

Organizational Demography and Turnover: An Examination of Multiform and Nonlinear Heterogeneity

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This paper advances the study of organizational demography and turnover by testing propositions derived from Blau's theory of heterogeneity and social structure. In a sample of 398 U.S. community hospitals, voluntary nursing turnover was examined in relation to three demographic dimensions—educational preparation, tenure and employment status—among nurse staff. The form of relationships between turnover and heterogeneity was specified to test whether heterogeneity affects turnover in a linear fashion or, alternatively, in an inverted U-shaped pattern. Our results suggest that effects of heterogeneity on turnover differ by dimension and that such effects can obtain independently of other dimensions. Further, interactions between demographic dimensions show that demographic dimensions also interact with each other to affect nursing turnover. Our findings partially support Blau's conceptualization of heterogeneity in social structure and highlight the importance of multiform heterogeneity in the study of organizational demography and group interaction outcomes.

KEY WORDS: organizational demography; heterogeneity; group interactions; turnover; nursing staff; hospitals.

INTRODUCTION

Organizational demography has been described as a collective property of an organization that reflects the compositional distribution of the workforce on a number of key dimensions. These dimensions include, but are

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not limited to, sex, tenure, age, education or socioeconomic status (Pfeffer, 1983, 1985). The demographic composition of organizations may influence several important behavioral patterns, including communications, job transfers, promotions, and turnover (Jackson et al., 1991; Zenger & Lawrence, 1989; O'Reilly, Caldwell, & Barnett, 1989; Wagner, Pfeffer, & O'Reilly, 1984; Pfeffer & Moore, 1980). The relationship between demography and organizational behavior assumes particular salience in the current health care climate in which competitive pressures and changing technologies emphasize collective styles of management. Also, jobs and organizational structure are redesigned to take advantage of the benefits of group interaction and teamwork (Banas, 1988; Porter, 1990; Schuler & Jackson, 1987; Jackson et al., 1991). To the extent that such organizational features depart from traditional practices which emphasized homogeneous groupings of workers, an examination of demographic heterogeneity and its effects on patterns of organizational behavior seems particularly relevant.

In the current investigation, we focus on voluntary turnover among hospital registered nurses (RNs) as the outcome of interest. We extend the line of inquiry on organizational demography and turnover by incorporating several propositions from Blau's theory of heterogeneity and social structure (Blau, 1977). The first, multiform heterogeneity, posits that multiple parameters of social structure independently and jointly influence the degree of cohesion and integration among social groups. By and large, previous demography research has examined only a single dimension of demography (e.g., tenure distribution) and thus has ignored the potential effects of multiple dimensions of demographic structure on outcomes such as turnover. We argue that a multidimensional conception of demographic heterogeneity is a more accurate reflection of the multiple and diverse characteristics of members in most health care organizations.

The second extension of existing research relates to the issue of the form of relationship between demography and turnover. 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 (Pfeffer & O'Reilly, 1987; Jackson et al., 1991; McCain et al., 1983). For example, O'Reilly et al. (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 (1977) noted that whereas heterogeneity created barriers to social interaction, very high levels of heterogeneity might weaken these barriers, because intergroup associations and interactions depended on opportunities for social contacts. Put another way, high levels of demographic heterogeneity promote intergroup

relations and thus weaken in-group pressures that inhibit communication, integration, and cohesion across dissimilar groups—conditions that reduce turnover.

Based on these considerations, this study addresses the following research questions: (1) How do different dimensions of demographic heterogeneity affect voluntary turnover rates among hospital registered nursing staff? (2) Does the relationship between demographic heterogeneity and turnover assume a positive, monotonic form or, alternatively, an inverted U-shaped pattern? And (3) does heterogeneity on multiple dimensions of demography affect turnover, over and above the independent effect of each dimension?

We examine these questions in a sample of 398 U.S. community hospitals. Multiple dimensions of demographic heterogeneity specific to nursing services in the hospital context are considered, as well as controls for a variety of alternative explanations of the relationship between demographic heterogeneity and voluntary nursing turnover. Nursing staffs in community hospitals are especially well suited to test our propositions because they 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 5–8 years among adjacent members in the departments produced significant effects on turnover among faculty.

A second study examined turnover among nurses in U.S. hospitals using the Gini index and an index of diversity as measures of demographic heterogeneity (Pfeffer & O'Reilly, 1987). This study found that the more heterogeneous the nursing staff in terms of date of entry, the greater the turnover. In a third study (O'Reilly et al., 1989), turnover in top management groups in a sample of 31 U.S. corporations was examined. 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.

The relationship between demographic heterogeneity and turnover at the top management level was further analyzed in two studies. In one study, Jackson and associates (1991) examined turnover among top management teams in 51 U.S. bank holding companies. Their findings suggested that of seven dimensions of heterogeneity examined, only age-based diversity significantly affected turnover rates among management groups. In the other study, Wiersema and Bird (1993) applied organizational demography arguments to an analysis of turnover among top management teams in 40 Japanese firms. Four dimensions of demographic heterogeneity (i.e., age, organizational tenure, team tenure, and the prestige of the university attended) were considered and all but organizational tenure were found to have significant effects on turnover.

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. Relatively few demographic studies of turnover, however, have focused on multiple dimensions of demographic heterogeneity (see, for example, Jackson et al., 1991; Wiersema & Bird, 1993) and none has examined the question of whether or not different dimensions of heterogeneity exercise joint or nonlinear effects on 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. It emphasizes the pattern of distribution among organizational members along relevant dimensions of organizational demography and is therefore distinct from the aggregation of individual characteristics 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 workforce in terms of entering experience, education, or occupational status which may engender more conflict and turnover (Pfeffer & 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 & Weick, 1984; Hambrick & Mason, 1984; Pfeffer, 1983). Consistent with Blau's assertion that multiple dimensions of demography operate in social structures, we maintain that this relationship may apply independently to each relevant dimensions of organizational demography. Based on these arguments, we hypothesize:

Hypothesis 1. The higher the level of demographic heterogeneity in organizations, the higher the rate of turnover.

The second hypothesis draws on Blau's (1977) theory of social structure to address the form of the relationship between individual dimensions of demography and turnover. Heterogeneity may not operate in a positive, monotonic fashion on turnover. Instead, very high levels of heterogeneity will improve communication, interaction, and social integration, because the barriers to such interactions are broken down by the presence of small, similar size of groupings (Blau, 1977). For example, in organizations in which members are evenly diffused over the categories of a demographic attribute (e.g., educational level, training school experience, tenure), we would anticipate that in-group identity and pressures would be reduced by the small size of these homogeneous groups, and intergroup communication and interaction increased because of the large number of out-group contacts. This logic forms the basis of the proposition that social interaction, communication, integration, and stability will be highest in organizations characterized by either very low *or* very high levels of demographic heterogeneity. Conflict and turnover will be highest at the intermediate levels of demographic heterogeneity, because categorical groupings will be concentrated and large enough to promote in-group identity and solidarity as well as significant social barriers that block intergroup interaction and communication. As in hypothesis 1, we assume that individual dimensions of demography (e.g., education, tenure) may vary in the extent to which they display nonlinear relationships with organizational turnover. Thus we predict:

Hypothesis 2. Turnover rates will be lowest in organizations whose demographic heterogeneity is either very high or very low, and highest in organizations that exhibit intermediate levels of demographic heterogeneity.

Blau's concept of multiform heterogeneity incorporates similar logic to suggest that the joint effects of heterogeneity across multiple dimensions of demography act to reduce integration barriers, improve communication, and consequently reduce organizational turnover. Specifically, when organ-

izational members manifest differences on multiple demographic characteristics, it becomes more difficult to create homogeneous groups that exhibit internal consistency on every demographic dimension. In Blau's words, "Multiple nominal parameters that intersect increase heterogeneity exponentially, and thereby reduce the size of perfectly homogeneous groups to the vanishing point. Multiform heterogeneity compels people to have associates outside their own group, because it implies that in-group relations are simultaneously intergroup relations in terms of different parameters" (1977, pp. 83-84).

Similar inferences can be obtained from the dynamics observed at the individual and group levels. For example, reference group theory suggests that individuals evaluate themselves by making comparisons to many possible groups in their social settings. As such, the process of self-appraisal will tend to reflect the complexity of social location in which the individual operates (Hyman & Singer, 1976). When individuals are characterized by single group membership, pressures may occur for individuals to behave in accordance to group values and/or norms, thus giving rise to intergroup distinctions and communication barriers. Such distinctions and barriers, however, can be removed if group members depart from normative behaviors due to simultaneous membership in multiple groups.

Following these arguments, we suggest, for example, that an organization whose membership displays heterogeneity on tenure but homogeneity on education will experience less integration and higher turnover than an organization whose membership is heterogeneous on both dimensions. We therefore hypothesize:

Hypothesis 3. Organizations whose members are heterogeneous on multiple demographic dimensions will experience lower turnover than organizations displaying heterogeneity on only one demographic dimension.

Demography of Hospital Nursing Staffs

As argued previously, we expect that demographic heterogeneity may express itself along a number of dimensions besides tenure. The current study considers three dimensions of demographic heterogeneity relevant to nursing staff in community hospitals: (1) educational preparation, (2) tenure, and (3) 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 three 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 training with a minimum liberal arts and biological science to advanced degree training in both social and biological sciences (Cleland, Marz, & Killeen, 1985). Different RN programs 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 (vs. the nursing profession), and the degree of conflict resulting from different orientations to nursing care (Bloom, Alexander, & Nuchols, 1992).

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, Alexander, & Nuchols, 1992).

RN Employment Status. The relative mix of full-time vs. 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 workforce (Amenta, 1977; Wakefield & Mathis, 1985). Hospitals, however, have been compelled by economic and nursing supply conditions to allow more employment flexibility into their workforce. 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 & 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 case mix se-

verity, (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, RN staff size may also affect the extent to which turnover is disruptive to the organization as a whole (McCain, Alexander, & Nuchols, 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 & O'Reilly, 1987). Based on a similar line of reasoning, relative wage may also 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 private 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 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, com-

plex medical interventions administered 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 dataset, which defined the study group of American community hospitals, was the Nursing 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 (Beyers, Mullner, Byre, & Whitehead, 1983).

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 20% 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% response rate) (Beyers et al., 1983).

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, (2) complete nursing demographic data on RN educational preparation, tenure, and employment status, and (3) RN staff levels greater than ten to minimize magnification of personnel changes in very small hospitals. The final usable sample was 398 hospitals. These hospitals should be construed as a convenience rather than a representative sample for the population of U.S. community hospitals.⁵

Measurement

The study adopts a cross-sectional design. All variables are measured in the same year.⁶ Table I presents measures and data sources for all study variables.

The primary independent variable for the study is demographic heterogeneity of hospital nursing staff. Three demographic dimensions are assessed in the model, each based on the proportional representation of hospital nursing staff in two or more categories. RN educational preparation measures the proportional composition of registered nurses according to their educational background in five levels (diploma, associate, bacca-

⁵Larger and private not-for-profit hospitals tend to be over-represented in our sample. We find in a separate analysis that effects of demographic heterogeneity on voluntary RN turnover are particularly salient in smaller hospitals compared to their larger counterparts. In light of this interactive effect, and the fact that large hospitals are over-represented in our sample, results of our study may actually underestimate the effects of demographic heterogeneity on turnover. Selection bias resulting from the over-representation of private nonprofit hospitals is likely to be small since no interactive effect is found between demographic heterogeneity and hospital ownership.

⁶An argument may be made that the causal relationship between demographic heterogeneity and turnover is opposite the one proposed in our study. For example, high turnover in the study year might significantly affect the composition of nursing staff in our sample hospitals if turnover was disproportionately concentrated in certain demographic categories. Such reverse causality would be plausible if the hospitals in our sample were staffed with a high proportion of short-tenured (<1 year) nurses (an indication of high turnover in the year of the study). In a separate analysis, we find that nurse staff in our sample hospitals are evenly distributed among the four tenure categories (as also reflected by the high value of the mean tenure diversity index in Table I, $\bar{X} = 0.83$) and that the mean percentage of nurses with less than 1 year of tenure in our sample is only 21%. These findings suggest that the reverse effect of turnover on demographic heterogeneity is minimal.

Table I. Variables, Measures, and Data Sources

Variable	Measure	Data source
Nursing demography		
RN educational preparation	Standardized diversity index ^d of RN nursing education (diploma/associate/baccalaureate/master/doctoral)	1981 AHA Nursing Personnel Survey
RN tenure	Standardized diversity index ^d of RN tenure (<1 yr/1-2 yrs/2-5 yrs/>5 yrs)	1981 AHA Nursing Personnel Survey
RN employment status	Standardized diversity index ^d of RN employment status (part-time/full-time)	1981 AHA Nursing Personnel Survey
Control variables		
Full-time RN staff size	Full-time RNs on payroll averaged over 4 quarters ^b	1981 AHA Nursing Personnel Survey
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
Hospital ownership	Not-for-profit (reference) Government (0 = no, 1 = yes) For-profit (0 = no, 1 = yes)	1981 AHA Hospital Survey
Case mix	Medicare case mix index	HCFA Case Mix File
RN competition	Number of RNs in county/number of hospital beds in county	1980 Area Resource File
Unemployment rate	County unemployment rate	1980 Area Resource File
Voluntary turnover		
RN voluntary turnover	Number of full-time RNs who voluntarily resigned from hospital in 1980	1981 AHA Nursing Personnel Survey

^dDiversity 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).

^bJan.-March, April-June, July-Sept., Oct.-Dec., 1980.

laureate, master, and doctoral). RN tenure measures 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 assesses 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, is 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 & 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 & 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 employ the standardized form of diversity index to control for the effects of category number (Lieberman, 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 1-year period for assessing turnover is chosen because of the following considerations. First, evaluating turnover for shorter periods (e.g., 1 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 might vary more widely within longer time periods, thus introducing the possible effects of unmeasured time lags (Mueller & 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 are 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 4 calendar year quarters as in the measurement of RN voluntary turnover. Hospital ownership is defined as whether the hospital is investor-owned (for-profit), operated by state or local government, or operated as a voluntary, not-for-profit hospital. Ownership is coded as two dummy variables with the not-for-profit, nongovernment hospitals as the reference group. Case mix index measures 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 & Klastorin, 1980). Relative RN starting wage assesses 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 & O'Reilly, 1987).

The two environmental variables are RN supply and unemployment rate. RN supply is measured as the ratio of the number of registered nurses per hospital bed in the county. Unemployment rate, also measured at the county level, is used to assess the economic condition and job opportunities in the geographic area where the focus hospital is located.⁷

⁷To maximize the number of analyzable cases, missing values on the control variables are replaced by the sample means for descriptive, correlation, and regression analyses. Missing cases of these variables consisted of .0–12.5% of the total sample ($N = 398$ hospitals). No imputation of missing values is carried out for the demographic and turnover variables.

Analysis

Ordinary least squares (OLS) regressions are employed to assess the effects of demographic heterogeneity on voluntary nursing turnover. The dependent variable in the regressions is the log of the number of registered nurses who voluntarily resigned from the hospital over a 1-year period. The rate of turnover is explicitly controlled by including the number of full-time RN staff in the multivariate models (Freeman & Kronenfeld, 1974).

Four nested, hierarchical models are estimated. The first model incorporates the set of seven control variables in order to evaluate the variance contributed to nursing turnover by organizational and environmental characteristics. The second model includes the control variable set and the linear forms of the three demographic indicators. This model assesses the independent and collective effects of demographic heterogeneity on turnover, controlling for a variety of alternative explanations of the demographic heterogeneity–turnover relationship. In model 3, the quadratic terms of demographic heterogeneity are added to the set of variables contained in model 2 to test whether a curvilinear relationship occurs between heterogeneity and turnover. Significant, negative coefficients for quadratic regression terms in conjunction with positive estimates for main effects would indicate that demographic heterogeneity affects nursing turnover in an inverted U-shaped pattern. Finally, model 4 adds a set of two-way interactions between demographic dimensions to examine the joint effects of demographic heterogeneity on turnover.

RESULTS

The mean voluntary turnover rate for the sample of 398 hospitals is 24%. Hospitals located in the Northeast region of the country, 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%, 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%, respectively).

Table II presents descriptive statistics and the intercorrelations among all the variables. Among the three indicators of demographic heterogeneity, RN educational preparation exhibits the lowest mean level of heterogeneity ($\bar{X} = .50$), followed by RN employment status ($\bar{X} = .78$) and RN tenure ($\bar{X} = .84$). The three diversity indices are correlated with each other. The correlation between educational and tenure heterogeneity appears to be particularly higher than those of the other two pairs of interdimensional relationships. Two of the three demographic heterogeneity indicators (RN

Table II. Means, Standard Deviations, and Pearson Correlations^a

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Voluntary turnover	23.54	29.27	—											
2. Full-time RN staff size	98.58	106.15	.78	—										
3. Relative RN wage	1.63	.31	-.24	-.30	—									
4. Not-for-profit	.66	.47	.10	.20	-.27	—								
5. Government	.27	.44	-.07	-.16	.32	-.85	—							
6. For-profit	.07	.25	-.08	-.10	-.05	-.38	-.16	—						
7. Case mix	1.01	.16	.36	.38	-.18	.17	-.13	-.09	—					
8. RN supply	.52	.19	.33	.39	-.57	.27	-.30	.02	.32	—				
9. Unemployment	6.80	2.17	-.02	.02	.14	.03	.02	-.10	.03	.11	—			
10. SDI ^b of RN education	.50	.19	.33	.29	-.19	.06	-.07	-.00	.14	.17	-.06	—		
11. SDI of RN tenure	.83	.19	.32	.30	-.23	.12	-.10	-.04	.19	.27	-.00	.38	—	
12. SDI of RN employment status	.78	.26	-.07	-.03	-.16	.33	-.31	-.08	.01	.11	-.01	.15	.18	—

^aDecimal points are omitted from correlation coefficients; correlations greater than + or - 10 are significant at $p < .05$.

^bSDI = standardized diversity index.

educational preparation and RN tenure) are positively and significantly correlated with turnover, thus providing initial support for hypothesis 1. Except for county unemployment rate and government and for-profit ownership, 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, RN supply as a reflection of competition for jobs among nurses in the neighboring areas displays a positive relationship with voluntary turnover. In general, hospitals under private not-for-profit control, with larger full-time RN staffs, with sicker mix of patients, located in areas with higher levels of RN supply and lower relative wages display higher RN voluntary turnover.

Table III presents the results of four hierarchical regression models. Model 1 contains the seven organizational and environmental control variables. The model is significant at the $p < .01$ level and accounts for 64% of the variance in RN voluntary turnover. Consistent with the results of bivariate correlations, full-time RN staff size and the dummy variable of government control display statistically significant ($p < .05$) associations with turnover.

Model 2 assesses the effects of demographic heterogeneity on nursing turnover, using the linear forms of the three demographic dimensions as predictors. Controlling for environmental and hospital organizational characteristics, heterogeneity of RN educational preparation exhibits a statistically significant association with the dependent variable at $p < .05$. Diversity of tenure and employment status are both significant at $p < .10$. Greater diversity in tenure is related to higher turnover. However, contrary to our expectation, diversity of employment status relates negatively to turnover. These results provide partial support for hypothesis 1 which predicted greater turnover in hospitals with higher levels of demographic heterogeneity in their nursing staffs.

To assess the contribution of the construct of demographic heterogeneity to explaining turnover, we apply a partial F test to the marginal contribution to the model R^2 resulting from the addition of the three demographic indicators to the model, after partialing out the contribution of all control variables.⁸ Results indicate that the marginal contribution of demographic heterogeneity is significant ($F = 25.84, p < .01$).

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

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.

Table III. OLS Regression Results: Effects of Nursing Demography on RN Voluntary Turnover^a

Independent variable	Model 1 ^b		Model 2 ^c		Model 3 ^d		Model 4 ^e	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Intercept	-11.12	9.32	-19.85*	10.43	-26.55**	13.11	-23.83**	11.00
Control variables								
Full-time RN staff size	.21***	.01	.20***	.01	.19***	.01	.20***	.01
Relative RN wage	.69	3.67	1.60	3.64	1.69	3.61	2.20	3.61
Government	4.99**	2.15	3.64	2.22	4.15*	2.21	4.04*	2.20
For-profit	1.46	3.60	.42	3.58	3.54	3.53	1.49	3.55
Case mix	11.39*	5.97	10.24*	5.86	9.01	5.82	10.06*	5.80
RN supply	5.69	6.06	4.40	5.97	7.57	5.98	7.23	5.94
Unemployment rate	-.50	.42	-.42	.42	-.30	.41	-.33	.41
Demographic diversity ^f								
RN education			15.33***	4.95	22.68***	6.24	16.96***	5.04
RN tenure			9.29*	5.16	20.58**	8.52	12.39**	5.97
RN employment status			-6.72*	3.69	-17.15***	5.82	-9.52**	3.84
[RN education] ²					39.31*	20.59	—	—
[RN tenure] ²					27.91*	15.40	—	—
[RN employment status] ²					-25.55**	11.97	—	—
RN education*RN tenure							47.00**	20.94
RN education*RN employment status							-49.80**	19.88
RN tenure*RN employment status							-11.97	19.18

^aOnly unstandardized coefficients are reported.

^bR² (Adj.) = .64 (F = 101.61; df = 7/397, p < .01).

^cR² (Adj.) = .65 (F = 75.77; df = 10/397, p < .01).

^dR² (Adj.) = .66 (F = 60.81; df = 13/397, p < .01).

^eR² (Adj.) = .66 (F = 51.15; df = 13/397, p < .01).

^fDemographic variables are centered (X - X̄) before the creation of quadratic and interaction terms to reduce computational bias caused by collinearity between linear terms and higher order terms of diversity indices in models 3 and 4 (Neter, Wasserman, & Kutner, 1985).

*p < .10

**p < .05.

***p < .01.

To test whether demographic heterogeneity assumes an inverted U-shaped relationship with turnover, model 3 includes both linear and quadratic terms of the demographic heterogeneity variables. Contrary to our expectation, none of the demographic diversity indicators displays an inverted U-shaped relationship with RN turnover. RN tenure and education diversity are significant at $p < 0.05$ after controlling for their quadratic terms in the model. Thus, diversity of tenure and education appear to assume a linear relationship with turnover. One heterogeneity term, the heterogeneity of employment status, exhibits a statistically significant, non-linear association with RN voluntary turnover. The regression coefficients for the linear and quadratic terms are both significant and negative, indicating that the relationship between heterogeneity in employment status and turnover assumes a downward curvilinear slope. RN voluntary turnover is high at low level of diversity in employment status but it decreases rather dramatically as the diversity of employment status increases. Such decreases gradually level off at moderate and high levels of heterogeneity.

Model 4 tests how the joint effects of diversity relates to employee turnover. Results suggest that although the diversity indices operate independently of one another with respect to explaining turnover, the presence of multiform diversity acts to boost or reduce the effects of demographic diversity on organizational turnover. The application of an F test to assess the marginal contribution of the interactions of diversity indices indicates a statistically significant contribution to the model ($F = 24.62, p < .01$). The specific joint effects of diversity dimensions on turnover are discussed below.

Heterogeneity of RN educational preparation exhibits different effects on RN turnover at different levels of employment status heterogeneity (see Appendix). In hospitals whose nursing staffs are highly homogeneous in employment status (diversity score = .1), increased heterogeneity of RN educational preparation is associated with increased levels of turnover. In hospitals with high employment status diversity (diversity score = .9), the impact of heterogeneous educational preparation on turnover is negative: the higher the educational diversity, the lower the turnover among hospital registered nurses. These results support our prediction that when heterogeneity is high on multiple dimensions, organizations are likely to experience low turnover among their members.

The relationship between educational diversity and turnover also depends on the level of diversity in organizational tenure. The pattern of results, however, do not support our hypothesis regarding multiform heterogeneity and turnover. No matter the levels of tenure diversity, increasing levels of educational diversity are associated with increasing turnover. For hospitals with higher tenure diversity (diversity score = .9) among nursing

staff, the slope depicting the relationship between educational diversity and turnover is much steeper than in those organizations with lower levels of tenure diversity (diversity score = .1) among the nursing staff. Thus, the joint distribution of tenure and educational diversity boosts the positive main effects of tenure and educational diversity on RN voluntary turnover.

DISCUSSION

According to Blau (1977), multiple parameters of social structure influence the degree of cohesion and integration in social groups. Our study extends the empirical testing of Blau's assertions and provides support for the importance of multiform heterogeneity in the informal social structure of organizations, specifically in explaining organizational turnover. Two attributes of multiform heterogeneity, as derived from Blau's work, were displayed in our results. The first was that multiple dimensions of organizational demography exercise independent effects on voluntary turnover in organizations. In our study, three indicators of demographic heterogeneity among hospital nursing staffs—RN educational preparation, tenure, and employment status—were significantly related to voluntary RN turnover. Importantly, however, heterogeneity on these dimensions did not operate in a similar direction on voluntary turnover. Whereas heterogeneity in RN educational preparation and tenure showed a significant, positive relationship with voluntary RN turnover, heterogeneity of employment status exhibited a significant, negative association with this dependent variable.

One explanation for these unexpected findings is that the hypothesized positive relationship of demographic heterogeneity and turnover obtains only when the distribution of demographic attributes involves hierarchical differentiation of membership status. The distinction between part-time and full-time employment is not hierarchical and reflects mainly the amount of time spent on the job. Tenure and educational preparation, by contrast, are important factors that determine not only the status that a person has achieved and/or can achieve within the organization or occupation. Such status differentiation represents a strong structural constraint that inhibits cross-level contacts (Lin, 1990). Because communication is motivated primarily by homophilous attractions among members with similar positions and values (Lin, 1990), cross-status, intergroup interactions will be difficult when there is high degree of heterogeneity in status-based demographic characteristics. This may explain why tenure and education preparation exhibited significant effects on turnover in our study and prior research (e.g., McCain et al., 1983; Pfeffer & O'Reilly, 1987; Wiersema & Bird, 1993).

A second proposition posited by Blau (1977) was that at extremely high levels of demographic heterogeneity, turnover would actually decline because of the difficulty of creating "in-groups" and excluding "out-groups" given a large number of social groupings of small size. We expected, therefore, to see an inverse U-shaped relationship between demographic heterogeneity and voluntary turnover. The quadratic term of one demographic attribute, employment status, was statistically significant. However, the relationship assumed a downward curvilinear shape rather than the expected inverse U form. Because this pattern of findings is not consistent with Blau's thesis, we can only speculate as to its meaning. One explanation is that the presence of part-time nursing personnel reduces voluntary turnover among RNs by increasing the flexibility of shift scheduling as well as by assigning part-time nurses more routine and less favorable tasks. Although such explanations cannot be definitely tested in this analysis, prior literature on labor and employment practices (Amenta, 1977; Wakefield & Mathis, 1985) provide indirect support for the curvilinear effects of diversity of employment status as a predictor of turnover.

The third of Blau's propositions on the effects of heterogeneity in social structure relates to the notion that the presence of multiple sources of demographic heterogeneity will break down the barriers to social interaction and cohesion. The absence of such barriers, according to Blau, should lead to less voluntary turnover in organizational settings. We tested this proposition by interacting our three measures of organizational demography with each other. Although our results yielded two significant interaction terms, they exhibited quite different effects on voluntary turnover among staff RNs. Supporting our hypothesis, the interaction of RN education diversity and RN employment status reduced the rates of voluntary turnover, independent of the main effects of these variables. When hospitals are heterogeneous on both RN educational preparation and RN employment status, they are likely to experience low levels of voluntary turnover among their full-time registered nurses. By contrast, the interaction of diversity of RN education and RN tenure actually increased the rate of voluntary turnover over and above the main effects of these two terms.

The positive interactive effect of education and tenure may result from the relatively strong, positive correlation between these two heterogeneity dimensions. It is possible that Blau's proposition regarding the positive effect of multiform heterogeneity on intergroup interaction is unlikely to hold in situations where demographic attributes covary. When distributions of demographic characteristics are highly correlated, their joint distribution is likely to increase the distance between groups by causing organizational members sharing similarities on multiple attributes to cluster

in one or few dominant groups. Thus, instead of increasing the difficulty of creating homogeneous groupings and promoting social contact, the joint effect of such covariate multiform heterogeneity may enhance in-group pressures that inhibit integration and result in high turnover. For example, high levels of turnover may be experienced by organizations whose dominant organizational group is characterized by white males with long tenure and high education. However plausible this explanation, additional research, possibly based on more complex interaction patterns and different dimensions of demography, will have to be conducted before this issue is resolved.

Organizational demography can be conceptualized in terms of different properties of organizational members. Each of these properties may assume an independent relationship with turnover. This study has focused on the distributional properties of organizational demography as expressed in the concept of heterogeneity. However, it should be recognized that, apart from the impact of elevated conflict and weakened integration associated with demographic heterogeneity, high turnover is also likely to be influenced by demographic composition through the concentration of organizational members in certain fast-replacing categories. For example, it has been suggested that hospital 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 the nursing profession (Becker, 1962; Bloom, Alexander, & Nuchols, 1992). While not included in this study, such alternative conceptions of demography are appropriate for examination in future research.

We have examined concepts from organizational demography in a specific context: hospitals and their nursing staff. Nurses with different educational backgrounds may have different philosophic views of nursing and patient care, and therefore different reasons to be working. Similarly, heterogeneity of tenure, representing differences in experiences in the organization and potentially different levels of assimilation, was also a significant predictor of voluntary turnover. These differences may prevent nurses collectively from becoming integrated in the social and cultural milieu of a hospital. Lack of integration may result in greater likelihood of voluntarily exiting from the hospital when alternative job opportunities present themselves. These findings are generally consistent with Blau's assertion that distributional differences in social status and/or experience preclude integration in social contexts, thus increasing dissatisfaction and turnover.

As noted previously, however, greater diversity in employment status among hospital RNs lowers the level of turnover among this group. In other

words, the greater the proportion of part-time RN staff in the hospital the lower the hospital's level of RN turnover. Unlike heterogeneity of tenure and educational status, a heterogeneous mix of full- and part-time staff does not appear to impede integration, cohesion, and organizational identity. Our results indicate that at certain levels, part-time RN staff may actually improve the retention of RN staff, no matter their level of job commitment. These part-time staff, for example, may provide the flexibility to loosen work demands on full-time RNs. Such context-specific explanations for demographic effects, however, are not necessarily applicable to other types of organizations. Future research should focus on defining the conditions under which specific dimensions of demography operate.

Other contexts may also affect the relationship between demographic heterogeneity and organizational outcomes. Wiersema and Bird (1993), for example, argued for the importance of sociocultural factors in studying demographic characteristics and organizational outcomes. In studies focusing on the dynamics of intra-organizational groups, identification and measurement of the relevant organizational environment in which group relations are embedded appears particularly relevant (Alderfer & Smith, 1982). For example, in separate analyses (not shown) we found that demographic diversity affected voluntary RN turnover in smaller nursing staffs (RN staff size ≤ 100), but not in large nursing groups (RN staff size > 100). The influence of demographic diversity on group interaction and membership turnover thus appears to be conditioned by organizational size. In large organizations, relationships tend to be formally structured and large size may make close contact among organizational members difficult (Kelvin, 1970). Hence, distinctions based on personal characteristics will be less salient in group formation and intergroup interactions.

CONCLUSION

Our findings suggest several implications for the study of organizational demography. First, they corroborate findings of recent investigations (Jackson et al., 1991; Wiersema & Bird, 1993) that demography in organizations operates in multidimensional fashion to affect turnover and other outcomes. An organization's demographic structure clearly includes attributes other than tenure, and these attributes may exercise independent as well as joint effects on organizational behavior. However, there remains an issue of whether or not a common set of demographic properties is appropriate for studying all types of organizations or organizational behaviors. We suggest that the attributes that best reflect the demographic structure of an organization or group should depend, in part, on the type of organization studied and the outcome of interest. In our investigation, for

example, the choice of demographic attributes was based on a consideration of professional distinctions that result in status differences among hospital RNs. These characteristics may or may not be appropriate for studying, say, manager-worker teams in a manufacturing firm or department faculty in a university setting.

A second, but related, issue is the notion that demographic heterogeneity does not operate similarly across all demographic attributes. We observed in our study, for example, that heterogeneity in employment status (full- vs. part-time) had very different effects on voluntary turnover than heterogeneity in tenure or education. This further reinforces the requirement that theoretical development in organizational demography needs to be specific to both the attribute and the context in which the attribute is studied. The distinction between status-based differences vs. nominal differences may represent a starting point for this type of inquiry.

Previous studies of organizational demography have assumed that demographic heterogeneity acts in both an independent and linear fashion. For example, these studies might posit that greater heterogeneity in organizational tenure results in higher turnover and that this relationship obtains independently of the effects of heterogeneity of other demographic properties. Our findings, however, reveal that organizational demography operates in more varied ways. Because social structures are inherently complex, it seems reasonable to assume that different combinations of demographic properties exist across organizations and groups and the particular combinations of demographic properties may either boost or reduce the effects of individual demographic attributes. Traditional multivariate studies of organizational demography effectively ignore this reality by artificially isolating the effects of individual demographic properties. In fact, the combination of demographic properties in an organization may create a dynamic that differs from that found when examining characteristics in isolation from others with which it may operate.

APPENDIX

1. Interaction of Employment Status (ST) and Education (E):

$$Y (\text{Turnover}) = 16.96 (E) - 9.52 (ST) - 49.80 (E) (ST) - 23.83$$

For employment status diversity score = .1:

$$Y = 11.98 (E) - 24.78$$

For employment status diversity score = .9:

$$Y = -27.86 (E) - 15.26$$

2. Interaction of Education (E) and Tenure (T):

$$Y (\text{Turnover}) = 16.96 (E) + 12.39 (T) + 47.00 (E) (T) - 23.83$$

For tenure diversity score = .1:

$$Y = 21.66 (e) - 22.59$$

For tenure diversity score = .9:

$$Y = 59.26 (E) - 12.68$$

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