

Running head: EVENT HISTORY ANALYSIS OF SOLDIER ATTRITION

An Event History Analysis of First-Term Soldier Attrition

Jennifer Lee Gibson

Consortium Research Fellows Program, U.S. Army Research Institute, Arlington, VA  
Fors Marsh Group LLC, Arlington, VA

Joy Hackenbracht

Fors Marsh Group LLC, Arlington, VA

Trueman R. Tremble

U.S. Army Research Institute, Arlington, VA

Correspondence should be addressed to Jennifer Lee Gibson ([jgibson@forsmarshgroup.com](mailto:jgibson@forsmarshgroup.com))

Author note: Jennifer Gibson is now at Fors Marsh Group in Arlington, VA. Trueman Tremble is now retired.

This research was sponsored by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). The views expressed in this article reflect those of the authors and do not necessarily represent those of the U.S. Army or ARI.

An Event History Analysis of First-Term Soldier Attrition

Abstract

The study of attrition has largely focused on identifying demographic or biographic characteristics that predict whether soldiers complete their enlistment term. As a result, much is known about *who* attrites. Less is known about *why* soldiers attrite. This research assessed the influence of two psychological factors on U.S. Army soldier attrition: self-reported confidence that one could complete one's term of service and ambivalence regarding the decision to enlist. The study sample consisted of first-term enlisted soldiers ( $N = 14,808$ ) who were respondents to Army surveys. Results of fitting three longitudinal models indicated that confidence in being able to complete one's term of obligation was *more* predictive of attrition for those reporting greater ambivalence regarding the decision to enlist. This effect was significant throughout a three-year period. This work adds to our understanding of attrition by highlighting the role of confidence and ambivalence. Implications for strategies to reduce attrition are discussed.

Keywords: U.S. military; attrition; attitudes; confidence in term completion; ambivalence

### An Event History Analysis of First-Term Soldier Attrition

Retaining qualified employees is an enduring concern of work organizations, including the U.S. military. In the context of the military, attrition refers to when a service member fails to complete his or her contractual enlistment obligation (Laurence, Naughton, & Harris, 1996). Around one fifth of service members do not meet their contractual enlistment obligation and turnover costs over \$75,000 for each soldier who attrites (Gubata, Boivin, Cowan, Connor, Gary, Grinblat-Moglin, et al., 2013). Thus, since the introduction of the All-Volunteer Force in 1973, understanding the factors that contribute to attrition in the U.S. military has been a topic of continued research.

The study of attrition has largely focused on identifying demographic or biographic characteristics that predict whether soldiers complete their contractual enlistment term. As a result, much is known about *who* attrites. Less is known about *why* soldiers attrite. To address this, this research assessed the influence of two psychological factors on U.S. Army soldier attrition: self-reported confidence that one could complete one's term of service and ambivalence regarding the decision to enlist. This study is a step toward understanding *why* soldiers attrite with the end goal of contributing to targeted interventions to reduce attrition in the U.S. military.

#### *The Study of Attrition*

Although not the same as in the civilian workplace, attrition is the military's equivalent of personnel turnover (Laurence, Naughton, & Harris, 1996). Most attrition occurs early during service. Of the soldiers who attrite, half do so during the first year of service (Flyer & Elster, 1983; GAO/NSIAD-00-146, 2000; Laurence, 1986) and one third do so in the first six months of service (Fischl & Blackwell, 2000; Flyer & Elster, 1983; Klein, Hawes-Dawson, & Martin, 1991).

According to the Accession Medical Standards Analysis and Research Activity (AMSARA) 2013 annual report, from fiscal year 2007 through fiscal year 2012, at two years of service attrition rates were the highest among Army active duty enlistees at 19.8% and the lowest for Air Force recruits at 15.6% (Gubata, Boivin, Cowan, Connor, Gary, Grinblat-Moglin, et al., 2013). For the Navy and the Marines attrition rates were 17.8% and 16.0%, respectively, among first-time active duty accessions. That is to say, across each of the services roughly one fifth of active duty recruits do not meet their contractual agreements.

From a financial standpoint, attrition is costly. “Recruiting, screening, and training costs are approximately \$75,000 per enlistee” (Gubata, Boivin, Cowan, Connor, Gary, Grinblat-Moglin, et al., 2013). Given the high rates of attrition and the costs to the U.S. taxpayer, much effort has gone into understanding attrition for the sake of reducing its occurrence.

In part, due to the availability of demographic and biographic information in databases, most research on attrition has focused on using demographic or biographic variables as predictors to understand *who* attrites (e.g., Knapik, Jones, Hauret, Darakjy, & Piskator, 2004, Laurence, Naughton, & Harris, 1996). This work highlights several key demographic predictors of attrition. Recruits who did not finish high school are twice as likely to attrite than high school graduates (Elster & Flyer, 1982; Means & Laurence, 1984). Women are more likely to attrite than men (Fischl & Blackwell, 2000; Ross, Nogami, & Eaton, 1984). Married soldiers are more likely to attrite than non-married soldiers (Fischl & Blackwell, 2000).

The psychosocial and health predictors are diverse. Attrition is higher among soldiers with lower Armed Forces Qualification Test scores (Cooke & Quester, 1992), those who conform less to rules and regulations (Laurence, 1986), individuals with a history of abuse (Booth-Kewley, Larson, & Ryan, 2002), and soldiers who received a medical waiver (Krauss,

Lily, Powers, & Yuanzhang, 2000). Recruits with a history of cigarette smoking and lower rates of physical activity prior to service are more likely to attrite during basic training (Quester, 1999).

Lower levels of motivation or self-reliance, and more pessimism toward training are also associated with higher rates of attrition (Carbone, Cigrang, Todd, & Fiedler, 1999; Cigrang, Carbone, Todd, & Fiedler, 1998). For instance, the more soldiers expected to graduate from training, were eager to learn new skills, and felt that others were willing to listen to them the more likely they were to complete basic training. The more influence sergeants believed they have on attrition and if given the opportunity that soldiers will persevere, the lower the attrition rates in these platoons (Sarason, Novaco, Robinson, & Cook, 1981). This work suggests, although did not directly test, that drill sergeant attitudes may indirectly influence attrition rates by increasing self-confidence, motivation, and commitment among recruits.

Given the number of factors that predict attrition, it is fair to say that our understanding of attrition is relatively complex. Needless to say, the study of attrition has focused more on identifying *who* is unable to complete his or her contractual term of service, and less on understanding *why* this is so frequently occurring. This work augments efforts to reduce attrition rates by exploring not only *who* attrites, but *why* attrition may be occurring. Among a sample of U.S. Army soldiers, we explored the influence of two psychological factors: self-reported confidence that one could complete one's term of service and ambivalence regarding enlistment.

#### *Attitude-Behavior Consistency*

In the civilian workplace, turnover has been modeled in terms of attitudinal, behavioral, and cognitive variables (Hom & Kinicki, 2001). The longstanding role of employee attitudes in turnover research is consistent with the theory of planned behavior, which holds that attitudes,

norms, and perceived behavioral control influence behavioral intentions, which in turn influences actual behaviors (Ajzen, 1999). According to the theory of planned behavior, behaviors can be linked to specific positively or negatively valued outcomes and attributes. These outcomes and attributes automatically influence an individual's attitude toward a particular behavior. Attitudes are overall evaluations of behavior and are derived from two behavioral beliefs: 1) the perceived likelihood of particular outcomes occurring and 2) the evaluation of these outcomes (Armitage & Conner, 1999).

In the current work, we used the theory of planned behavior as a framework for understanding *why* attrition occurs. The primary attitude we examined was self-reported confidence that one would complete one's term of obligation (i.e., behavioral belief). This research was designed to first characterize the association between soldiers' behavioral beliefs and their subsequent attrition behavior, and secondly to explore the moderating effect of attitude strength. We expected that behavioral belief would negatively predict attrition, such that as confidence in one's ability to complete his or her term of service increased his or her likelihood to attrite decreased.

#### *Moderators of the Attitude-Behavior Relationship*

Many factors can disrupt or moderate the continuity of attitudes and behavior. Ambivalence is the existence of conflicting evaluations regarding an attitude (Smelser, 1998) and has been found to moderate the effect of attitudes on behavior (Petty, Wegener, & Fabrigar, 1997). In the current work, we expected that as ambivalence increased, the weaker the association between self-confidence and attrition. In other words, among soldiers who felt that enlisting may have been the wrong decision, the weaker the association between behavioral

belief and attrition. Among soldiers who felt that enlisting was definitely the right decision, the stronger the association between behavioral belief and attrition.

This research also examined how this effect might vary over time. As noted previously, military attrition most often occurs early on during training, either during the first six months or first year of service (GAO/NSIAD-00-146, 2000; Laurence, 1986). Likewise, most studies on civilian turnover show that the effect of job satisfaction on absenteeism (Brayfield & Crockett, 1955) and thoughts about quitting on turnover behavior diminish with time (Hom & Kinicki, 2001). Given the relevance of time in prior findings, this research seeks to specify the period during which attitude-behavior relationships remain significant. Thus, a series of event history models were fitted to explore temporal changes in the predictive power of behavioral belief and attitude ambivalence.

In sum, the following research questions were examined:

- a) To what extent does behavioral belief influence whether and when a soldier attrites?
- b) Does the effect of behavioral belief on the hazard function vary non proportionally over time? If so, how does the strength of prediction during the initial period of organizational entry compare to later prediction?
- c) Does behavioral belief interact with attitude ambivalence in the prediction of hazard?

## Method

### *Participants*

Participants ( $N = 14,808$ ) were part of an existing survey sample of first-term U.S. Army soldiers who enlisted during fiscal year 1999 (FY99). Data included questionnaire responses taken at reception to the Army, as well as demographic information and attrition data taken from

administrative files. Most participants were male (84%), high school graduates (100%), and White (65%). The mean age at entry to the Army was 20.2 years ( $SD = 3.1$ ).

### *Measures*

*Demographics.* Age at entry to the Army, race, and gender (0 = male, 1 = female) were taken from Army administrative databases. Marital status (0 = not married, 1 = married) and parental status (0 = no children, 1 = at least one child) at entry were self-reported by participants.

*Behavioral Belief.* Behavioral belief, regarding completion of one's term of service (typically three to four years), was assessed with a single global item from the reception survey. The item is "How confident are you that you will complete your term of obligation." The response options ranged from 1 (*Not Confident At All*) to 5 (*Extremely Confident*), and, after examination of the observed distribution, were recoded to 1 (*Not Confident At All*), 2 (*Slightly or Moderately Confident*), and 3 (*Very or Extremely Confident*).

*Attitude Ambivalence.* Attitude ambivalence regarding the enlistment contract was assessed with the following item: "At the present time, how do you feel about your decision to enlist in the Army?" Response options ranged from 1 (*Definitely made the wrong decision*) to 5 (*Definitely made the right decision*), and, after examination of the observed distribution, was recoded to 1 (*Definitely or probably made the wrong decision*), 2 (*Not Sure*), and 3 (*Probably or Definitely made the right decision*).

Descriptive statistics and correlations involving behavioral belief and attitude ambivalence, computed before and after recoding, were compared. Because the strength and significance of correlations were highly similar for the original and recoded data, it appeared that correlations were not attenuated by the recoding. Therefore, behavioral belief and attitude



ambivalence were recoded to maximize simplicity and ease interpretation of the belief-ambivalence interaction.

*Attrition.* Attrition (as of September 2002) was coded dichotomously. In this research, the event was defined as separation from the Army before the end of one's term of service (usually three to four years). Therefore, any soldier who experienced the event during the observation period (0 – 1200 days) was coded as a leaver (1).

Those who were still in the Army at the end of September 2002 (i.e., individuals who did not experience the event during the period of observation) were non leavers (0). Following Macy and Mirvis (1983), those who transferred to other positions within the Army were considered non leavers.

Censoring is a virtually inevitable problem in event occurrence data (Singer & Willett, 2003). A case is censored when the associated event time is unknown, either because the event never occurred or because the event did not occur during the observation period (Singer & Willet, 2003). In the case of this research, event times were unknown for individuals who had not left by September 2002, but whose term of service had not yet ended by that time. These soldiers may or may not have experienced the event after the observation period ended.

Reception survey dates and separation dates (where applicable) were obtained from Army administrative records. Number of days served until attrition was calculated (by subtracting separation date from reception date) for the 3,800 individuals (26% of the total sample) who left the Army. For non leavers ( $N = 10,903$ ) as of the end of the observation period (September 2002), number of days served until censoring was calculated by subtracting September 30, 2002 from reception date.

*Analyses*

Because of the continuous metric for time (number of days), the nature of event occurrence data, and substantive interest in changes in the effect of the predictor over time, Cox regression analysis, or proportional hazards modeling, was chosen as the analysis method. Censored cases provide partial information about event occurrence. Cox regression, but not traditional statistical tools, can simultaneously analyze observed and censored event times (Singer & Willett, 2003). The Cox model (Cox, 1972) employs a partial maximum likelihood estimation method and expresses a transformation of cumulative hazard as a linear function of predictors (Singer & Willett, 2003). Continuous-time hazard is a rate, not a probability, so its logarithm is treated as the dependent variable. In continuous-time models, the hazard function assesses the risk, at a particular moment, that an individual who has not yet experienced the event will do so.

The event (attrition) is either observed or censored for each individual. The event time (in days) is the amount of time from reception to attrition, and can only be calculated for observed events. The period of observation (0 to 1200 days) was delimited to include all known event times. Note that SPSS®, the software used in this study, uses the Breslow method for handling ties in event times. Breslow approximation, instead of considering all possible underlying orderings, assumes that the observed ties occurred sequentially (Singer & Willet, 2003). Within the Cox regression model, the ranked values of observed event times, rather than the observed event times, are used to compute parameter estimates, standard errors, and goodness-of-fit statistics (Singer & Willet, 2003). Thus, ties in event times are undesirable.

First, a life table, summarizing the sample distribution of attrition times, was constructed (Table 1). Although time was measured in terms of days, the period of observation was divided

into equal intervals of manageable size (60 days) for the purpose of the life table. The number experiencing the event (attrition) during each interval was used as a general characterization of attrition. Then, the survival and hazard functions, at the mean of the covariates, were plotted.

Next, three Cox regression models were fitted to the data to determine the best description of attrition in the study sample. Model A included behavioral belief, attitude ambivalence, the interaction between behavioral belief and attitude ambivalence, and two demographic variables (gender and marital status) as predictors. All effects were not permitted to vary over time.

Model B served as a test of whether the respective effects of behavioral belief and attitude ambivalence vary linearly over time (by day). Thus, Model B was a non proportional model via a continuous interaction with time. This type of model is conventionally explored prior to testing more complicated interactions with time (Singer & Willett, 2003). It was expected that the relationship between the predictors, which were measured at entry, and attrition would diminish over time.

Model C was a non proportional model via categorical interaction between time and behavioral belief, and between time and attitude ambivalence. The effects of behavioral belief and attitude ambivalence were allowed to differ across the two epochs: 0 to 90 days and 90 to 1,200 days. The first 90 days of the observation period are of particular interest, as they correspond to the initial training period. For most soldiers, the initial training period includes basic combat training and job-specific training. Therefore, interactions between time (defined by the two epochs) and the two predictors would indicate whether the quality of prediction differed across the two epochs. The interaction between behavioral belief and attitude ambivalence, plus the demographic predictors gender and marital status were also included in Model C.

## Results

In consideration of the large sample size, a stringent criterion for statistical significance ( $p < .001$ ) was employed for all significance tests. It is noteworthy that behavioral belief and attitude ambivalence demonstrated strong zero-order correlations with the dichotomous outcome, attrition. Point-biserial correlations ( $r_{pb}$ ), unlike correlations between continuous variables, are bounded by  $\pm.7978$ . The value of  $r_{pb}$  is also attenuated by the variance of the dichotomous variable, which is maximized when equal proportions (50%) of the sample have either value. In this study, 26% of the sample was categorized as experiencing the event (attrition). This proportion is considerably less than 50%. Corrections for range restriction (Steel, Shane, & Griffeth, 1990) were not applied because Cox regression accounts for the proportion of individuals who have experienced the event. However, the influence of these factors on observed bivariate correlations is noted.

A life table was constructed for descriptive purposes (Table 1). Although the time variable was continuous, the period of observation (0 to 1200 days) was divided into 60-day epochs to ease interpretation. The largest per-interval losses occurred during the first two intervals. This suggests that the first 120 days of service differed qualitatively from later stages, and comprised a period of rapid change. The finding that high rates of loss occurred in the earliest career stage is expected based on past findings (Knapik, Jones, Hauret, Darakjy, & Piskator, 2004). Soldiers complete basic combat and job-specific training (Advanced Individual Training) during that time and these experiences may be soldiers' first occasion to manage "real" Army life. Other factors may also influence attrition during training.

Graphs of the cumulative survival and hazard functions, stratified by the two predictors of interest, behavioral belief and attitude ambivalence, were constructed to evaluate the

proportionality assumption for time-invariant predictors (Figures 1 and 2). The proportionality assumption of the Cox regression model states that when the effect of a predictor is constant over time, the vertical distance between the hazard functions is constant over time. Examination of Figure 1 shows that the distance between the three functions was not constant. Examination of Figure 2 shows that, again, the distance between the three functions was not constant. Thus, it is likely that the influences of behavioral belief and attitude ambivalence on log hazard vary over time. These observations support the appropriateness of a non proportional model.

Models A, B, and C were then fitted to the data. Parameter estimates, asymptotic standard error estimates, and indices of model fit are presented in Table 2. The results of fitting Model A show that the two demographic variables, gender and marital status, contributed significantly to the prediction of attrition. Specifically, gender and marital status were positively related to attrition, indicating that women and also married soldiers were more likely to attrite. Behavioral belief and attitude ambivalence were significantly negatively related to attrition. Specifically, those reporting higher confidence that they would complete their term of service were less likely to attrite than those reporting lower confidence. The results also indicate that those reporting higher certainty that they had made the right decision to enlist were less likely to attrite. The regression coefficients in Model A were significantly different from zero,  $\chi^2(5) = 724.19, p < .001$ . Model A provided a significantly better fit to the data than the null model,  $\Delta-2LL = 548.88, p < .001$ . However, the overall fit of the model, as indicated by the Bayesian Information Criterion (BIC; 71,249.01), suggested that other relevant predictors were not included. Note that the BIC, which adjusts the log-likelihood according to the number of variance component parameters and the sample size, can be used to compare non-nested models.

Model B was tested to determine whether the effects of behavioral belief and attitude ambivalence vary linearly over time. Again, the regression coefficients were significantly different from zero,  $\chi^2(4) = 691.60, p < .001$ . Model fit was not important for this particular model, as it was used only to test for the possibility of time-varying predictor effects. The statistically significant parameters for linear change showed that the influence of behavioral belief and attitude ambivalence diminish with time.

Because evidence for the time-varying effects of the predictors was found in Model B, Model C was fitted to the data. The results showed that gender, marital status, the interaction between behavioral belief and ambivalence, and the respective interactions of time with behavioral belief and attitude ambivalence were, as a group, significant predictors of log hazard,  $\chi^2(7) = 963.43, p < .001$ . Examination of the parameter estimates showed that as in Model A, gender and marital status were positively related to log hazard. The interaction between behavioral belief and attitude ambivalence was also significant.

A graphical representation of the interaction (Figure 3) shows that the negative relationship between behavioral belief and hazard was stronger when the individual reported feeling the decision to enlist was wrong, than when he or she was not sure or believed enlisting was the correct decision. The nature of these relationships is reflected in the correlations between behavioral belief and attrition status, when the sample is divided by level of attitude ambivalence. Examination of these correlation coefficients confirms that the behavioral belief-attrition relationship is strongest for respondents endorsing “wrong decision” ( $N = 1232, r_{pb} = -.26, p < .01$ ), less strong for those who were “not sure” ( $N = 3117, r_{pb} = -.08, p < .01$ ), and near zero for those endorsing “right decision” ( $N = 10459, r_{pb} = -.02, p < .05$ ).

Lastly, behavioral belief and attitude ambivalence were significant predictors of log hazard during both the first (0 to 90 days) and second (90 to 1,200 days) intervals. Through both intervals, the predictors were negatively related to log hazard, meaning that higher values on behavioral belief and attitude ambivalence were related to a decrease in log hazard.

The parameters estimated in Model C were converted to odds ratios (log of beta), for further interpretation (Table 2). The results showed that women were 54% more likely to leave than men, and that married individuals were 40% more likely to leave than those who were unmarried. Each unit increase in confidence that one would complete one's term of service (reported at day zero) was related to a 58% decrease in log hazard during the first interval (0 to 90 days) and a 44% decrease in log hazard during the second interval (90 to 1,200 days). Likewise, each one unit increase in attitude ambivalence (e.g., reporting that one had made the right decision as opposed to being "not sure") was associated with a 58% decrease in log hazard during the first interval and a 40% decrease in log hazard during the second interval.

## Discussion

### *Findings*

This research demonstrates that behavioral belief and attitude ambivalence predict attrition among a sample of U.S. Army soldiers. Among more ambivalent soldiers (those who believed enlisting was the wrong decision) the behavioral belief-attrition association was weaker than among less ambivalent soldiers (those who believed enlisting was the right decision). The results also support the time-varying nature of these predictive relationships. Although the strength of prediction remained significant throughout the observation period, it decreased from the first interval to the second. These results offer evidence that attending to time when predicting attrition may inform efforts at modeling military turnover.

These findings have direct implications for strategies to reduce attrition. Existing approaches range from screening interventions, such as psychiatric and health screening, to training interventions, including counseling, physical fitness and incentive programs (see Kubisiak et al., 2008). These approaches largely stem from our understanding of the known demographic and biographic characteristics related to attrition. The current work demonstrates that above and beyond demographic and biographic factors, intervention programs could also benefit from boosting soldier's confidence in their ability to complete their term of service and minimizing ambivalence regarding the decision to join the military at enlistment. Increasing confidence especially early on in training is most likely to reduce attrition rates, and minimizing ambivalence at enlistment may amplify this effect.

#### *Strengths and Limitations*

This work contributes to our understanding of *why* soldiers attrite. It utilized longitudinal data which are highly valued in the study of causal relationships and change (Payne, Finch, & Tremble, 2003). Longitudinal data for large samples allows for powerful analyses, as parameter estimates are likely to have small sample variances when the sample is large (Schaubroeck & Green, 1989). While it employed a longitudinal approach, the sample evaluated in this study is specialized in that it focused on U.S. Army soldiers in their first several years of service. We suggest that these results be replicated with a more in depth study and also among other services. Behavioral belief and attitude ambivalence were assessed with single-item measures. Replication of this study with multi-item measures would certainly strengthen support for these findings.

Future work should explore the context in which a lack of self-confidence in term completion and feelings of ambivalence about enlisting may occur. For example, much work has demonstrated that economic factors, such as employment rate (see Dale & Gilroy, 1983 for a



review), influence enlistment. Likewise, the status of the economy may predict feelings of ambivalence, such that during periods of growth people may feel more ambivalent regarding the decision to enlist than during tough economic times. Understanding the contextual factors at play could provide more specific direction for strategies and interventions to reduce attrition. For instance, when unemployment rates are relatively high addressing enlistment ambivalence may be more of a priority than when unemployment rates are relatively low.

The theory of planned behavior (Ajzen, 1999) served as a framework for understanding military attrition. While we assessed certain components of this theory, not all elements were taken into account in this research. Normative beliefs, or subjective norms, refer to an individual's perception regarding referent others' approval or disapproval of a particular behavior. Normative beliefs regarding attrition were not assessed in this research. If pressure to complete one's term of enlistment is high for all recruits, the influence of normative beliefs on attrition may be minor. However, whether such norms predict attrition is still an empirical question. Exploring normative beliefs and additional job factors known to predict civilian turnover are several avenues for future work.

### *Conclusions*

This study explored the temporal variation and interactive effects of self-reported confidence that one could complete one's term of service and ambivalence regarding the decision to enlist on military attrition. This research extends prior work by focusing not on *who* attrites, but on *why* this may be occurring. The data suggest that interventions to reduce attrition in the U.S. military may benefit from improving soldiers' confidence in their ability to complete their contractual enlistment term and minimizing ambivalence at the time of enlistment.

References

- Ajzen, I. (1999). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Armitage, C.J., & Conner, M. (1999). The theory of planned behavior: Assessment of predictive validity and 'perceived control.' *British Journal of Social Psychology*, 38, 35-54.
- Booth-Kewley, S., Larson, G.E., & Ryan, M.A.K. (2002). Predictors of Naval attrition. I. Analysis of 1-year attrition. *Military Medicine*, 167, 760-769.
- Brayfield, A.H. & Crockett, W.H. (1955). Employee attitudes and employee performance. *Psychological Bulletin*, 52, 396-424.
- Carbone, E.G., Cigrang, J.A., Todd, S.L., & Fiedler, E.R. (1999). Predicting outcome of military basic training for individuals referred for psychological evaluation. *Journal of Personality Assessment*, 72, 256-265.
- Cigrang, J.A., Carbone, E.G., Todd, S. & Fiedler, E. (1998). Mental health attrition from Air Force Basic Military Training. *Military Medicine*, 163, 834-838.
- Cooke, T.W. & Quester, A.O. (1992). What characterizes successful enlistees in the All volunteer Force: a study of male recruits in the U.S. Navy. *Social Science Quarterly*, 73, 238-251.
- Cox, D.R. (1972). Regression models and life tables. *Journal of the Royal Statistical Society*, 34, 187-202.
- Dale, C. & Gilroy, C. (1983). The Effects of the Business Cycle on the Size and Composition of the U.S. Army. *Atlantic Economic Journal*, 11, 42-53.

- Elster, R.S. & Flyer, E. (1982). *A study of relationships between educational credentials and military performance criteria* (Technical Report No. NPS54-82-008). Monterey, CA: Naval Postgraduate School.
- Fischl, M.A., & Blackwell, D.L. (2000). *Attrition in the Army from signing of the enlistment contract through 180 days of service* (Research Report No. 1750). Alexandria, VA: U.S. Army Research Institute for the behavioral and Social Sciences.
- Flyer, E.S., & Elster, R.S. (1983). *First-term attrition among non-prior service enlisted personnel: loss probabilities based on selected entry factors* (Report No. NPS54-83-007). Monterey, CA: Naval Postgraduate School.
- Gubata, M. E., Boivin, M. R., Cowan, D. N., Connor, R. R., Garay, J. K., Grinbat-Mogline, V. J., et al. (2013). *Accession Medical Standards Analysis and Research Activity (AMSARA) 2013 Annual Report*. Silver Spring, MD: Walter Reed Army Institute of Research.
- Hom, P.W., & Kinicki, A.J. (2001). Toward a greater understanding of how dissatisfaction drives employee turnover. *Academy of Management Journal*, 44, 975-987.
- Klein, S., Hawes-Dawson, J., & Martin, T. (1991). *Why recruits separate early* (Report No. R-3980-FMP). Santa Monica, CA: The RAND Corporation.
- Knapik, J.J., Jones, B.H., Hauret, K., Darakjy, S., & Piskator, E. (2004). *A review of the literature on attrition from the military services: Risk factors for attrition and strategies to reduce attrition* (USACHPPM Report No. 12-HF-01Q9A-04). Ft. Knox, KY: Center for Accessions Research.
- Krauss, M.R., Lily, T., Powers, T., & Yuanzhang, L. (2000). *AMSARA: Accessions Medical Standards Analysis and Research Activity 1999 Annual Report*. Washington, DC.

- Kubisiak, U.C., Lentz, E., Horgen, K.E., Bryant, R.H., Connell, P.W., Tuttle, M.D., Borman, W.C., Young, M.C., & Morath, R. (2008). *Review of interventions for reducing enlisted attrition in the U.S. military: An update* (Institute Report 636). Tampa, FL: Personnel Decisions Research Institutes, Inc.
- Laurence, J.H. (1986). *A comparison of moral character predictors of military performance* (Technical Report No. 86-8). Alexandria, VA: Human Resources Research Organization.
- Laurence, J.H., Naughton, J.A., & Harris, D.A. (1996). *Attrition revisited: Identifying the problem and its solutions* (ARI Research Note 96-20). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (ADA 309 172)
- Macy, B.A., & Mirvis, P.H. (1983). Assessing rates and costs of individual work behaviors. In S.E. Seashore, E.E. Lawler, P.H. Mirvis, & C. Cammann (Eds.), *Assessing organizational change*, (pp. 139-177). New York, NY: Wiley.
- Means, B., & Laurence, J.H. (1984). *Characteristics and performance of recruits enlisted with General Education Development Credentials* (Technical Report No. FR-PRD-84-6). Alexandria, VA: Human Resources Research Organization.
- Payne, S.C., Finch, J.F., & Tremble, T.R. (2003). Validating surrogate measures of psychological constructs: The application of construct equivalence to archival data. *Organizational Research Methods*, 6, 363-382.
- Petty, R.E., Wegener, D.T., & Fabrigar, L.R. (1997). Attitudes and attitude change. *Annual Review of Psychology*, 48, 609-647.
- U.S. Government Accountability Office. (2000). *Military personnel: Services need to assess efforts to meet recruiting goals and cut attrition* (Report No. GAO/NSIAD-00-146). Washington, DC: General Accounting Office.

- Quester, A.O. (1999). *Bootcamp attrition rates: predictions for FY 1999* (Report No. CAB 99-57). Alexandria, VA: Center for Naval Analysis.
- Ross, R.M., Nogami, G.Y., & Eaton, N.K. (1984). *The impact of occupational speciality and soldier gender on first tour enlisted attrition* (Technical Report No, 627). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Sarason, I.G., Novaco, R.W., Robinson, G.L., & Cook, T.M. (1981). *Recruit attrition and the training unit environment* (Technical Report No. AR-004, 1981). Arlington, VA: Office of Naval Research.
- Schaubroeck, J., & Green, S.G. (1989). Confirmatory factor analytic procedures for assessing change during organizational entry. *Journal of Applied Psychology, 74*, 892-900.
- Singer, J.D., & Willett, J.B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. New York, NY: Oxford University Press.
- Smelser, N.J. (1998). The rational and the ambivalent in the social sciences. *American Sociological Review, 63*, 1-16.
- Steel, R.P., Shane, G.S., & Griffeth, R.W. (1990). Correcting turnover statistics for comparative analysis. *Academy of Management Journal, 33*, 179-187.

Table 1

*Life Table Describing Attrition of First-Term Soldiers*

Interval start time (days)	Number			Proportion	
	Exposed to risk during interval	Leaving during Interval	Censored during interval	Leaving	Staying
0	14,703	814	0	0.0551	0.9446
60	13,889	621	0	0.0447	0.9553
120	13,268	326	0	0.0246	0.9754
180	12,942	144	0	0.0111	0.9889
240	12,798	150	0	0.0117	0.9883
300	12,648	140	0	0.0111	0.9889
360	12,508	136	0	0.0109	0.9891
420	12,372	177	0	0.0143	0.9857
480	12,195	194	0	0.0159	0.9841
540	12,001	194	0	0.0162	0.9838
600	11,807	193	0	0.0163	0.9837
660	11,614	154	0	0.0133	0.9867
720	11,460	271	0	0.0236	0.9764
780	11,189	106	0	0.0095	0.9905
840	11,083	47	0	0.0042	0.9958
900	11,036	13	0	0.0012	0.9988
960	11,023	11	0	0.0010	0.9990
1020	10,582	22	860	0.0021	0.9979
1080	9,427	60	1406	0.0064	0.9936
1140	6,532	11	4264	0.0017	0.9983
1200	2,202	16	4373	0.0073	0.9927

*Note.* The cumulative proportion surviving at the end of 1200 days was .7360.

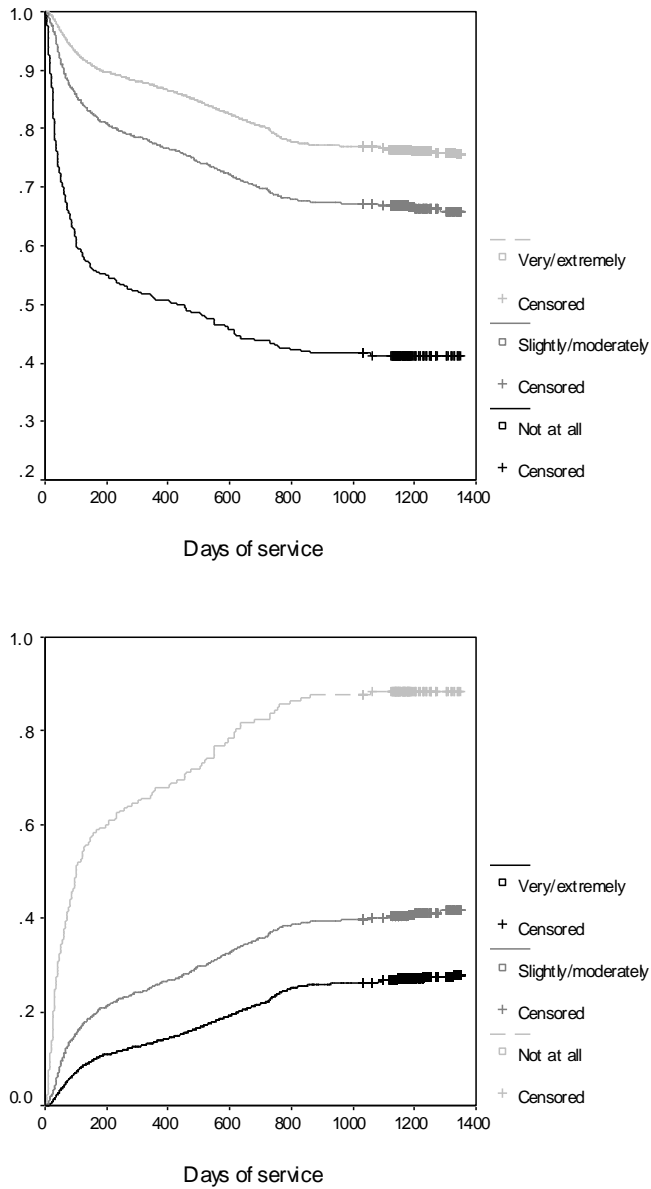
Table 2

*Fitting Cox Regression Models of First-Term Soldier Attrition*

	Model A		Model B		Model C	
<i>Standardized Parameter Estimates and Asymptotic Standard Errors</i>						
						<i>OR</i>
Gender	0.43 ***				0.43 ***	1.54
	0.04				0.04	
Marital status	0.34 ***				0.34 ***	1.40
	0.05				0.05	
Behavioral belief	-0.82 ***		-0.59 ***			
	0.08		0.05			
Ambivalence	-0.79 ***		-0.43 ***			
	0.12		0.04			
Behavioral belief X Ambivalence	0.22 ***				0.16 ***	1.18
	0.04				0.04	
Behavioral belief X (Time - 1)			0.001 ***			
			0.00			
Ambivalence X (Time - 1)			0.001 ***			
			0.00			
Behavioral belief (0 to 90 days)					-0.87 ***	0.42
					0.09	
Behavioral belief (90 to 1,200 days)					-0.58 ***	0.56
					0.10	
Ambivalence (0 to 90 days)					-0.88 ***	0.42
					0.12	
Ambivalence (90 to 1,200 days)					-0.51 ***	0.60
					0.12	
<i>Goodness-of-fit and Deviance-Based Hypothesis Tests</i>						
LL	-35,614.09		-35,626.62		-35,548.62	
-2LL	71,228.17		71,253.23		71,097.24	
$\Delta$ -2LL	548.88 ***		523.82 ***		130.93 ***	
Comparison model	Null		Null		Model A	
Number of parameters	5		4		7	
BIC	71,249.01		71,269.90		71,126.41	

Note. \*\*\*  $p < .001$ . -2LL for the null model is 71,777.05.  $N = 14,703$ ,  $N$  events = 3,800. Odds ratios for Model C are reported in the right most column.

Breslow method for handling ties.



*Figure 1.* Estimated survival (top panel) and cumulative hazard (bottom panel) functions, stratified by behavioral belief, an indicator of respondents' confidence that he or she would complete the current term of service. Note: Response options for behavioral belief ranged from 1 (*very/extremely confident in term completion*) to 3 (*not at all confident in term completion*).



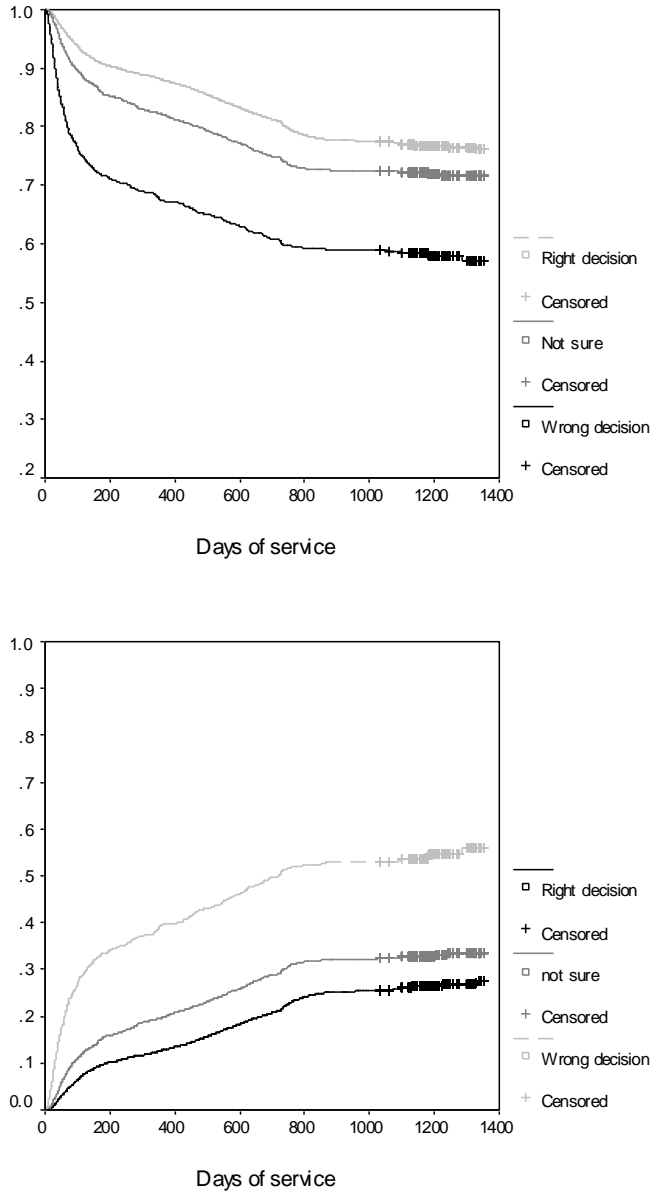


Figure 2. Estimated survival (top panel) and cumulative hazard (bottom panel) functions, stratified by attitude ambivalence, an indicator of respondents' feelings regarding the decision to enlist. Note: Response options for attitude ambivalence ranged from 1 (*made the wrong decision to enlist*) to 3 (*made the right decision to enlist*).

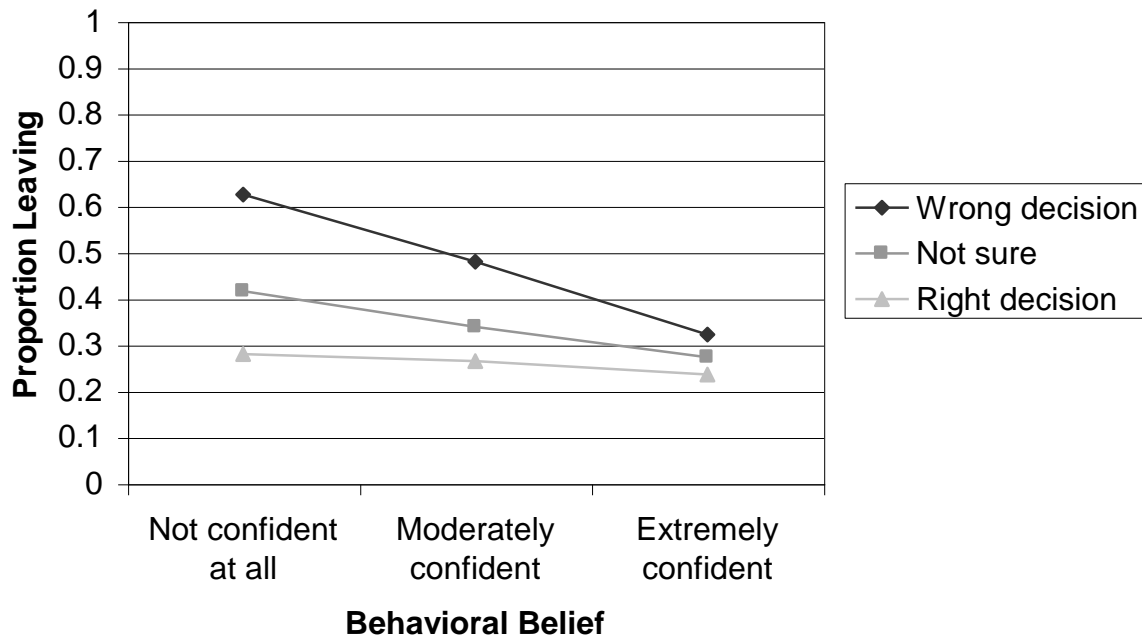


Figure 3. Behavioral belief (confidence in term completion) and attitude ambivalence about the enlistment decision interact to predict attrition.