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## Should I stay or should I go? Career change and labor force separation among registered nurses in the U.S.

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### ABSTRACT

Efforts to retain nurses within the profession are critical for resolving the global nursing shortage, but very little research explores the phenomenon of nursing workforce attrition in the U.S. This study is the first to simultaneously investigate the timing of attrition through survival analysis, the exit path taken (career change vs. labor force separation), and the major socioeconomic, family structure, and demographic variables predicting attrition in this country. Using nationally representative U.S. data from the 2004 National Sample Survey of Registered Nurses ( $N = 29,472$ ), we find that the rate of labor force separation is highest after the age of 60, a typical pattern for retirement. However, a non-trivial proportion of career change also occurs at older ages (50+ years old), and the rate of labor force separation begins to climb at relatively young ages (30–40 years old). Particularly strong predictors of early labor force separation include being married and providing care to dependents in the home (young children or elderly parents). Career change is predicted strongly by higher levels of education, male gender, and current enrollment in a non-nursing degree program. Having an Advanced Practice credential reduced the hazards of attrition for both exit paths. The results suggest a fruitful path for future research and a number of policy approaches to curbing nurse workforce attrition.

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### Introduction

The nursing shortage is an ongoing problem affecting both developed and developing countries. Germany and the Netherlands were each short 13,000 nurses in 2003 (Oulton, 2006), and the ratio of nurses to population is exceptionally low in many parts of South America and Africa (ICN, 2004). The United States (U.S.) had 116,000 vacancies for registered nurses (RNs) as of December 2007 in hospitals alone (American Hospital Association, 2007). In developed countries, an aging population demanding more healthcare and an aging nurse workforce nearing retirement combine to predict a worsening shortage over the next decade. In less developed countries, many homegrown nurses are immigrating to more developed countries for higher wages and enhanced career opportunities, redistributing the nursing shortage to countries that are less well equipped to deal with it (Buchan, 2002).

Attrition of nurses from the nursing workforce is a major component of the U.S. nursing shortage, yet few studies have accurately quantified the timing, exit path (career change vs. labor

force separation), and causes of nurse workforce attrition in this country. A few European studies utilize administrative tracking systems to explore in detail the employment decisions of nurses (e.g., Friis, Ekholm, Hundrup, Obel, & Gronbaek, 2007; Holmås, 2002). Unfortunately, available data in the U.S. do not allow longitudinal tracking of nurses from entry into the profession through labor force separation. This is a problem for workforce planners and analysts whose goal is to ensure that the U.S. has the number and types of nurses available at the time they are needed.

Models that forecast future nursing supply typically make projections based on the expected age of nurses at separation from the workforce, among other factors. The accuracy of those models depends, in part, on good estimates of RN age at separation. A commonly used RN supply forecasting model in the U.S., the Health Resources and Services Administration (HRSA) Nurse Supply Model, currently approximates RN attrition rates by using rates for “college educated women” from the Current Population Survey (Biviano, Fritz, Spencer, & Dall, 2004). The model results would be improved if actual RN ages could be used, but to date no credible estimates exist.

The most informative study of nurse employment in the U.S. is the National Sample Survey of Registered Nurses (NSSRN), a survey of more than 30,000 licensed RNs. Based on the most recent wave

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of the quadrennial survey released for public use, it is estimated that 16.8 percent of licensed RNs – or about 488,000 – were not employed in the field of nursing in 2004 (U.S. Department of Health and Human Services [USDHHS], 2006). Almost 34 percent of these RNs reported being retired, but the age at which they retired or the factors contributing to their retirement decision have not been explored in detail. Americans become eligible for Social Security between the ages of 65 and 67, depending on birth year, but it is unknown what proportion of nurses retires before, at, or after the age at which benefits become available. Due to the aging of the RN workforce in the U.S., the number and proportion retiring from the workforce is expected to rise (Minnick, 2000). As a consequence, ways are being explored to extend employment for older nurses (Buerhaus, Staiger, & Auerbach, 2000).

A number of RNs leave the nursing workforce prior to retirement age in order to change careers, stop work temporarily to raise children, or stop working permanently. Exact information is not available on the percentage of RN attrition that is not retirement-related, but extrapolating from the 2004 NSSRN results, it would appear that around two-thirds of all attrition occurs for other reasons. This type of attrition may be even more important than the large cohort of older RNs expected to retire within the decade, since it indicates that the nursing profession is losing individuals who have many remaining years of work life.

Effective policy solutions for reducing RN attrition depend on accurate information about the ages at which separation occurs and the predictors of separation (reaching “retirement age,” illness/disability, family responsibilities, financial circumstances, and work environment). These are important variables because strategies for reducing separation from nursing will differ based on the reason for separation. For example, reducing the number of young RNs who leave the workforce because of difficult working conditions requires different policies than those needed to lower the number of young RNs who leave to care for family members. Those policies, in turn, are different from ones that could be implemented to reduce the number of early retirees.

In this study we examine the labor force separation behavior of RNs in the U.S. through creative use of the most accurate and recent nurse workforce data available, the 2004 NSSRN. We use retrospective reports of years since nursing employment to identify the ages at which separation from nursing occurred, and we use survival analysis to identify predictors of separation timing and exit path (career change vs. labor force separation). We discuss the implication of results for policies designed to reduce attrition and future studies needed to further the literature on workforce attrition in nursing and other health professions.

### Review of the literature

#### Nurse workforce attrition at non-normative ages

Trend analysis of cross-sectional NSSRN studies from 1992, 1996, and 2000 demonstrated two concerning patterns related to pre-retirement nurse attrition in the U.S.: accelerating losses in the cohort of nurses aged 31–40 and a waning proportion of newly licensed RNs working within the field of nursing (Sochalski, 2002). Unfortunately, studies that identify the timing and predictors of nurse workforce attrition are rare because they require tracking nurses over time or identifying former nurses for a cross-sectional study and then collecting information about the timing of employment transitions from those nurses.

Such studies appear to be more common in European countries. For example, Holmås (2002) combined administrative data from the Norwegian Association of Local and Regional Authorities and Statistic Norway to assemble a dataset tracking the employment outcomes of nurses. Barron and West (2005) used data from the

British Household Panel Survey – which followed individuals over time and began with a retrospective employment history – to perform an event history analysis of nurses’ careers. In Sweden, a longitudinal survey obtaining a high response rate at follow-up allowed identification of individuals who had left the nursing workforce over a ten-year period (Fochsen, Josephson, Hagberg, Toomingas, & Lagerstrom, 2006).

These European studies found that predictors of early attrition from the nursing workforce were male gender, younger age, less tenure in the profession, the presence of musculoskeletal problems, and poor work environment (limited use of transfer devices for lifting patients, inability to use own initiative at work, and high numbers of beds per nurse). Although Barron and West (2005) found that family responsibilities significantly increased the risk of attrition, Holmås (2002) found that having young children had no significant impact on rates of workforce attrition. Since countries vary substantially in the types of benefits available for working mothers, the discrepancy between the two studies could be a result of their different samples. The similar findings noted for other predictors point to cross-national problems with the nursing work environment that may be improved to better retain nurses – especially those who are new to nursing or sex-atypical within the profession.

A few studies in the U.S. and Europe surveyed former (or inactive) nurses to learn more about the reasons they left nursing employment. These studies identify both personal characteristics (education level and family responsibility) and workplace characteristics (workload, autonomy, salary, and opportunities for advancement) as important reasons. In the U.S., analysis of the 2004 NSSRN shows that (allowing for multiple responses) 49.3 percent who are not working in nursing left nursing for personal or family reasons, 49.5 percent for personal career reasons, and 42.7 percent for reasons connected with the workplace (USDHHS, 2006). This suggests that personal and workplace/professional factors are of equal importance for further studies of attrition in this country.

International and state-level studies within the U.S. echo the need to focus on both personal and workplace causes of attrition. Those who had left nursing are much more likely to report trouble balancing work life with family responsibilities (Duffield, Pallas, & Aitken, 2004; Williams et al., 2006), and having higher levels of education appears to increase the risk of leaving nursing for other professions (Duffield et al., 2004; Pierce, Freund, Luikart, & Fondren, 1991). Former nurses identified dissatisfaction with patient loads, staffing levels, their ability to work autonomously, the physical nature of nursing work, and stress/burnout as environmental and professional problems that lead them to give up nursing (Cheung, 2004; Pierce et al., 1991). Pierce et al. (1991) explored the issue of nurse wages, finding that while low salary was identified as a reason for seeking non-nursing employment, respondents were satisfied with their entry-level salary. Instead, they left because they felt they had limited opportunities for raises throughout their careers – a phenomenon known as wage compression.

Studies of *intent* to leave the profession (ITL) are much easier to accomplish because cross-sectional samples of currently licensed registered nurses are comparatively easy to draw. Consequently, they are more common than studies of former nurses or longitudinal studies that prospectively follow nurses’ employment decisions. These studies shed light on the phenomenon of nurse workforce attrition to the extent that *intent* to leave the profession results in *actually leaving* the profession. One study found direct evidence of this progression among nurses, showing that the most proximate predictor of actual attrition was ITL (Lane, Mathews, & Presholdt, 1988). Unfortunately, in many studies large proportions of nurses report an intention to leave. One U.S. study reported that

46 percent of respondents were considering leaving the profession (Borkowski, Amann, Song, & Weiss, 2007), and a study of multiple European countries found ITL to vary between 10.4 percent (Netherlands) and 35.6 percent (United Kingdom) across countries (Estryn-Behar et al., 2007).

Predictors of ITL are typically similar to those found among the smaller set of studies examining actual attrition. Conflict between the responsibilities of family and work remains an important risk factor for ITL (Estryn-Behar et al., 2007; Flinkman, Laine, Leino-Kilpi, Hasselhorn, & Salanterä, 2008). Work environment deficiencies including lack of career progression, perceived lack of autonomy or decision-making, burnout, low salary, high patient loads, and low levels of job satisfaction also contribute to ITL (Estryn-Behar et al., 2007; Flinkman et al., 2008; Hart, 2005). Lynn and Redman (2005) found that one important determinant of ITL was the extent to which the family depended on the nurse's salary; nurses plan to stay in the profession when their nursing salaries make up a larger part of the total household income.

Fewer studies of ITL examine demographic predictors (Borkowski et al., 2007), yet these predictors are important because they identify groups of individuals who are experiencing the nursing workforce differently from others. As in the literature on actual attrition, ITL is more common among men, younger nurses, and nurses with less experience (Borkowski et al., 2007; Estryn-Behar et al., 2007; Nogueras, 2006). In contrast to studies linking higher levels of education to higher probabilities of career change, some studies of ITL find that higher levels of education *reduce* the intent to leave the profession (e.g., Borkowski et al., 2007; Nogueras, 2006). It is for now unclear why higher levels of education would be linked to reduced ITL but greater probabilities of actual nurse workforce attrition.

#### Nurse retirement

If tracking nurse workforce attrition at younger ages is difficult, identifying the timing and predictors of retirement from the nurse workforce is even more difficult. Consequently, although many recent articles discuss the impending waves of retirement owing to aging of the nursing workforce and discuss the ways in which work patterns vary by age (e.g., Minnick, 2000), few studies are able to quantify retirement timing or assess its major predictors. As was true in the literature on nurse workforce attrition at non-normative ages, most major studies of actual nurse retirement behavior have been conducted in developed countries outside the U.S.

These studies show, in contrast to the literature on nurse career change, that personal characteristics play a heightened role in retirement decisions. Two studies reported that job characteristics such as workload, physical demands, and job satisfaction are eclipsed by personal characteristics such as health, income, marital status, gender, and the draw of having time to spend with family (Blakeley & Ribeiro, 2008; Friis et al., 2007). Early retirement is more likely when health is poor or a nurse is disabled, female, married, or has lower income. However, in these and other studies (e.g., Andrews, Manthorpe, & Watson, 2005; Boumans, de Jong, & Vanderlinden, 2008) characteristics of the work environment do play a role in the retirement decision. The same workplace deficiencies that drive younger nurses to change careers – lack of autonomy, patient loads, lack of career progression, and stress – also lead older nurses to retire early.

Though studies of retirement behavior among nurses are rare, the economic and sociological literatures have identified predictors of retirement in the general population. It has been found that predictors of early retirement include poor health (Disney, Emmerson, & Wakefield, 2006; Shultz & Wang, 2007), availability of health insurance in retirement (Rogowski & Karoly, 2000), financial security in the form of pensions, entitlements, and savings

(Bahrami, Elder, & Jacobson, 2002), work environment deficiencies (Bahrami et al., 2002), and marriage/family structure (Smith & Moen, 1998).

One seemingly contradictory finding on retirement in the general population concerns the effect of income. Although financial security may be seen as a prerequisite for retirement, some studies have found that higher income is associated with delayed retirement (Bahrami et al., 2002). The literature also indicates that individuals from higher status occupational categories (i.e., white-collar careers, “professions”) retire later, even if the individuals had saved enough money to live comfortably (Hardy, 1985). These findings point to the “psychic” income resulting from meaningful work, which may be more prevalent in the careers of individuals with higher levels of education and income. Although less satisfied workers are likely to retire as soon as they are financially able, professionals whose identities are tied to employment may delay retirement even when there is little financial reason to do so.

#### Summary and research questions

Our review of the literature shows that studies of *actual* nurse workforce attrition are scarce when compared to studies on *intent* to leave the profession. The latter are more typically focused on attrition at pre-retirement ages and address factors that lead nurses to change careers; nurse retirement is particularly understudied. Further, most of the studies addressing the timing and predictors of nurse workforce attrition have been conducted outside the U.S. It is, at present, unknown if similar patterns hold in this country, which has a healthcare system dominated by private, for-profit healthcare providers and insurance companies.

To address these gaps in the literature, this study examines the following research questions using U.S. data: 1) When do nurses leave the nursing profession, and how prevalent is attrition at different ages? 2) How does age at attrition vary by the different “exit paths” of career change and labor force separation? 3) What are the socioeconomic, family structure, and demographic predictors of attrition, and do they vary by exit path?

#### Methods

The data for this study are from the 2004 National Sample Survey of Registered Nurses (NSSRN). Conducted every four years by the Health Resources and Services Administration (HRSA), the NSSRN is a large, nationally representative survey of RNs in the U.S. The survey's target population was all actively licensed RNs, including advanced practice RNs such as Nurse Practitioners, in the country. Through rigorous follow-up by phone, this mailed survey obtained a relatively high response rate of 70.47%. More detail about the sampling design and discussion of sampling (and non-sampling) error can be found in USDHHS (2006).

This study uses survival analysis, also called event history analysis, to study the phenomenon of nursing workforce withdrawal. Survival analysis is a group of analytic techniques used to model the occurrence and timing of events. In addition to using information about the timing of events, survival analysis also incorporates the fact of non-event (over some period of time) for cases that are censored, or lost to observation before an event occurs. In this study, two different events mark the withdrawal of a nurse from the nursing workforce: movement into a non-nursing position (career change) and complete withdrawal from the workforce (labor force separation). Because these two events likely have very different rates of occurrence, timing, and predictors, the two types of workforce attrition are examined separately in survival analysis.

Cox regression was used to estimate competing risks models that identify the effects of predictor variables on the hazards of career change or labor force separation. Cox's method produces

semiparametric proportional hazards models predicting the hazards of an event occurring at a specific time:

$$h_i(t) = \lambda_0(t)\exp\{\beta_1x_{i1} + \dots + \beta_kx_{ik}\}$$

The equation specifies that the hazard for an individual  $i$  at time  $t$  is the product of a baseline hazard function and an exponentiated set of fixed covariates. The technique can be extended to include competing events by specifying models for each event type that treat cases experiencing the alternate event as censored at the time of that event (Allison, 1995). Survival and hazard functions were estimated with covariate effects controlled. The analysis was conducted using PROC PHREG in SAS version 9.1.3.

This is a retrospective survival analysis: the data are cross-sectional, but respondents were asked questions about their professional history that allowed measurement of event timing. A prospective, longitudinal study – in which events are recorded as they happen – is the ideal study design for performing survival analysis since respondent recall is not required. However, many topics have been fruitfully explored with retrospective survival analyses, including the timing of hospice referral (Kyusuk, Essex, & Samson, 2008) and choice of cohabitation or marriage (Bradatan & Kulcsar, 2008). In many cases, the data needed to analyze events prospectively are simply unavailable. Though perhaps not ideal in design for survival analysis, the NSSRN data provide several advantages. In addition to being nationally representative, the study's sample size is very large (more than 30,000) – maximizing the number of older RNs who have already retired as well as the number of RNs at any age who have experienced workforce attrition. To the authors' knowledge, there exists no more appropriate set of data for the study of nurse workforce issues in the U.S. than the NSSRN.

The cross-sectional data used here present a sample selection issue that affects the way in which results should be interpreted. Because the sampling frame used for the NSSRN was constructed using licensure databases, only *currently* licensed nurses were eligible to participate in the study. It is unknown how many former nurses have ceased to renew their licenses. It is known anecdotally that many nurses retain a nursing license in perpetuity – regardless of their current employment situation (Biviano et al., 2004). Professional nursing becomes a part of many people's identities, and maintaining a license signifies a commitment to this identity. In addition, if a nurse wants to keep open the option of returning to nursing work, the maintenance of a license is preferable to dropping and then reapplying for a nursing license.

Unfortunately, the sample selection method used by NSSRN is the only reasonable way to draw a large sample of RNs. For the analysis presented here, the sample selection problem (omitted former nurses) means that the survival curves may not accurately describe the proportion of RNs who withdraw from the labor force at each age. They should, however, do reasonably well at showing how timing (age) affects the decision to withdraw. Since we have no reason to suspect that nurses who fail to renew a license are different in terms of socioeconomic status, family structure, or demographics than nurses who do renew (regardless of work status), we believe that Cox regression models accurately describe the impact of covariates on the decision to leave the nursing profession.

The dependent variable in any survival analysis is *time to event or censorship*. In the analyses presented here, chronological age is used as the time origin. This origin allows us to interpret survival function values as the proportion expected to remain in the nursing workforce at each age, and covariates in regression can be interpreted in terms of their ability to increase or decrease the hazards of workforce attrition at each age.

Because individuals enter the field of nursing at different ages, use of this time origin results in left-truncated data for survival

analysis: individuals enter the period of risk for attrition at different ages. To correct for this problem, a variable representing the age at which nurses were initially licensed is used to specify the nature of left-truncation in PROC PHREG (the ENTRY = option within the MODEL statement). Initial licensure is a reasonably good proxy for the start of a nursing career, as most nurses begin work immediately after licensure.

An alternative time origin based on age of initial licensure, *length of tenure as a nurse*, was also investigated. Because age and professional tenure are strongly related, the survival curves were nearly identical in shape and the estimated effects of covariates were similar in Cox regression models. To facilitate interpretation of results and comparisons to other professions, we present results for chronological age only.

Respondents not working in nursing were asked "how long has it been since you last were employed or self-employed as a registered nurse?" (2004 NSSRN Question #41). *Age at event or censorship* was defined by subtracting the number of years since nursing employment from respondents' age in 2004. Those still employed in the field of nursing were assigned their age as of 2004 (the year of censorship). The censorship variable had three categories: *censored* (no event occurred as of 2004), *career change* (respondent was working in a non-nursing field in 2004), and *labor force separation* (respondent was not working at all in 2004). Unfortunately, we did not have enough information to discern whether the event was permanent (i.e., retirement) or temporary (i.e., laid off, taking time for child-rearing). We treat events as permanent changes for the purpose of this analysis but recognize cases where strong predictors – such as the presence of young children at home – may signal a temporary departure from nursing.

Independent variables in this analysis were classified as socioeconomic, family structure, and demographic variables. They were assessed in 2004, which for some respondents will be after their departure from the labor force. Unfortunately, we are forced to use current reports of the variables as a proxy for respondents' status at the time of workforce departure because of the study's cross-sectional design. Socioeconomic variables include *highest degree earned* (diploma/associate's, bachelor's, master's or above), *advanced practice credentials earned* (1 = yes, 0 = no), and *total household income*. Since family income was collected in categories, we recoded nurses in each category to the category midpoint. We then divided each value by 10,000 so that effects in regression could be interpreted as the effect on hazards of attrition of increasing income by \$10,000.

Previous literature (c.f., Hardy, 1985) examined the effect of *benefit eligibility* on a binary or multinomial measure of workforce attrition. Eligibility for federal Social Security and Medicare benefits is often used when information on pensions and savings is unavailable, since it can be defined based on federal age requirements. We created a measure of federal benefit eligibility based on age as follows: respondents under age 62 (at time of event or censorship) were eligible for no benefits, respondents at or above age 62 were eligible for partial benefits, and respondents at or above 65–67 (depending on birth year) were eligible for full benefits. This measure was not easily interpretable in Cox regression models given the time dynamics of survival analysis.<sup>1</sup> However, for comparability to previous work we did estimate the

<sup>1</sup> When chronological age is used as the time origin, manifestations of the age variable – such as our measure of benefit eligibility – do not work mathematically in Cox regression models. When professional tenure is used as the time origin, chronological age can be used as a time-varying independent variable but interpretation of effects is complex. The coefficients represent the impact of age on the hazards of attrition at any given tenure in the profession, not merely the risk of attrition due to age.

effect of benefit eligibility in multinomial logistic regression models.

Family structure variables included *marital status* (1 = currently married, 0 = not married) and the presence of dependents for which respondents provided significant care. They were asked to check all that apply from a list of dependents including “children less than 6 years old at home,” “children 6–18 years old at home,” “other adults at home (i.e., parents or dependents),” and “others living elsewhere (i.e., children, parents, or dependents)”. We constructed a four-category variable using the information they provided with the following categories: *no dependents in the home*, *children only in the home*, *adults only in the home*, and *children and adults in the home*. Each respondent fell into one and only one of the categories we constructed, though they could select from more than one of the original categories provided.

Demographic variables included gender (female = 1, male = 0), race/ethnicity (white = 1, non-white = 0), age at initial nursing licensure, and current enrollment at a college or university. Because we suspected that some nurses may pursue degrees in non-nursing careers as preparation for a career change, we coded enrolled students as enrolled in pursuit of a *nursing degree* or a *non-nursing degree*. Listwise deletion for missing data was used to achieve a uniform sample size ( $N = 29,472$ ) for all analyses.

We were unable to use work environment variables in this analysis because the NSSRN does not ask the same set of questions regarding work environment to both RNs working in nursing and those who left the profession.

## Results

Table 1 presents descriptive statistics for our sample. Most of the respondents are still in the nursing workforce (87.4%) and represent censored cases in our analysis, while 9.1 percent reported a labor force separation and 3.5 percent reported a career change. Thus, only 12.6 percent of respondents had experienced an event of interest to this analysis. The mean age at event or censorship was 46.1 years, which very closely reflects the average age of all nurses in 2004 since the majority of cases are censored. Based on their age at event or censorship, about 3.4 percent were eligible for partial social security benefits, while another 3.6 percent were eligible for full social security benefits.

Respondents had a yearly household income of approximately \$85,000. Slightly over half of the sample had a Diploma or Associate’s degree, and 13.6 percent had a Master’s degree or higher. Most of the sample was married (73%), and 38 percent had children in the home. Although the proportion of minorities and men in the nursing field has been increasing very slowly over time, this representative sample (as of 2004) remains overwhelmingly white (90%) and female (94%). Very few of the respondents were currently enrolled in a non-nursing college degree program (0.93%), and 6.65% were enrolled in a nursing degree program.

Survival curves show retention in the nursing workforce as a function of time, and Fig. 1 may be interpreted as the proportion of nurses expected to remain in the nursing workforce at each age. The curve shows very little attrition before the age of 51 years: over 80 percent of nurses are expected to remain in the workforce. The slope of the curve begins to increase at an increasing rate after age 51 and becomes very steep after age 61, indicating that nurses are leaving the workforce quite rapidly after this age. Though the curve clearly shows the trend toward a very high rate of attrition after the age of 61, sample selection bias likely causes us to overestimate the proportion of nurses we can expect to remain in the workforce at older ages.

Survival functions are presented separately for the two exit paths – labor force separation and career change – in Fig. 2. They overlap until age 40, indicating that there is little difference

**Table 1**  
Descriptive statistics ( $N = 29,472$ ).

	% Of sample	Mean	SD	Range
<b>Event/censoring variable</b>				
Still in Nsg workforce (censored)	87.35			
Career change	3.52			
Labor force separation	9.14			
<b>Time origin and entry</b>				
Age at event or censoring		46.09 yrs	10.66 yrs	21–84 yrs
Age at 1st nursing licensure		27.28 yrs	7.38 yrs	20–59 yrs
<b>Socioeconomic variables</b>				
<i>SSI benefit eligibility</i>				
Partial eligibility	3.40			
Full eligibility	3.60			
Household income		\$85,135.55	\$40,132.65	\$10 K - \$175 K
<i>Highest earned degree</i>				
Diploma/associates	51.12			
Baccalaureate	35.30			
Master’s or higher	13.57			
Advanced practice credential	8.96			
<b>Family structure variables</b>				
Currently married (vs. not)	72.95			
<i>Dependents in home</i>				
Children	38.35			
Parents (or elderly dependent)	9.21			
Both children and parents	6.32			
<b>Demographic variables</b>				
Female (vs. male)	94.11			
White (vs. non-white)	89.63			
Age in 2004		46.85 yrs	10.89 yrs	21–87 yrs
<i>Current enrollment in college</i>				
Nursing program	6.65			
Non-nursing program	0.93			

between the two exit paths in the rate of attrition throughout those years. However, the curves diverge substantially beginning at age 50: the slope for career change levels off somewhat between the ages of 60 and 70, but the rate of labor force separation increases dramatically. More notable than the difference, however, is the fact that the rate of career change continues to increase (if only slightly) during the late 40s and 50s. This finding may signal that many

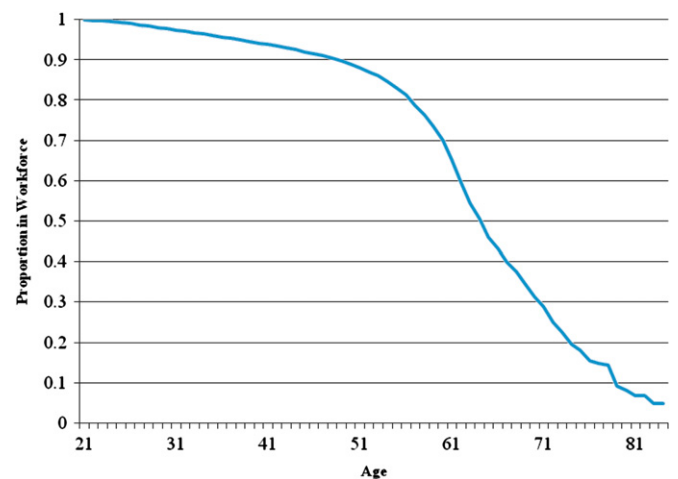


Fig. 1. Survival function for nursing workforce attrition.

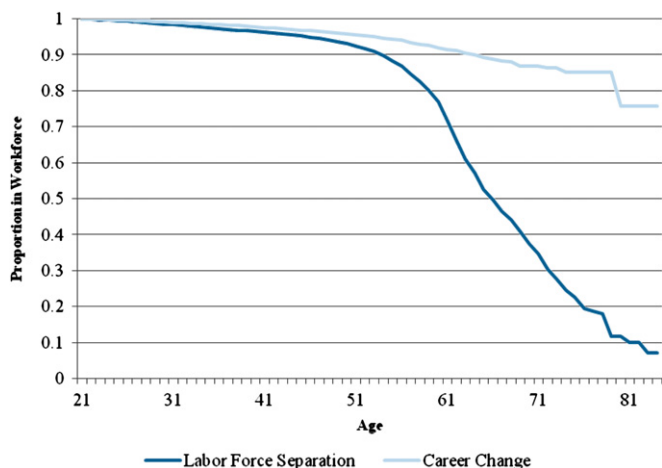


Fig. 2. Survival function for nursing workforce attrition by event type.

nursing roles are incompatible with the aging workforce in terms of physical demands.

The survival function reveals particularly steep slopes within the early 60s, consistent with previous research showing that eligibility for Social Security benefits is a major driver of the retirement decision. To further evaluate the impact of benefit eligibility, we estimated multinomial logistic regression models (not shown) using our age-defined measures of benefit eligibility. With all other variables controlled, we found that full benefit eligibility more than doubled the odds of labor force separation (OR: 2.17,  $p < 0.0001$ ). Partial benefit eligibility (when compared with no eligibility) nearly tripled the odds of labor force separation (OR: 2.82,  $p < 0.0001$ ). Both partial and full benefit eligibility significantly reduced the odds of career change, which would be expected given the age of persons meeting eligibility requirements.

Table 2 shows the Cox regression models we estimated to evaluate the impact of predictors on career change or labor force separation at each age. Nurses were significantly more likely to

have made a career change if they had higher incomes, a BSN or Graduate degree, children in the home, or were white. Nurses enrolled in school in pursuit of a non-nursing degree were almost 6 times more likely to have made a career change (HR = 5.7,  $p < 0.001$ ). Several variables were also significant predictors of being less likely to make a career change. Nurses who held an Advanced Practice (AP) credential, female nurses, and those attending nursing school were significantly less likely to make a career change.

Predictors of labor force separation were different in a number of ways. Increases in income, for example, were associated with decreased hazards of retirement. With every \$10,000 increase in income, the hazards of leaving the workforce decreased 5% (HR = 0.95,  $p < 0.001$ ). Having an AP credential reduced the hazards of labor force separation at each age, but the effect was much less strong than was found for career change. Family structure variables were particularly strong indicators of labor force separation. Where the single indicator “children in the home” increased the rate of career change, nearly all family structure variables had an effect on labor force separation. Married nurses were almost twice as likely to leave the labor force and nurses with children in the home were about two and a half times more likely to leave the labor force. Finally, while female gender substantially reduced the hazards of career change, it increased the likelihood of labor force separation by 29 percent (HR = 1.29,  $p < 0.05$ ). We hypothesized that competing risks models in which the different exit paths (career change and labor force separation) were modeled separately would add predictive power when compared with models that treated all attrition identically. As the bottom row of Table 2 shows, comparison of exit paths demonstrated that our predictive capability was enhanced by treating the two events separately in competing risks models.

#### Discussion and conclusions

We presently face a severe and chronic shortage of RNs in the U.S. resulting from an aging general population requiring more healthcare and an aging nurse workforce eyeing retirement.

Table 2  
Cox regression models predicting career change and labor force separation.

	Career change		Labor force separation	
	HR	95% CL	HR	95% CL
<i>Socioeconomic variables</i>				
Income (in 10Ks)	1.073***	(1.06–1.09)	0.950***	(0.94–0.96)
BSN (vs. ADN)	1.282***	(1.12–1.47)	1.176***	(1.08–1.28)
Grad (vs. ADN)	1.628***	(1.36–1.95)	0.967	(0.84–1.11)
AP-credentialed	0.344***	(0.26–0.45)	0.660***	(0.55–0.79)
<i>Family structure variables</i>				
Married	0.924	(0.79–1.08)	1.929***	(1.75–2.12)
Children in home only	1.387***	(1.18–1.62)	2.534***	(2.28–2.82)
Parents in home only	1.103	(0.90–1.35)	0.926	(0.80–1.07)
Children and parents	1.167	(0.88–1.55)	1.254*	(1.01–1.56)
<i>Demographic variables</i>				
Female	0.625***	(0.49–0.80)	1.287*	(1.02–1.63)
White	1.383**	(1.09–1.75)	1.412***	(1.22–1.64)
Nursing school	0.615**	(0.43–0.88)	0.760*	(0.60–0.97)
Other school	5.693***	(4.20–7.71)	1.771***	(1.17–2.67)
<i>Model statistics</i>				
LR chi-square	296.36***		652.58***	
Event cases	1036		2693	
Censored cases	28,436		26,779	
Comparison of exit paths ( $\chi^2$ )	288.5***			

Notes: HR = hazard ratio; 95% CL = 95% confidence limits; LR = likelihood ratio.

\* $p < 0.05$ .

\*\* $p < 0.01$ .

\*\*\* $p < 0.001$ .

Bottlenecks in our capacity to produce new nurses through our country's nursing education system, which result in part from a shortage of nurse faculty (Cleary, Bevill, Lacey, & Nooney, 2007), mean that the shortage will not be resolved merely through increased production of new nurses. Retention of our current nurse workforce must also be prioritized. Unfortunately, the literature on professional attrition of U.S. nurses is not very well developed. This study sought to advance the state of science on attrition in hopes of generating new ideas for retention efforts. It is among a few studies to address *actual*, rather than intended, separation from the nursing profession. It is the first to simultaneously investigate the timing of attrition through survival analysis, the exit path taken (career change vs. labor force separation), and the major socioeconomic, family structure, and demographic variables predicting attrition in the U.S.

Consistent with previous research on retirement, analysis of survival functions indicated that a substantial portion of labor force separation occurs between the ages of 60 and 70 – typical ages of retirement. Yet a non-trivial portion occurs *before* typical retirement ages and points toward the need for concerted retention efforts, both for younger nurses and those nearing (but not yet at) retirement age. Further highlighting this need is the finding that a substantial portion of career change also occurs later in life. Since these nurses clearly need or want to continue working, it would behoove the healthcare system to consider ways in which a nursing role can be made attractive to older nurses. These seasoned nurses are critically important to the nursing workforce since they house years of experiential and institutional knowledge; they are apt mentors for the next generation of nurses. Efforts to design new roles that capitalize on their experience while acknowledging their physical limitations are ripe for design and implementation.

Our study also revealed that the predictors of nursing attrition differ by exit path, which underscores the need for multifaceted policies aimed at retaining nurses. For example, women are much less likely than men to leave the nursing field for a non-nursing career, yet women have increased hazards of separating from the labor force entirely at each age. This suggests that the nursing profession must consider ways to more fully meet the employment goals of men and also to understand the factors motivating labor force separation of women. Similarly, increases in income are associated with career change, indicating that some nurses make a career change because they can earn larger salaries outside the nursing field; they either lack access to or are unaware of attractive career growth opportunities within the field. On the other hand, decreases in income are associated with labor force separation, which likely reflects the fact that family income is reduced when a nurse stops working.

We found, consistent with previous research in nursing and in the general labor force, that one factor predisposing nurses (who are predominantly women) toward labor force withdrawal is family responsibilities, including marriage and dependents (young children and elderly parents for whom they provide substantial care). More flexible schedules may better accommodate women with primary responsibility for children or elderly parents, as would employer-sponsored child care assistance. Career advancement opportunities, which yield increased income and potentially more decision-making power within the family, may provide a dual benefit of enhancing the professional status of nursing *and* making a nurse's income and career aspirations indispensable for the family.

Paradoxically, well-educated RNs holding a baccalaureate or graduate degree are more likely to leave the profession for another career. Given the goal of increasing the professional stature of nurses and the nursing profession, this troublesome finding must be explored in more detail. It is notable that well-educated nurses

with an Advanced Practice credential (requiring at minimum a master's degree) do not follow this pattern. One potential reason is the high autonomy and salaries of AP-credentialed nurses, who often function as Nurse Practitioners, Nurse Midwives, and Nurse Anesthetists. Examination of the roles and salaries of other well-educated nurses – such as those teaching in nursing education programs and working as hospital administrators – must be undertaken.

Though this study breaks ground in modeling the timing and exit path of nursing workforce attrition, more research is needed to clarify the reasons for our findings and generate actionable policy recommendations. We lack a critical group of variables measuring nurses' satisfaction with the work environment, such as workload, autonomy, shared governance, physical demand, and opportunities for advancement. Unfortunately, the NSSRN did not retrospectively collect this information from nurses who left the field in a way that permitted comparison with their respondents who remained in the field. Additional variables needed for an exhaustive study of attrition include savings and secondary pensions, availability of health insurance, and self-reported health and activity limitations.

A prospective, longitudinal study in which nurses are followed from initial licensure through separation is needed to increase the accuracy of attrition rates at each age. A prospective study would not suffer from the sample selection issue faced in retrospective analysis of the NSSRN, where only currently licensed nurses are sampled and former nurses who failed to retain a nursing license are omitted. In addition, such a study would be able to follow nurses through temporary departures from the workforce and subsequent re-entries. The most important benefit of estimating attrition rates by age would be a dramatic improvement in our ability to 1) forecast the future supply of working RNs and 2) plan appropriately for deficiencies in the nurse supply. While the present study brings us some distance toward understanding the timing and causes of nursing workforce attrition – and illustrates the power of survival analysis for describing this phenomenon – the future state of the science on this topic depends on maintenance of a long-term panel study of newly licensed nurses.

It is worth noting again that many European countries collect more detailed information on individual employment outcomes as part of their routine health or general workforce statistics. It is our hope that the U.S., which houses one of the largest nurse workforces in the world, will one day have as rich a data source. Efforts to standardize state-level nurse workforce information in the U.S. are underway; the National Forum of State Nursing Workforce Centers (National Forum) has as a goal the aggregation of state-level information, once standardized. The Forum recently released its recommendations for a standardized Minimum Nurse Supply Dataset that would bring participating states into alignment (National Forum, 2009). Should standardization and aggregation be implemented, the U.S. will be able to more accurately track the workforce attrition of nurses in the future. The result will hopefully be more data-driven policy approaches to resolving imbalances in nurse supply and demand in this country.

Readers outside the U.S. will note that many of the predictors of attrition and retention we found are similar to those found in other countries. The U.S. also shares with the international community a concern regarding the severity of the future nursing shortage. The drivers of the shortage – an aging nurse workforce and an aging general population – affect developed countries around the world. As we move forward with efforts to resolve the shortage through retention efforts and increased production of new nurses, scholars and workforce planners around the world are likely to benefit from sharing research results and policy strategies for increasing the nurse supply.

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