



## **Attrition Among Female Tenure-Track Faculty**

Louise August  
Research Specialist  
Center for the Education of Women

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**Center for the Education of Women**  
**The University of Michigan**  
**330 E. Liberty St. Ann Arbor, MI 48104-2289**  
**734/998-7080**  
**<http://www.cew.umich.edu>**

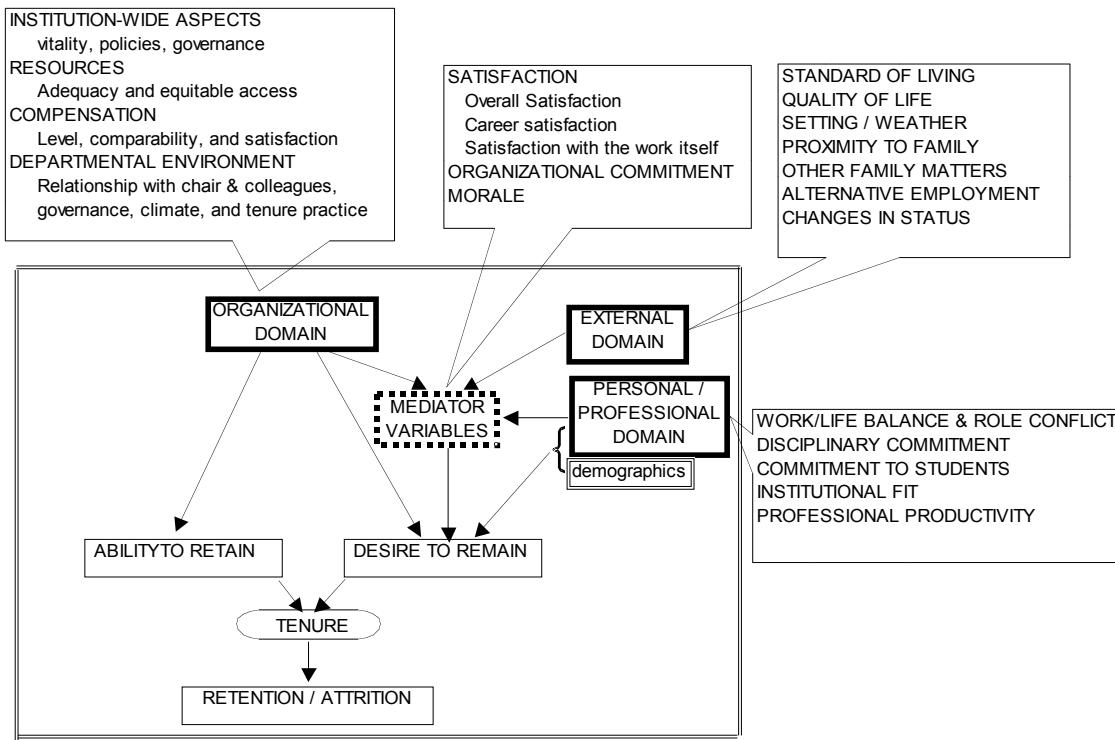
**ABSTRACT:** This study examines data from a 1996 faculty survey updated in late 2004 with current employment information at a Research I institution in the Midwest. A series of logistic regressions was conducted to examine faculty attrition using actual departure rather than self-reported departure intentions. The rate of attrition was found to be higher for women than for men ( $p < .01$ ). The findings further suggest, as does the research literature, that women experience their academic careers differently from men, and that different factors contribute to their decisions to leave.

While the number and percentage of women in the professorate has been increasing, they are still far from parity in representation. This is a complex, multi-faceted problem that is the result of a number of related smaller, but no less important issues. In particular, two studies (Rausch et al., 1989; Rothblum, 1988) found that the rate of voluntary departure was more than two times greater for women than men. A tenure-track position and the eventual attainment of tenure is the aspiration of most would-be faculty. However, these types of positions, once the mainstay of academia, are becoming less prevalent as institutions increase their utilization of part-time positions and full-time, but non-tenure-track, faculty positions. (NCES, 2004), (NCES, 2002). Having achieved such a coveted, yet scarce position, why do women in tenure-track positions choose to leave them? It is this particular point of leakage from the pipeline, women's attrition from the academy, that is the focus of this research. Studies that do not investigate gender difference make an implicit (and incorrect) assumption that the experiences of women and men are alike. Likewise, studies that only examine women may provide insight into women's particular experience, however, they do not tell us how those experiences differ from men. This study provides the opportunity to examine attrition for both women and men.

## CONCEPTUAL FRAMEWORK

To aid in conceptualizing faculty's employment decisions, Figure 1 presents an original comprehensive framework to draw together the various constructs and variables the research has demonstrated as being correlated with retention and attrition. This model addresses the dynamics of retention and attrition for talented, competent faculty whom the institution wishes to retain; it is not intended to include individuals not capable of achieving tenure whose departure would occur through contract non-renewal, tenure denial, or dismissal for cause. Retention is an outcome that results from the institution's ability to retain valued faculty in conjunction with the valued faculty member's desire to remain in the institution. Attrition is the outcome when this intersection does not occur - either because the individual wishes to leave or the institution is unable to induce them to stay. Variables are clustered in the three major domains (personal/professional, organizational, and external) shown in heavy boxes, plus mediator variables shown in a dashed box. Each of these four major groups has a callout box listing specific constructs shown to be important to attrition. This basic structure is suggested throughout the literature where distinctions are made between individual and organizational constructs (e.g., Cotton & Tuttle, 1986; Hagedorn, 2000; Johnsrud & Heck, 1994; Smart, 1990; Steel & Ovalle, 1984). The presence of intermediate constructs positioned between various antecedents and actual departure was conceptualized in numerous studies (e.g., Barnes, Agago, & Coombs, 1998; Bluedorn, 1982; Johnsrud & Rosser, 2002; Manger & Eikeland, 1990; Smart, 1990). Likewise a group of external factors such as career opportunities and family considerations (e.g., Caplow & McGee, 1958; Hagedorn, 2000; Lee & Mitchell, 1994; Matier, 1990; Steers & Mowday, 1981; Sorcinelli & Near, 1989).

**Figure 1: Framework for Conceptualizing Faculty Retention/Attrition**



It should be noted that the framework also applies to tenured faculty, in which case the tenure oval drops out. Retention is then the intersection of the institution's ability to retain faculty in conjunction with faculty's desire to remain in the institution, without mediation by the tenure process.

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## METHODOLOGY

The study utilizes data from a 1996 faculty work/life survey updated with current employment information at a Research Extensive institution in the Midwest. The study employed a census approach to survey all university faculty who held at least half-time instructional appointments and had been at the university for at least one year. Tests comparing survey data with the university personnel database showed no significant differences across several measures, indicating that the respondent group was fairly representative of the faculty population as a whole, at least in terms of observable characteristics.

The addition of current data provides the opportunity to examine actual departure behavior rather than other proxy measures such as faculty's self-reported intentions to leave or engagement in job seeking activities (i.e., conversations/interviews about other academic positions, completing applications, and receiving offers of employment). The new data also provided information needed to create variables for current academic rank, employment status, and for identifying certain non-voluntary departures.

There was an overall response rate of 45% (n=962) with similar response levels among the three ranks. Overall, women responded at a somewhat higher rate than men, 52% vs. 42% respectively. Respondents came from a wide range of disciplines across the university, representing nearly all schools, colleges, and departments.

In studying populations of leavers, it is appropriate to consider only voluntary departures and identify those who have left the institution involuntarily due to death, denial of tenure or termination for cause. While departure due to retirement is certainly voluntary, it is likely to be undertaken for very different reasons and motivations, and therefore should not be conflated with voluntary departures. The university's personnel database identifies three categories of departures: death, retirement, and termination. Within the third category are all other types of departures, including all manner of voluntary departures, as well as involuntary departures as a result of tenure denial.

Identifying those who leave as a result of tenure denial (or in anticipation of a negative tenure decision) would be a desirable refinement however, the inability to do so may not create an unacceptable distortion of the results. At least one study (Rausch et al., 1989) found that the majority of those who left were next employed at other prestigious teaching or research institutions and often went on to achieve tenure at the new institution. As the authors noted,

“leaving is not necessarily synonymous with ‘failure’ or non-tenure” (p.2). Identifying particular types of departures allows the examination of attrition to focus on the stayers and leavers without the possibly confounding effects such as those described above. This results in a study sample of 756 cases; of which approximately three quarters are stayers – those still actively employed within the university

Factor analysis was conducted to reduce the data and produce scales sufficiently connected to thematic areas to be useful in the conceptual model, using the principle axis method to extract the factors with varimax rotation to produce a more meaningful solution. Variables with factor loading values less than .30 are considered insubstantial (Benson & Nasser, 1998; Kim & Mueller, 1978) and have been dropped from the factor for the development of subsequent summated scales. Chronbach’s alpha was calculated for each factor to evaluate the reliability or internal consistency of the items. Factors with alpha values of less than .60 were discarded (Nunnally, 1964). The following table (Table 1) describes how the variables map onto the model’s constructs.

**Table 1: Variables in the Model**

<b>Model Domains</b>	<b>Item Type</b>	<b>Crohnbach's Alpha</b>
<b>PERSONAL / PROFESSIONAL</b>		
Demographics	Various	--
Discipline	Single item	--
Work/Life Balance	Single item	--
Disciplinary commitment	Factor	.6865
Commitment to teaching/students	Factor	.7687
Institutional Fit	Single item	--
Professional productivity	Factor	.7259
<b>ORGANIZATIONAL</b>		
Organizational barriers	Single item	--
Equitable resource distribution	Single item	--
Resource adequacy	Factor	.8327
Importance of salary	Factor	.6846
Satisfaction of salary	Single item	--
Comparability of salary	Single item	--
Relations with chair	Factor	.8562
Inequitable Workload	Factor	.7088
Departmental influence	Factor	.8318
Disparaging remarks	Factor	.8195
Collaborate with colleagues	Single item	--
Valued as scholar	Factor	.8051
Ease of fitting in	Factor	.7534
Fair tenure practices	Factor	.8258
<b>EXTERNAL</b>		
Improve standard of living	Single item	--
Improve quality of life	Factor	.7069
Improve work life	Factor	.7726
Job betterment	Factor	.8226
Proximity to family	Single item	--
Improve partner's career	Single item	--
Recently promoted	Single item	--
New to institution	Single item	--
<b>MEDIATOR VARIABLES</b>		
Choose faculty career again	Single item	--
Satisfaction with teaching	Factor	.7304
Satisfaction w/ professional development	Factor	.6653
Organizational commitment	Single item	--
Hold administrative post	Single item	--
Committee service	Single item	--

The outcome item in the conceptual framework is “retention/attrition”. At any point in time, faculty will have made a one of the two available choices; to stay or to leave. The dependent variable used throughout this study is whether that event (a faculty member leaving her/his employment at the university) has or has not occurred. This is a dichotomous variable; that is, having only two possible values - they are still here (=0) or have left (=1). Logistic regression accommodates a dichotomous dependent variable as well as non-continuous independent variables (Menard, (2001), as is the case in this study).

Logistic regression applies a natural log transformation ( $\ln$ ) to the following equation (see Figure 2). The dependent variable becomes the log of the odds that a particular choice will be made (DesJardins, Dundar, & Hendel, 1999). The logistic regression model is described mathematically in Figure 2:

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**Figure 2: Logistic Regression Formula**

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$$\ln \frac{P}{1 - P} = \ln (\text{odds}) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$


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Where  $P$  is the probability that a faculty member has left the university and  $1-P$  is the probability that they have not left.  $X_1$  is the set (domain) of personal/professional variables,  $X_2$  is the set of organizational/departmental variables,  $X_3$  is the set of external variables, and  $X_4$  is the set of mediator variables.  $\alpha$  and  $\beta$  are regression coefficients to be estimated, and  $\varepsilon$  is a random error term that is logically distributed (DesJardins et al., 1999). The dependent variable in the regression equation is the natural logarithm of the odds (log odds) that a particular choice will be made. Tests indicated there was no statistical evidence for either collinearity or multicollinearity (Hair, Anderson, Tatham, & Black, 1995; Tabachnick & Fidell, 1989).

A series of logistic regressions were performed using the variables in the model to examine relationships between the various domains of independent variables in the model and the retention/attrition outcome. The independent variables were entered in blocks corresponding to the domains described in the framework (see Figure 1).

### *Limitations*

Academics are not a homogenous population, nor are the institutions in which they serve; institutions vary greatly in size and mission and there is enormous variation among the academic disciplines. Accordingly, single site studies are often assumed not to generalize well to academia overall. However, none of the national or multiple-site studies found institutional type to be a significant variable (e.g., Johnsrud & Rosser, 2002; McCain et al., 1983; Nussel & others, 1988; Smart, 1990; Tolbert et al., 1995). This suggests that the research findings are stable across various institutional types and are in fact more generalizable than might be supposed.

Though marital status is a commonly used demographic variable, neither the original survey questionnaire nor the university's personnel database capture this information. This may not be a serious problem; although numerous studies in the literature included marital status in their demographic variables, none reported that it was significant in their findings.

## RESULTS

### *Rate of Attrition*

Nearly one quarter of respondents have left their employment at the university (see Table 5). The rate of attrition is higher for women (29%) than for men (21%); a difference that is statistically significant ( $p < .01$ ).

**Table 5: Rate of Attrition by Gender**

	Stayers		Leavers		Total	
	N	%	N	%	N	%
Female	154	71%	62	29%	216	29%
Male	429	79%	111	21%	540	71%
Total	583		173		756	
% of Total Category		77%		23%		100%

$\chi^2(df=1, N=756) = 5.805, p < .01$ .

The rate of attrition has an inverse relationship with rank, that is, attrition diminishes as higher rank is attained (see Table 6). One-way ANOVA analyses were performed to explore the impact of rank on the stay/leave decision for the sample as a whole and when split by gender. There is a statistically significant difference for the three ranks: the rate of attrition for assistant professors is higher than all others; more than twice that of associate professors, and more than three times that of full professors. Post hoc comparisons using the Tukey HSD test indicate that the difference between assistant professors and the other two ranks are statistically significant at  $p < .0001$ . The difference in the rate of attrition between full and associate professors is not statistically significant. The same patterns of attrition are evident when examining rank within gender classifications.

Overall, women have a higher rate of attrition than men and that difference, as described above, is statistically significant. Additionally, assistant professors have a rate of attrition statistically higher than their tenured colleagues both overall and within gender classifications. However, when examining the attrition of women and men at each rank separately, the differences are minimal. For example, at the assistant professor rank women and men both show a stay/leave pattern of approximately 60/40 (see Table 6).

**Table 6: Rate of Attrition by Gender and Rank**

	Women		Men		Total	
	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers
Full	82%	18%	89%	11%	88%	12%
Assoc	82%	18%	82%	18%	82%	18%
Asst	60%	40%	58%	42%	59%	41%
Total	71%	29%	79%	21%	77%	23%
N	154	62	429	111	583	173
ANOVA	F=6.676 (2,213), p <.002		F=28.865 (2,537), p <.0001		F=37.170 (2,753), p <.0001	
Tukey	Asst-Assoc: sig p<.005		Asst-Assoc: sig p<.0001		Asst-Assoc: sig p<.0001	
	Asst-Full: sig p<.013		Asst-Full: sig p<.0001		Asst-Full: sig p<.0001	
	Assoc-Full: not sig		Assoc-Full: not sig		Assoc-Full: not sig	

### *Results of Logistic Regression & Interpreting the Regression Coefficients*

Logistic regression analysis is performed regressing the dependent variable on the independent variables described in Tables 1-4 and identified in the conceptual framework. The measures used to evaluate the statistical significance of the model and the measures of explanatory power are similar to those used in linear regression. Log-likelihood is the criterion for increasing model fit in a logistic regression model (this is similar to the ANOVA output in OLS regression analysis). The log-likelihood multiplied by -2 (abbreviated as -2LL) approximates a Chi-square distribution where the degrees of freedom (df) are equal to the difference between the number of parameters in the two models being compared (DesJardins et al., 1999). Nagelkerke pseudo R<sup>2</sup> is a statistic analogous to R<sup>2</sup> in OLS used to estimate the model's explanatory power (Menard, 2001).

Bivariate analysis indicates that attrition is significantly higher for women than for men. To understand better the ways in which they differ the sample is split on gender and the model run for the women in the sample (n=216) and again for the men in the sample

(n=540). These results are presented in Table 7. The variables are stable and consistent across the block of the models, so to conserve space, only the final blocks are shown.

**Table 7: Results of Logistic Regression Analysis**

Variable Blocks	All n=756		Women n=216		Men n=540	
	B	Sig.	B	Sig.	B	Sig.
Demographics						
Gender	-0.482	*				
Race	-0.131		0.411		-0.207	
Children living w/ you	-0.032		-0.045		-0.047	
Personal / Professional						
Life sciences	-0.595		-1.106		-0.165	
Science / engineering	-0.206		1.253		-0.367	
Social science	0.180		-0.031		0.295	
Humanities	0.197		0.234		0.499	
Work / life balance	-0.265	*	-0.083		-0.361	*
Importance of teaching	-0.003		-0.068		0.065	
Institutional fit	0.024		-0.310		-0.018	
Organizational						
Organizational barriers	0.600	**	1.312	*	0.247	
Equitable resource distribution	0.296		0.286		0.269	
Resource adequacy	0.043		0.090		0.028	
Importance of salary	-0.069		0.089		-0.088	
Satisfaction w/ salary	0.073		0.248		-0.034	
Comparability of salary	0.205		-0.034		0.269	
Relations w/ chair	-0.002		0.015		-0.068	
Workload	0.144	*	0.280	*	0.114	
Departmental influence	-0.079	*	-0.194	*	-0.003	
Disparaging remarks	-0.058	*	-0.169	**	-0.009	
Collaboration w/ colleagues	-0.074		-0.158		-0.046	
Value as a scholar	-0.102		-0.224		-0.031	
Ease of fitting in	0.016		0.059		-0.027	
Fair tenure practices	-0.040		0.122		-0.033	

**Table 7: Results of Logistic Regression Analysis – continued**

Variable Blocks	All n=756		Women n=216		Men n=540	
	B	Sig.	B	Sig.	B	Sig.
<b>External</b>						
Improve standard of living	-0.087		-0.301		0.082	
Improve quality of life	0.061		0.172	*	0.020	
Improve work life	-0.044		-0.033		0.033	
Job betterment	0.145	*	0.109		0.121	
Proximity to family	0.176	*	-0.061		0.236	*
Improve partner's career	0.152		0.022		0.139	
Recently promoted	0.291		-0.954		-0.012	
New to UM	0.201		1.455		0.498	
<b>Mediators</b>						
Choose again	-0.669	***	-0.757		-0.731	**
Satisfaction w/ teaching	0.013		0.115		-0.018	
Satisfaction w/ professional development	-0.020		-0.083		0.048	
Organizational commitment	0.126		0.423		0.123	
Hold admin post	0.016		-0.224		0.428	
Committee service	0.155		1.235		-0.645	
Constant	-2.017		-4.402		-2.112	
-2 Log Likelihood Improvement						
Degrees of freedom	110.40		86.10		95.21	
	38		40		40	
	***		***		***	
Nagelkerke pseudo R <sup>2</sup>						
	.22		.48		.27	

\* p<.05, \*\*p<.01, \*\*\*p<.001

The models for women and men are both significant at p<.001, with pseudo R<sup>2</sup> = 48% and 27%, respectively. Demographic variables are not significant in either model. None of the variables in the personal/professional domain are significant in the women-only model. WORK / LIFE BALANCE is significant only for men (p<.05).

None of the variables in the organizational domain are significant in the men-only model. For women several organizational variables are significant; the perception of ORGANIZATIONAL BARRIERS (p<.05), and perception of a disproportionately high WORKLOAD (p<.05) increase the probability of attrition, while level of DEPARTMENTAL INFLUENCE

( $p < .05$ ), and the frequency of overhearing DISPARAGING REMARKS made about others ( $p < .01$ ) decrease the probability.

In the external domain, the only variable significant for women is the motivation for leaving named IMPROVE QUALITY OF LIFE ( $p < .05$ ). This factor includes items that measure the importance of achieving better balance in life, a less pressured working environment, and greater job security as a motivation for leaving. The only variable significant for men in the external domain is the motivation for leaving named PROXIMITY TO FAMILY ( $p < .05$ ), which measures the importance of living near family and friends.

None of the mediator variables is significant for women, and only CHOOSE AGAIN (agreeing that if given the chance one would again choose to be a UM faculty member) is significant for men ( $p < .01$ ).

In logistic regression, instead of calculating the expected value of the dependent variable as in OLS regression, the dependent variable is the log-odds that a particular choice (stay / leave) will be made (DesJardins et al., 1999). The estimated regression coefficients produced in the analyses are changes in the log-odds of the event (attrition) occurring due to incremental changes in the values of the coefficients. Interpretation of changes in log-odds is conceptually difficult, however a transformation can be applied to facilitate interpretation by taking the log of both sides of the equation described above (DesJardin, 2001). This changes the log odds to an odds ratio, which allows for interpretation of a one-unit change in an independent variable as a change in the odds of the event occurring.

In interpreting these coefficients, it is important to remember that because the dependent variable is coded as “stay” = 0 and “leave” = 1, a negative coefficient indicates that increased response values to the variable will reduce the probability of attrition , while

a positive coefficient will increase the probability of attrition. The odds ratios and inverse odds ratios (described below) for the models are presented in Table 8. For estimated coefficients that are negative, that is, an odds ratio less than one, the interpretation is still fairly non-intuitive. This is corrected by calculating the inverse odds ratio ( $1 \div$  odds ratio) (DesJardins, 2001). Inverse odds ratios are only calculated for negative coefficients and the effect on the odds of attrition is shown only for significant variables.

An example from Table 8 may facilitate interpretation using the odds ratio calculation. The estimated regression coefficient for WORKLOAD is 0.280 indicating that the log-odds of leaving is 0.280 units higher for those who perceive the presence of organizational barriers that impede their career progress. The corresponding odds ratio for this variable is 1.32, indicating that the odds of leaving are 1.32 times (or 32%) higher for individuals who perceive a disproportionately heavy workload. Coefficients with larger absolute values (that is, without regard to sign) will have a larger effect on attrition. For example, the coefficient for ORGANIZATIONAL BARRIERS is 1.312, indicating that the log-odds of leaving is 1.312 units higher for those who perceive the presence of organizational barriers that impede their career progress. The corresponding odds ratio for this variable is 3.71, indicating that the odds of leaving are 3.71 times (or 271%) higher. Conversely, smaller absolute values (that is, without regard to sign) will have a smaller effect on attrition.