Implications of an Aging Registered Nurse Workforce

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Context The average age of registered nurses (RNs), the largest group of health care professionals in the United States, increased substantially from 1983 to 1998. No empirically based analysis of the causes and implications of this aging workforce exists.

Objectives To identify and assess key sources of changes in the age distribution and total supply of RNs and to project the future age distribution and total RN workforce up to the year 2020.

Design and Setting Retrospective cohort analysis of employment trends of recent RN cohorts over their lifetimes based on US Bureau of the Census Current Population Surveys between 1973 and 1998. Recent workforce trends were used to forecast long-term age and employment of RNs.

Participants Employed RNs aged 23 to 64 years (N = 60 386).

Main Outcome Measures Annual full-time equivalent employment of RNs in total and by single year of age.

Results The average age of working RNs increased by 4.5 years between 1983 and 1998. The number of full-time equivalent RNs observed in recent cohorts has been approximately 35% lower than that observed at similar ages for cohorts that entered the labor market 20 years earlier. Over the next 2 decades, this trend will lead to a further aging of the RN workforce because the largest cohorts of RNs will be between age 50 and 69 years. Within the next 10 years, the average age of RNs is forecast to be 45.4 years, an increase of 3.5 years over the current age, with more than 40% of the RN workforce expected to be older than 50 years. The total number of full-time equivalent RNs per capita is forecast to peak around the year 2007 and decline steadily thereafter as the largest cohorts of RNs retire. By the year 2020, the RN workforce is forecast to be roughly the same size as it is today, declining nearly 20% below projected RN workforce requirements.

Conclusions The primary factor that has led to the aging of the RN workforce appears to be the decline in younger women choosing nursing as a career during the last 2 decades. Unless this trend is reversed, the RN workforce will continue to age, and eventually shrink, and will not meet projected long-term workforce requirements.

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Registered nurses (RNs) comprise the largest group of health care professionals in the United States, with more than 2.0 million RNs employed in health care organizations in 1998.[1] This profession has experienced substantial changes during the last decade.[2-8] However, little attention has been given to the change in the age structure of the RN workforce. Data from the Census Current Population Survey (CPS) show that between 1983 and 1998 the average age of working RNs increased by more than 4 years, from age 37.4 to 41.9 years.[1] During the same time period, the proportion of the RN workforce younger than 30 years decreased from 30.3% to 12.1%, and the actual number of working nurses younger than 30 years decreased by 41%. In hospitals, the average age of RNs increased by 5.3 years between 1983 and 1998.[9] In contrast, the average age of the US workforce as a whole increased by less than 2 years during this period (age 37.4 to 39.0 years), while the total labor force in the United States younger than 30 years decreased by less than 1%.

Explanations for the increasing average age of RNs involve a combination of demographic, social, and educational forces. Although the proportion of men in nursing has been increasing, explanations focus on women, who continue to make up more than 90% of the RN workforce. The size of the cohort of women aged 15 to 19 years from which nurse education programs drew students during the 1960s and 1970s declined in the 1980s, thereby decreasing the number of younger prospective nursing students in the US population. Also, the recent expansion of career opportunities and rising wages for women relative to men[10] may have further reduced the pool of prospective nursing students because many women entered other careers. Similar aging trends have occurred in other professions and occupations traditionally dominated by women (eg, teachers, social workers, secretaries, and hair dressers). In addition, the aging of the RN workforce has been attributed to the

See also p 2985.

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expansion of 2-year associate degree nursing programs during the 1980s, which apparently attracted individuals in their mid to late 30s interested in a second career.[11] Currently, 59% of entry-level nursing students graduate from associate-degree programs (Theresa M. Valiga, RN, EdD, National League for Nursing, 2000, unpublished data for 1998).

The nursing profession has been increasingly concerned about the ramifications of its aging workforce. In a survey of health care executives in 1995, the aging of the RN workforce was among the most frequently identified problems.[12] In 1996, the Institute of Medicine noted that older RNs have a reduced capacity to perform certain physical tasks and warned that the aging of the workforce presents serious implications for the future.[13] A 1999 survey administered to nurse executives during a national conference found that 83% believed that the aging of the RN workforce will result in serious shortages of RNs in the next 10 to 15 years (P.I.B., unpublished data, 1999).

Despite this concern within the nursing profession, there has been little empirically based analysis of the causes and implications of an aging RN workforce. In this article, we investigate the quantitative contribution of various factors to the aging of the RN workforce. Using annual data from the past 25 years, we analyze the employment patterns of successive cohorts of RNs during their lifetimes to identify and assess key sources of observed changes in the age distribution and total supply of RNs, project the future age distribution and total RN supply to the year 2020, and compare projections to estimated requirements for RNs over the same period.

METHODS

Data

Data on employment of RNs were obtained from the CPS, which is a household-based survey administered monthly by the Bureau of the Census that covers a nationally representative sample of more than 100 000 individuals.[1] In addition to demographic information collected in each month of the survey, detailed questions about employment (including occupation and hours worked) have been asked since 1973. Between 1973 and 1978, these questions were asked of all respondents to the May survey. From 1979 through 1998 (the latest year for which complete data were available), 25% of the sample in every month was asked the employment questions. The sample in each year was a representative cross-section of individuals, but each housing unit appears in the sample twice (exactly 1 year apart). Thus, some individuals may appear twice in the sample. Data from the CPS are used extensively by researchers and by the US Department of Labor to estimate current trends in unemployment, employment, and earnings.

Data from the CPS were obtained for all individuals aged 23 to 64 years employed as RNs in the week of the survey (N=60 386). Because individuals aged 65 years and older comprise less than 2% of the RN workforce, they were excluded from the analysis. Registered nurses who worked less than 30 hours in a typical week were considered part-time workers. These data were used to estimate the number of RNs of each single year of age who were working in each year. We estimated the number of working RNs on a full-time equivalent (FTE) basis (ie, as the number of full-time employees plus one-half the number of part-time employees). All estimates were weighted by sampling weights provided by the CPS, making them representative of the US noninstitutionalized population.

To ensure confidence that estimates based on CPS data reflect the population of RNs in the United States, CPS estimates were compared with data reported in the National Sample Survey of Registered Nurses (NSSRN).[14] This survey, conducted by the Bureau of Health Professions approximately every 4 years since the late 1970s, is the principal source of national data on RNs. As shown in the TABLE, CPS estimates of the average age and total number of RNs are similar to NSSRN estimates from corresponding years. Beginning in 1984, the NSSRN changed from asking age (as is done in the CPS) to asking year of birth, and the difference in the survey question appears to have generated a slight increase in the average age estimated by the NSSRN as compared with CPS. For our analysis, we relied solely on the CPS data because the CPS is available annually and has asked a consistent set of questions over a longer time period than the NSSRN.

Table. Comparison of Estimates of Total RN FTEs and Average Age of RNs*

	Total FTEs, No.		Average Age, y	
	NSSRN	CPS	NSSRN	CPS
1977	785 060	812 217	38.9	38.9
1980	985 788	1 090 232	38.0	37.9
1984	1 196 839	1 195 262	38.5	37.7
1988	1 345 915	1 342 641	39.2	38.4
1992	1 545 699	1 566 003	40.6	39.9
1996	1 777 151	1 743 191	41.9	40.8

*Data from the National Sample Survey of Registered Nurses (NSSRN)[15] and the Current Population Survey (CPS) for individuals between age 23 and 64 years.[1] RN indicates registered nurse; FTEs, full-time equivalents.

Additional data on the US population by year and age between 1970 and 1998 were obtained from US Bureau of the Census.[15] Forecasts of the US population through 2020 by age were obtained from the "middle series" projections prepared by the US Bureau of the Census.[16]

Statistical Analysis

Model. The analysis relies on a simple statistical model, commonly used by demographers and economists, that decomposes observed changes in the size and age of the RN workforce over time into 3 distinct components: population, cohort, and age effects.[17] The term *population* refers to the size of the total US population of a given age in a given year. Population effects are expected to play an important role because the overall age distribution in the United States has changed recently with the aging of the baby boom generation. The term *cohort* refers to all the individuals born in any given year. Likewise, the term *cohort effect* refers to the propensity of

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individuals born in any given year to work as RNs. Cohort effects are expected to be important because women born in recent years have much broader career opportunities and, therefore, are less likely to choose nursing over other professions. Finally, the term *age* refers to a person's age in a given year. Age effects reflect the relative propensity of RNs to work at any given age and are expected to capture the tendency of RNs to work less during their childbearing years and as they approach retirement age.

More formally, the number of FTE RNs of a given age (a) that were born in a given year (b) can be described by the following equation:

(1) No. of FTE $RN_{a,b}$ = ($POPULATION_{a,b}$)(q_b)(α_a), for a = 23,...,64 and b = 1909,...1975.

The observed cohorts, born between 1909 and 1975, correspond to the cohorts that were between age 23 and 64 years at some point in the CPS sample years (1973-1998). The first term on the right-hand side of equation 1 captures population effects, with $POPULATION_{a,b}$ referring to the total US population of a given birth cohort (b) at a given age (a). The second term captures cohort effects, with q_b representing the propensity of individuals from a given cohort to work as RNs. The final term captures age effects, with α_a representing the relative propensity of RNs to work at a given age. Thus, the total number of FTE RNs of a given age that are working in a given year is the product of the size of the population, the propensity of that cohort to choose nursing as a career, and the propensity of RNs to be working at that age.

Estimation. Both the cohort effects (q_b) and the age effects (α_a) are parameters that must be estimated. Rearranging Equation 1 and taking logs yields the following estimation equation:

(2) ln(No. of FTE $RN_{a,b}$ / $POPULATION_{a,b}$) = log(q_b) + log(α_a), for a = 23,...,64 and b = 1909,...,1975.

Analysis of variance (ANOVA) was used to estimate the parameters of this equation. The unit of observation was an age-cohort group (eg, the 1955 cohort at age 30 years). The dependent variable was the logged fraction of a given birth cohort at a given age that is working as RNs (defined on an FTE basis). The data cover 42 age years (23-64 years) and 26 calendar years (1973-1998) for a total of 1092 observations. The ANOVA model estimated main effects for cohort (birth year) and age. These parameter estimates were exponentiated to yield estimates of q_b and α_a. Standard errors for these estimates were calculated by the bootstrap method in a manner that accounted for the existence of multiple observations in the sample for some individuals and households.[18]

It is important to note that the ANOVA model in Equation 2 does not include main effects for the year in which the RNs were working (ie, year effects). If year effects were included, then age and cohort effects would no longer be uniquely identified because year, cohort (or birth year), and age are linearly related to each other (year = birth year + age).[17] Thus, in the context of our model, a major change to conditions facing the entire RN workforce in a given year may be manifested via the cohort effect for future cohorts but not via a uniform effect on RNs of all ages working in a given year. For example, a sudden jump in RN wages may make nursing more attractive to new cohorts of RNs entering the labor market but would not encourage older cohorts to work more. This assumption is supported by findings from many studies showing that variation in RN wages has small effects on labor supply,[19-21] suggesting that year effects are likely to be small and may be safely ignored. In addition, year effects were not found to be jointly statistically significant at the 5% level (P = .08) when added to the model.

Forecasting. Forecasts of the total number of FTE RNs of each age in the years 2000-2020 were constructed based on Equation 1. The FTE forecasts were summed by year and age to produce aggregate forecasts. Constructing forecasts for a given age group in a given year required estimates of the population by age in future years, along with estimates of the cohort (q_b) and age (α_a) effects for the age group in that year. Population estimates were obtained from the US Census "middle series" projections. The ANOVA model in Equation 2 provides estimates of age effects (α_a) for each age (23-64 years). The model also provides estimates of cohort effects (q_b) for cohorts born between 1909 and 1975. However, the model does not provide estimates of cohort effects for cohorts that were born after 1975 (not yet age 23 years by 1998, the last year of our data). Therefore, to construct forecasts of the cohort effect (q_b) for cohorts born after 1975, we used the average cohort effect from the 5 most recent cohorts observed in the estimation period (the cohorts born from 1971-1975). If future cohorts behave like recent cohorts, then this will yield accurate forecasts. We also investigated the sensitivity of forecasts to this assumption. Standard errors on the forecasts were estimated using the bootstrap method in a manner that accounted for the existence of multiple observations for some individuals and households.[18]

RESULTS

Estimates of Age and Cohort Effects

Estimates of age effects (α_a) from the model described in Equation 2 were jointly statistically significant (P < .001). FIGURE 1A plots the estimates relative to the effect at age 45 years (ie, α_a/α_{45}). Thus, if population and cohort are fixed, Figure 1A shows the expected size of the RN workforce at each age as a percentage of the size of the workforce at age 45 years.

The overall pattern of the age effects is consistent with expectations of how work effort varies over the life cycle. There is at first a rapid, and then more gradual, rise in FTEs through age 45 years, as many RNs finish nursing education and enter the labor force while others increase labor force activity as they pass out of their child-

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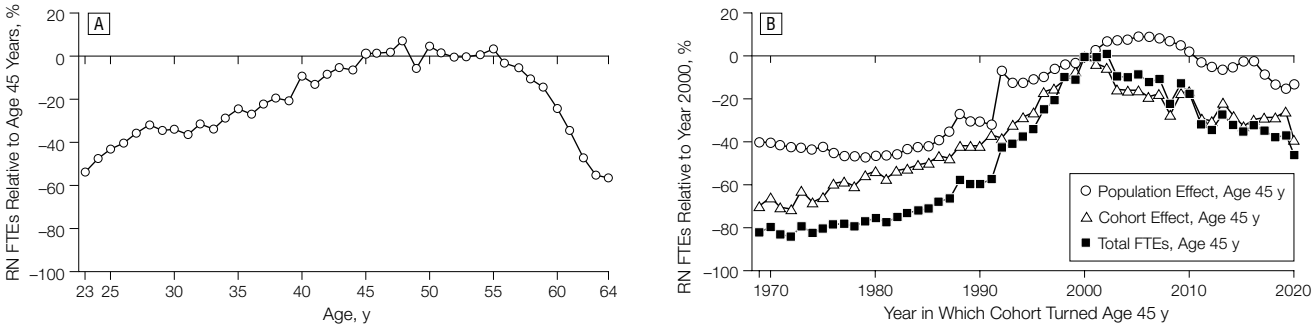
Figure 1. Estimated Percentages of RN FTEs by Age and Year



RN indicates registered nurse; FTEs; full-time equivalents. Estimates are based on the model described in Equation 2, "Statistical Analysis" subsection. Figure 1A shows expected percentage of RN FTEs for a given cohort at each age relative to age 45 years (open circles). Standard errors for these estimates are 5%-10%. Figure 1B shows RN FTEs at age 45 years relative to 1955 birth cohort at age 45 years (in 2000) by population effect (open circles), cohort effect (open triangles), and total FTEs (closed squares). Standard errors are 5%-8% for estimates between 1978 and 2011 and 5%-15% for all other estimates.

rearing years. Total FTEs are relatively stable from approximately age 45 to 55 years, followed by a rapid decline as RNs approach the usual retirement age of 65 years. Note that the age effects reflect both the number of RNs in the labor force at any given age and the average hours worked among those RNs in the labor force. Thus, while average hours worked among RNs in the labor force generally peaks prior to age 40 years,[21] total FTEs peak somewhat later because of an increased number of RNs in the labor force at older ages.

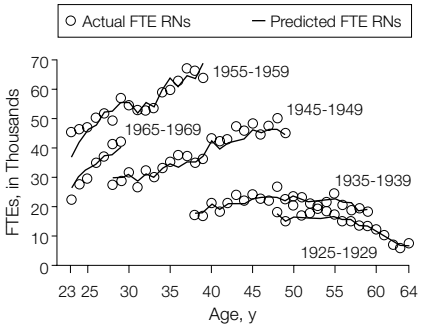
Estimates of cohort effects (q_b) from the model were jointly statistically significant ($P<.001$). Figure 1B plots the estimates relative to the cohort of individuals born in 1955—or equivalently, relative to the cohort that is age 45 years in the year 2000. The estimates are reported according to the year in which each cohort turned age 45 years (rather than the cohort's birth year). Figure 1B also shows estimates of the relative cohort effects (q_b/q_{1955}) and relative population effects ($\text{Population}_b/\text{Population}_{1955}$). In addition, we plot the product of these 2 effects, which is an estimate of the size of the RN workforce at a given age, relative to the 1955 birth cohort at the same age (total FTEs, age 45 years). Thus, Figure 1B shows the estimated size of the RN workforce that was or will be aged 45 years in each year, relative to the year 2000, and how much of the relative difference is due to population vs cohort effects.

The estimated differences across years are dramatic and consistent with expectations of how population and the attractiveness of a nursing career have changed over time. We estimate that the number of 45-year-old RNs will peak around the year 2000, reflecting both the effects of the baby boom (ie, a large overall population aged 45 years) and the high propensity of women born around 1955 to choose nursing as a career (ie, a large cohort effect). Prior to 1990, there were less than half as many 45-year-old RNs because of both a smaller overall population aged 45 years and a lower propensity of these earlier cohorts to choose nursing as a career. However, after the year 2000, most of the estimated decline in 45-year-old RNs will be due to the lower propensity of cohorts born after 1955 to choose nursing as a career (cohort effects). For example, in 2015 there will be about as many individuals aged 45 years in the population as there are in the year 2000, but the number of 45-year-old RNs will be about 35% lower because the cohort born in 1970 was much less likely to choose nursing as a career than the cohort born in 1955.

Evaluating the Validity of the Model

One criterion for evaluating the validity of our approach is the model's ability to predict the size and age distribution of the RN workforce within the estimation sample. The overall fit for the model was relatively good, with an adjusted R^2 of 0.82. The model's ability to fit the data is apparent in FIGURE 2, which plots the predicted and actual number of FTE RNs for selected 5-year birth cohorts. Each data point represents an average over 5 birth-year cohorts. For example, the curve marked "1945-1949" traces out the predicted average annual FTEs supplied by RNs born in 1945-1949 at age 28 through 49 years. The actual number of average annual FTEs supplied by RNs in these cohorts lies quite close to the predicted values. Moreover, as predicted by the model, each cohort ap-

Figure 2. Predicted and Actual Number of FTE RNs by Age for Selected 5-Year Birth Cohorts



Each data point represents an average over 5 birth-year cohorts. FTE indicates full-time equivalent; RNs, registered nurses.

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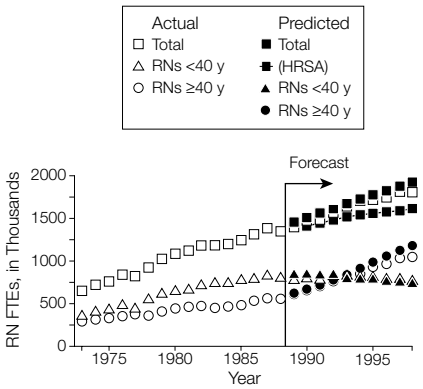
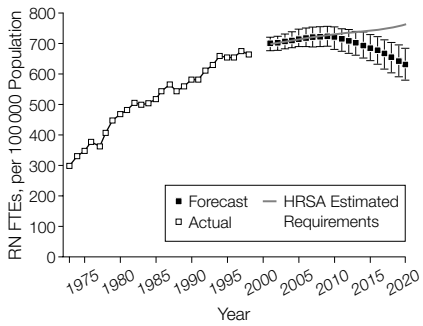
pears to follow a similar trajectory of FTE production as the cohort ages. Yet while the curves follow roughly the same shape with age, each cohort tends to provides a different level of FTEs throughout its lifetime. This is best illustrated by the 1955-1959 cohort, which has supplied more FTEs at every age than other cohorts.

Figure 3. Split-Sample Forecast of Total Annual RN FTEs and FTEs for RNs Younger Than 40 Years and Age 40 Years and Older



The upper curve (shown in squares) is the total annual full-time equivalents (FTEs) produced by registered nurses (RNs) of all birth cohorts and ages in a given year. In lower curves (shown in triangles and circles), the FTEs are split into those produced by RNs aged 40 years and older and younger than 40 years. Closed symbols represent forecast for the years 1989 through 1998. Projections made by the Health Resources and Services Administration (HRSA) in 1988 of total FTE RN supply for the years 1990-1998 are provided for comparison.[22]

Figure 4. Projections of Total RN FTEs vs Health Resources and Services Administration (HRSA) Estimates of Registered Nurse (RN) Requirements Through 2020



For comparison, the most recent (1995) estimates of RN requirements made by HRSA are plotted.[23] The HRSA estimates are based on models of demand in each major employment sector that take into account changes in demographic variables, health insurance coverage, income and affluence levels, and the impact of managed care. Error bars represent 90% confidence intervals. FTEs indicates full-time equivalents.

The implications of Figure 2 for the size of the future RN workforce are profound. The number of FTE RNs supplied by the largest cohorts (eg, 1955-1959) are likely to remain stable for another 10 to 15 years, before declining as these cohorts reach retirement age. However, the number of RNs supplied by younger cohorts (eg, 1965-1969) are likely to remain well below the number supplied by cohorts born in the 1950s. Thus, in the short term we can expect an aging workforce (as the largest cohorts grow older), while in the longer term the workforce will shrink (as the largest cohorts retire and are replaced by much smaller cohorts of RNs).

To evaluate the model's ability to forecast RN supply beyond the estimation sample, we conducted a split-sample forecast. The model was estimated using data from 1973-1988 only, and the results were then used to forecast FTE RN supply for the years 1989-1998 (see "Methods" section for details). We show the results in FIGURE 3 aggregated in 2 ways: the upper curve shows total annual RN FTEs of all birth cohorts and ages and the lower curves show a similar comparison of forecasts for RNs younger than 40 years and for RNs aged 40 years and older. The forecast from our model tracks the actual number of FTEs quite well. In contrast, a Health Resources and Services Administration (HRSA) projection, based on data from 1988, underpredicted the number of FTEs throughout the 1990s, with a mean squared error more than 5 times as large as that for the forecast from our model.[22] In addition, our model accurately forecast a decline in the number of RNs younger than 40 years (and an accelerating growth aged 40 years and older) despite the fact that there was little evidence of this trend prior to 1988. Overall, the split-sample forecasts support the validity of our model: the model correctly predicted both the continued growth in FTEs, and the changeover in predominance from younger to older RNs that occurred in the 1990s.

Projection to 2020

Using the same methods as in the split-sample forecast, we estimated the model by using all years of data (1973-1998) and projected the size of the RN workforce for the years 2001-2020. These projections, along with 90% confidence intervals, are shown in FIGURE 4. Our projections suggest that, following years of steady growth, the overall number of FTE RNs per capita will reach a peak in the year 2007 and will thereafter decline for the remainder of the forecast period. The absolute size of the RN workforce (not per capita) begins declining in 2012, and by 2020 will be approximately the same size as it is today. Based on these projections, the size of the RN workforce will be near HRSA-estimated requirements during the first decade of the new millennium, but will fall nearly 20% below requirements by the year 2020.

In addition to a decline in overall labor supply, the projections indicate a continued aging of the RN workforce. FIGURE 5 shows the actual and projected age distribution of the RN workforce every 10 years from 1980-2020. After increasing by roughly 3 years between 1990 and 2000, the average age of working RNs is projected to increase another 3 years before peaking at age 45.4 years in 2010 and declining slowly thereafter. Here again, the large 1950s cohorts dominate past and future trends in RN labor supply. In 1980 and 1990, when these large cohorts were in their 20s and 30s, the RN workforce was dominated by young RNs, with more than half the workforce younger than 40 years. By the year 2000, however, this distribution changes substantially. The 1950s cohorts are in their 40s, and RNs of this age dominate the workforce, outnumbering RNs in their 20s by nearly 4 to 1 (compared with 1980, when RNs in their 20s actually outnumbered RNs in their 40s). By 2010, the age distribution will have shifted as far as it will go (just before the 1950s RNs begin to retire), and more than 40% of RNs are pro-

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jected to be older than 50 years. Only when the 1950s cohorts are reaching retirement age in 2020 does the projected distribution begin to shift back toward younger RNs.

Forecast Assumptions

These forecasts depend importantly on 2 assumptions. First, we have assumed that future cohorts will enter nursing at a rate similar to cohorts that are currently in their mid 20s. Of course, future cohorts could be more likely to enter nursing (eg, if wages or work conditions improve) or less likely to enter nursing (eg, if the trend toward better career opportunities for women in other occupations continues). If we assumed that all future cohorts would be 10% more (less) likely to enter nursing, then the model would forecast an RN workforce in 2020 that was roughly 4.5% larger (smaller) and half a year younger (older). Thus, while the magnitude of the projected aging and future shortage is somewhat sensitive to what we assume about future cohorts, our basic conclusions are not. For example, for there to be no shortage by the year 2020, we would have to assume that all future cohorts (beginning with the cohort entering the labor market this year) entered nursing at a rate similar to that seen among the cohorts born in the 1950s. In other words, the size of the RN workforce during the next 20 years is largely determined by the size of cohorts that have already entered the labor market, and changes in the size of entering RN cohorts will be felt only gradually.

A second important assumption of our model is that changes over time in the size of the workforce for any given cohort depend only on the age of the cohort, and not factors that are specific to a given year. Thus, for a given cohort, any increase in the number of FTEs over time is interpreted as an age effect and not the result of economy-wide factors such as increasing wages. Of course, some of the increase in FTEs seen over the 1980s may have been in part caused by rising wages. We investigated this possibility by estimating alternative models that incorporated these year effects in various ways (results available from authors). These alternative models yielded estimates of age effects that increased less with age. The resulting forecasts of total FTEs were roughly similar in shape but 10% lower by 2020. Forecasts based on these alternative models were not robust to small changes in specification but consistently imply a workforce that is aging and shrinking even more rapidly than indicated by our base analysis.

COMMENT

Our analysis suggests that a fundamental shift occurred in the RN workforce during the last 2 decades. As opportunities for women outside of nursing have expanded, the number of young women entering the RN workforce has declined. This decline in the propensity of younger cohorts to choose nursing as a career has resulted in a steadily aging RN workforce. Over the next decade this aging will continue as the largest cohorts of RNs will be in their 50s and 60s, after which the RN workforce will contract as these cohorts begin to retire. As a result, the size of the RN workforce is forecast to be nearly 20% below projected requirements by 2020.

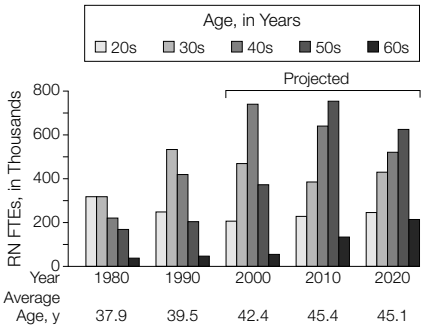
The continued aging of the RN workforce has important implications for employers. Efforts to restructure patient care delivery must be more ergonomically sensitive to older RNs, who are more susceptible to neck, back, and feet injuries and have a reduced capacity to perform certain physical tasks compared with younger RNs who once dominated the workplace.[24] Also, older and more experienced RNs may have higher expectations of working conditions and require greater autonomy and respect than has typically been accorded.

The RN shortages we foresee are in stark contrast to the oversupply expected by the Pew Health Professions Commission in 1995.[25] Moreover, unlike past shortages, the coming RN shortage will be driven by fundamental, permanent shifts in the labor market that are unlikely to reverse in the next few years. As shortages develop during the next 20 years, it can be expected that RN wages will rise, and employers will have little choice but to substitute other personnel for RNs. In anticipation of these developments, employers and nursing leaders should begin working together now to plan how best to use increasingly scarce RNs to deliver patient care in the future.

Long-term strategies to increase RN supply are needed to avoid a shortage. Although higher wages and better working conditions may attract more women and men to choose nursing as a career, these effects will occur only slowly and will be limited by the continued expansion of career opportunities for women outside of nursing. Alternatively, immigration of RNs educated outside the United States may provide the most feasible strategy. However, eliminating the projected shortage would require immigration on an unprecedented scale, and such a policy would not be without controversy.

Finally, the impending decline in the supply of RNs will come at a time when the first of 78 million baby boomers begin to retire and enroll in the Medicare program in 2010. Because RNs are vital in ensuring access to and quality of health care, it is critical that policymakers understand, and develop appropriate responses to, the implications of a rapidly aging RN workforce.

Figure 5. Actual and Projected Number of RN FTEs by Age Group for Selected Years



Standard errors for the estimates are 2% to 5%. Dates after 1990 are projected. RN indicates registered nurse; FTEs, full-time equivalents.

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> The scientist does not study nature because it is useful to do so. He studies it because he takes pleasure in it, and he takes pleasure in it because it is beautiful.
>
> —Jules Henri Poincaré (1854-1912)

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