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**ORGANIZATIONAL DEMOGRAPHY AND TURNOVER:
AN EXAMINATION OF MULTIFORM AND NON-LINEAR HETEROGENEITY**

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ABSTRACT

This paper advances the study of organizational demography and its relationship to organizational turnover by examining two of Blau's concepts of social structure: non-linear and multiform heterogeneity. In a sample of 383 community hospitals, nursing turnover was examined in relation to four dimensions of demographic heterogeneity among nursing staff in those hospitals. The form of the relationships between turnover and heterogeneity was specified to test whether heterogeneity relates to higher turnover in a linear fashion or, alternatively, whether heterogeneity affects turnover in an inverted U-shaped pattern. Results of multivariate analyses suggested strong support for the former proposition. Three of the four dimensions of demographic heterogeneity in hospital nursing staffs were positively and monotonically related to voluntary turnover among full-time registered nurses (RNs). No support was found for a curvilinear relationship, nor did mean levels of the demography measures, reflecting the locus of concentration, account for the observed relationship between demographic heterogeneity and turnover.

INTRODUCTION

Organizational demography has been described as a collective property of an organization that reflects the compositional distribution of the work force on a number of key dimensions. These dimensions include, but are not limited to, sex, tenure, age, education or socioeconomic status (Pfeffer, 1983; 1985). According to Pfeffer and others, the demographic composition of organizations may influence several important behavioral patterns, including tenure, communications, job transfers, promotions, and turnover (Jackson, et al., 1991; Zenger and Lawrence, 1989; O'Reilly, et al., 1989; Wagner, et al., 1984; Pfeffer and Moore, 1980). The relationship between demography and organizational behavior assumes particular salience in the current economic climate in which competitive pressures and changing technologies emphasize collective styles of management and jobs that are redesigned to take advantage of the benefits of group interaction and teamwork (Banas, 1988; Porter, 1990; Schuler and Jackson, 1987; Jackson, et al., 1991). To the extent that such modes of production depart from those that have traditionally emphasized homogeneous groupings of workers, an examination of demographic heterogeneity and its effects on patterns of organizational behavior seems particularly germane.

In the current investigation, we focus on voluntary organizational turnover as the outcome of interest. We extend the line of inquiry on organizational demography and turnover by examining two concepts from Blau's work on heterogeneity and social structure (Blau, 1977). The first, multiform heterogeneity, posits that multiple parameters of social structure potentially influence the degree of cohesion and integration among social groups. Previous demographic research has tended to examine only a single dimension of demography (e.g., usually tenure distribution) and thus has ignored the potential effects of multiform structures on organizational outcomes. We argue that a multidimensional conception of demographic heterogeneity is a more accurate reflection of the multiple, intersecting parameters that characterize most social structures.

The second extension of existing research on demography and turnover relates to the form of the relationship (Pfeffer and O'Reilly, 1987; Jackson, et al., 1991; McCain, et al., 1983). Previous research has been based on the premise that increasing levels of demographic

heterogeneity produce corresponding increases in voluntary turnover in organizations owing to barriers to communication, integration and social association among widely dissimilar groupings of employees. For example, O'Reilly, Caldwell and Barnett (1989) found that heterogeneity of group tenure was associated with lower levels of social integration, which, in turn, was positively associated with individual turnover. However, Blau noted that whereas heterogeneity creates barriers to social interaction, very high levels of heterogeneity may weaken these barriers by increasing opportunities for social contacts (Blau, 1977). Put another way, high levels of demographic heterogeneity make intergroup relations less rare by weakening in-group pressures that inhibit communication, integration and cohesion across dissimilar groups -- conditions that reduce turnover.

Based on the above, this study addresses the following research questions: 1) Is there an empirical association between multiform, demographic heterogeneity and voluntary turnover rates in organizations? and 2) Does the relationship between demographic heterogeneity and organizational turnover assume a positive, monotonic form or, alternatively, an inverted U-shaped form in a fashion consistent with Blau's thesis?

To examine these questions, we considered the predictors of voluntary nursing turnover in a sample of 383 community hospitals. Multiple dimensions of demographic heterogeneity specific to nursing services and hospitals were considered, as well as controls for a variety of alternative explanations of the relationship of demographic heterogeneity and voluntary turnover. Nursing staffs in community hospitals are especially well suited to test our propositions because they may exhibit considerable variation in their demographic properties (e.g., professional education, tenure and employment status) and rely heavily on interactive, team-based approaches to the delivery of patient care.

Background

The empirical literature on demography and organizational turnover, although sparse, is consistent in its results. An early study investigated a sample of academic departments in two California University campuses (McCain, et al., 1983). Specifically considered was the issue of

whether or not turnover would be greater to the extent there were 1) cleavages or gaps between the dates of entry of persons into the organizations, and 2) discontinuous distributions of the organizational length of service. Controlling for other factors that might affect the amount of turnover, results suggested that the size of the older cohort and the number of gaps of 5 to 8 years among adjacent members in the departments produced significant effects on turnover among individual faculty.

A second study examined turnover in top management groups in a sample of 31 U.S. corporations (O'Reilly, et al., 1989). Controlling for the firms' financial performance and other factors, it was found that at the top management group level more heterogeneous groups experienced more turnover. In a third study (Pfeffer and O'Reilly, 1987), turnover among nurses in U.S. hospitals was examined using the Gini index and an index of diversity as measures of demographic heterogeneity. This study found that the more heterogeneous the nursing staff in terms of date of entry the greater the turnover. Finally, a recent study (Jackson, et al., 1991) examined turnover among top management teams in 51 U.S. bank holding companies. Study findings suggested that of seven dimensions of heterogeneity examined, only age-based diversity significantly affected turnover rates among management groups.

As a group, these studies provided support for the proposition that greater demographic heterogeneity is associated with higher rates of turnover in organizations or organizational groups. Except for Jackson and associates' study (1991), however, demographic studies of turnover have rarely focused on multiple dimensions of demographic heterogeneity and none has examined the question of whether or not heterogeneity assumes a non-linear association with turnover.

HYPOTHESES

Although organizational demography may be expressed by a number of different metrics, this study focuses specifically on demographic heterogeneity. Heterogeneity is defined as the extent to which differences or inequalities exist among categories of organizational members. At the organizational level, the concept of heterogeneity reflects distributional properties of

organizational membership and is therefore distinct from the aggregation of individual attributes to the organizational level (Pfeffer, 1983; 1985).

Turnover is affected by demographic heterogeneity through several processes: 1) variation in cohort size makes advancement opportunities fluctuate in ways that may produce turnover; 2) distributional differences in tenure cohorts produce unequal and fluctuating burdens on older cohorts for socializing newer ones; and 3) heterogeneity provides a dissimilar and often fragmented work force in terms of entering experience, education, or occupational status which may engender more conflict and turnover (Pfeffer and O'Reilly, 1987; Blau, 1977). Underlying these processes is the common premise that heterogeneity is associated with differences in attitudes, values and beliefs among organizational members and that such differences have the potential to create conflict and weaken integration among members. Such conditions influence group outcomes such as turnover (Daft and Weick, 1984; Hambrick and Mason, 1984; Pfeffer, 1983). Based on these arguments, we hypothesize:

H1: The greater the level of demographic heterogeneity in organizations, the higher the rate of turnover.

An alternative hypothesis suggests that heterogeneity does not operate in a positive, monotonic fashion on turnover. Instead, very high levels of heterogeneity will improve communication, interaction, and social integration since the barriers to such interactions are broken down by small group size (Blau, 1977). For example, in organizations in which members are evenly diffused over a wide number of nominal categories (e.g., educational levels, training school experience, tenure), we would anticipate that in-group identity would be reduced by the small size of these homogeneous groupings and that inter-group communication and interaction would increase because of the prevalence of a large variety and number of such groupings. This logic forms the basis of the proposition that social interaction, communication, and stability will be highest in those organizations characterized by either very high levels of demographic homogeneity or very high levels of demographic heterogeneity. Integration, conflict and turnover will be

highest at the intermediate levels of demographic heterogeneity, because categorical groupings will be large enough to promote in-group identity and solidarity as well as significant social barriers that block cross-group interaction and communication. Thus we predict:

H2: Turnover rates will be lowest in organizations whose demographic heterogeneity is either very high or very low, and highest in those organizations that exhibit intermediate levels of demographic heterogeneity.

Several previous studies have focused on the distributional properties of tenure cohorts in organizations in relation to organizational turnover. However, it is reasonable to expect that demographic heterogeneity may express itself along a number of dimensions besides tenure. Indeed, Blau (1977) has made a strong case for examining multiform heterogeneity in social systems. The current study considers four dimensions of demographic heterogeneity relevant to nursing staff in community hospitals: 1) RN educational preparation, 2) nursing staff licensure; 3) RN tenure, and 4) RN employment status. These demographic dimensions may vary independently in the degree to which they display heterogeneous/homogeneous properties. Heterogeneity is at a maximum for a given number of categories within a dimension when the population is evenly divided among them and at a minimum when the population is concentrated in one or a few categories. Each of the four dimensions of demographic heterogeneity is discussed below in terms of its potential impact on voluntary turnover among hospital registered nurses.

RN educational preparation

Registered nurses are trained under a variety of educational programs ranging from applied nurse training with a minimum liberal arts and biological science to advanced degree training in both social and biological sciences (Cleland, et al., 1985). Different programs of RN training create conflicting nursing care philosophies through their varying emphasis on professional autonomy and types of interaction with members of the health care team. The relative mix of registered nurses with these educational backgrounds, therefore, may affect the prevailing ideology of nursing service, the level of commitment to the organization (versus the nursing "profession")

and the degree of conflict resulting from different orientations to nursing care (Bloom, et al., 1992).

Nursing Staff Licensure

Hospital nursing staff fall into three general licensure categories: professionally trained registered nurses (RNs), licensed vocational/practiced nurses (LVNs/LPNs), and nursing aides (NAs). The relative mix of these groups on the hospital nursing staff will influence RN turnover through conflict and communication problems engendered by differences in skill levels, orientation to nursing care, and the amount of supervision required of registered nurses over lesser trained nursing staff. The later factor will influence the amount of time RNs spend in supervision or administrative activities versus the more preferred, hands-on patient care (Halloran, 1983; Glandon, et al., 1989). In addition, the relative mix of hospital nursing staff will impact the availability of colleagues to help problem solving as well as discuss the latest professional literature and emerging medical technology. This determines the degree of professional support and learning opportunities provided to RNs by the organization.

RN Tenure

The effects of organizational cohorts defined by length of service have been the focus of much of the organizational demography literature. Variation in cohort size and distribution affects turnover through its influence on advancement opportunities within the organization, stress associated with socializing new cohorts falling unequally on older cohorts and the differences in values and orientations owing to changes in training experience over time (Bloom, et al., 1992).

RN Employment Status

The relative mix of full-time versus part-time registered nurses may engender turnover as a result of conflicts over organizational commitment, continuity of task communication and barriers to creating a cohesive work force (Amenta, 1977; Wakefield and Mathis, 1985). Hospitals, however, have been compelled by economic and nursing supply conditions to allow more employment flexibility into its work force. Paradoxically, part-time employment is argued to

improve job satisfaction, lessen burnout and thereby reduce turnover at the individual level (McGillick, 1983).

CONTROL VARIABLES

Following the practice of previous research on the effects of organizational demography (Jackson, et al., 1991; Pfeffer and O'Reilly, 1987), a number of control variables are considered on the basis of their potential as alternative explanations of the demography-turnover relationship. Although the objective of the study is not to test the adequacy of turnover models, some known correlates of turnover could also be expected to correlate with the demographic properties of nursing staffs in hospitals. Six control variables are specifically considered: 1) RN staff size, 2) relative RN starting wage, 3) hospital ownership/control, 4) hospital casemix severity, 5) local nursing supply relative to potential demand, and 6) local unemployment rate.

RN Staff Size

In investigating the number of RN exits from the hospital, it is obvious that a staff size of 40 RNs has more potential for exit than one of ten, other things being equal. Turnover is higher simply because there may be more persons who can exit. In addition, however, RN staff size may also affect the extent to which turnover is disruptive to the organization as a whole (McCain, et al., 1983; Grusky, 1961), and consequently the efforts of the organization to prevent such exiting. Using similar reasoning, the effects of demography on turnover might be explained by systematic differences in staffing patterns between smaller and larger organizations.

Relative RN Starting Wage

Organizational wages compared to the expected wages for relevant labor markets affect turnover through the probability of employees' finding a higher paying job. In situations where the relative wage rate is high, turnover will be reduced since the probability of finding a higher paying job will be low. Alternatively, if relative wage rates are low, probability of turnover will be high since higher paying jobs in other organizations will be more available (Pfeffer and O'Reilly, 1987). Using a similar line of reasoning, we also argue that relative wage can affect a hospital's

nursing staffing pattern because wage levels reflect the hospital's propensity or ability to recruit or retain a significant proportion of well-educated, professional nurses.

Hospital Ownership

Because systematic differences occur between governmental, investor-owned, and non-governmental not-for-profit hospitals in work roles, civil service protection, seniority benefits, and other conditions affecting employment, we anticipate that turnover may also differ among these ownership types. To the extent that these different hospital types also engage in different staffing patterns in their nursing services, the demography of these organizations may also differ. On the basis of these considerations we include a set of categorical controls for hospital ownership in the analysis.

Case Mix

Case mix refers to the level of complexity or severity of patients that a hospital treats. Hospitals with more severe case mixes may experience higher nursing turnover owing to the psychological stress and burnout associated with dealing with a demanding patient load. At the same time, case mix may determine the hospital's personnel policies and practices. For example, hospitals treating sicker patients may require staffing with more highly trained, experienced nurses than hospitals with less severe case mixes. Case mix may also be viewed as a proxy for the technology of the hospital because more severely ill patients require more intensive, complex medical interventions which require administration by more experienced or more highly educated nurses (Halloran, 1985).

Alternative Employment Opportunities

Turnover may be affected by the extent to which alternative employment opportunities are present in the local market. Models of turnover in economics literature have emphasized the availability of alternatives in the local market, typically indexed by the unemployment rate and/or the size of the labor pool relative to available jobs. Unemployment rate is included in the model to capture the effects of availability of other employment options to hospital staff nurses. Number of registered nurses per hospital bed in the market is included to reflect the competition for nursing

jobs, the propensity of hospitals to engage in retention strategies for their nursing staff, and hospital "cost" in staffing their nursing services with RNs.

METHOD

Data Sources

Multiple data sources were used in this study. The primary data set, which defined the study group of American community hospitals, was the Nurse Personnel Survey, conducted by the American Hospital Association (AHA) in 1981. This survey gathered aggregate (hospital level) information about vacancies and turnover among hospital nursing personnel as well as other staffing, organizational and policy data, and the hospitals' nursing services. The survey was addressed to the Chief Executive Officer of each hospital with the expectation that the Personnel Director's Office would assist in completing it. Telephone follow-up by AHA staff was conducted to ascertain the reliability and accuracy of the data.

Data from three additional sources were merged to the Nursing Personnel Survey data file. The 1981 AHA annual survey of hospitals provided information on hospital ownership. The Area Resource File (Bureau of Health Professions, 1985) provided data at the county level for constructing measures of three control variables: relative RN starting wage, RN supply, and unemployment rate. The Health Care Financing Agency (HCFA) 1982 Medicare Case Mix File (Federal Register, 1983) provided data on hospital case mix.

Sample

The Nursing Personnel Survey was sent to a twenty percent random sample (1233 hospitals), drawn from a universe of approximately 5380 community hospitals throughout the country. It was sent to the hospitals in three waves with a telephone follow-up by AHA faculty. AHA Regional Directors were asked to encourage member hospitals to complete and return the questionnaire. This effort yielded a sample of 732 hospitals (a 59.9 percent response rate).

For the purposes of this analysis, a "subsample" of AHA's sample was drawn based on hospitals reporting: 1) four consecutive quarters of turnover data (January 1 to December 31,

1980) for full-time registered nurses (RNs), 2) complete nursing demographic data on RN educational preparation, tenure and employment status, and nursing staff licensure, and 3) RN staff levels greater than ten to minimize magnification of personnel changes in very small hospitals. The final usable sample was 383 hospitals.

These sample hospitals were compared to the community hospital population on five selected hospital characteristics--size, control type, urban/rural location, teaching status, and regional location. In general, hospitals that were large, not-for-profit, located in urban areas and the northeast region were over-represented in our sample. This suggests that caution should be exercised in extending our findings to the hospital population. However, because the study focuses on exploring questions concerning the relationship between organizational demography and turnover, this sample bias does not represent a major concern.

Measurement

Table 1 presents measures and data sources for all study variables.

(Insert Table 1 about here)

The primary independent variable for the study was demographic heterogeneity of hospital nursing staff. Heterogeneity is defined as "the distribution of population elements along a continuum of homogeneity to heterogeneity with respect to one or more variables" (Teachman, 1980, p. 341). Four demographic dimensions were assessed in the model, each based on the proportional representation of hospital nursing staff in two or more categories. RN educational preparation measured the proportional composition of registered nurses according to their educational background in five levels (diploma, associate, baccalaureate, master, and doctoral). Nursing staff licensure assessed relative mix of three subgroups of nurses based on licensure status: nursing aids (NAs), licensed practical nurses (LPNs), and registered nurses (RNs). RN tenure measured length of employment in the hospital for registered nursing staff in terms of four categories (< 1 years, 1-2 years, 2-5 years, and > 5 years). Finally, RN employment status

assessed proportionately the part-time/full-time composition of registered nurses in each of the sample hospitals.

The use of categorical demographic variables at the organizational level is designed to avoid problems of bias stemming from individual-based data aggregated to the level of the organization. Accordingly, the diversity index, originally developed by Shannon (1948) for assessing system-wide heterogeneity using qualitative data, was selected as the measure of nursing demographic heterogeneity. This index is defined as (Teachman, 1980):

$$H = - \sum_{i=1}^N p_i \log p_i = \sum_{i=1}^N p_i \log(1/p_i),$$

where N = the number of categories in which elements of a system can be placed, and p_i = the fractional share of the i th category with $\sum p_i = 1$.

The diversity index has been utilized broadly in measuring economic inequality (Theil, 1967), the distribution of seats and votes among different political parties (Theil, 1969), and, more recently, to evaluate the effects of tenure distribution on nursing turnover (Pfeffer and O'Reilly, 1987). Compared to other qualitatively based measures of heterogeneity (e.g., Gini index), the diversity index is less sensitive to the share of the largest category, and thus has a smoother distribution. This is so because a logarithm of p_i is used in the computation of the index, rather than the product of p_i and itself (Taagepera and Ray, 1977).

However, the diversity index is affected not only by the distribution of elements across categories but also by the number of categories represented under a given variable (Teachman, 1980). In order to compare the degree of variation between measures of heterogeneity which differ in the number of qualitative categories, we employed the standardized form of diversity index to control for the effects of category number (Lieberson, 1969). To standardize, the original index is divided by its theoretical maximum, $\log N$ (Teachman, 1980):

$$H' = H / \log N.$$

The resulting standardized index reflects the evenness of a distribution and ranges from 0 to 1. If concentration of a demographic characteristic is complete (i.e., completely homogeneous), the

corresponding value of standardized diversity index will be zero. If there is complete heterogeneity, the standardized index will be equal to 1.

The dependent variable for the study is voluntary RN turnover. Turnover is measured as the number of full-time registered nurses who voluntarily resigned from their positions from January 1 through December 31, 1980 (four calendar year quarters). A one year period for assessing turnover was chosen because of the following considerations. First, evaluating turnover for shorter periods (e.g., one month) may lead to unreliable estimates since patterns for a given organization may be unlikely to repeat in subsequent months. Alternatively, assessment periods greater than one year are subject to the opposite problem. Turnover may vary more widely within longer time periods, thus introducing the possible effects of unmeasured time lags (Mueller and Price, 1989).

In calculating turnover rates, the denominator consists of the mean number of full-time registered nurses on staff over the four quarters during the same period. Both turnover and staffing level data were reported separately for each quarter. The overall turnover and turnover rate measures were calculated by the investigators.

Six hospital characteristics and environmental conditions are included as control variables in the multivariate regression models. Full-time RN staff size of the hospital is defined as the number of full-time RNs on payroll averaged over the same four calendar year quarters as in the measurement of RN voluntary turnover. Hospital ownership was defined as whether the hospital was investor-owned (for-profit), operated by state or local government, or operated as a voluntary, not-for-profit hospital. Ownership was coded as two dummy variables with the not-for-profit, non-government hospitals as the reference group. Case mix index measured the differences in severity of illness treated by sample hospitals. Obtained from HCFA Medicare Case Mix File (Federal Register, 1983), this index scales case mix complexity for individual hospitals to a base of one for hospitals with average case complexity. Higher values reflect a more complex, severe case mix while lower reflect a simpler case mix (Watts and Klastorin, 1980). Relative RN starting wage assessed a hospital's starting wage averaged for RNs with diploma, associate and

baccalaureate degrees, compared to the average wage level in the county in which the hospital is located (Pfeffer and O'Reilly, 1987).

The two environmental variables were RN supply and unemployment rate. RN supply was measured as the ratio of the number of registered nurses per hospital bed in the county.

Unemployment rate, also measured at the county level, was used to assess the economic condition and job opportunities in the geographic area where the focus hospital is located.¹

Analysis

Ordinary least squares (OLS) regressions were employed to assess the effects of demographic heterogeneity on nursing turnover. The dependent variable in the regressions was the log of the number of registered nurses who voluntarily resigned from the hospital over a one year period. The rate of turnover is explicitly controlled by including size of full-time RN staff in the multivariate models (Fréeman and Kronenfeld, 1974).

Three nested, hierarchical models were estimated. The first model incorporated the set of seven control variables in order to evaluate the variance contributed to nursing turnover by organizational and environmental characteristics. The second model included the control variable set and the linear forms of the four demographic indicators. This model assessed the independent and collective effects of demographic heterogeneity on turnover, controlling for a variety of alternative explanations of the demographic heterogeneity-turnover relationship. Finally, in model 3, the quadratic terms of demographic heterogeneity were added to the set of variables contained in model 2 to test whether a curvilinear relationship occurs between heterogeneity and turnover. Negative and significant signs for quadratic regression terms would indicate that demographic heterogeneity affects nursing turnover in an inverted U-shaped pattern.

RESULTS

The mean voluntary turnover rate for the sample of 383 hospitals is 27 percent. Hospitals located in Northeast, hospitals without residency training programs, hospitals operated by county and state governments and those of middle size display the lowest mean turnover rates (21, 26, 26

and 25 percent respectively). Small hospitals (<100 beds), investor-owned hospitals, teaching hospitals and those operating in the Western region of the country have relatively high rates (32, 32, 31 and 38 percent, respectively).

Table 2 presents descriptive statistics and the intercorrelations among all the variables. Among the four indicators of demographic heterogeneity, RN educational preparation exhibits the lowest mean level of heterogeneity ($\bar{X} = 0.50$), while nursing staff licensure has the highest mean level of heterogeneity ($\bar{X} = 0.86$) in the sample. Three of the four demographic heterogeneity indicators (RN educational preparation, RN tenure, and RN employment status) are positively and significantly correlated with turnover, thus providing initial support for hypothesis 1. Except for-profit ownership and county unemployment rate, all control variables are significantly correlated with voluntary turnover. The direction of the relationships between RN staff size, relative RN wage, governmental control type, case mix and turnover are consistent with our expectations. Contrary to expectation, however, RN supply as a reflection of competition for jobs among nurses in the neighboring areas displays a positive relationship with voluntary turnover. In general, non-governmental hospitals, hospitals with larger full-time RN staffs and sicker mix of patients, hospitals located in areas with higher levels of RN supply, and those having lower relative wages display higher RN voluntary turnover.

(Insert Table 2 about here)

Table 3 presents the results of three hierarchical regression models. Model 1 contains the seven organizational and environmental control variables. The model is significant at the $p < 0.001$ level and accounts for 22% of the variance in log of RN voluntary turnover. Consistent with the results of bivariate correlations, full-time RN staff size, RN supply, and the dummy variable of government control display statistically significant associations with log turnover. Relative RN wage, for-profit ownership, case mix and unemployment rate exercise no significant effects on turnover in Model 1.

(Insert Table 3 about here)

Model 2 assesses the effects of demographic heterogeneity on nursing turnover. Controlling for environmental and hospital organizational characteristics, heterogeneity of RN educational preparation, nursing staff licensure, and RN tenure exhibit both positive and statistically significant associations with log of RN voluntary turnover. Only the diversity index of RN employment status (full-time/part-time) fails to exhibit a statistically significant association with the dependent variable. These results provide substantial support for hypothesis 1 which predicted greater turnover in hospitals with higher levels of demographic heterogeneity in their nursing staffs. Based on comparisons of standardized regression coefficients of the three significant indicators (not shown in Table 5), RN tenure exercises the greatest impact on turnover, followed by nursing staff licensure and RN educational preparation. To assess the contribution of the demographic heterogeneity construct to the model, we applied a partial F test to the incremental R^2 resulting from the addition of the demographic indicators to the model, after partialing out the contribution of all control variables.² Results indicate that the marginal contribution of demographic heterogeneity is significant at $p < 0.001$ ($F = 15.83$).

To test whether demographic heterogeneity assumes an inverted U-shaped relationship with turnover (hypothesis 2), a third model was specified to include both the linear and quadratic terms of demographic characteristics. Results from Model 3 indicate that two of the linear demographic heterogeneity terms (nursing staff licensure and RN tenure) continue to assume positive and statistically significant associations with log RN voluntary turnover. However, none of the quadratic terms is significant. These results suggest lack of support for hypothesis 2 which posited that moderate levels of demographic heterogeneity are associated with higher turnover. Application of an F test ($F = 0.88$, $p > 0.05$) to assess the marginal contribution of quadratic diversity terms further confirms this finding.

Organizational demography, as previously noted, can be conceptualized as different compositional properties of organizational members and be expressed by a wide variety of metrics.

Each of these properties may assume a distinct and independent relationship with turnover. This study has focused on the distributional properties of organizational demography in hospital nursing staff. However, it should be recognized that, apart from the effects of elevated conflict and weakened integration associated with demographic heterogeneity, high turnover may also be influenced by demographic composition through the concentration of organizational members in certain fast-replacing categories. For example, it has been suggested that hospitals hiring a significant proportion of well-educated, professionally oriented nurses may experience high turnover in their nursing staff because these nurses tend to have less loyalty to their hospitals and higher commitment to nursing profession (Beck, 1962; Bloom, et al., 1992).

Although our diversity indices measure the degree of concentration or dispersion of demographic qualities of an organization, they do not take into account the categories in which concentration occurs. In the final stage of our analysis, "locus of concentration" measures of the demographic variables were employed in a fourth model to control for the alternative explanation that turnover is a function of concentration of organizational members in certain fast-replacing categories.³ This model tests whether demographic heterogeneity indicators maintain their significant association with nursing turnover when mean levels, reflecting "locus of concentration" of the demographic characteristics, are statistically controlled. Results displayed in Table 4 indicate that nursing staff licensure and RN tenure continue to display positive and statistically significant relationships with log RN voluntary turnover. None of the demographic mean levels shows significant effect at $\alpha = 0.05$ level. These findings, therefore, do not support the alternative explanation that distributional concentration in demographic characteristics are related to RN voluntary turnover.

(Insert Table 4 about here)

DISCUSSION

Findings of this study are consistent with previous organizational research that has demonstrated a linear relationship between demographic heterogeneity and turnover. We found strong evidence that the greater the level of demographic heterogeneity in hospital nursing staffs, the higher the levels of voluntary turnover among RNs. Further, the demographic diversity construct explained a significant amount of variance in organizational turnover over and above that attributed to organizational and environmental factors such as ownership, size, case mix, relative wage rates, local labor market and unemployment rate.

Our findings did not support the proposition that an inverted "U" shape best describes the relationship between demographic heterogeneity and organizational turnover. These results may be indicative of the underlying process linking demographic diversity and turnover. Perhaps it is not size or number of groups per se that leads to decreased organizational communication, integration and cohesion, but the strength of different experiences in nursing practice that define separate demographic categories. For instance, in this study, the degree of dispersion across different education, licensure, or tenure cohort categories may reflect the differences in nursing care philosophy and practice which in turn lead to poor communication and integration, and the subsequent high turnover among nursing groups.

The majority of previous organizational demography studies have examined the effects of a single dimension of demography, typically the distribution of tenure in the organization (Pfeffer and O'Reilly, 1987). Our work supports the importance of tenure distribution as a predictor of important patterns of organizational behavior. Indeed, among the four demographic parameters examined, heterogeneity of RN tenure was the strongest predictor of hospital turnover. Importantly, however, our results indicate that tenure heterogeneity alone does not fully describe the range or interdependence of demographic factors that affect organizational turnover.

According to Blau (1977), the diversity of multiple parameters of social structure influences the degree of cohesion and integration in social groups. Our empirical test of Blau's assertions provides support for the importance of multiform heterogeneity in the informal social structure of

organizations, specifically in explaining organizational turnover. Three of the four indicators of demographic heterogeneity of hospital nursing staff (RN tenure, nursing staff licensure, and RN educational preparation) were related significantly to voluntary RN turnover. Multifactor heterogeneity thus provides a more complete picture of the socio-demography of an organization and describes how a variety of cleavages in social structure can occur. For example, nurses with different educational backgrounds and professional training have different philosophic views of nursing and patient care and different reasons to be working. These differences may prevent them from becoming integrated into the social and cultural milieu of the hospital. To the extent they are not integrated, they are more likely to voluntarily leave the hospital when alternative opportunities are available. The only other organizational demography study looking at multiple parameters (Jackson, et al., 1991) examined seven dimensions of heterogeneity and found that only age-based diversity significantly affected turnover rates among top management teams.

We were unable to test, however, whether organizational effects of demographic diversity are also evident at the individual and team levels of analysis. Recent studies have identified effects of demographic heterogeneity at the work team level. Jackson et al. (1991) found that for executive teams in banking companies, turnover rate was predicted by group heterogeneity in age, experience outside the industry and college curriculum. O'Reilly et al. (1989) showed that heterogeneity in group tenure and age was negatively associated with individual turnover; and specifically that the effect of tenure heterogeneity on turnover was moderated by levels of group social integration. Both studies found that individuals whose personal attributes were dissimilar to other team members were more likely to leave. Therefore, the evidence points to demographic heterogeneity as a potential explanation of turnover at individual, work group, and organizational levels of analysis. It is less clear to what degree social integration, communication, similarity of personal attributes, or similarity in work values, practices or experiences account for the relationship seen between demographic diversity and turnover at all levels of analysis. Which heterogeneity measure is more predictive of turnover in a particular instance may be affected by the extent to which category difference reflect significant differences in experiences, for it is these

varying experiences that are likely to account for the differing attitudes and perspectives underlying demographic effects. These pose interesting questions for future analysis. For example, in the hospital setting, unit level analyses could test the degree to which demographic heterogeneity affects integration, communication patterns and professional practices. One might observe specific types of units where demographic diversity has greater effects (e.g., intensive care unit).

This study and Jackson and associates' (1991) recent research are the first looking at heterogeneity of professional education. Jackson et al. (1991) found that members were more likely to leave the team if they were dissimilar with respect to education level, college curriculum and industry experience. Our study was able to consider diversity of professional education and training in greater detail due to variety of types of RN education available and the multiple levels of licensure within nursing. Through measures of heterogeneity of professional education and licensure, we were able to examine heterogeneity of professional experience as well as the organizational experience (tenure) previously modeled. Diversity of licensure measured the differing degrees of professional education and identification with a professional role. Future research should also look at length of time (or tenure) in profession as another measure of professional experience. In this study, diversity of tenure measured only the variation in exposure to organizational experiences or "on-the-job" training, and thereby the identification with organization-specific policies and practices. Tenure heterogeneity may also have significant consequences primarily when organizational cohorts have experienced meaningfully different organizational conditions, such as organizational growth versus decline or implementation of different competitive strategies.

The relationship between organizational demography and turnover assumes particular importance due to changing societal demographics and increasingly competitive business climate. Changing demographic patterns in the American workforce reflect the growing cultural diversity of our population as well as the greater number of women working outside the home. In this study we have focused on heterogeneity of professional experience and training. In other professions, demographic factors, such as age, gender and race may play a significant role in characterizing

organizational diversity. As competitive pressures and changing technologies emphasize participatory management and teamwork among diverse groups (Porter, 1990) as well as cost-effective modes of production, the effects of demographic heterogeneity on organizational behavior are likely to assume even greater relevance.

END NOTES

1. To maximize the number of analyzable cases, missing values on the control variables were replaced by the sample means for descriptive, correlation and regression analyses. Missing cases of these variables consisted of 0.0 to 12.5 percent of the total sample (N= 383 hospitals). No imputation of missing values was carried out for the demographic and turnover variables.

2.
$$F = \frac{(R_{y,ab}^2 - R_{y,a}^2)/b}{(1 - R_{y,ab}^2)/(N - a - b - 1)}$$

Where $R_{y,ab}^2$ is the incremental R^2 based on the regression containing the control and demographic heterogeneity indicators. $R_{y,a}^2$ is the R^2 based on the regression containing only the control variables. "a" and "b" are, respectively, the number of variables in the control variable set and the number of demographic heterogeneity indicators.

3. To compute mean levels of the heterogeneity indicators, a number was assigned to each category according to its ordinal position within a given demographic characteristic. For RN educational preparation, nursing staff licensure and RN employment status, an integer number was used for each category. "1" represents the lowest category of a variable (e.g., diploma and part-time). The greater the number, the higher the level of the category. The resulting values of these three variables range from 1 to 5, depending on the number of categories. For RN tenure, the midpoint of each classification was used: 0.5 was assigned for the "0-1 year" category, 1.5 for "1-2 years", 3.5 for "2-5 years", and 7 for the "> 5 years" category (Pfeffer and O'Reilly, 1987).

After assigning a number to each category, mean levels of the demographic characteristics were then calculated using the following equation:

$$\bar{X} = \frac{\sum_{i=1}^N k_i m_i}{\sum_{i=1}^N m_i},$$

where \bar{X} = mean level, N = number of categories, k_i = the value assigned to the *i*th category, and m_i = number of cases in the *i*th category.

TABLE 1
Variables, Measures, and Data Sources

Variable Name	Measure	Data Source
<u>Nursing Demography</u>		
1. RN Educational Preparation	Standardized Diversity Index ⁽¹⁾ of RN Nursing Education (Diploma/Associate/Baccalaureate/Master/Doctoral)	1981 AHA Nursing Personnel Survey
2. Nursing Staff Licensure	Standardized Diversity Index ⁽¹⁾ of Nursing Staff Licensure (N.A./L.P.N./R.N.)	1981 AHA Nursing Personnel Survey
3. RN Tenure	Standardized Diversity Index ⁽¹⁾ of RN Tenure (<1 yr/1-2 yrs/2-5 yrs/>5 yrs)	1981 AHA Nursing Personnel Survey
4. RN Employment Status	Standardized Diversity Index ⁽¹⁾ of RN Employment Status (Part-time/Full-time)	1981 AHA Nursing Personnel Survey
<u>Control variables</u>		
5. Full-time RN Staff Size	Full-time RNs on Payroll Averaged Over 4 Quarters ⁽²⁾	1981 AHA Nursing Personnel Survey
6. Relative RN Starting Wage	Starting Wage Averaged for Diploma, Associate, and Baccalaureate RNs/Per Capita Income in County	1981 AHA Nursing Personnel Survey & 1980 Area Resource File
7. Hospital Ownership	Not-for-Profit (Reference) Government (0=no, 1=yes) For-Profit (0=no, 1=yes)	1981 AHA Hospital Survey
8. Case Mix	Medicare Case Mix Index	HCFA Case Mix File
9. RN Supply	Number of RNs in County/Number of Hospital Beds in County	1980 Area Resource File
10. Unemployment Rate	County Unemployment Rate	1980 Area Resource File
<u>Voluntary Turnover</u>		
11. RN Voluntary Turnover	Number of Full-time RNs Who Voluntarily Resigned from Hospital in 1980	1981 AHA Nursing Personnel Survey

1 Diversity index (H) = $-\sum_{i=1}^N p_i \log p_i$, where p_i = the proportion cases in the i^{th} category with $\sum p_i = 1$.

Standardized diversity index (H') = $H / \log N$, where N = number of categories (Teachman, 1980).

2 Jan. - March, April - June, July - Sept., Oct. - Dec., 1980.

TABLE 2

Descriptive Statistics and Pearson Correlation Matrix⁽¹⁾

	Mean	S.D.	Correlation coefficients												
			1	2	3	4	5	6	7	8	9	10	11	12	13
1 Log voluntary turnover	0.63	1.90	-												
2 Full-time RN staff size	100.60	107.04	41	-											
3 Relative RN wage	1.62	0.31	-24	-30	-										
4 Not-for-profit	0.67	0.47	22	19	-26	-									
5 Government	0.26	0.44	-25	-15	32	-85	-								
6 For-profit	0.07	0.25	04	-09	-07	-39	-16	-							
7 Case mix	1.01	0.16	25	39	-17	15	-10	-10	-						
8 RN Supply	0.52	0.19	33	37	-57	25	-28	03	31	-					
9 Unemployment	6.79	2.17	-02	02	14	03	03	-10	05	12	-				
10 SDI ⁽²⁾ of RN education	0.50	0.19	31	28	-19	05	-06	02	14	15	-06	-			
11 SDI of nursing staff licensure	0.86	0.13	-03	-32	31	-13	15	-01	-15	-40	-07	-02	-		
12 SDI of RN tenure	0.84	0.19	43	29	-21	11	-10	-03	18	24	01	38	01	-	
13 SDI of RN employment status	0.78	0.26	12	-04	-15	32	-32	-05	-01	10	-02	13	-02	18	-

1 Decimal points omitted.

2 SDI = standardized diversity index.

3 | correlations | > 10 are significant at p < 0.05.

TABLE 3
 OLS Regression Results
 Effects of Nursing Demography on RN Voluntary Turnover⁽¹⁾
 (Unstandardized Regression Coefficients, Standard Errors in Parentheses)

	Model 1		Model 2		Model 3	
	B	S.E.	B	S.E.	B	S.E.
Intercept	-1.32	(0.92)	-1.29	(0.86)	-1.40	(.88)
1. Full-time RN Staff Size	0.06E-1*** ⁽²⁾	(0.09E-2)	0.05E-1***	(0.09E-2)	0.05E-1***	(0.09E-2)
2. Relative RN Wage	0.07	(0.36)	0.17	(0.34)	0.17	(0.34)
3. Government	-0.65**	(0.21)	-0.62**	(0.21)	-0.63**	(0.21)
4. For-profit	0.32	(0.35)	0.36	(0.33)	0.29	(0.33)
5. Case Mix	0.85	(0.60)	0.63	(0.56)	0.62	(0.57)
6. RN Supply	1.53**	(0.59)	1.62**	(0.57)	1.87**	(0.58)
7. Unemployment Rate	-0.04	(0.04)	-0.02	(0.04)	-0.03	(0.04)
8. Diversity ⁽³⁾ -RN Education			0.95*	(0.46)	0.90	(0.58)
9. Diversity ⁽³⁾ -Nursing Staff Licensure			2.08**	(0.71)	3.26**	(1.03)
10. Diversity ⁽³⁾ -RN Tenure			2.61***	(0.49)	2.21**	(0.80)
11. Diversity ⁽³⁾ -RN Employment Status			0.16	(0.34)	-0.12	(0.55)
12. [Diversity Index-RN Education] ²					0.02	(1.97)
13. [Diversity-Nursing Staff Licensure] ²					6.18	(3.77)
14. [Diversity-RN Tenure] ²					-0.61	(1.47)
15. [Diversity-RN Employment Status] ²					-0.89	(1.13)
Adjusted R ²	0.22		0.33		0.32	
Degrees of Freedom	7/382		11/382		15/382	
F Value	16.34***		17.80***		13.27***	

* p < 0.05 ** p < 0.01 *** p < 0.001

1 RN voluntary turnover is log transformed to meet the assumption of normality in ordinary least squares regression analysis.

2 E-a = 10^{-a}. For example, the coefficient 0.06E-1 would be 0.06*10⁻¹ in its full expression.

3 Demographic variables are expressed as deviations from sample means ($X - \bar{X}$) to reduce computational bias caused by collinearity between linear and quadratic terms in model 3 (Neter, Wasserman and Kutner, 1985).

TABLE 4

OLS Regression Results
 Effects of Nursing Demography and Distributional Concentration on RN Voluntary Turnover
 (Unstandardized Regression Coefficients, Standard Errors in Parentheses)

	B	S.E.
Intercept	-8.17*	(3.63)
1. Full-time RN Staff Size	0.05E-1*** ⁽¹⁾	(0.09E-2)
2. Relative RN Wage	0.08	(0.35)
3. Government	-0.61**	(0.21)
4. For-profit	0.32	(0.34)
5. Case Mix	0.53	(0.57)
6. RN Supply	1.49*	(0.58)
7. Unemployment Rate	-0.03	(0.04)
8. Diversity-RN Educational Preparation	0.91	(0.58)
9. Diversity-Nursing Staff Licensure	2.41**	(0.76)
10. Diversity-RN Tenure	2.30***	(0.53)
11. Diversity-RN Employment Status	0.59	(0.49)
12. Mean Level of RN Education	-0.03	(0.31)
13. Mean Level of Nursing Staff Licensure	3.03	(1.66)
14. Mean Level of RN Tenure	-0.03	(0.08)
15. Mean Level of RN Employment Status	0.78	(0.66)
Adjusted R ²	0.33	
Degrees of Freedom	15/382	
F Value	13.42***	

* p < 0.05 ** p < 0.01 *** p < 0.001

¹ E-a = 10^{-a}. For example, the coefficient 0.05E-1 would be 0.05*10⁻¹ in its full expression.

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