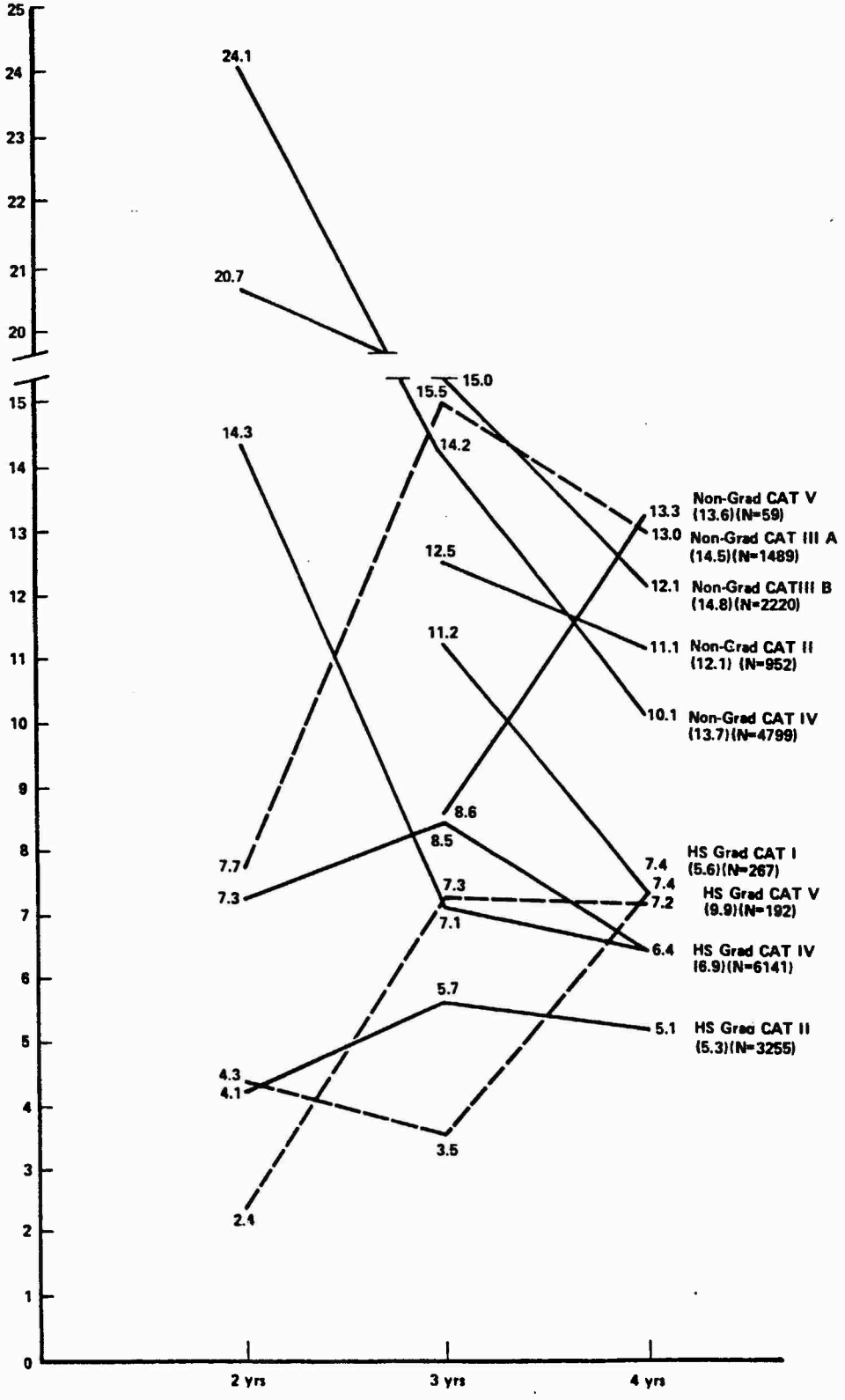


Figure C.2. Loss Type by Term of Service Controlling for Education and Aptitude (Part 1)

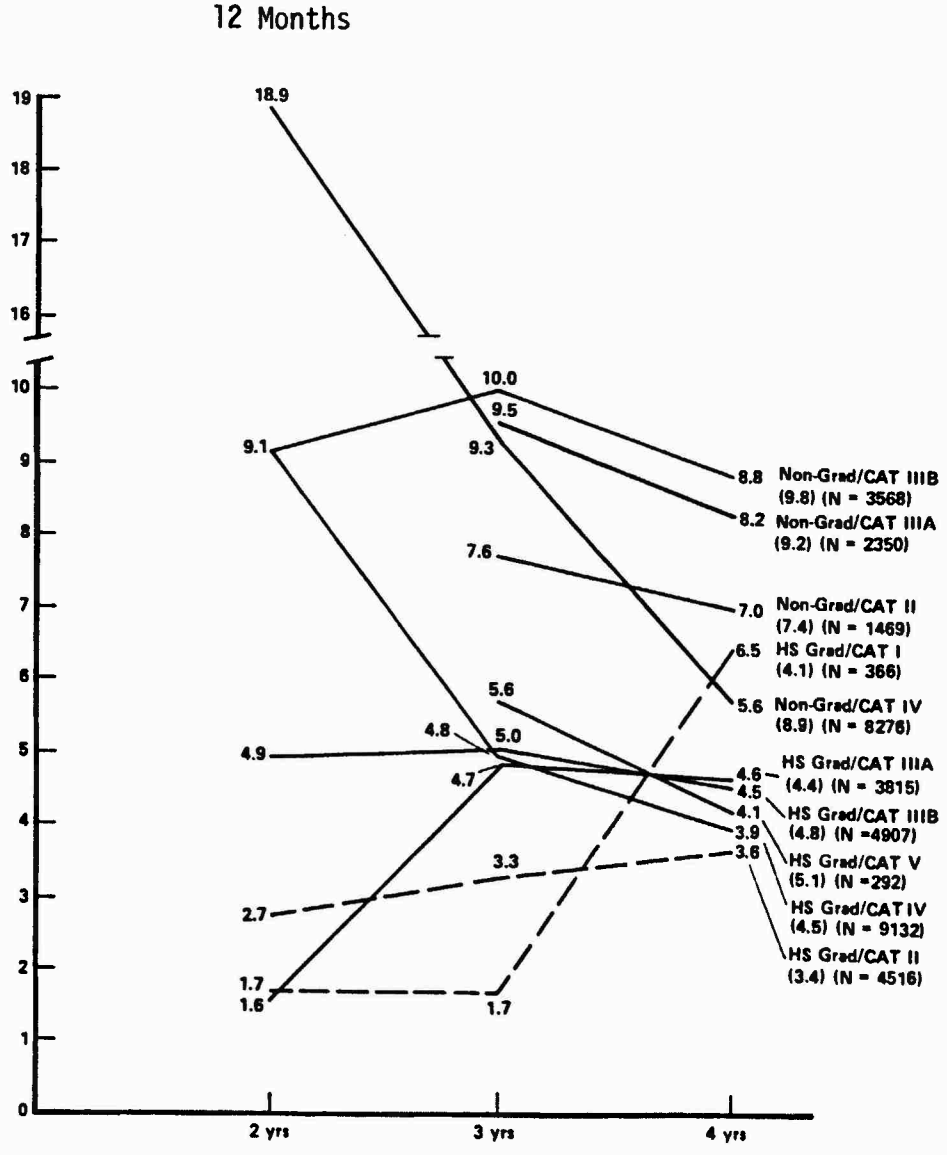


Figure C.2. Loss Type by Term of Service Controlling for Education and Aptitude (Part 2)

18 Months

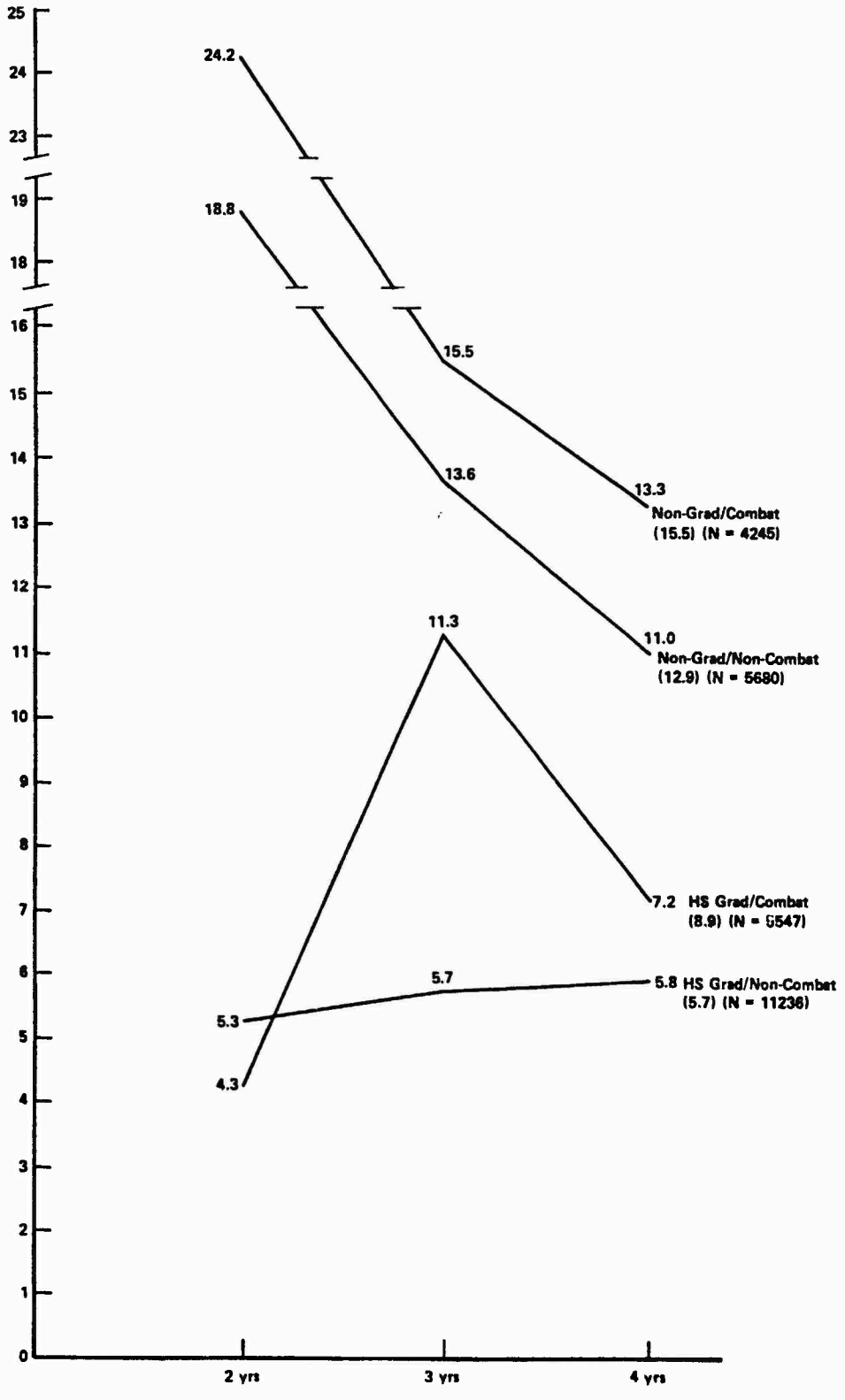


Figure C.3. Loss Type by Term of Service Controlling for Education and MOS (Part 1)

12 Months

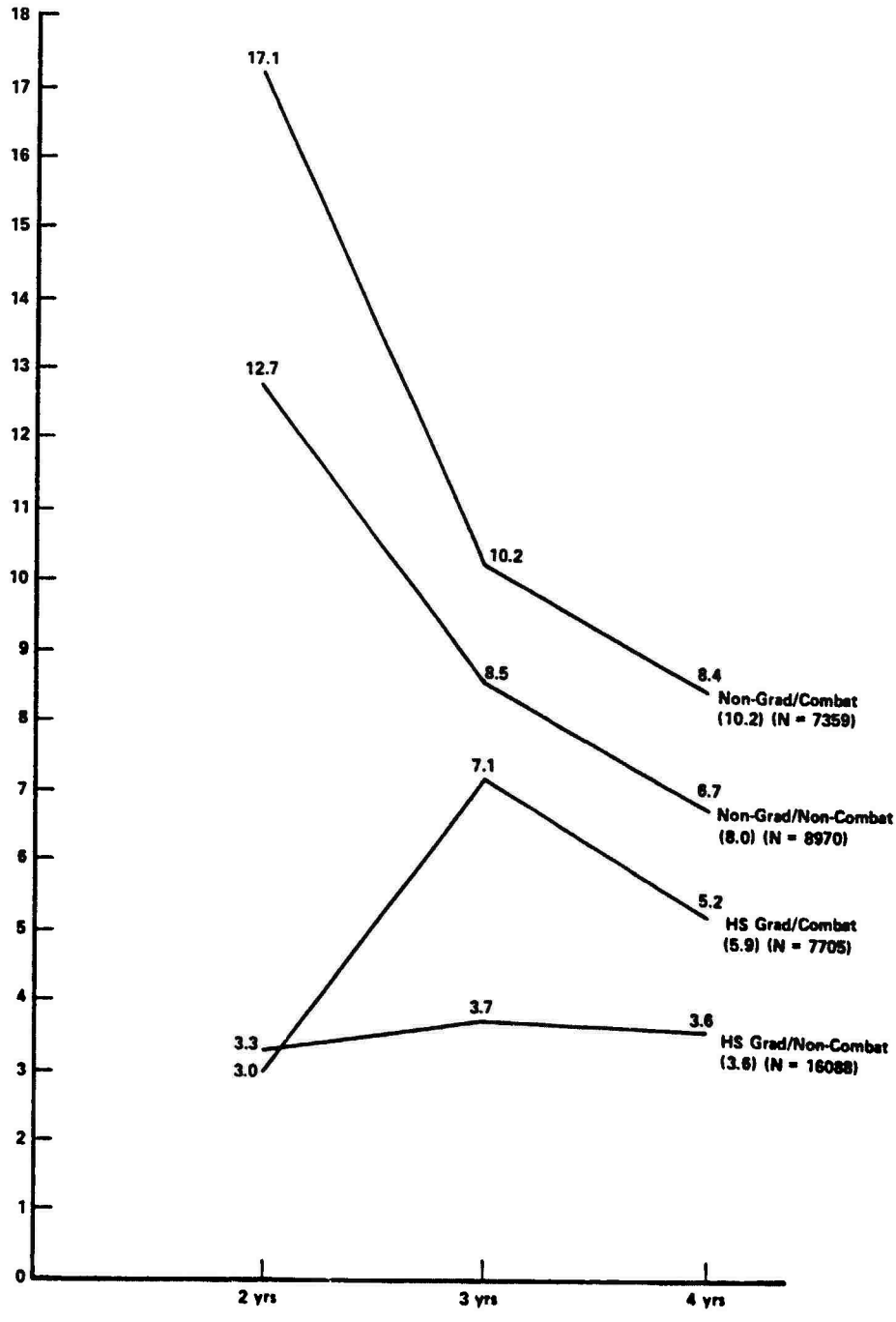


Figure C.3. Loss Type by Term of Service Controlling for Education and MOS (Part 2)

18 Months

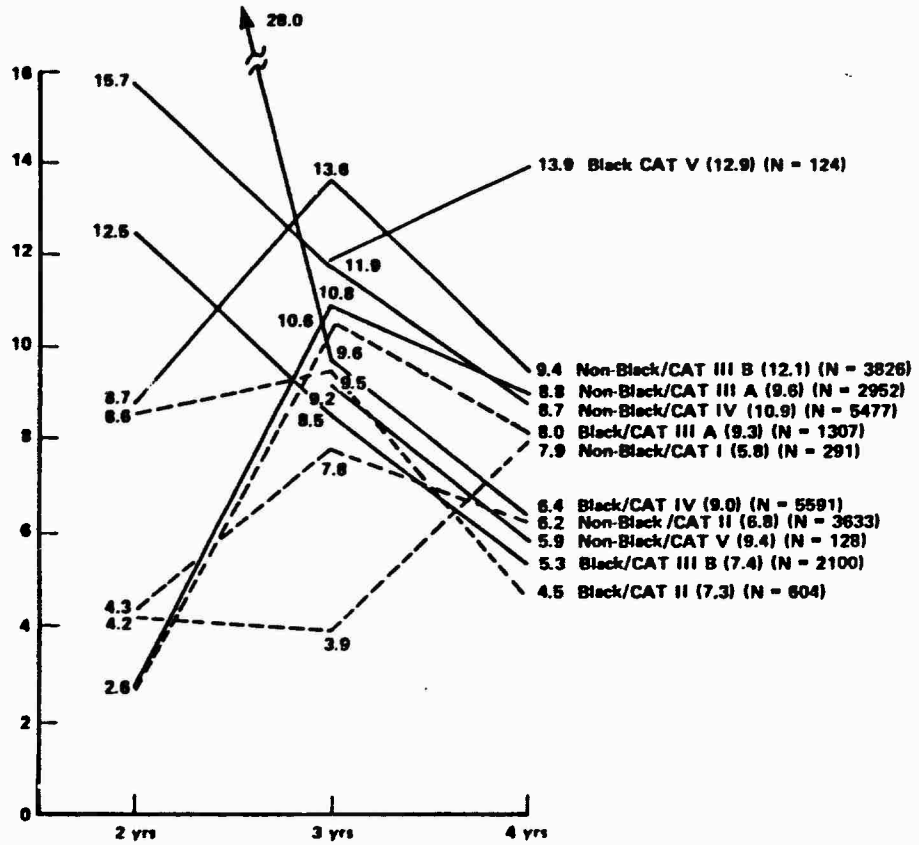


Figure C.4. Loss Type by Term of Service Controlling for Race and Aptitude Category (Part 1)

12 Months

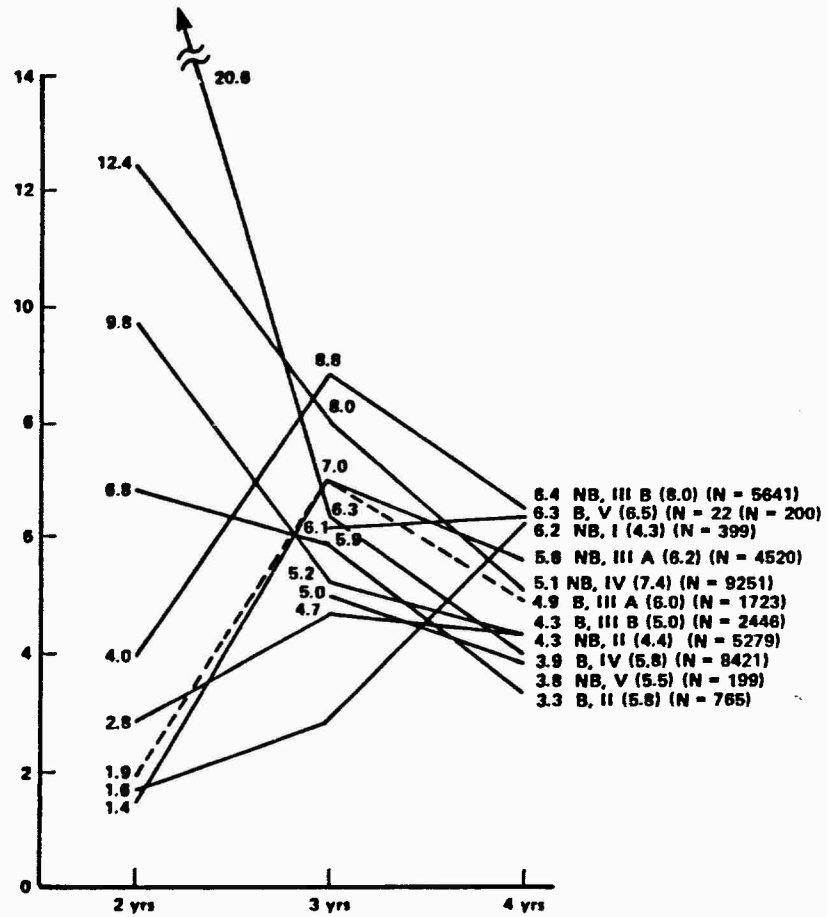


Figure C.4. Loss Type by Term of Service Controlling for Race and Aptitude Category (Part 2)

18 Months

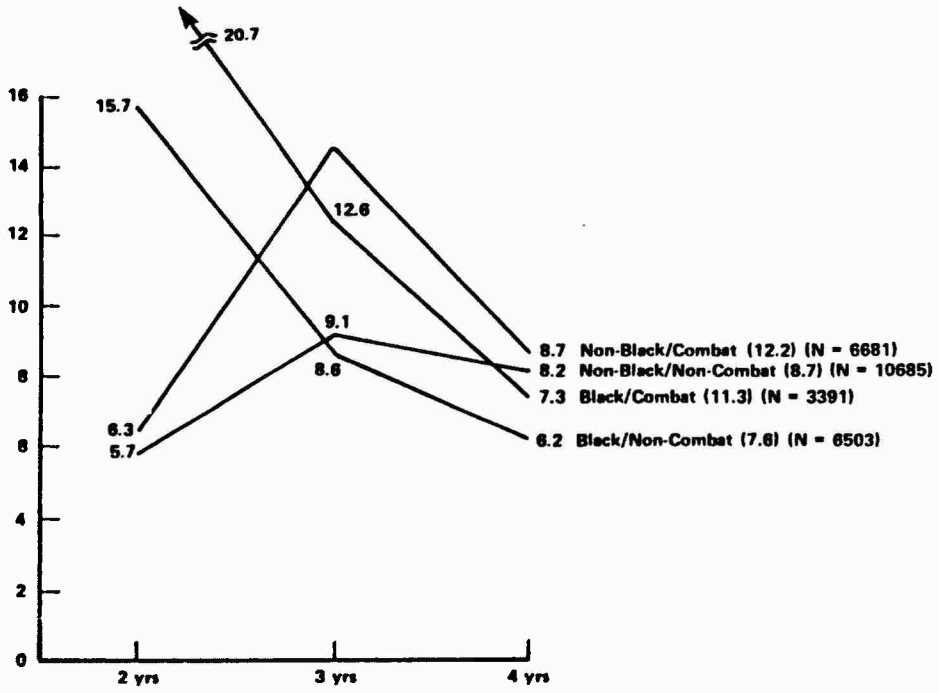


Figure C.5. Loss Type by Term of Service Controlling for Race and MOS Group (Part 1)

12 Months

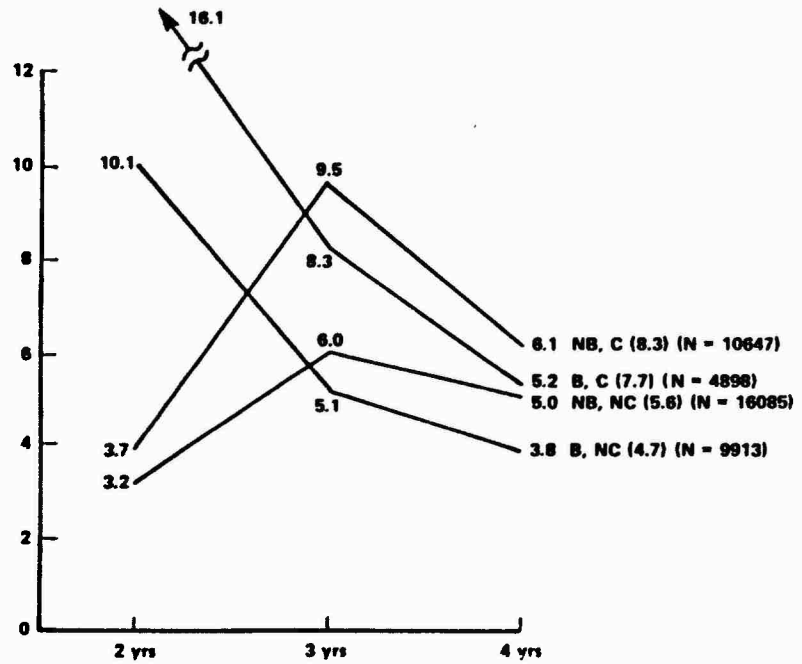


Figure C.5. Loss Type by Term of Service Controlling for Race and MOS Group (Part 2)

Appendix D

Correlation and Regression Results

Table D-1

Predictor—Criterion Correlations for Each Cohort

	12-Month Cohort		18-Month Cohort		24-Month Cohort	
	Negative Losses	Neutral Losses	Negative Losses	Neutral Losses	Negative Losses	Neutral Losses
TOUR LENGTH	.0307	-.0092	.0333	-.0080	.0809	-.0164
TERM OF SERVICE	-.0306	-.0026	-.0380	.0009	-.0392	.0013
AGE	-.0073	.0200	-.0128	.0289	-.0514	.0409
GENDER*	-.0383	.1692	-.0492	.2241	-.0738	.2156
RACE*	-.0190	.0075	-.0198	.0002	-.0209	-.0170
NUMBER OF DEPENDENTS	.0210	-.0002	.0123	.0021	-.0007	-.0078
ETHNICITY*	-.0153	-.0048	-.0261	-.0048	-.0221	-.0126
APTITUDE*	-.0281	.0199	-.0344	.0307	-.0501	.0476
MOS*	.0560	-.0430	.0592	-.0597	.0685	-.0472
RANK	-.0417	.0176	-.0505	.0194	-.0812	.0340
EDUCATION*	-.0890	.0463	-.1127	.0589	-.1421	.0670
MARITAL STATUS*	.0233	.0036	.0089	.0104	.0097	-.0007

*1=Combat, 0=Noncombat
1=Black, 0=Nonblack
1=Male, 2=Female
1=Low, 6=High (Cat. I)
1=Nongraduate, 2=High School Graduate
1=Married, 0=Not Married

Table D-2

Negative Attrition

Multiple Regression for 12-Month Cohort

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F
EDUCATION	0.08897	0.00792	0.00792	-0.08897	-0.1886998D-01	-0.07542	176.717
MOS	0.09925	0.00985	0.00193	0.05603	0.1959740D-01	0.03891	51.865
MARITAL STATUS	0.10261	0.01053	0.00068	0.02320	0.1737191D-01	0.01933	5.772
GRADE	0.10415	0.01085	0.00032	-0.04165	-0.7020978D-02	-0.01683	9.690
ETHNICITY	0.10537	0.01110	0.00025	-0.01530	-0.2301479D-01	-0.02137	16.326
TERM OF SERVICE	0.10623	0.01128	0.00018	-0.03058	-0.5106356D-02	-0.01083	3.826
AGE	0.10704	0.01146	0.00017	-0.00726	0.3220818D-02	0.01662	9.051
RACE	0.10800	0.01166	0.00021	-0.01905	-0.9568347D-02	-0.01883	11.451
APTITUDE	0.10877	0.01183	0.00017	-0.02810	-0.2690237D-02	-0.01286	5.153
TOUR LENGTH	0.10906	0.01189	0.00006	0.03074	0.1920543D-03	0.00899	2.541
NUMBER OF DEPENDENTS	0.10921	0.01193	0.00003	0.02098	0.6781983D-02	0.00877	1.191
GENDER	0.10931	0.01195	0.00002	-0.03826	-0.3677794D-02	-0.00499	.826
(CONSTANT)					0.7080147D-01		

Table D-3

Negative Attrition

Multiple Regression for 18-Month Cohort

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F
EDUCATION	0.11269	0.01270	0.01270	-0.11269	-0.3000755D-01	-0.09709	205.198
MOS	0.12209	0.01491	0.00221	0.05923	0.2393955D-01	0.03902	35.445
ETHNICITY	0.12459	0.01552	0.00062	-0.02611	-0.4266394D-01	-0.03261	25.566
GRADE	0.12641	0.01598	0.00046	-0.05047	-0.1109824D-01	-0.02192	11.236
RACE	0.12769	0.01630	0.00033	-0.01983	-0.1519202D-01	-0.02493	13.595
NUMBER OF DEPENDENTS	0.12894	0.01662	0.00032	0.01233	0.1194916D-01	0.01307	1.839
TERM OF SERVICE	0.13018	0.01695	0.00032	-0.03804	-0.9200581D-02	-0.01677	6.175
APTITUDE	0.13123	0.01722	0.00028	-0.03444	-0.4435171D-02	-0.01764	6.991
AGE	0.13202	0.01743	0.00021	-0.01278	0.3844883D-02	0.01590	5.694
GENDER	0.13224	0.01749	0.00006	-0.04924	-0.7627072D-02	-0.00856	1.616
TOUR LENGTH	0.13231	0.01751	0.00002	0.03331	0.1193617D-03	0.00461	.447
MARITAL STATUS	0.13232	0.01751	0.00000	0.00886	0.3026815D-02	0.00283	.086
(CONSTANT)					0.1527644		

Table D-4

Negative Attrition

Multiple Regression for 24-Month Cohort

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F
EDUCATION	0.14214	0.02020	0.02020	-0.14214	-0.3693556D-01	-0.11025	51.993
TOUR LENGTH	0.15230	0.02319	0.00299	0.08092	0.1235072D-02	0.04362	8.275
MOS	0.15932	0.02538	0.00219	0.06853	0.2353749D-01	0.03553	5.841
GRADE	0.16187	0.02620	0.00082	-0.08116	-0.1447297D-01	-0.02786	3.486
GENDER	0.16327	0.02666	0.00046	-0.07378	-0.1722984D-01	-0.01934	1.597
ETHNICITY	0.16414	0.02694	0.00028	-0.02210	-0.3142046D-01	-0.02240	2.439
RACE	0.16514	0.02727	0.00033	-0.02086	-0.1473246D-01	-0.02286	2.258
APTITUDE	0.16596	0.02754	0.00027	-0.05009	-0.4632923D-02	-0.01783	1.279
AGE	0.16631	0.02767	0.00012	-0.05136	-0.3445047D-02	-0.01325	.808
NUMBER OF DEPENDENTS	0.16662	0.02776	0.00010	-0.00073	0.1411031D-01	0.01520	.531
MARITAL STATUS	0.16683	0.02778	0.00002	-0.00975	-0.7617212D-02	-0.00696	.111
TERM OF SERVICE	0.16698	0.02779	0.00001	-0.03922	0.2003618D-02	0.00338	.053
(CONSTANT)					0.2670027		

Table D-5

Neutral Attrition

Multiple Regression for 12-Month Cohort

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F
GENDER	0.16921	0.02863	0.02863	0.16921	0.1090892	0.17002	963.253
TERM OF SERVICE	0.16945	0.02871	0.00008	-0.00256	-0.4772037D-02	-0.01162	4.422
APTITUDE	0.16959	0.02876	0.00005	0.01988	-0.1987727D-02	-0.01090	3.722
TOUR LENGTH	0.16970	0.02880	0.00004	-0.00921	-0.1260532D-03	-0.00677	1.452
RACE	0.16982	0.02884	0.00004	0.00751	-0.3493329D-02	-0.00789	2.047
ETHNICITY	0.16986	0.02885	0.00001	-0.00476	-0.3672206D-02	-0.00391	.552
EDUCATION	0.16989	0.02886	0.00001	0.04627	0.8939666D-03	0.00410	.542
MOS	0.16991	0.02887	0.00000	-0.04303	-0.1052336D-02	-0.00240	.198
GRADE	0.16992	0.02887	0.00000	0.01759	-0.6722620D-03	-0.00185	.118
NUMBER OF DEPENDENTS	0.16992	0.02887	0.00000	-0.00017	-0.3005710D-02	-0.00446	.312
MARITAL STATUS	0.16994	0.02888	0.00001	0.00356	0.3428748D-02	0.00438	.300
(CONSTANT)					-0.7309131D-01		

Table D-6

Neutral Attrition

Multiple Regression for 18-Month Cohort

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F
GENDER	0.22405	0.05020	0.05020	0.22405	0.8977302D-01	0.22673	1107.867
RACE	0.22442	0.05036	0.00017	0.00023	-0.5447073D-02	-0.02011	8.651
APTITUDE	0.22507	0.05066	0.00029	0.03071	-0.2294552D-02	-0.02054	8.600
MARITAL STATUS	0.22520	0.05072	0.00006	0.01042	0.8113779D-02	0.01708	3.062
NUMBER OF DEPENDENTS	0.22535	0.05078	0.00007	0.00214	-0.5306394D-02	-0.01306	1.795
TERM OF SERVICE	0.22546	0.05083	0.00005	0.00093	-0.2319676D-02	-0.00951	1.943
MOS	0.22552	0.05086	0.00003	-0.05965	-0.1473141D-02	-0.00540	.664
ETHNICITY	0.22556	0.05088	0.00002	-0.00476	-0.2884765D-02	-0.00496	.579
TOUR LENGTH	0.22560	0.05090	0.00002	-0.00803	-0.5153067D-04	-0.00448	.413
AGE	0.22563	0.05091	0.00001	0.02889	0.3495638D-03	0.00325	.233
EDUCATION	0.22565	0.05092	0.00001	0.05893	0.4717387D-03	0.00343	.251
GRADE	0.22566	0.05092	0.00001	0.01941	-0.6814541D-03	-0.00303	.210
(CONSTANT)					-0.7129797D-01		

Table D-7

Neutral Attrition

Multiple Regression for 24-Month Cohort

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F
GENDER	0.21564	0.04650	0.04650	0.21564	0.8632617D-01	0.22097	194.790
TERM OF SERVICE	0.21703	0.04710	0.00060	0.00130	-0.6874627D-02	-0.02642	3.007
RACE	0.21776	0.04742	0.00032	-0.01698	-0.8707778D-02	-0.03081	3.832
APTITUDE	0.21859	0.04778	0.00036	0.04760	-0.3081904D-02	-0.02705	2.750
AGE	0.21927	0.04808	0.00030	0.04085	0.2036638D-02	0.01786	1.372
ETHNICITY	0.21974	0.04828	0.00021	-0.01259	-0.9462322D-02	-0.01539	1.075
EDUCATION	0.22002	0.04841	0.00012	0.06702	0.1494087D-02	0.01017	.413
NUMBER OF DEPENDENTS	0.22021	0.04849	0.00009	-0.00779	-0.4962926D-02	-0.01219	.319
GRADE	0.22026	0.04852	0.00002	0.03398	0.1119818D-02	0.00492	.101
MOS	0.22031	0.04854	0.00002	-0.04723	0.1422729D-02	0.00490	.104
TOUR LENGTH	0.22035	0.04855	0.00002	-0.01642	-0.5441362D-04	-0.00438	.078
MARITAL STATUS	0.22035	0.04856	0.00000	-0.00073	0.1380019D-02	0.00288	.018
(CONSTANT)					-0.8661398D-01		

Table D-8

Attrition Pattern

Multiple Regression for 18-Month Cohort

SUMMARY TABLE

VARIABLE	MULTIPLE R	R SQUARE	RSQ CHANGE	SIMPLE R	B	BETA	F
MARITAL STATUS	0.08734	0.00763	0.00763	-0.08734	-1.256928	-0.07820	13.403
ETHNICITY	0.09771	0.00955	0.00192	-0.04974	-1.332330	-0.05364	6.641
RACE	0.10957	0.01200	0.00246	-0.04109	-0.5175861	-0.05340	6.060
GENDER	0.11671	0.01362	0.00162	-0.04010	-0.9020666	-0.04917	5.058
MOS	0.12692	0.01611	0.00249	-0.03317	-0.5434976	-0.05879	7.498
TOUR LENGTH	0.13001	0.01690	0.00079	0.03826	0.1103709D-01	0.02742	1.493
AGE	0.13241	0.01753	0.00063	-0.05633	-0.1014737	-0.02789	1.603
APTITUDE	0.13410	0.01798	0.00045	-0.00781	-0.1039411	-0.02468	1.270
EDUCATION	0.13466	0.01813	0.00015	-0.00949	0.6242336D-01	0.01327	.351
GRADE	0.13509	0.01825	0.00011	-0.00618	0.1038888	0.01080	.258
TERM OF SERVICE	0.13515	0.01827	0.00002	-0.00691	-0.4318419D-01	-0.00470	.045
(CONSTANT)					13.03447		