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Analyzing and Adjusting for Nonresponse to the AFRP Spouse Survey

Vincent G. Iannacchione and Jennifer G. Milne
Research Triangle Institute

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EDGAR M. JOHNSON
Technical Director

MICHAEL D. SHALER
COL, AR
Commanding

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Technical review by

Hyder A. Lakhani
Barbara Quigley

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This report presents a detailed analysis of the reasons for failure to respond to the AFRP Spouse Survey and describes the procedures used to minimize the biasing effects of nonresponse. The report summarizes the selection and implementation of the AFRP Soldier and Spouse Surveys, describes the opportunities for spouse nonparticipation, and presents the models developed to predict the probability of spouse participation. It also presents details of the nonresponse adjustments made to the spouse sampling weights.

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Vincent G. Iannacchione and Jennifer G. Milne
Research Triangle Institute

Personnel Utilization Technical Area
Paul A. Gade, Chief

Manpower and Personnel Research Laboratory
Zita M. Simutis, Director

U.S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

Office, Deputy Chief of Staff for Personnel
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FOREWORD

The Army Family Research Program (AFRP) is a 5-year integrated research program that was started in November 1986 in response to research mandates in the CSA White Paper, 1983: The Army Family and the subsequent annual Army Family Action Plans. The objectives of the research were to (1) determine the demographic characteristics of Army families, (2) identify ways to improve family adaptation to Army life, (3) increase the Army sense of community and partnership, (4) increase family support for retention, and (5) demonstrate which family factors affect individual and unit readiness.

The research is being conducted under a Letter of Agreement (LOA) between the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and the U.S. Army Community and Family Support Center (CFSC) entitled Sponsorship of ARI Army Family Research. This LOA, dated 18 December 1986, made CFSC the sponsor of the research. The work was done by the Personnel Utilization Technical Area of the Manpower and Personnel Laboratory of ARI with the assistance of the Research Triangle Institute, Caliber Associates, HumRRO, and Decision Sciences Consortium, Inc.

This report presents a detailed analysis of the reasons for nonparticipation in the AFRP Spouse Survey conducted in 1989. These results were shared with the project's Scientific Advisory Committee in May 1990 and became the basis for adjusting the sampling weights of participating spouses to generate estimates of spouse characteristics and opinions in all subsequent AFRP spouse reports.

EDGAR M. JOHNSON
Technical Director

ANALYZING AND ADJUSTING FOR NONRESPONSE TO THE AFRP SPOUSE SURVEY

EXECUTIVE SUMMARY

Requirement:

The Army Family Research Program (AFRP) is an Army-wide sample survey of active-duty soldiers and their spouses. Soldier data were collected in group administrations of the Soldier Survey (with routing of questionnaires to the units of individuals not available for the group administrations). At the end of the questionnaire, married soldiers were asked to provide their spouses' addresses so that a Spouse Questionnaire could be mailed to them. Spouses who did not respond to the initial mailing received up to three follow-up mailings.

Despite the follow-up mailings, slightly more than half of the eligible spouses who were mailed a questionnaire responded. If eligible spouses who were not mailed a questionnaire are included, the participation rate falls to about one in three eligible spouses. (A Spouse Questionnaire was mailed only when a participating soldier provided his or her spouse's mailing address.) Although not uncommon for mail surveys of military spouses, the potential for nonresponse bias is very great at this level of participation.

Unlike sampling error, nonresponse bias is not necessarily reduced by a large sample size. (Over 3,200 spouses participated in the Spouse Survey.) Instead, the magnitude and direction of the nonresponse bias that affects a survey estimate depend both on the difference between the responding and nonresponding populations and on the size of the latter. As a result, even small differences between respondents and nonrespondents can generate large biases if the nonresponding population is itself large.

The purpose of this research is to analyze the reasons for spouse nonparticipation and to incorporate the findings into an adjustment procedure that will minimize the biasing effects of nonresponse.

Procedure:

Because spouse participation depends on the soldier's providing a mailing address, the analysis of spouse nonparticipation was dichotomized into (a) an analysis of the soldier's propensity to provide a mailing address and (b) an analysis of the spouse's propensity to complete and return a questionnaire once an address

was obtained. Logistic response probability models were used to determine the factors most related to each propensity.

The underlying assumption of the response probability models was that the probability of a spouse's participation could be predicted by knowing the demographics, attitudes, and data collection environment of each participating soldier. To test this assumption, a set of potential predictor variables was constructed from the Army personnel files, the Soldier Questionnaire, and the survey's control system. Because the significance of most of the predictors was expected to vary by rank, all predictor variables were interacted with a six-level categorical variable that identified three enlisted groups (Enlisted, NCO, and Senior NCO) and three officer groups (Warrant, Company Grade, and Field Grade).

Findings:

The final response models were obtained by a stepwise elimination of predictors that did not contribute significantly to the predicted response probability. The predictors most related to soldier and spouse participation propensity are listed below.

A soldier's propensity to provide a spouse mailing address was affected by

- **Respondent fatigue.** The closer the soldier got to the end of the Soldier Questionnaire, the more likely he or she was to comply with the request for a mailing address, which was on the last page of the questionnaire.
- **Location.** Enlisted personnel and junior NCOs stationed in Europe and/or living away from their spouses were less likely to provide an address.
- **Army-civilian job comparison.** Young enlisted soldiers and young officers were less likely to provide an address if they believed they could have better jobs in civilian life than in the military.
- **Family factors.** Except for senior NCOs, soldiers were less likely to provide an address if they indicated that their family had frequent disagreements and/or difficulty adjusting to Army life.

A spouse's propensity to respond was affected by

- **Gender.** Male spouses of enlisted personnel and warrant officers were less likely to respond than female spouses.

- **Race.** Except for the spouses of Black warrant officers, spouses of Black soldiers were less likely to respond than spouses of non-Black soldiers.

- **Location.** Spouses of senior NCOs and field grade officers were less likely to respond if they lived apart from their spouses.

- **Family factors.** Spouses of young officers and enlisted personnel who indicated that their families had difficulty adjusting to Army life or that there was a risk of marital separation were less likely to respond than other spouses.

Utilization of Findings:

The predicted response probabilities obtained from the models were used to adjust the spouse sampling weights for the potentially biasing effects of differential nonresponse. The adjusted spouse sampling weight is stored on the spouse analytic data file and should be used to estimate spouse and couple population parameters.

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Introduction

The Army Family Research Program (AFRP) is designed to examine the role of family factors in retention, readiness, and sense of community among Army personnel. The results of this research will help Army leaders develop future policies and programs for soldiers and their families. These programs include support services, leadership training, and relocation help.

The Core Research Effort of the AFRP collected data from a large, cross-sectional probability sample of active-duty soldiers and their spouses. The Soldier Survey asked soldiers about their work, their community, and the preparedness of their unit to perform its mission. In addition, soldiers were asked about their family characteristics and their perceptions of Army and civilian life alternatives.

Each married soldier was asked to provide his or her spouse's mailing address for use in a mail survey. The Spouse Survey, which was mailed to spouses of participating soldiers, asked spouses about their opinions of Army life, their opportunities for work, and their relocations. Spouses were also asked about their finances, their family and friends, and the chances of their spouses staying in the Army.

This report presents a detailed analysis of the reasons for spouse nonparticipation and describes the procedures used to minimize the biasing effects of nonresponse. The report summarizes the selection and implementation of the Soldier and Spouse Surveys, describes the opportunities for spouse nonparticipation, and presents the models developed to predict the probability of spouse participation, along with details of the nonresponse adjustments made to the spouse sampling weights.

Survey Methodology

Sample Design and Weighting

The AFRP sample design used a sampling technique known as multistage, cluster sampling to achieve desired cost savings without negating the inferential capability of the sample. Details of this commonly used statistical procedure are available in standard texts on survey sampling (e.g., Kish, 1965). The sample design specified three stages of AFRP sample selection: geographic areas, units located within selected geographic areas, and soldiers (and their spouses) assigned to selected units. Stratification was used at each stage to control the distribution of the samples with respect to organizational and demographic characteristics. These included region of the world at the first stage, unit function at the second stage, and demographic categories defined by paygrade, sex, and marital status at the third stage. The sample design and sample selection activities are described in detail in the AFRP Report on Survey Implementation (RTI, 1990).

Sampling weights were computed to reflect the three-stage, hierarchical sample design used to select the AFRP sample. Initial sampling weights were assigned to each sampling unit as the inverse of its selection probability. Adjustment factors were applied to the sampling weights of participating soldiers and spouses to compensate for survey ineligibility and nonresponse. Details of the development of sampling weights for soldiers are presented in Sampling Weights for the AFRP Core Research Effort (Iannacchione & Milne, 1991). Details of the adjustments made to the spouse weights to compensate for nonresponse are described later in this report.

Data Collection Methodology

Soldier Survey. The Soldier Survey was designed to be administered in group sessions at Army installations by survey teams working with designated Army liaison officers. Whenever possible, all sampled soldiers from a unit were scheduled for the same time slot. However, some soldiers and, in some cases whole units, were unable to attend their scheduled group session because of special assignment, field training exercises, or because of the nature of their mission (e.g., military police or health services personnel). The questionnaire packets for units or individual soldiers who were unable to attend the group administration sessions were routed to the appropriate unit liaison officer who was briefed on the distribution, administration, and confidentiality procedures for the questionnaires.

Soldiers were informed that their participation was voluntary and that the data they provided would be kept confidential and used for research purposes only. The Soldier Questionnaire took an average of 2 hours to complete. (Married soldiers were asked to provide at least 400 distinct responses.) Spouse addresses were requested of married soldiers on the last page of the Soldier Questionnaire. However, the completion of the address form could not be verified on site because the confidentiality procedures developed for the survey required that the soldier instrument be sealed by the soldier before being returned.

Spouse Survey. Unlike the soldiers, spouses could not be tasked to attend survey administrative sessions. Instead, a self-administered, mail-out/mail-back questionnaire was developed for spouses of sample soldiers. In addition, a Korean version of the Spouse Questionnaire was developed to encourage the participation of Korean-speaking spouses of soldiers stationed in Korea. An introductory letter from the commanding general of the U.S. Army Community and Family Support Center accompanied each questionnaire. A postage-paid return envelope was also included in the packet.

Each participating soldier was asked to provide his or her spouse's mailing address. If the married soldier did not provide an address, no attempt was made to obtain it from another source (e.g., the soldier's unit). Spouse addresses were obtained only from soldiers, in keeping with the voluntary participation and informed consent policy conveyed to participating soldiers.

Originally, plans were made to use postcard reminders and an intensive telephone follow-up to increase the response rate for the spouse survey. However, budget constraints precluded both activities. Instead, three additional mailings of the letters and the questionnaire were made to nonrespondents. Questionnaires that were returned by the Postal Service as undeliverable were remailed if a forwarding address was provided. The participation rates among married soldiers and their spouses are summarized in Table 1.

Opportunities for Spouse Nonresponse

The requirement that a spouse address be obtained directly from the soldier made soldier participation a prerequisite for spouse participation. That is, if the soldier was selected for the Soldier Survey but either did not participate or did not provide his or her spouse's address, the spouse was not sent a questionnaire and was considered nonresponding. As a result, two of the three opportunities for spouse nonresponse described below deal with soldier nonparticipation.

1. **A married soldier was selected for, but did not participate in the Soldier Survey.** Less than one of every four eligible soldiers selected for the Soldier Survey did not provide a completed Soldier Questionnaire. This response rate was slightly less than the expected 80 percent rate in other military surveys with on-site data collection (e.g., Bray, 1988). The primary reason for nonparticipation was lack of availability caused by priority duty, temporary duty (TDY), leave, or minor illness. Although refusals were low among those who were available, respondent fatigue, induced by the length of the Soldier Questionnaire, resulted in a noticeable number (305) of largely incomplete questionnaires.

2. **The married soldier participated in the Soldier Survey but did not provide his/her spouse's address.** Among the married soldiers who participated in the Soldier Survey, about 20 percent did not provide their spouses' addresses. This source of nonresponse was both unexpected and a cause for concern because it was unclear why a soldier would complete all, or at least most, of the Soldier Questionnaire and then not provide his or her spouse's address. If, for example, the soldier did not want the spouse to

Table 1

Participation of Married Soldiers and Their Spouses

Participation status	Count	Percent	
		Within groups	Across groups
Soldier survey			
Did not provide a completed Soldier Questionnaire			
Reason:			
Not available[a]	823	33.7	
Refused	44	1.8	
Questionnaire incomplete	305	12.5	
Unknown	1,272	52.0	
	2,444	100.0	23.9
Provided a Soldier Questionnaire			
Without spouse address	1,669	21.4	
With spouse address	6,123	78.6	
	7,792	100.0	76.1
Total married soldiers	10,236		100.0
Spouse survey			
Did not provide a completed Spouse Questionnaire			
Reason:			
Refused	10	0.4	
Questionnaire returned incomplete	5	0.2	
Undeliverable	431	15.1	
Soldier no longer in Army	10	0.4	
Not returned (forwarding address)	112	3.9	
Not returned (original address)	2,278	81.1	
	2,846	100.0	46.5
Provided a completed Spouse Questionnaire after:			
One mailing	1,593	48.6	
Two mailings	819	25.0	
Three mailings	575	17.5	
Four mailings	290	8.9	
	3,277	100.0	53.5
Total spouses	6,123		100.0

[a]Soldiers who were on temporary duty, priority duty, leave, or were sick during data collection.

communicate family problems to the Army, then the prospect of bias in the analysis of spouse responses would be a real possibility. On the other hand, if the soldier simply developed respondent fatigue before reaching the address form at the back of the questionnaire then the potential for bias would be reduced.

3. **An address was provided and a Spouse Questionnaire was mailed, but the spouse either did not receive it or did not complete and return it.** After four mailings, slightly more than half of the spouses for whom an address was obtained returned a completed spouse questionnaire. This response rate is comparable with other mail surveys of military spouses (Griffith, Stewart, & Cato, 1988). Because nothing was received from 81 percent of the nonrespondents after four mailings, soldier responses and demographic data from the Army personnel files must be relied on for insight into the reasons for their nonparticipation. Most of the remaining nonresponse was caused by a change in address that is probably attributable to the 6- to 8-week lag between the time the soldier provided the address and the time the questionnaires were first mailed. During this time, the spouse addresses were edited, batched, keyed, and entered into a control system.

Each of these opportunities for nonresponse is a potential source of bias that requires some compensatory activity. For nonparticipation in the Soldier Survey, the sampling weights of participating soldiers were ratio-adjusted to preserve weight sums in classes defined by paygrade, marital status, gender, and region of the world. Details of the sampling weights developed for the Soldier Survey are described in Sampling Weights for the AFRP Core Research Effort (Iannacchione & Milne, 1991).

Because all spouses of eligible soldiers were included in the sample, the final adjusted sampling weights assigned to participating soldiers are the inital sampling weights assigned to spouses. To compensate for spouse nonparticipation, logistic regression models were used to derive response probability adjustment factors for the sampling weights of participating spouses. The remainder of this report motivates the use of such models and describes their development and implementation.

Logistic Response Probability Models

Background

Logistic regression analysis (Koch & Edwards, 1985) consists of fitting a linear logistic model to an observed proportion or rate to measure the relationship between the outcome variable and one or more predictor variables. Logistic regression provides more accurate probability estimates than linear discriminant analysis when the assumptions of the latter (i.e., multivariate normality of predictor variables with common covariance matrix) are violated (Press & Wilson, 1975). In addition, the logistic model does not require a linear relationship between the outcome variable and the predictor variables, and the predicted probabilities will necessarily range between zero and one.

Procedures have been developed at the Research Triangle Institute (RTI) (Shah, 1989) for the specific problem of fitting logistic regression models to survey data so that the model parameter estimates and their variance-covariance matrix take the survey design into account. LaVange, Iannachione, and Garfinkel (1986) present an application of these methods to predict high-cost users of medical care based on data from the National Medical Care Utilization and Expenditure Survey.

Folsom (1990) has modified the design-weighted logistic regression algorithm to derive response probability adjustment factors for the sampling weights of survey respondents. This weight adjustment procedure constrains the logistic coefficients so that, like the post-stratification ratio adjustment, the adjusted weight sums of respondents for specified reporting domains (post-strata) equal corresponding totals across respondents and nonrespondents. Unlike post-stratification, however, the logistic adjustment algorithm extends this property to achieve equalization of respondent and nonrespondent weighted means for continuous response predictors.

For the AFRP Spouse Survey, the response probability weight adjustment procedure is particularly useful because spouse response is conditional on soldier response. As a result, answers to questions from the Soldier Questionnaire may be used as predictors of spouse response. For example, one of the significant predictor variables in the spouse response model is a zero-one indicator created from the soldier's response to the question: "Is your spouse now living with you at the same location?" Spouses of soldiers answering no (zero) to this question were less likely to provide a Spouse Questionnaire than the spouses of soldiers who answered yes (one). As a result, a disproportionately small number of Spouse Questionnaires were obtained from spouses living away from the soldier. The effect of the weight adjustment procedure is to alleviate this disproportionality by applying a larger adjustment factor to the sampling weights of spouses living at another location who did participate.

Model Specification

An eligible spouse was not mailed a questionnaire unless the soldier provided a mailing address. This precondition for spouse response motivated the development of two response probability models: The first model was used to predict the probability of obtaining an address from the soldier; the

second model was used to predict the probability of spouse response conditional on obtaining a mailing address. Taken together, these models identify the set of known factors most related to spouse participation.

To specify these models notationally, let

$S \equiv$ the sample of 7,792 married soldiers who participated in the Soldier Survey,

and assign the following zero-one indicators to each soldier i in S:

$$A_i \equiv \begin{cases} 1 & \text{if soldier i provided a spouse address,} \\ 0 & \text{otherwise,} \end{cases}$$

and

$$R_i \equiv \begin{cases} 1 & \text{if the spouse of soldier i responded,} \\ 0 & \text{otherwise.} \end{cases}$$

The probability of a spouse response (i.e., $R_i=1$) may be written as

$$P[R_i=1] = P[A_i=1] \cdot P[R_i=1 \mid A_i=1]$$
$$= \alpha_i \cdot \rho_i .$$

Two logistic regression models were serially developed to estimate each of these response probabilities. The specification of the models is described in the next two sections.

Spouse Address Model. For soldier i in S, the following logistic model assumed for the probability that he or she provides a spouse address:

$$\alpha_i = Pr[A_i=1 \mid \underset{\sim}{X}_i, \underset{\sim}{\beta}] = [1 + \exp(-\underset{\sim}{X}_i\underset{\sim}{\beta})]^{-1} \qquad (1)$$

where

$\underset{\sim}{X}_i \equiv (1, X_{1i}, \ldots, X_{pi})$, a p+1 element vector with a 1 as the first element followed by p predictor variables; and

$\underset{\sim}{\beta} \equiv$ a vector of logistic regression coefficients (for notational convenience the intercept term is included in the vector).

The logistic regression coefficients $\hat{\underset{\sim}{\beta}}$ are estimated iteratively by solving the following estimation equations:

$$\sum_{i \in S} (W_{Si} \cdot \hat{\alpha}_i) \underset{\sim}{X}_i^T A_i = \sum_{i \in S} (W_{Si} \cdot \hat{\alpha}_i) \underset{\sim}{X}_i^T \hat{\alpha}_i , \qquad (2)$$

where

W_{Si} = the adjusted sampling weight assigned to participants of the Soldier Survey, and

$$\hat{\alpha}_i = [1 + \exp(-\underset{\sim}{X}_i\hat{\underset{\sim}{\beta}})]^{-1} .$$

Spouse Response Model. For the spouse of soldier i, the following logistic model is assumed for the probability of spouse participation given that an address is obtained:

$$\rho_i = P[R_i=1 \mid A_i=1, \underset{\sim}{Z}_i, \underset{\sim}{\theta}] = [1 + \exp(-\underset{\sim}{Z}_i\underset{\sim}{\theta})]^{-1} , \qquad (3)$$

where

$\underset{\sim}{Z}_i \equiv (1, Z_{1i}, \ldots, Z_{qi})$, a q+1 element vector with a 1 as the first element followed by q predictor variables, and

$\underset{\sim}{\theta}$ ≡ the vector of logistic regression coefficients (for notational convenience the intercept term is included in the vector).

Analogous to the spouse address model, the logistic regression coefficients $\hat{\underset{\sim}{\theta}}$ are estimated iteratively by solving the following estimation equations:

$$\sum_{i\epsilon S} W_{Si}A_i \div (\hat{\alpha}_i\hat{\rho}_i)\underset{\sim}{Z}^T\hat{\rho}_i = \sum_{i\epsilon S} W_{Si}A_i \div (\hat{\alpha}_i\hat{\rho}_i)\underset{\sim}{Z}_i^T R_i \quad . \qquad (4)$$

where

$$\hat{\rho}_i = [1 + \exp(-\underset{\sim}{Z}_i\hat{\underset{\sim}{\theta}})]^{-1} .$$

Section 4 describes the components of $\underset{\sim}{Z}_i$, the vector of predictors for the spouse response model, and $\underset{\sim}{X}_i$, the vector of predictors for the spouse address model.

Predicting Response

Predictor Variables

To be useful in predicting response, predictor variables must be known for both respondents and nonrespondents. Because soldier participation was a precondition for spouse participation, answers to the Soldier Questionnaire, except for item nonresponse, satisfied this requirement and provided an excellent source of data about the factors that could influence a soldier's propensity to provide his or her spouse's address and a spouse's propensity to participate. In addition, demographic variables from the Army personnel files were available to examine response patterns by region of the world, major command structure, and type of unit. Finally, the survey's control system and analysis files were available to assess the effects of respondent fatigue and mode of administration on the probability of obtaining a spouse address from the soldier.

The underlying assumption of the spouse participation model was that a significant amount of the variation in spouse response could be explained by three kinds of predictor variables:

1. Demographic variables, e.g., the soldier's paygrade, gender, race, location, and type of unit;

2. Attitudinal variables, e.g., the soldier's career intentions, separation coping, and his or her family's adjustment to Army life; and

3. Variables describing the data collection environment, i.e., group versus individual administration, respondent fatigue, and the time between soldier interview and the first mailing of the Spouse Questionnaire.

Table 2 provides a complete list of the predictor variables considered for the soldier and spouse response models. The response rates by these variables are presented in Appendix A.

Some of the predictor variables derived from the Soldier Questionnaire were relatively straightforward and could be used as zero-one indicators (e.g., Does your spouse work?). However, most of the information required multiple indicators to ensure maximum sensitivity of measurement (e.g., family adjustment to Army life or Army-civilian job comparisons). When two or more questionnaire items were designated as components of a scale, the relationship among the items was analyzed using factor analysis procedures. Questionnaires responses that were correlated with the same factor were added together to form a scaled variable. Those scales expected to be related to response were used extensively as predictor variables in both the spouse address and spouse response models. Details of the scaling procedures are presented in Appendix D of the AFRP Analysis Plan (RTI, 1990).

Table 2

Predictor Variables Considered for Soldier and Spouse Response Models

Demographic Predictors	
Soldier's paygrade	Is soldier Hispanic?
Soldier's education	Live on-post?
Soldier's gender	Does spouse have paid job?
Region of the world	Is spouse on active duty?
Type of unit	Will soldier retire soon?
Major command	Is soldier Black?
Number of dependent children	Number of years married
Attitudinal Predictors	
Satisfaction with Army	Probability of staying in Army
Happiness of marriage	Spouse involvement
How decided to stay in Army	Army values agreement
Army-civilian job comparison	Work satisfaction
Spouse support of soldier	Frequency of family disagreements
Family adjustment to Army	Locus of control
Husband should be head of family	Marital separation risk
Data Collection Environment	
Administration of soldier survey (group or individual)	
Completeness of last section of Soldier Questionnaire	
Time between when the soldier provided spouse address and first mailing of Spouse Questionnaire	

Model Development

Separate logistic response probability models were developed to predict the probability of a soldier providing spouse address and to predict the probability of spouse response given an addresss. Because of the importance of paygrade in virtually all planned analyses, hierarchical logistic response probability models were developed by intersecting all potential predictor variables with the following paygrade groups:

E2 to E4: Enlisted Personnel,
E5 and E6: Junior NCOs,
E7 to E9: Senior NCOs,
W1 to W4: Warrant Officers,
O1 to O3: Company Grade Officers, and
O4 to O6: Field Grade Officers.

Soldiers in paygrades E1 (recruits) and O7 through O10 (general officers) and their spouses were not eligible for the survey.

Each response model was parsed by eliminating any predictor variables that were not significant at the 0.05 level for at least one paygrade group. The intercept was retained so that the sum of the respondents' adjusted weights would equal the unadjusted weight sum across respondents and nonrespondents.

Item nonresponse among the predictor variables in the final models caused about 17 percent of the observations to be deleted from the models. (Most of these observations had just one missing predictor variable.) Because the response probability adjustment factors require nonmissing predictor values, a weighted sequential hot deck imputation procedure (Cox, 1980) was used to impute missing values. The significance levels of the final models were basically unaffected by the addition of observations with imputed predictors.

Generalized Wald statistics, adjusted for design effects (Rao & Scott, 1981), were used to test the goodness of fit of each model and were found to be highly significant (i.e., at least one regression parameter not zero) at the 0.001 level of significance. However, the overall predicted probability of a spouse's participation (i.e., the predicted value produced by the spouse address model multiplied by the predicted value produced by the spouse response model) was not amenable to conventional regression analysis because of the lack of independence between the models. Instead, Receiver Operating Characteristic (ROC) curves (Hanley & McNeil, 1982) were constructed to assess the overall predictive ability of the combined model.

ROC curves are used to judge the discrimination ability of statistical methods that combine various clues, test results, etc., into a prediction. For example, in a signal detection experiment using the two-alternative forced choice technique, subjects are asked to use available evidence to decide which of two stimuli is "noise" and which is "signal plus noise." For the spouse participation models, the predicted response probability that provides the evidence for detecting response acts as the signal.

A point on an ROC curve is constructed by considering a given predicted probability as a cutoff point for deciding whether a spouse is a respondent or

a nonrespondent. For a given cutoff, a point on the ROC curve is obtained by plotting the proportion of respondents with a predicted probability greater than the cutoff (i.e., the proportion of true positives) versus the proportion of nonrespondents with a predicted probability greater than the cutoff (i.e., the proportion of false positives). The points on an ROC curve are obtained by computing the proportion of true and false positives for the entire range of possible cutoff points: from always predicting response (i.e., cutoff less than lowest predicted response probability) to never predicting response (i.e., cutoff greater than highest predicted response probability).

The area under an ROC curve measures the probability that a randomly chosen pair of observations, one respondent and one nonrespondent, will be correctly ranked. This probability of a correct pairwise ranking is the same quantity that is estimated by the nonparametric Wilcoxon statistic, which is usually computed to test whether the levels of a quantitative variable in one population tend to be greater than in a second population. No assumptions about how the variable is distributed in the populations are needed to implement the test.

The null hypothesis associated with the Wilcoxon test is that the variable is not a useful discriminator between the populations. For the spouse response model, this corresponds to a null hypothesis that the predicted response probability of a respondent is just as likely to be smaller than the predicted response probability of a nonrespondent as it is to be greater. Thus, if the null hypothesis is true, the ROC curve will be a diagonal line that reflects the equally likely chance of making a correct or incorrect decision and the area under the curve will be 0.5. If the null hypothesis is not true, the ROC curve will rise above the diagonal and the area under the curve will be significantly greater than 0.5.

ROC curves for the predicted probability of spouse participation are shown for each paygrade group in Figure 1. The areas under each curve were approximated using Simpson's rule. The levels of significance associated with the Wilcoxon tests for each paygrade group were found to be highly significant ($p<0.0001$). However, the curves indicate that the predicted probabilities discriminate most effectively for enlisted persons and junior NCOs and least effectively for field grade officers.

Factors Affecting a Soldier's Propensity to Provide a Spouse Address

The single most significant predictor of a soldier's propensity to provide his or her spouse's address was the completeness of the last section of the Soldier Questionnaire. The positive regression coefficients associated with this predictor within each paygrade group indicate that the more complete the section, the more likely the soldier was to have provided an address. Because the spouse address form followed the last section, a plausible explanation for not obtaining a spouse address was that the soldier developed "respondent fatigue" and stopped answering questions before reaching the address form.

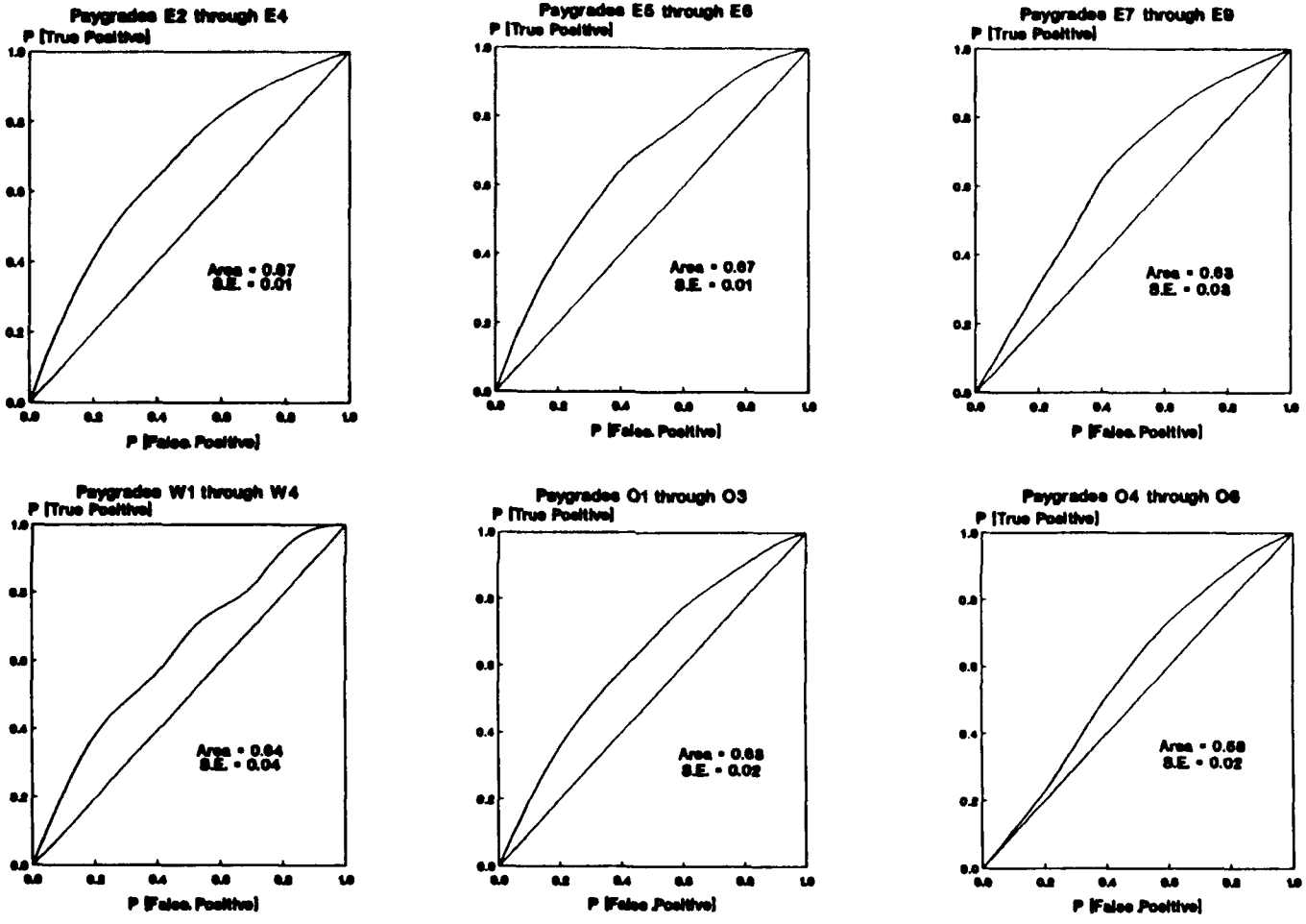

Figure 1. Receiver Operating Characteristic (ROC) Curves for the Predicted Probability of Spouse Participation

The area under an ROC curve measures the probability that a randomly chosen respondent has a higher predicted response probability than a randomly chosen nonrespondent. The diagonal line represents an equally likely outcome, i.e., the predicted probability is unrelated to response.

The mode of administration was believed to be another factor that may have affected a soldier's awareness of the request for a spouse address. Soldiers who attended group administrations were given verbal instructions about the spouse address form at the end of the questionnaire; soldiers who received the questionnaire through their units had to read the instructions to be aware of the request for their spouses' addresses. However, a zero-one predictor variable indicating group administration was not significant.

Among the demographic predictors, junior and mid-grade personnel were less likely to provide an address if they were stationed in Europe than elsewhere, and field grade officers were more likely to provide an address if they were living with their spouses. All other paygrades were unaffected by region of the world and living arrangement.

Among the attitudinal predictors, young enlisted persons and young officers were less likely to provide an address if they rated civilian jobs more favorably than Army work. Except for senior NCOs, soldiers were less likely to provide an address if they indicated that their families had frequent disagreements and/or difficulty adjusting to Army life.

Factors Affecting a Spouse's Propensity to Respond

Although the time between soldier interview and the first mailing of a Spouse Questionnaire varied substantially, it was not a significant predictor of spouse response. Instead, a combination of demographic and attitudinal variables constituted the final spouse response model.

Among the demographic predictors, living arrangement was an important predictor among the spouses of older personnel. Spouses of senior NCOs and field grade officers were less likely to respond if they lived apart from their spouses. Male spouses of enlisted personnel and warrant officers were less likely to respond than female spouses of personnel in these ranks. And, the spouses of Black soldiers other than warrant officers were less likely to respond than the spouses of non-Black soldiers.

As with soldier response, family adjustment to Army life was a key attitudinal predictor of spouse response. The spouses of company grade officers and enlisted persons who said that their families had difficulty adjusting and/or a risk of marital separation were less likely to respond than other spouses of soldiers in these paygrades.

The final soldier and spouse response models, including the estimated logistic regression coefficients and their standard errors and the level of significance for the test of the hypothesis that the coefficient is zero, are presented in Tables 3 and 4, respectively. Graphical representations of the expected response probabilities of the spouse address model are shown in Appendix B and the expected probabilities for the spouse response model are presented in Appendix C.

Weight Adjustment Factors

The logistic coefficients of the final models were used to compute an expected response probability for the spouse of each participating soldier.

Table 3

Logistic Regression Coefficients for Spouse Address Model

Predictor variable/ paygrade	Logistic regression coefficient	Standard error	T statistic	Level of significance
Intercept	-0.657	0.341	-1.928	0.061
Soldier stationed in Europe[a]				
E2-E4	-0.521	0.134	-3.879	<0.001
E5-E6	-0.488	0.133	-3.670	0.001
E7-E9	-0.287	0.321	-0.893	0.377
W1-W4	0.078	0.517	0.152	0.880
O1-O3	-0.340	0.212	-1.606	0.116
O4-O6	-0.137	0.230	-0.595	0.555
Spouse living with soldier[a]				
E2-E4	0.477	0.144	3.307	0.002
E5-E6	0.549	0.211	2.598	0.013
E7-E9	0.550	0.378	1.456	0.153
W1-W4	0.786	0.525	1.497	0.142
O1-O3	0.335	0.240	1.396	0.170
O4-O6	0.963	0.380	2.535	0.015
Family adjustment to Army life				
E2-E4	-0.031	0.040	-0.790	0.434
E5-E6	-0.150	0.042	-3.571	0.001
E7-E9	-0.045	0.058	-0.782	0.439
W1-W4	-0.327	0.149	-2.195	0.034
O1-O3	-0.183	0.051	-3.558	0.001
O4-O6	-0.162	0.052	-3.126	0.003
Army/civilian job comparison				
E2-E4	0.032	0.008	3.790	0.001
E5-E6	0.041	0.010	4.186	<0.001
E7-E9	0.014	0.017	0.816	0.419
W1-W4	-0.004	0.030	-0.124	0.902
O1-O3	0.048	0.013	3.795	0.001
O4-O6	0.028	0.014	1.940	0.059

(continued)

Squared multiple correlation coefficient: 0.078.
Overall model level of significance: <0.001.

[a]Dichotomous variables for which the reference level is the opposite of the specified level.

Table 3

Logistic Regression Coefficients for Spouse Address Model
(continued)

Predictor variable/ paygrade	Logistic regression coefficient	Standard error	T statistic	Level of significance
Family disagreements				
E2-E4	-0.031	0.014	-2.308	0.026
E5-E6	-0.038	0.014	-2.710	0.010
E7-E9	-0.031	0.020	-1.537	0.132
W1-W4	-0.042	0.037	-1.131	0.265
O1-O3	-0.045	0.017	-2.668	0.011
O4-O6	-0.077	0.022	-3.488	0.001
Percent complete of last section of Soldier Questionnaire				
E2-E4	0.019	0.002	10.237	<0.001
E5-E6	0.017	0.003	6.221	<0.001
E7-E9	0.018	0.006	3.151	0.003
W1-W4	0.028	0.011	2.610	0.013
O1-O3	0.021	0.004	4.878	<0.001
O4-O6	0.024	0.003	7.331	<0.001

Table 4

Logistic Regression Coefficients for Spouse Response Model

Predictor variable/ paygrade	Logistic regression coefficient	Standard error	T statistic	Level of significance
Intercept	-0.520	0.315	-1.652	0.106
Female soldier[a]				
E2-E4	-1.027	0.210	-4.891	<0.001
E5-E6	-0.285	0.158	-1.799	0.080
E7-E9	-0.211	0.467	-0.451	0.654
W1-W4	1.304	0.462	2.823	0.007
O1-O3	-0.302	0.265	-1.139	0.262
O4-O6	-0.145	0.286	-0.508	0.614
Black soldier[a]				
E2-E4	-0.714	0.122	-5.849	<0.001
E5-E6	-0.558	0.132	-4.224	<0.001
E7-E9	-0.740	0.220	-3.367	0.002
W1-W4	-0.989	0.743	-1.330	0.191
O1-O3	-0.947	0.161	-5.869	<0.001
O4-O6	-0.697	0.243	-2.874	0.006
Spouse living with soldier[a]				
E2-E4	0.187	0.179	1.045	0.302
E5-E6	0.373	0.277	1.348	0.185
E7-E9	1.104	0.393	2.806	0.008
W1-W4	1.595	0.733	2.176	0.036
O1-O3	0.297	0.269	1.105	0.276
O4-O6	0.843	0.357	2.361	0.023
Family adjustment to Army life				
E2-E4	-0.165	0.033	-5.040	<0.001
E5-E6	-0.098	0.045	-2.180	0.035
E7-E9	-0.059	0.062	-0.953	0.347
W1-W4	-0.028	0.201	-0.139	0.890
O1-O3	-0.098	0.047	-2.102	0.042
O4-O6	-0.004	0.059	-0.062	0.951

(continued)

Squared multiple correlation coefficient: 0.101.
Overall model level of significance: <0.001.

[a]Dichotomous variables for which the reference level is the opposite of the specified level.

Table 4

Logistic Regression Coefficients for the Spouse Response Model (continued)

Predictor variable/ paygrade	Logistic regression coefficient	Standard error	T statistic	Level of significance
Locus of control				
E2-E4	-0.022	0.014	-1.601	0.117
E5-E6	-0.023	0.018	-1.255	0.217
E7-E9	-0.055	0.024	-2.254	0.030
W1-W4	-0.100	0.055	-1.825	0.075
O1-O3	0.040	0.022	1.802	0.079
O4-O6	-0.036	0.023	-1.602	0.117
Marital separation risk				
E2-E4	0.141	0.040	3.548	0.001
E5-E6	0.131	0.050	2.630	0.012
E7-E9	0.154	0.070	2.193	0.034
W1-W4	0.259	0.156	1.663	0.104
O1-O3	0.076	0.053	1.450	0.155
O4-O6	0.194	0.065	2.994	0.005

These probabilities were then used to adjust the sampling weights of the 3,277 spouses who participated in the Spouse Survey. Continuing the notation of Section 3, the adjusted weight assigned to the spouse of soldier i is

$$W_{Ri} = W_{Si} R_i \div (\hat{\alpha}_i \hat{\rho}_i) \quad .$$

That is, each W_{Si} is divided by the estimated overall probability of spouse response (i.e. $\hat{\alpha}_i \bullet \hat{\rho}_i$). The adjusted weight of spouses who did not participate is zero.

Notice that for any zero-one predictor Z_{ik} of $\underset{\sim}{Z}_i$, the estimation equations in Equation (2) require that

$$\sum_{i \epsilon S} W_{Ri} Z_{ik} = \sum_{i \epsilon S} W_{Si} Z_{ik} \cdot$$

Because the first element of $\underset{\sim}{Z}_i$ is uniformly 1, the constraint equations in Equation (3) force the adjusted W_{ri} weight sums for participating spouses (i.e., R_i=1) to equal the corresponding W_{Si} weight sum across all spouses of participants in the Soldier Survey. In addition, the weight sum equality constraint holds for any sample subset identified by any zero-one indicator in $\underset{\sim}{Z}_i$.

The adjusted spouse weights described above have been assigned to each of the 3,277 participants in the AFRP Spouse Survey and are stored on the spouse data file as SPOUWT. Analysts are encouraged to use these adjusted weights when estimating parameters of the spouse population. Their use in the estimation process will reduce the potentially biasing effects of differential nonresponse among spouses selected for the AFRP Spouse Survey. The mean adjustment factors applied to the spouse weights to compensate for nonresponse are shown by paygrade group in Table 5.

Table 5

Spouse Weight Adjustment Factors

Paygrade	Eligible spouses in population[a]	Spouse Sample			Mean adj factor[2]
		Eligible[b]	Address provided	Questionnaire provided	
Spouses of enlisted persons					
E2-E4	83,113	2,690	2,113	826	3.44
E5-E6	109,998	1,750	1,315	613	2.79
E7-E9	38,970	524	397	226	2.37
	232,081	4,964	3,825	1,665	3.06
Spouses of officers					
W1-W4	8,202	170	124	87	1.96
01-03	19,799	1,345	1,111	752	1.82
04-06	17,959	1,313	1,063	773	1.69
	45,960	2,828	2,298	1,612	1.76
Overall	278,041	7,792	6,123	3,277	2.42

[a]Survey estimates.

[b]Spouses of soldiers who provided a usable Soldier Questionnaire.

[c]Mean adjustment factor applied to the sampling weights of spouses who provided a usable Spouse Questionnaire.

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APPENDIX A

SOLDIER AND SPOUSE RESPONSE RATES BY PREDICTOR VARIABLES CONSIDERED FOR THE SPOUSE PARTICIPATION MODELS

Appendix A. Soldier and Spouse Response Rates by Predictor Variables Considered for the Spouse Participation Models

Variable	Response Rates: Soldiers Providing a Spouse Address n	%	(s.e.)	Spouses Providing a Questionnaire n	%	(s.e.)
All Soldiers/Spouses	7,792	77.2	(0.9)	6,123	50.1	(0.7)
Soldier's Paygrade						
E2-E4	2,690	78.0	(1.1)	2,113	37.2	(1.2)
E5-E6	1,750	75.4	(1.2)	1,315	47.8	(1.6)
E7-E9	524	76.2	(2.3)	397	57.3	(2.8)
W1-W4	170	73.9	(3.3)	124	67.9	(4.5)
01-03	1,345	82.8	(1.7)	1,111	66.1	(2.4)
04-06	1,313	82.1	(1.9)	1,063	73.1	(1.3)
Soldier's Education						
No High School Diploma	26	74.4	(10.6)	18	28.0	(10.1)
High School	3,315	76.4	(1.2)	2,574	42.4	(1.1)
Some College	1,508	76.1	(1.4)	1,146	53.4	(1.9)
College Degree	2,914	81.3	(1.3)	2,374	63.9	(1.3)
Soldier's Gender						
Male	6,930	77.2	(0.9)	5,458	51.0	(0.9)
Female	862	77.2	(1.6)	665	33.3	(2.2)
Soldier's Race						
Black	1,790	73.8	(1.5)	1,477	36.2	(1.5)
White	5,456	79.0	(1.0)	4,376	55.4	(0.9)
Other	288	76.5	(3.1)	226	53.6	(3.6)
Soldier's Location						
CONUS	4,691	79.3	(1.2)	3,789	51.8	(1.1)
Europe	2,372	72.1	(1.4)	1,739	44.5	(1.3)
Other	729	79.8	(2.8)	595	49.4	(2.9)
Type of Unit						
Combat	2,764	77.5	(1.5)	2,189	48.2	(1.3)
Combat Support	996	75.4	(2.0)	754	49.0	(1.8)
Combat Service	1,481	77.7	(1.4)	1,143	42.2	(2.0)
TDA	2,551	77.5	(1.7)	2,037	56.4	(1.5)
Was English the First Language Spouse Learned to Speak?						
Yes	6,201	78.8	(1.0)	4,976	51.0	(0.9)
No	1,225	75.4	(1.7)	919	46.2	(1.1)

Appendix A. Soldier and Spouse Response Rates
by Variables Used in the Spouse Participation Models (cont.)

Variable	Response Rates: Soldiers Providing a Spouse Address n	%	(s.e.)	Response Rates: Spouses Providing a Questionnaire n	%	(s.e.)
MACOM						
FORSCOM	3,116	79.9	(1.3)	2,530	48.8	(1.1)
TRADOC	739	76.0	(3.1)	596	54.6	(1.7)
USAREUR	2,049	71.3	(1.3)	1,483	43.5	(1.4)
HSC	694	80.3	(2.5)	555	57.6	(3.2)
Spouse Lives with Soldier						
Yes	6,706	79.8	(1.0)	5,651	51.2	(0.9)
No	655	65.2	(2.4)	443	32.1	(3.0)
Spouse Works						
Yes	4,257	78.1	(1.1)	3,362	49.3	(1.0)
No	3,144	78.4	(1.0)	2,511	51.4	(1.4)
Lives On-post						
Yes	2,590	78.1	(1.1)	2,076	51.2	(1.7)
No	5,072	77.9	(1.1)	3,993	48.9	(1.0)
Soldier's Satisfaction with Army						
Very Satisfied	1,715	78.6	(1.5)	1,398	55.0	(2.2)
Somewhat Satisfied	3,256	78.7	(1.3)	2,591	51.6	(1.3)
Neutral	960	72.3	(1.6)	720	44.5	(2.4)
Somewhat Dissatisfied	1,221	79.8	(1.1)	963	46.2	(1.9)
Very Dissatisfied	603	69.1	(2.2)	427	38.8	(2.8)
Soldier's Happiness of Marriage						
1 - Very Unhappy	154	60.5	(5.0)	95	27.5	(5.8)
2	187	74.8	(3.3)	140	41.9	(5.2)
3	296	74.4	(3.8)	224	35.1	(3.9)
4	700	78.6	(2.2)	558	42.1	(3.3)
5	1,258	78.2	(1.6)	1,013	48.5	(2.1)
6	2,173	82.0	(1.4)	1,778	54.5	(1.7)
7 - Very Happy	2,550	78.3	(1.1)	2,049	53.0	(1.5)
How Decided to Stay in Army						
Soldier Only	386	72.6	(2.9)	276	42.1	(4.5)
Considered Spouse	1,907	77.2	(1.5)	1,501	47.4	(1.8)
Soldier and Spouse	5,248	78.6	(1.0)	4,188	51.5	(1.1)
Spouse	137	73.7	(4.2)	103	38.0	(6.9)

Appendix A. Soldier and Spouse Response Rates
by Variables Used in the Spouse Participation Models (cont.)

Variable	Response Rates: Soldiers Providing a Spouse Address n	%	(s.e.)	Response Rates: Spouses Providing a Questionnaire n	%	(s.e.)
Will Soldier Retire at End of Obligation						
Yes	753	76.2	(2.2)	580	60.7	(3.3)
No	6,983	77.5	(0.9)	5,526	48.3	(0.9)
Comparing what Soldier gives to Army with what he gets						
Sold-much better deal	96	62.3	(6.9)	63	41.3	(8.3)
somewhat better	143	75.6	(4.6)	108	48.9	(7.0)
slightly better	236	78.6	(2.8)	187	43.4	(4.2)
equally good	2,445	77.0	(1.4)	1,934	48.0	(1.5)
Army-slightly better deal	1,395	79.5	(1.5)	1,121	50.1	(1.9)
somewhat better	1,560	78.8	(1.4)	1,239	52.8	(1.8)
much better deal	1,852	75.4	(1.4)	1,421	49.8	(1.4)
How Supportive Spouse is of Soldier being in Army						
Very	3,553	79.7	(1.0)	2,885	53.8	(1.2)
Fairly	1,821	79.7	(1.4)	1,472	53.4	(1.9)
Neutral	1,476	77.2	(1.5)	1,143	43.2	(2.0)
Fairly Unsupportive	278	76.6	(3.4)	219	39.9	(4.5)
Very Unsupportive	263	73.1	(3.7)	193	37.3	(4.7)
How Well has Family Adjusted to being an Army Family						
1-Extremely Well	1,946	80.4	(1.3)	1,602	54.6	(1.3)
2	2,389	80.6	(1.4)	1,952	56.1	(1.8)
3	1,320	81.0	(1.2)	1,059	46.9	(1.8)
4-Neither	1,040	72.5	(1.7)	759	43.1	(2.1)
5	472	70.5	(2.6)	413	39.4	(3.3)
6	252	73.0	(4.4)	222	34.5	(3.3)
7-Extremely Badly	134	71.1	(4.6)	116	35.7	(5.5)
Husband Should be Head of the Family; Soldier:						
Strongly Agrees	1,386	78.2	(1.5)	1,098	48.6	(1.8)
Agrees	2,337	78.8	(1.0)	1,869	49.7	(1.4)
Is Neutral	2,857	76.1	(1.3)	2,222	51.1	(1.6)
Disagrees	780	76.2	(2.2)	603	49.1	(2.4)
Strongly Disagrees	362	75.5	(3.0)	279	40.2	(4.4)

Appendix A. Soldier and Spouse Response Rates
by Variables Used in the Spouse Participation Models (cont.)

Variable	Response Rates: Soldiers Providing a Spouse Address n	%	(s.e.)	Response Rates: Spouses Providing a Questionnaire n	%	(s.e.)
Probability of Staying in Army						
0/10	625	69.7	(2.8)	1,414	45.2	(1.6)
1/10	475	74.2	(2.6)	356	43.7	(4.0)
2/10	347	79.1	(2.8)	277	48.1	(3.3)
3/10	494	76.8	(2.5)	384	51.6	(2.6)
4/10	354	75.0	(2.4)	276	50.9	(4.2)
5/10	492	78.2	(2.3)	390	42.4	(3.8)
6/10	444	77.0	(2.4)	349	48.9	(3.6)
7/10	411	78.8	(2.7)	328	50.2	(3.9)
8/10	522	80.5	(2.3)	427	56.4	(3.1)
9/10	735	79.6	(2.0)	603	48.5	(2.7)
10/10	1,580	80.4	(1.4)	1,292	55.1	(1.7)
Spouse on Active Duty						
Yes	926	74.9	(1.7)	712	35.7	(2.1)
No	6,507	78.5	(1.0)	5,184	51.9	(0.9)
Number of Dependent Children						
0	2,091	75.2	(1.3)	1,597	44.8	(1.7)
1	2,084	76.6	(1.4)	1,633	49.2	(1.5)
2	2,329	78.4	(1.4)	1,867	52.7	(1.5)
3	888	78.8	(1.9)	703	50.9	(2.3)
4	289	81.9	(2.9)	243	48.7	(4.4)
5 or more	110	70.7	(5.5)	79	55.9	(6.7)
Years Married						
Less than 1	676	78.8	(1.6)	529	38.1	(2.2)
1-2	1,451	78.1	(1.6)	1,160	42.4	(1.8)
3-5	1,910	79.6	(1.5)	1,530	48.5	(1.7)
6-10	1,518	76.4	(1.3)	1,189	51.7	(1.9)
11-20	1,509	77.7	(1.7)	1,201	62.2	(1.3)
21+	355	79.7	(4.0)	282	57.2	(4.4)
Spouse Involvement in Soldier's Career						
Not Involved	550	68.3	(2.5)	385	37.7	(2.9)
Neither	2,449	77.3	(1.3)	1,893	44.3	(1.8)
Somewhat Involved	3,706	80.9	(1.1)	3,043	55.2	(1.2)
Very Involved	784	78.0	(2.0)	640	51.0	(2.8)

Appendix A. Soldier and Spouse Response Rates
by Variables Used in the Spouse Participation Models (cont.)

Variable	Response Rates: Soldiers Providing a Spouse Address n	%	(s.e.)	Spouses Providing a Questionnaire n	%	(s.e.)
Soldier Agreement with Army Values						
Disagrees	2,173	76.9	(1.2)	1,676	45.9	(1.6)
Is Neutral	5,416	78.0	(1.0)	4,312	51.5	(0.9)
Agrees	195	63.0	(5.2)	130	34.9	(5.8)
Soldier's Work Satisfaction						
Bad or Very Bad	547	67.1	(2.7)	381	40.3	(3.8)
Neither	3,147	77.0	(1.0)	2,445	48.5	(1.3)
Good	3,719	79.5	(1.3)	2,995	52.1	(1.1)
Very Good	365	74.4	(3.4)	293	47.2	(4.2)
Army/Civilian Job Comparisons						
Civilian Much Better	362	67.4	(2.8)	246	32.8	(4.8)
Better	2,438	75.8	(1.1)	1,858	48.2	(1.6)
Same	4,185	79.5	(1.2)	3,386	52.2	(1.4)
Worse or Much Worse	673	82.6	(2.0)	560	52.4	(2.8)
Is Soldier Hispanic						
Yes	598	75.1	(2.0)	460	47.3	(3.0)
No	7,034	77.6	(0.9)	5,543	49.8	(0.9)
Frequency of Family Disagreements						
4 - 6 - Never	130	70.2	5.3	86	31.4	5.7
>6 - 10	503	78.5	2.7	394	39.8	2.6
>10 - 14	1,104	80.5	1.5	904	47.4	2.0
>14 - 18	2,134	81.9	1.2	1,755	50.7	1.4
>18 - 22	3,051	75.0	1.2	2,365	52.0	1.1
>22 - 24 - Everyday	870	69.2	2.2	619	49.4	2.5
Soldier's Locus of Control						
>5 - 10 - Soldier not in control	184	78.0	3.3	144	44.7	5.2
>10 - 15	2,036	74.8	1.4	1,538	45.6	1.7
>15 - 20	4,197	78.5	1.0	3,334	51.2	1.1
>20 - 25 Soldier in control	1,375	77.7	1.7	1,107	52.6	2.1
Marital Separation Risk						
4 - High	141	54.8	4.4	84	26.4	5.2
5	969	77.5	1.7	755	35.8	2.7
6	537	78.8	2.1	425	47.4	2.7
7	878	80.8	2.1	720	47.1	2.1
8 - Low	5,267	77.2	0.9	4,139	53.7	1.0

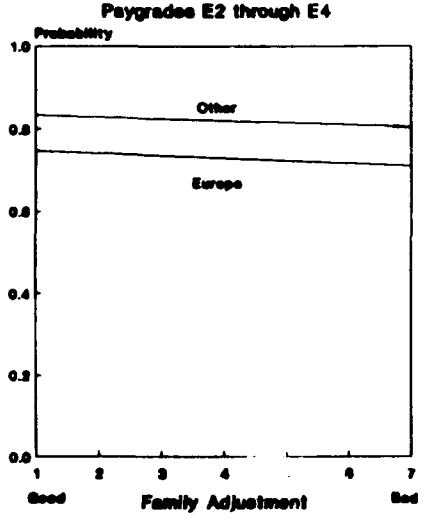
Appendix A. Soldier and Spouse Response Rates
by Variables Used in the Spouse Participation Models (cont.)

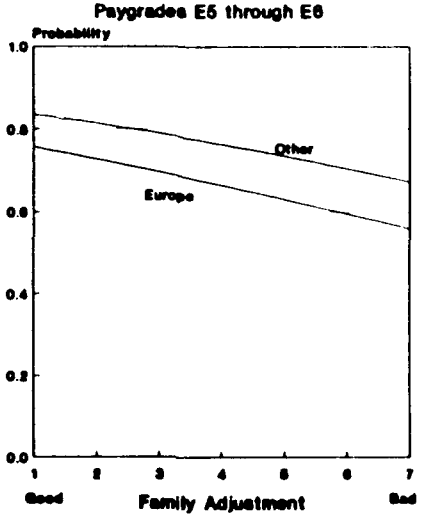
Variable	Response Rates: Soldiers Providing a Spouse Address n	%	(s.e.)	Response Rates: Spouses Providing a Questionnaire n	%	(s.e.)
Percentage Complete of Last Section of Soldier Questionnaire						
< 25	208	41.9	(4.6)	na	na	na
25 - < 50	114	66.7	(4.0)	na	na	na
50 - < 75	1,085	67.5	(1.7)	na	na	na
75 - < 95	898	72.3	(1.9)	na	na	na
≥ 95	5,487	82.2	(0.9)	na	na	na
How Questionnaire was Administered						
Group	5,973	78.0	(1.1)	na	na	na
Self	1,683	73.9	(1.4)	na	na	na
Don't Know	136	79.3	(3.0)	na	na	na
Days Between 1st Mailing of Spouse Questionnaire and Data Collection						
≤ 30	na	na	na	523	52.4	(4.6)
31-60	na	na	na	2,775	49.5	(1.3)
61-90	na	na	na	1,397	47.9	(2.0)
≥ 90	na	na	na	1,428	47.9	(1.5)

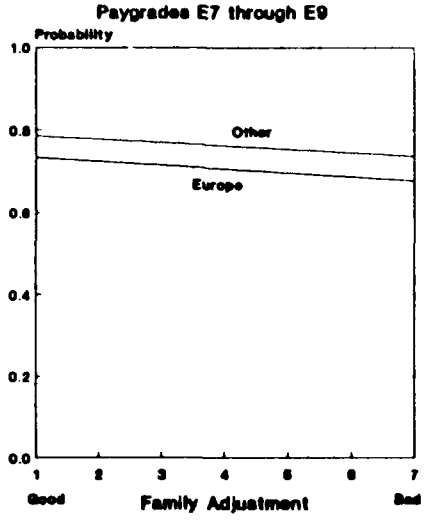
APPENDIX B

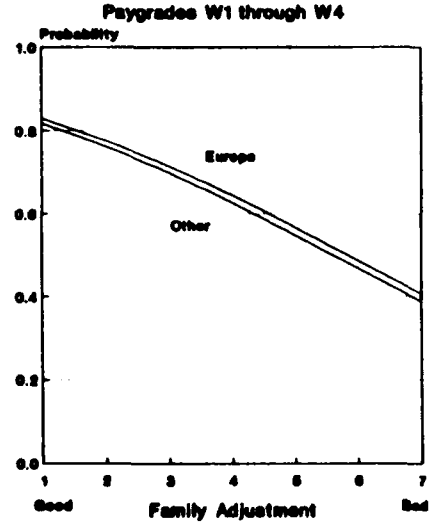
PREDICTED PROBABILITY OF OBTAINING A SPOUSE ADDRESS BY PREDICTOR VARIABLES IN THE FINAL LOGISTIC REGRESSION MODEL

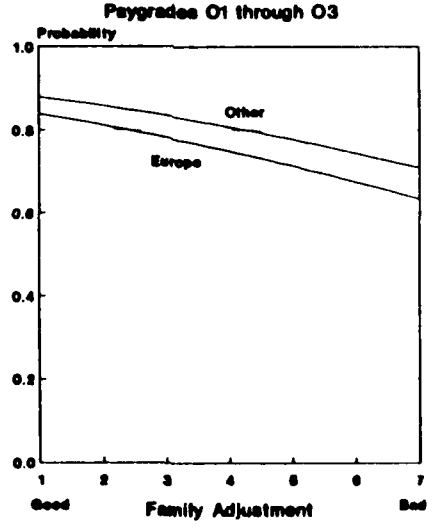
Exhibit B-1. Probability of Obtaining a Spouse Address by Paygrade, Family Adjustment, and Region











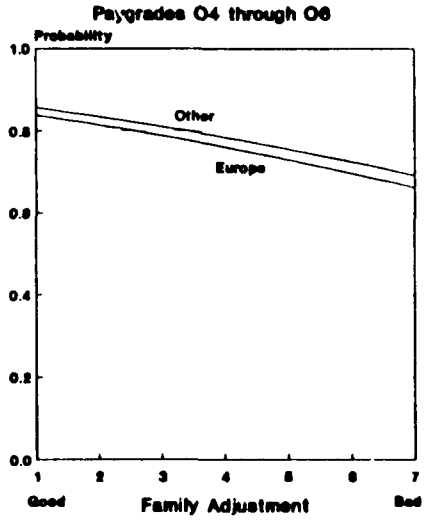
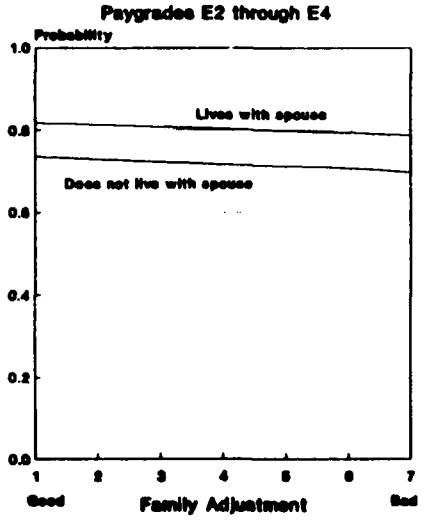
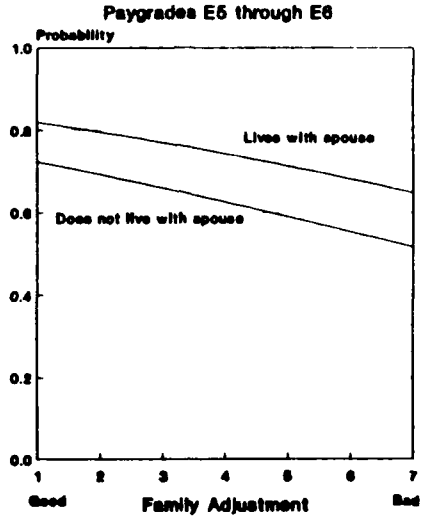
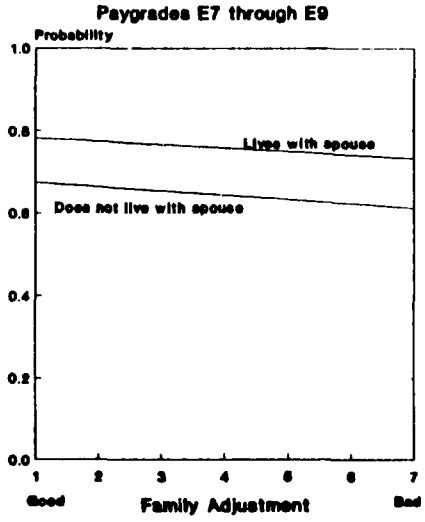
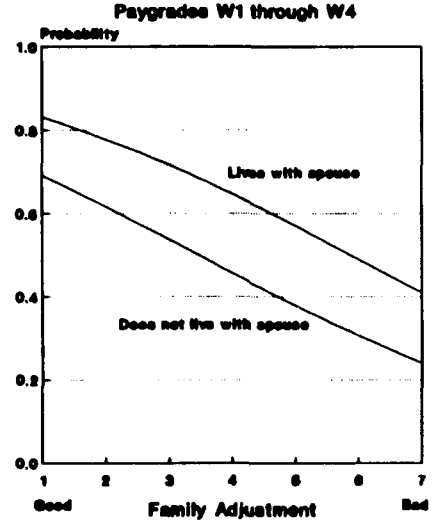


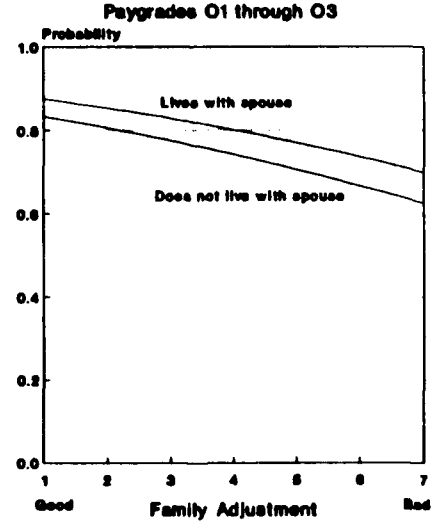
Exhibit B-2. Probability of Obtaining a Spouse Address by Paygrade, Family Adjustment, and Living Arrangement











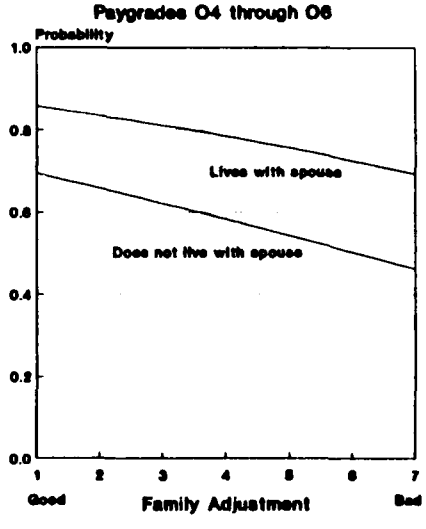


Exhibit B-3. Probability of Obtaining a Spouse Address by Paygrade, Job Comparability, and Region

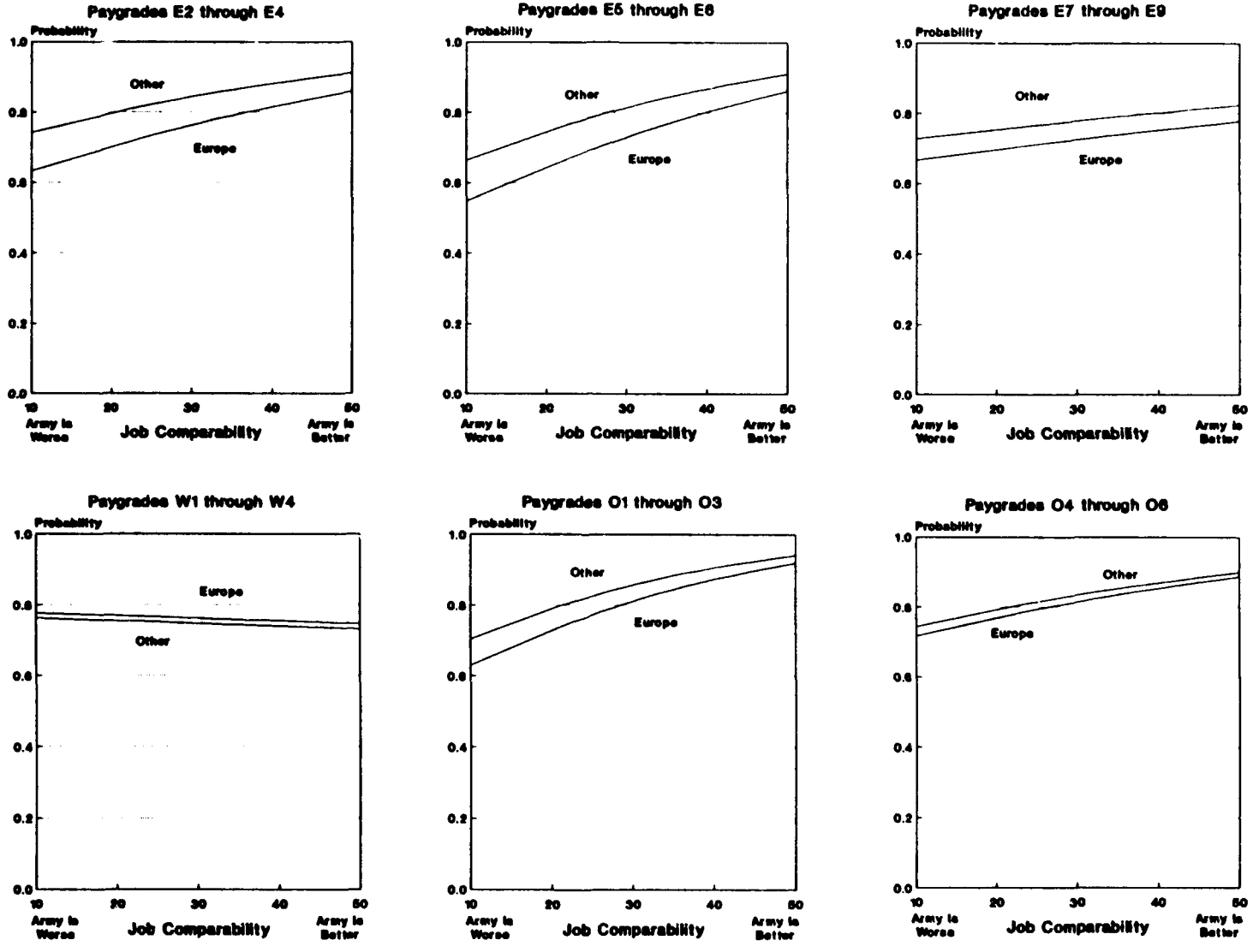


Exhibit B-4. Probability of Obtaining a Spouse Address by Paygrade, Job Comparability, and Living Arrangement

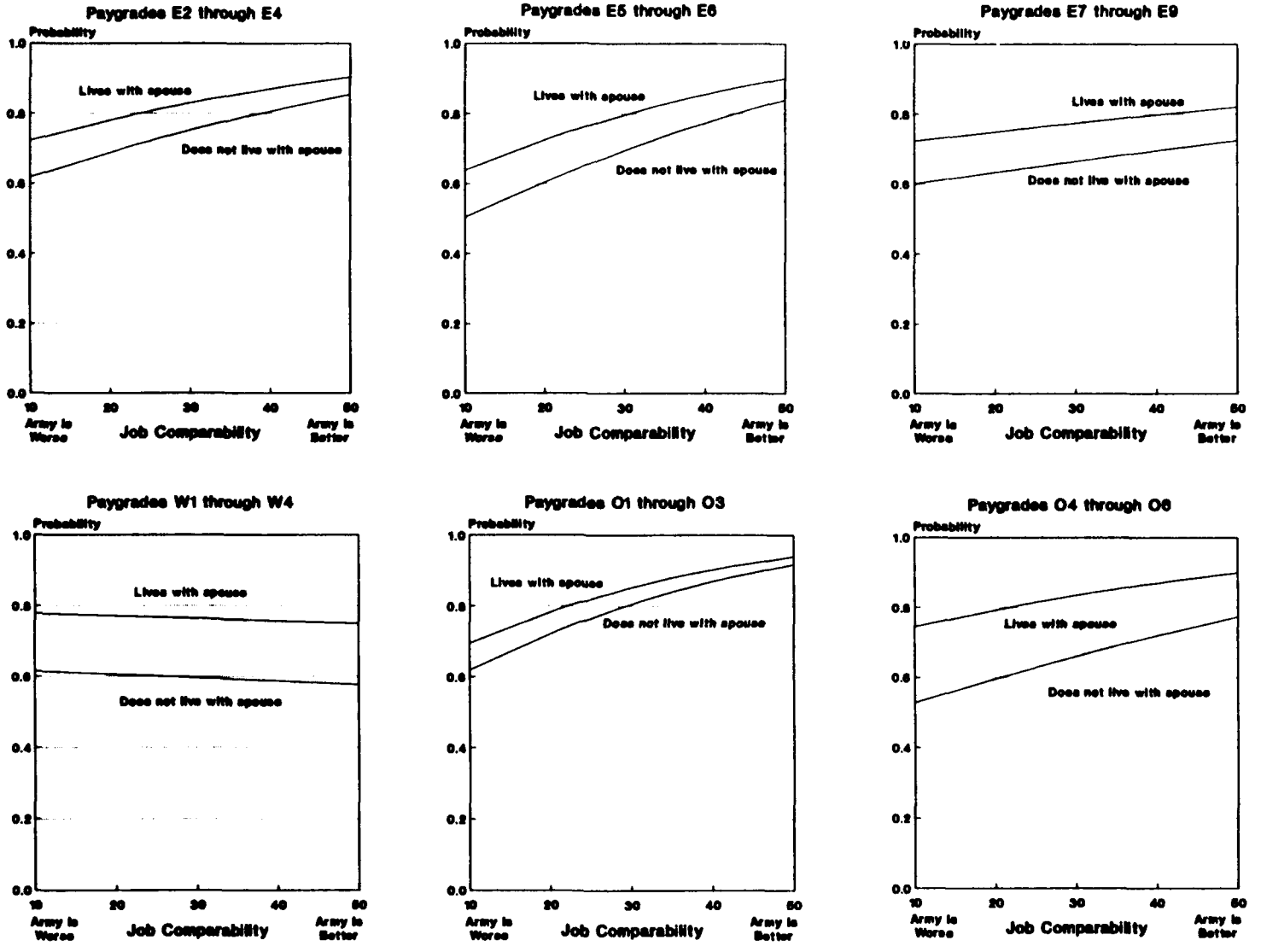


Exhibit B-5. Probability of Obtaining a Spouse Address by Paygrade, Family Disagreement, and Region

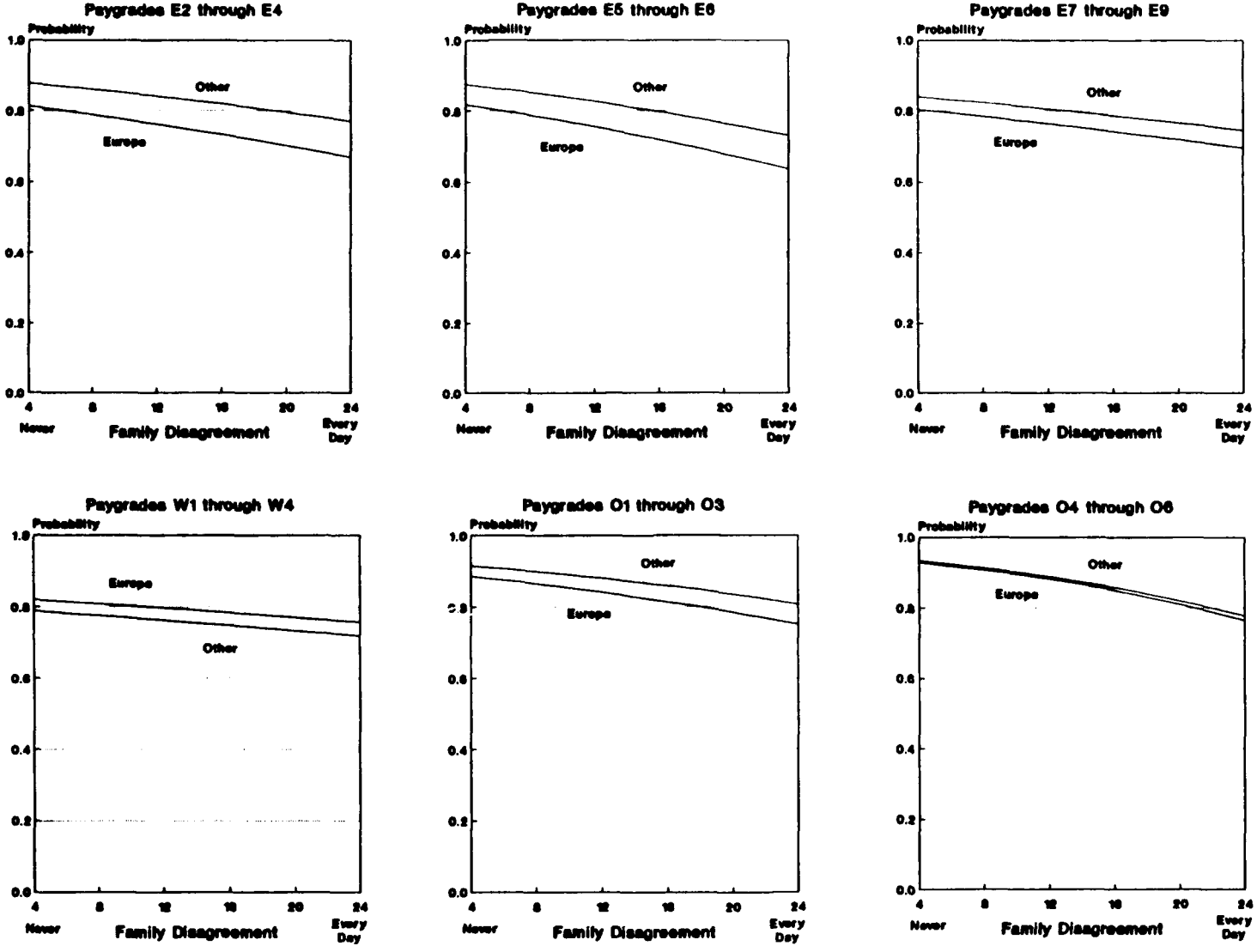
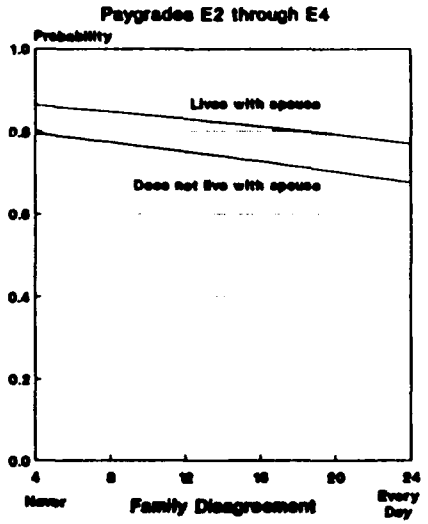
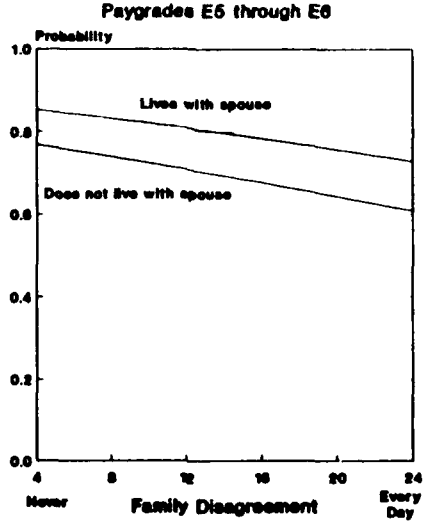
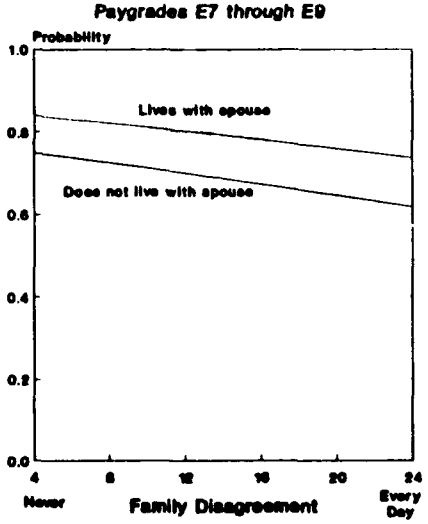
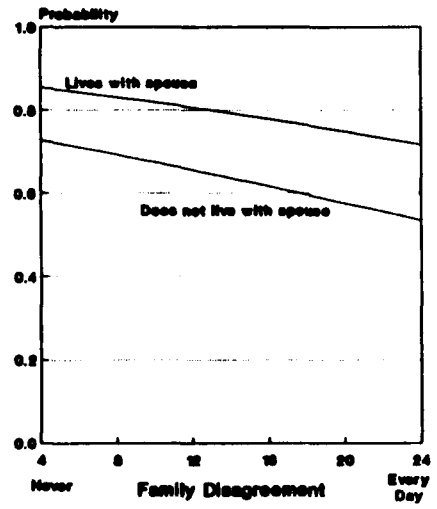


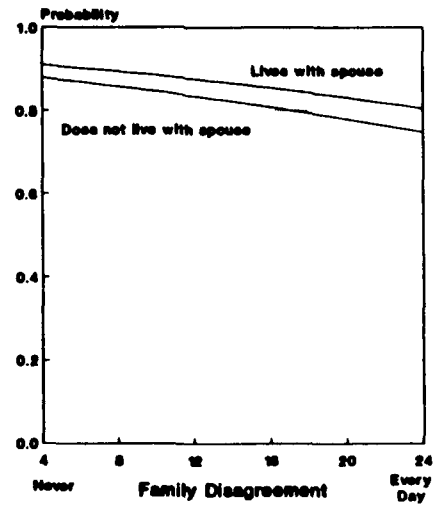
Exhibit B-6. Probability of Obtaining a Spouse Address by Paygrade, Family Disagreement, and Living Arrangement











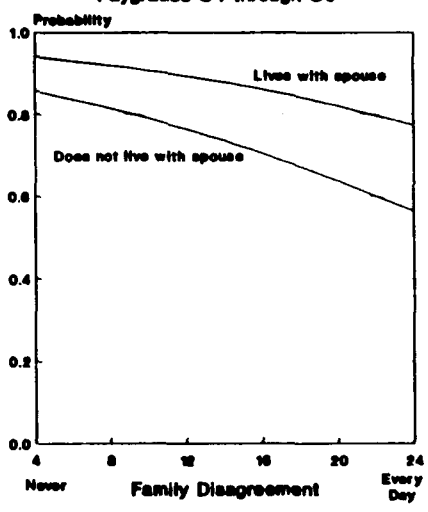


Exhibit B-7. Probability of Obtaining a Spouse Address by Paygrade, Region, and Completeness of Final Section of Soldier Questionnaire

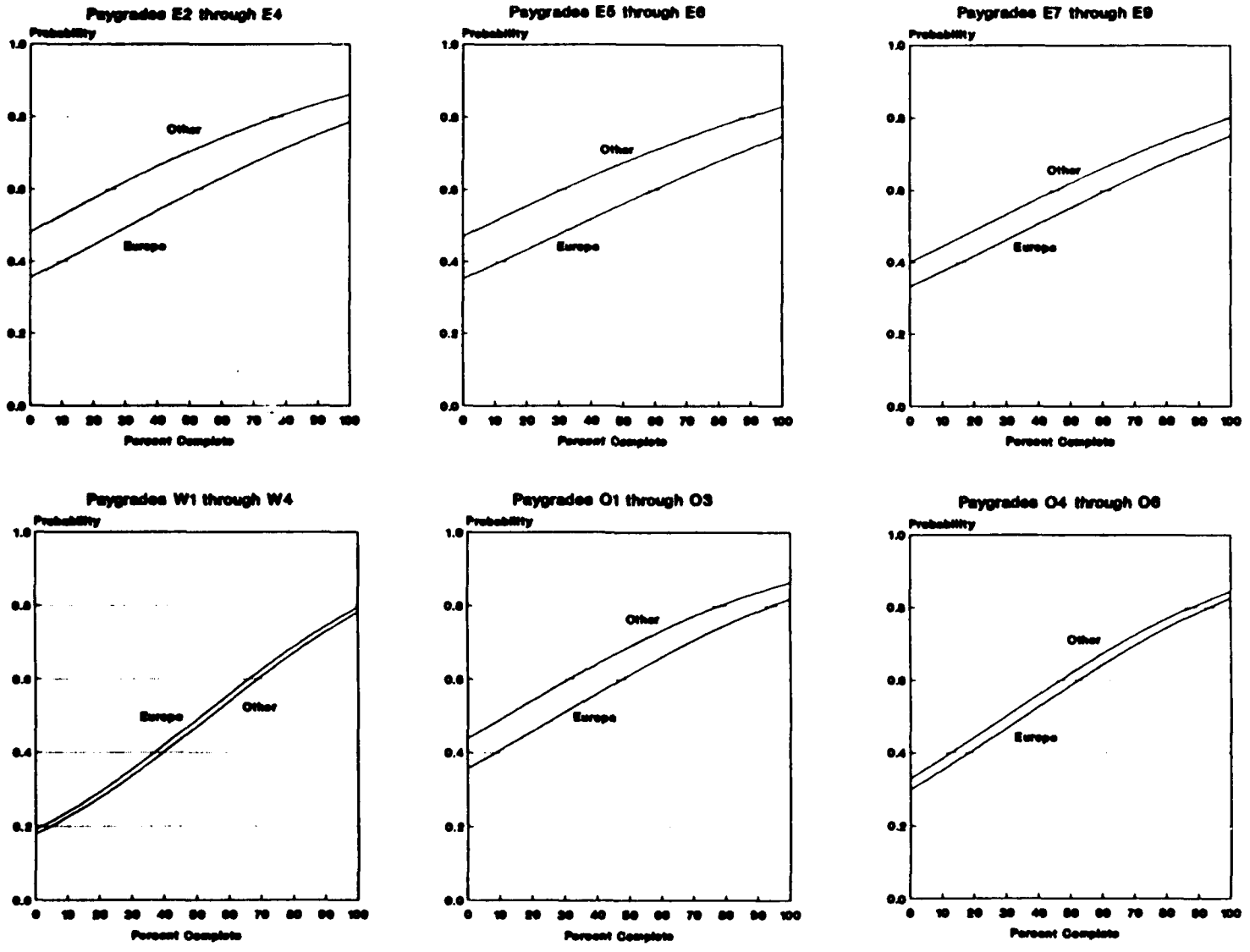
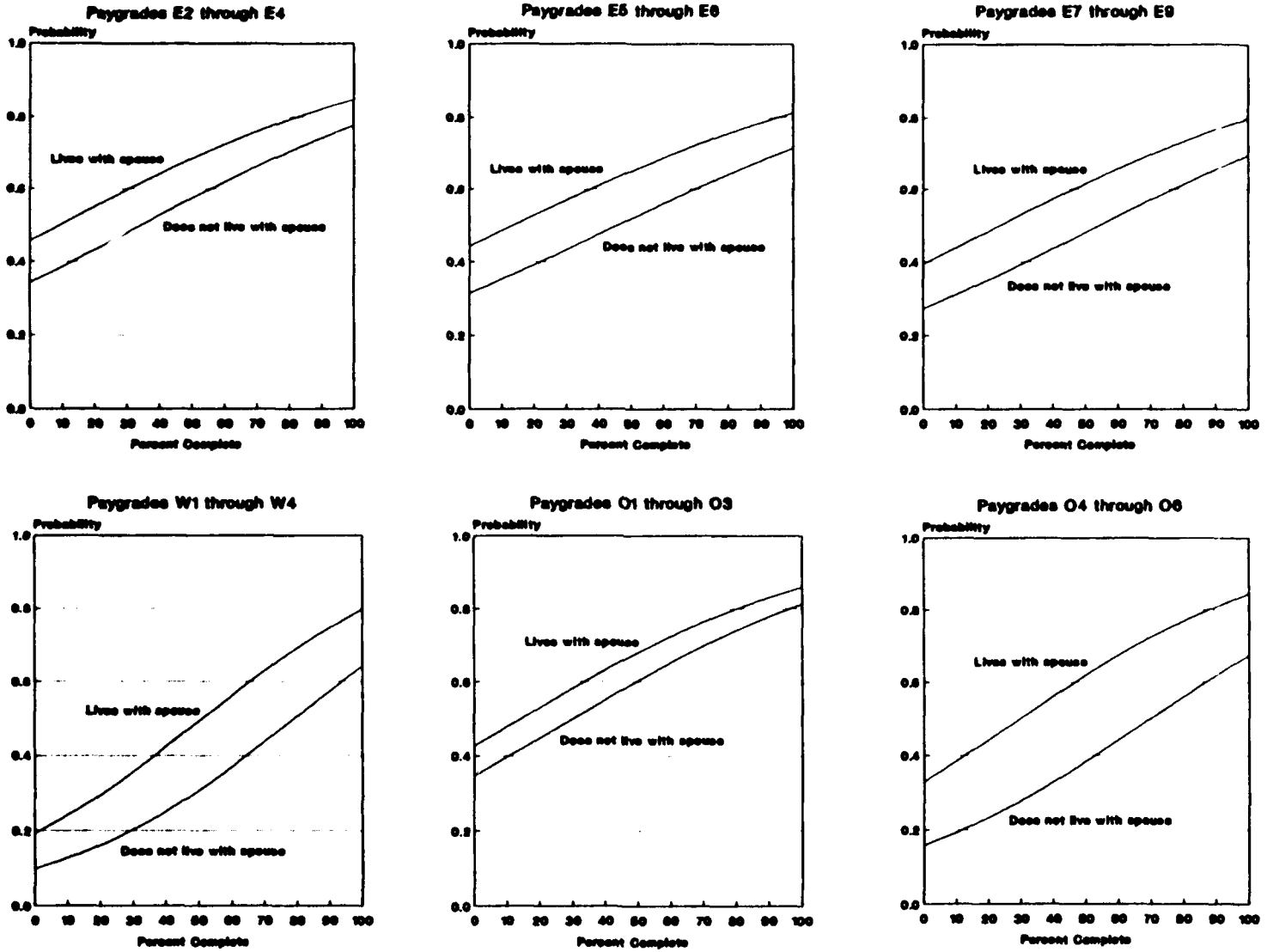


Exhibit B-8. Probability of Obtaining a Spouse Address by Paygrade, Living Arrangement, and Completeness of Final Section of Soldier Questionnaire



APPENDIX C

PREDICTED PROBABILITY OF SPOUSE RESPONSE BY PREDICTOR VARIABLES IN THE FINAL LOGISTIC REGRESSION MODEL

Exhibit C-1. Probability of Spouse Participation by Paygrade, Family Adjustment, and Spouse's Gender

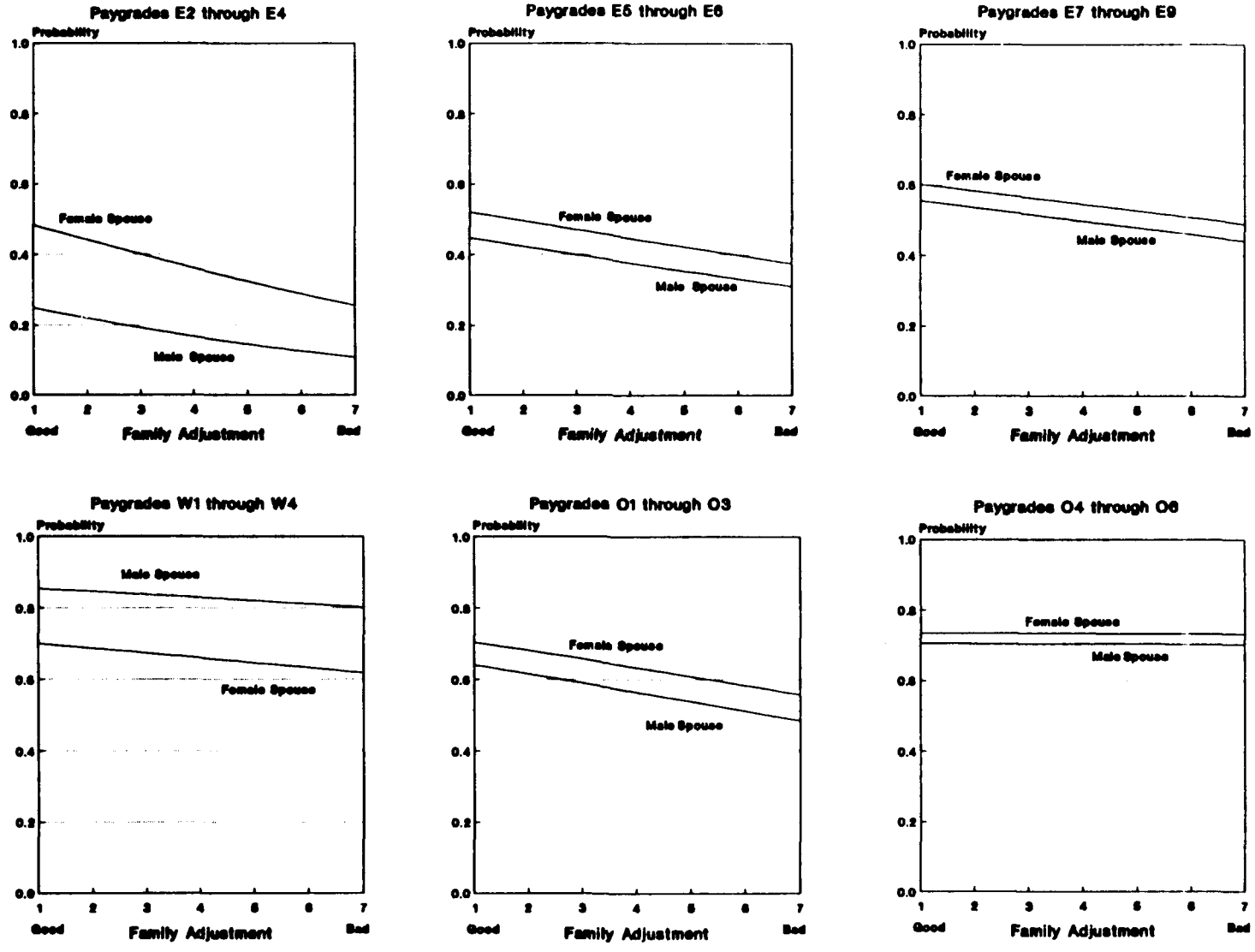
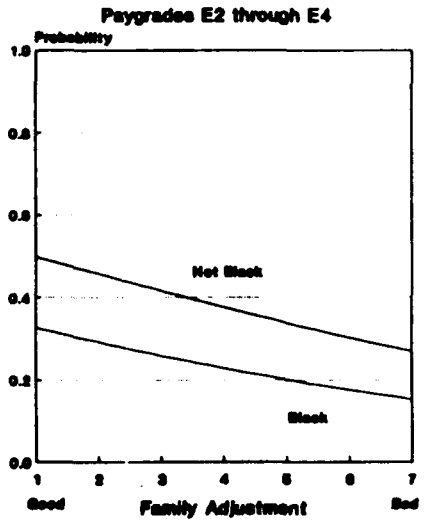
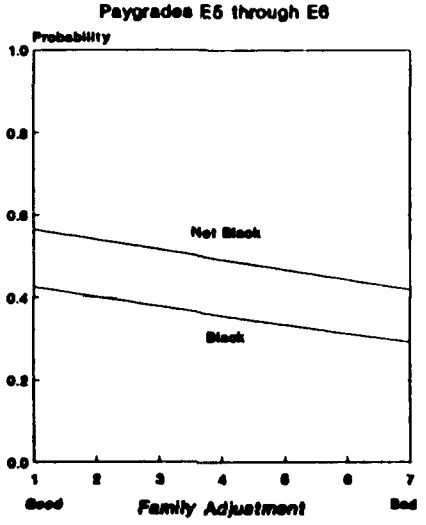
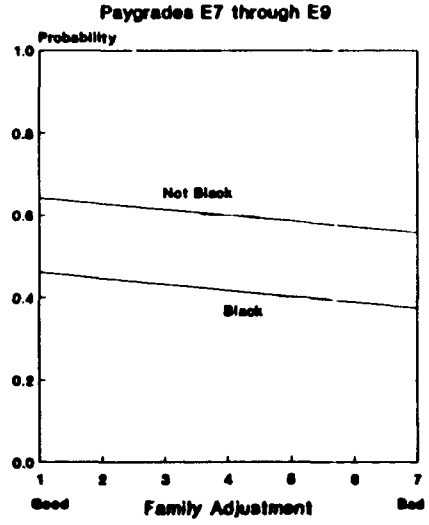
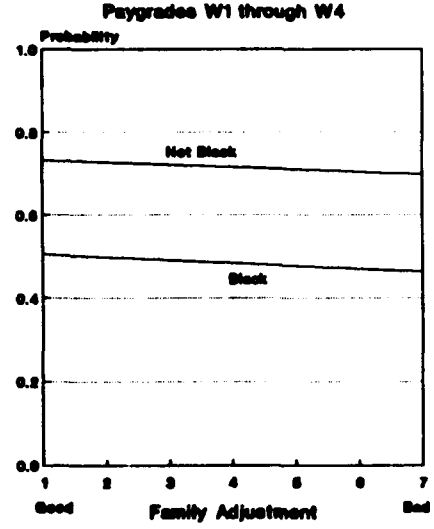


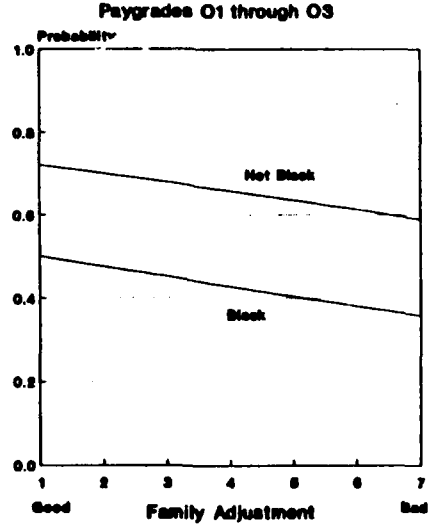
Exhibit C-2. Probability of Spouse Participation by Paygrade, Family Adjustment, and Race











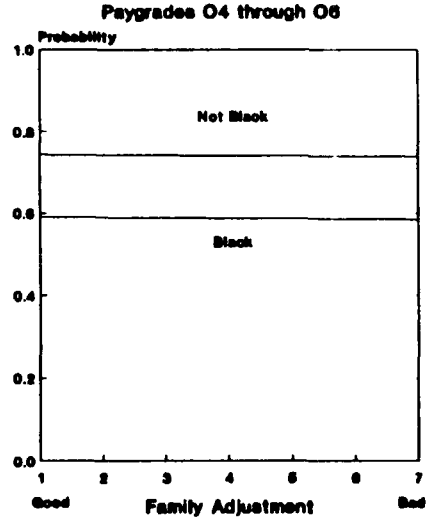


Exhibit C-3. Probability of Spouse Participation by Paygrade, Family Adjustment, and Living Arrangement

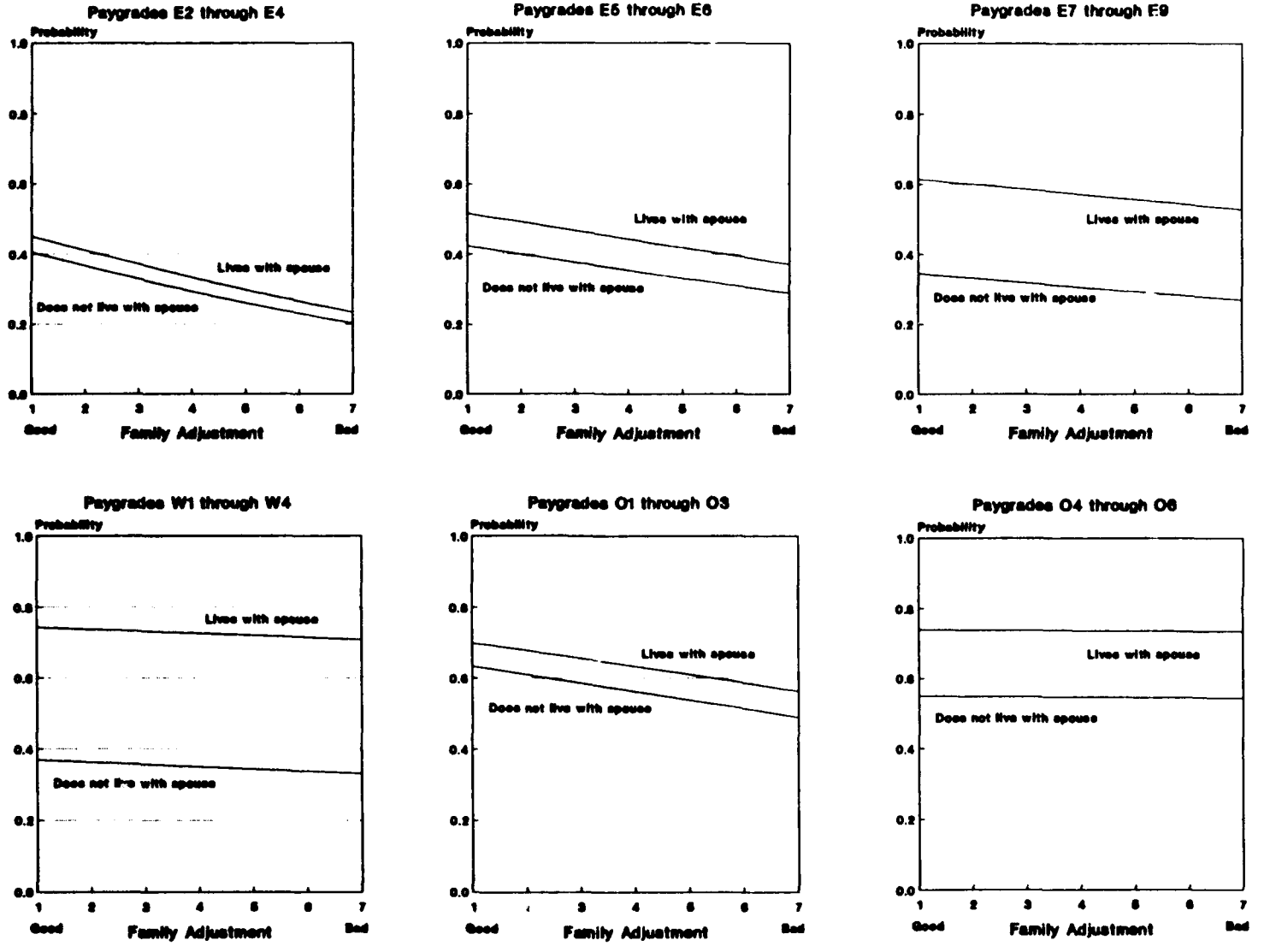


Exhibit C-4. Probability of Spouse Participation by Paygrade, Soldier's Locus of Control, and Spouse's Gender

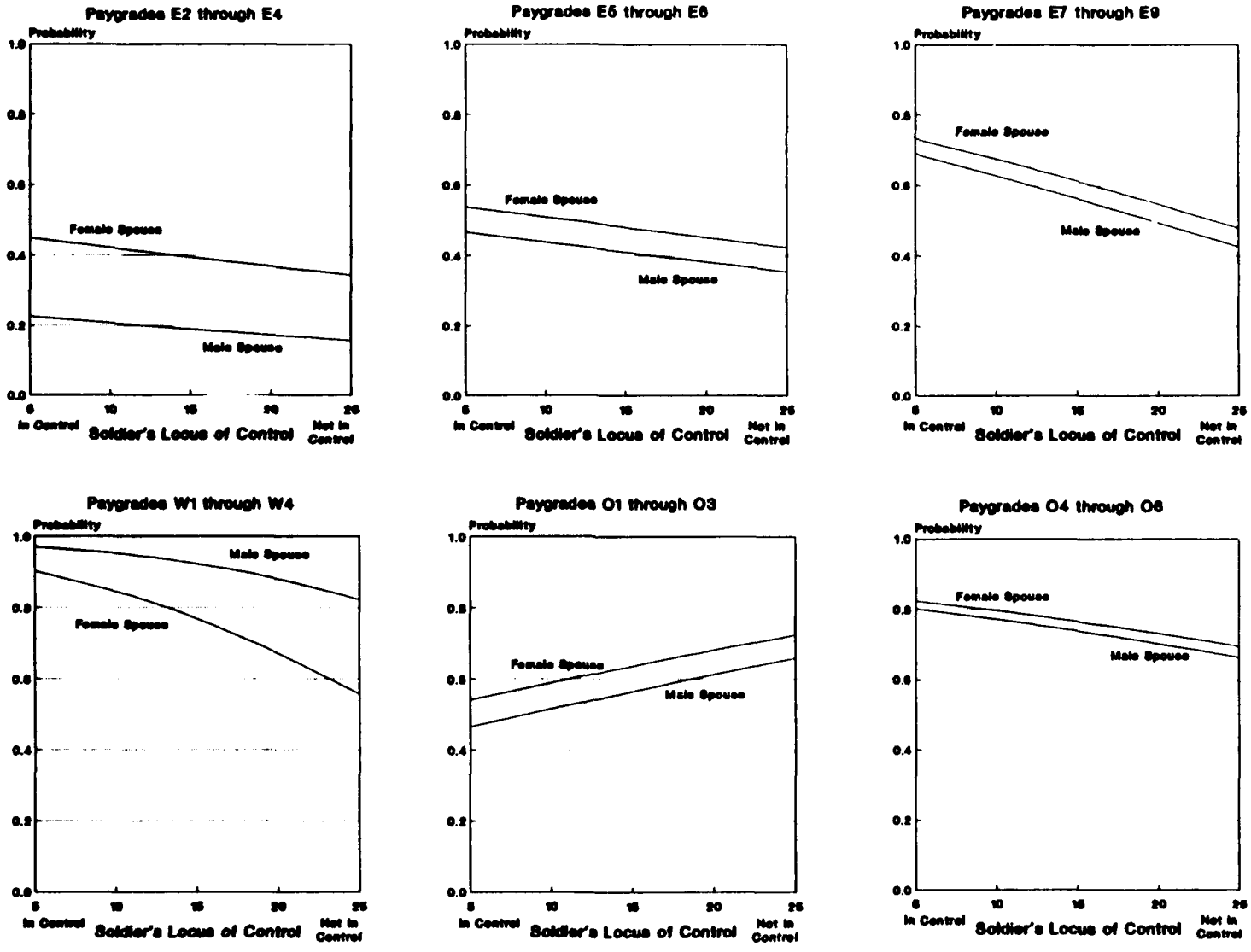


Exhibit C-5. Probability of Spouse Participation by Paygrade, Soldier's Locus of Control, and Race

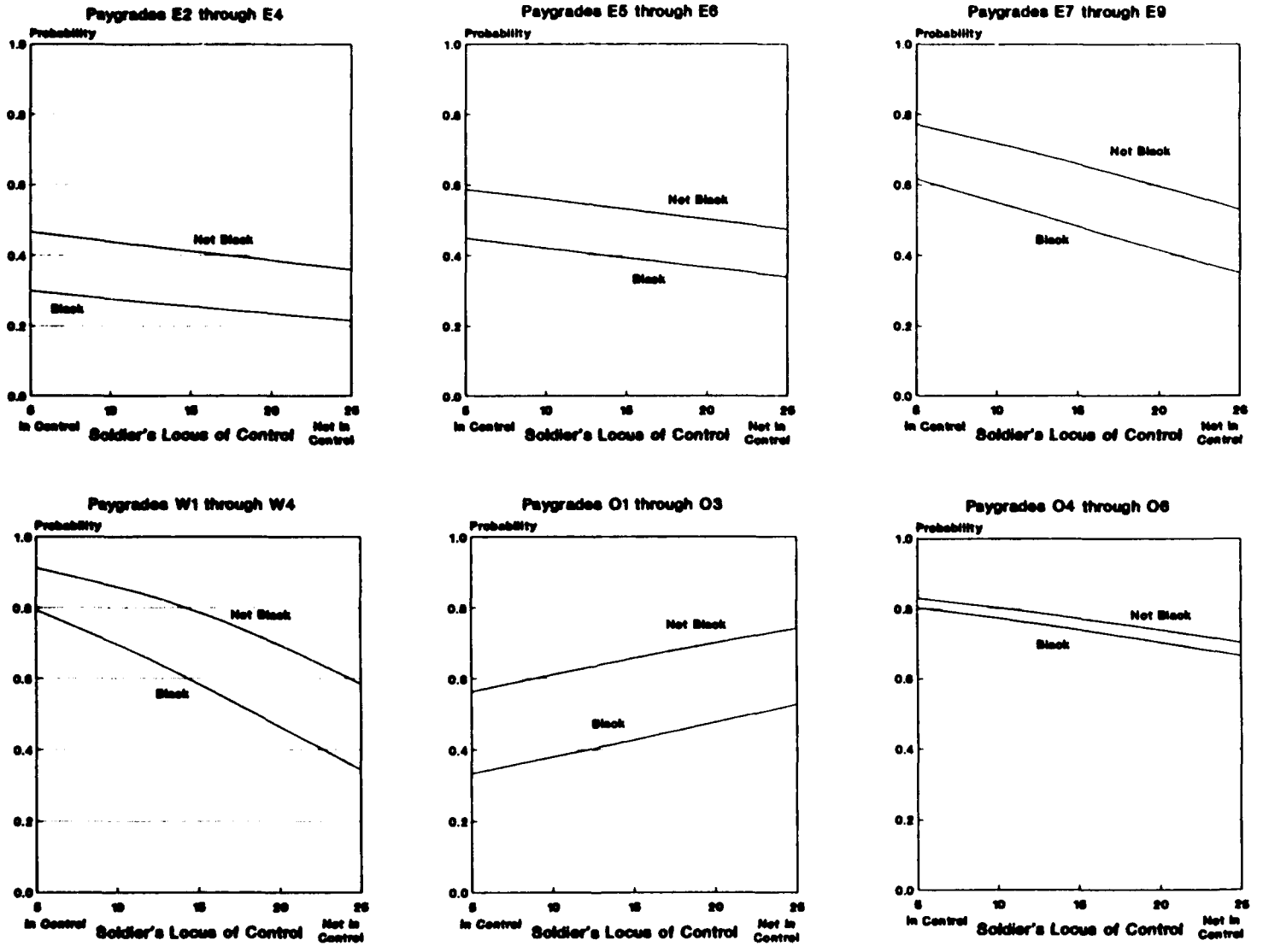


Exhibit C-6. Probability of Spouse Participation by Paygrade, Soldier's Locus of Control, and Living Arrangement

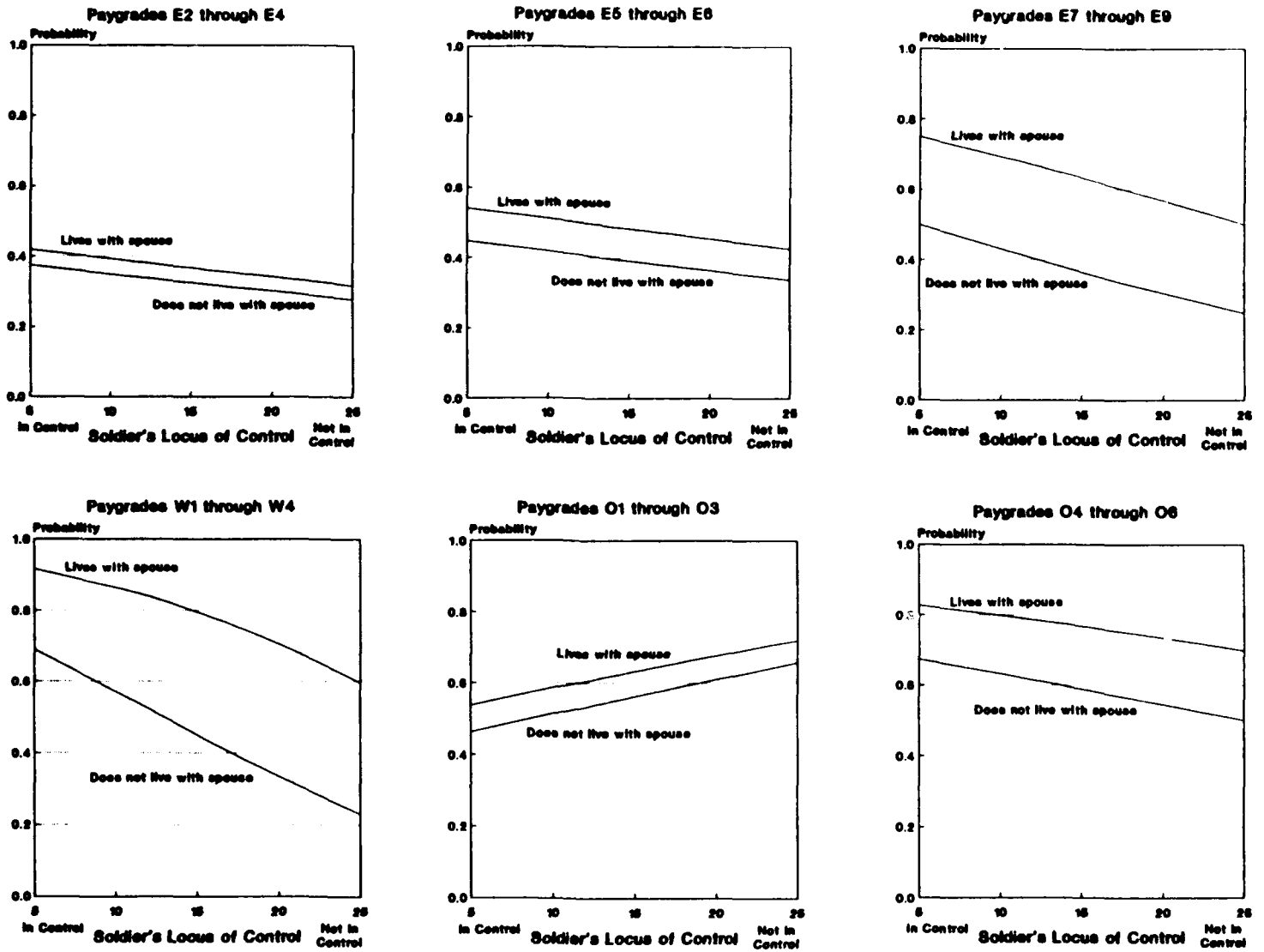


Exhibit C-7. Probability of Spouse Participation by Paygrade, Marital Separation Risk, and Race

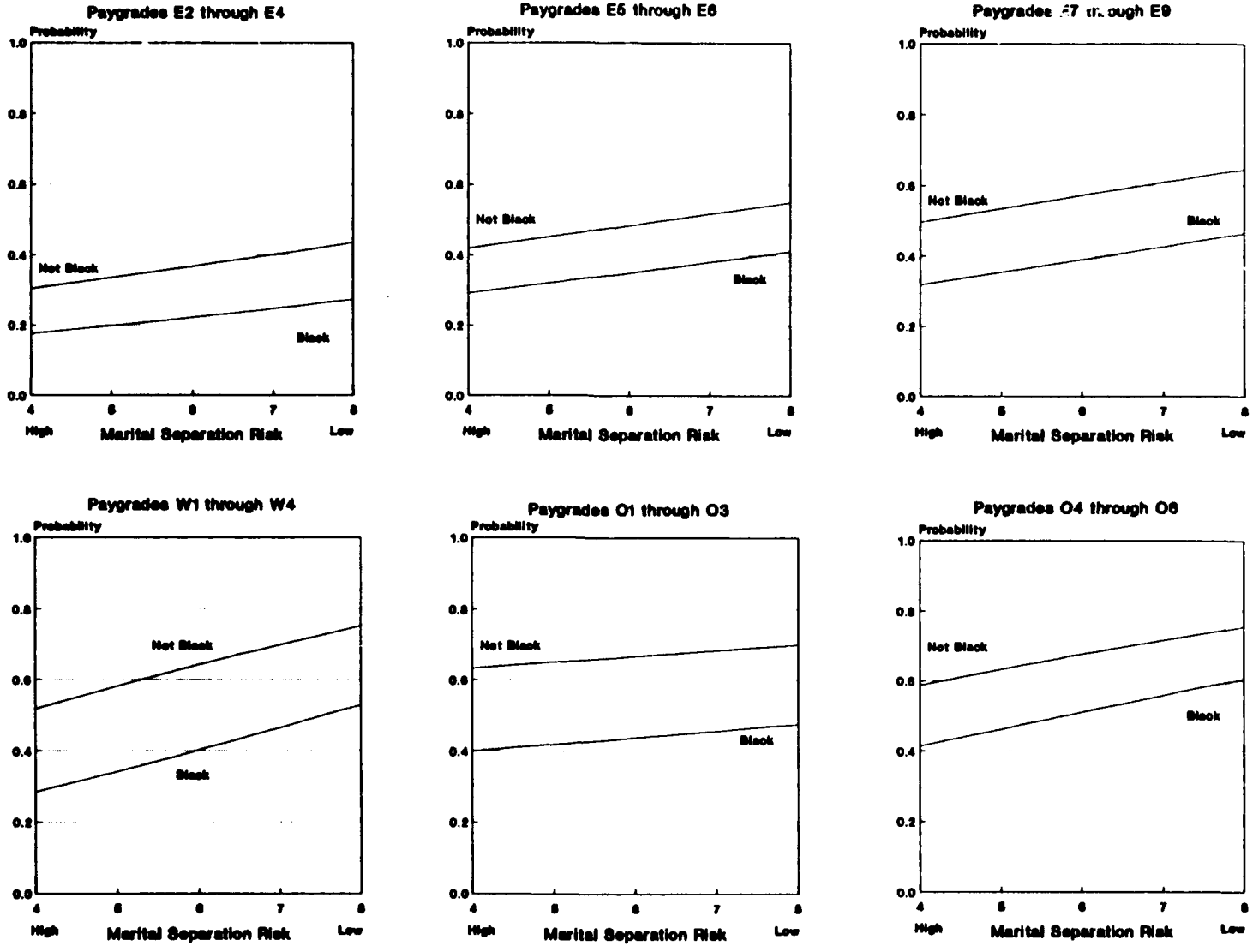


Exhibit C-8. Probability of Spouse Participation by Paygrade, Marital Separation Risk, and Spouse's Gender

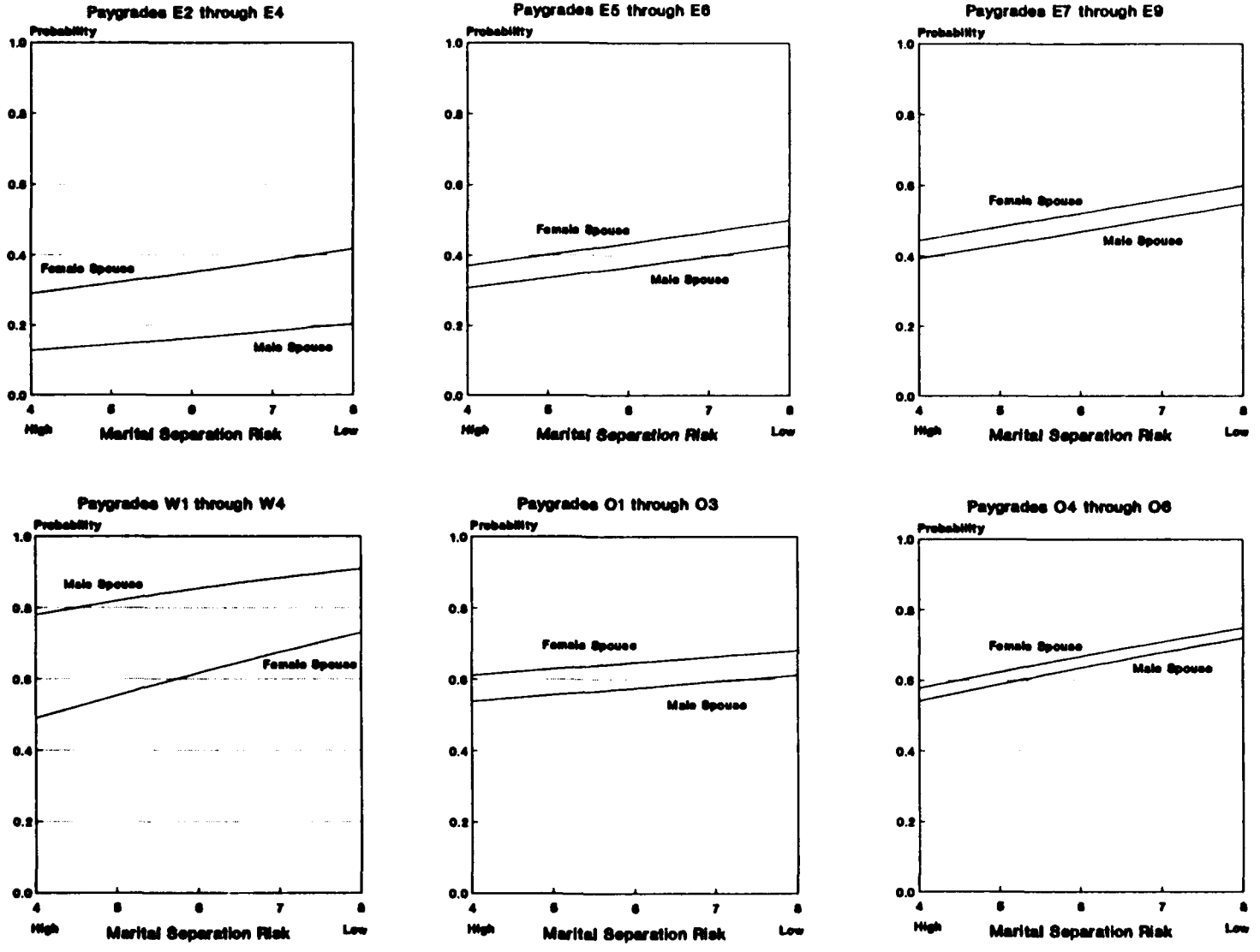


Exhibit C-9. Probability of Spouse Participation by Paygrade, Marital Separation Risk, and Living Arrangement