

David I. Auerbach
Peter I. Buerhaus
Douglas O. Staiger

Associate Degree Graduates and The Rapidly Aging RN Workforce

Executive Summary

- ▶ This second segment of a four-part series examines the inter-relationship between the growth in associate degree nursing programs and the aging of the RN workforce.
- ▶ A growing proportion of new RNs have entered the workforce via associate degree programs, increasing from 40% in 1977 to 60% in 1996.
- ▶ New graduates, as well as working RNs, are approximately 5 years older in 1996 than 20 years earlier.
- ▶ Findings suggest that the rapid aging of the RN workforce can not be directly attributed to the rise in the number of older-aged graduates of associate degree programs.
- ▶ Rather, the declining propensity of those born after 1960 to enter nursing has resulted in fewer young RNs, and therefore: (1) an aging workforce, and (2) fewer new grads from baccalaureate programs (which have always attracted younger RNs) relative to grads from associate degree programs (which have always attracted older RNs).

IN THIS SECOND of a four-part series on changes in the RN workforce, the extent to which the large number of older-aged RN graduates of associate degree programs are a major cause of the rapidly aging RN workforce is discussed. In Part One of this series, which was published in the May/June 2000 issue of *Nursing Economic\$* (Buerhaus, Staiger, & Auerbach, 2000a), data were presented that showed the decreasing number of RNs under the age of 30 may be partly responsible for the current shortage of RNs in hospital intensive care units. In addition, data were presented which suggested that shortages of operating room RNs may be explained in part by the retirement of older-age RNs who dominate this work setting. In Part Three, the growth of career options for women during the last 3 decades will be discussed, emphasizing the adverse impact on enrollment in nursing education programs and the inability of the profession to replace the large number of RNs born in the baby-boom generation (1946-1960) who are nearing retirement. The series concludes in Part Four with a discussion of ideas and strategies for strengthening the current and future RN workforce.

Background

According to data from the National Sample Survey of Registered Nurses (NSSRNs) (1980, 1984, 1998, 1992, 1996), the average age of working RNs has increased over 4 years during the past 2 decades (see Table 1). Moreover, the number of employed RNs under age 30 has declined sharply, from 376,532 (30% of the workforce) in 1980, to 217,776 RNs (10% of the workforce) in 1996. Forecasts from a recent study

.....
DAVID I. AUERBACH, PhD(c), is a Doctoral Student, Program in Health Policy, Harvard University, Cambridge, MA; and a Pre-Doctoral Fellow in Health and Aging, National Bureau of Economic Research, Cambridge, MA.

PETER I. BUERHAUS, PhD, RN, FAAN, is Associate Dean for Research, and Valere Potter Distinguished Professor, Vanderbilt University School of Nursing, Nashville, TN.

DOUGLAS O. STAIGER, PhD, is Associate Professor of Economics, Dartmouth College, Hanover, NH; and Research Associate National Bureau of Economic Research, Cambridge, MA.

ACKNOWLEDGMENT: This study was funded by the Robert Wood Johnson Foundation, Princeton, NJ.

Table 1.
Selected Characteristics of Employed RNs

Year	Average Age	Average Age of Recent Graduates	Number under 30	Percent of Workforce Under 30
1980	38.1	28.0	376,532	29.6%
1984	38.8	29.5	347,071	23.4%
1988	39.4	30.2	295,745	18.2%
1992	41.0	31.7	236,274	12.8%
1996	42.3	33.4	217,776	10.3%

Source: The National Sample Survey of Registered Nurses
Recent graduates refers to graduates within the previous 4 years of the survey date.

Figure 1.
New RN Graduates (within the past 4 years of the survey year)
by Degree Type

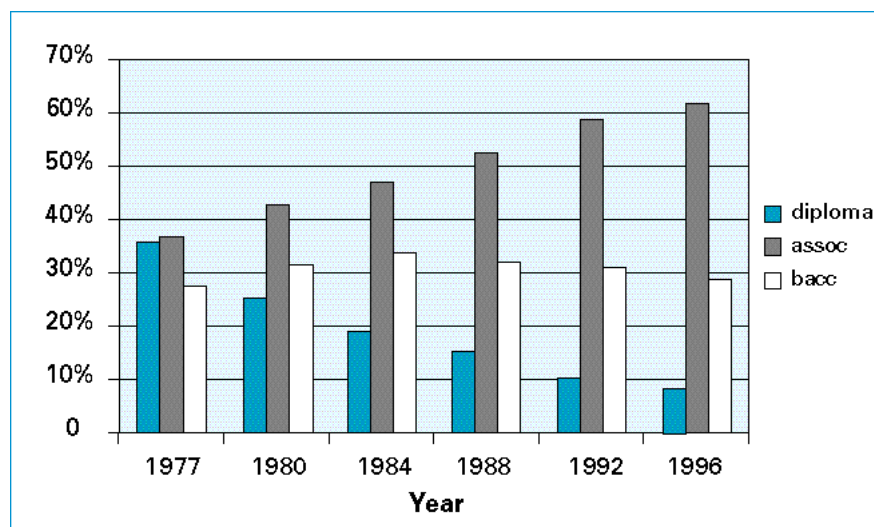


Table 2.
Growth of Associate Degree Programs

Year	Number of Programs
1960-61	57
1970-71	437
1980-81	697
1990-91	829
1996-97	876

Source: U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions. Table 109: Number of Health Professions Students, Graduates and Schools, Selected Academic Years 1949-50 to 1996-97 and Projections for 1999-2000 (continued), p. 16.

(Buerhaus, Staiger, & Auerbach, 2000b) suggest that within the next 10 years, the average age of employed RNs will increase another 3.4 years to 45.4, while more than 40% of the RN workforce is expected to be over the age of 50. The total number of FTE RNs is projected to peak around the year 2010 and decline steadily thereafter as large numbers of RNs retire. By the year 2020, the RN workforce is forecast to be roughly the same size at it is today, falling nearly 20% below projected RN requirements.

The rapid aging of the RN workforce has been attributed, among other things, to the older

age of graduates of 2-year associate degree nursing programs, a trend believed to have begun with the swift increase in the number of these programs (see Table 2). By the late 1970s, Figure 1 shows that the percentage of graduates from associate degree programs had displaced diploma programs as the percentage of graduates coming from baccalaureate programs has changed very little over time. Associate degree programs seem to have attracted individuals in their mid-30s interested in a career in nursing (McBride, 1996) who did not want to enroll in longer, 4-year baccalaureate degree nursing education programs. Figure 2 shows

that, in fact, associate degree graduates are approximately 5 years older than graduates of baccalaureate programs, although the trend toward older graduates is apparent among all nursing education programs. Nevertheless, the rise of associate degree programs appears to play an important role in explaining the sharp rise in the average age of employed RNs, particularly because graduates of these programs are older than graduates of other programs.

However, the increase in associate degree graduates does not appear to be a major cause of the rapid aging of the RN workforce. Rather, findings suggest that both

the aging of the RN workforce and the rise in associate degree graduates result from the same underlying cause.

Data and Methods

Data for this study were obtained primarily from the NSSRNs which have been conducted by the Bureau of Health Professions approximately every 4 years since 1977. These data are widely recognized as the principal source of demographic, employment, and educational data on all those licensed to practice as an RN in the United States. The survey asks RNs about the degree program from which they obtained their basic nursing education (diploma program, associate or baccalaureate degree) and the year the degree was obtained. Employed RNs were analyzed based on their age at graduation, the program from which they obtained their basic nursing education, and year of birth.

From each survey, data were obtained on recent RN graduates in a manner that avoids bias due to the RN's age. For example, in the survey year 1996, all RNs who obtained their basic nursing degree between 1992 and 1995 and were working in 1996 appear in the sample. For information on RNs who obtained their degrees between 1988 and 1991, the 1992 survey was used, and so on. Thus, all RNs are observed soon after they obtained their degrees. Therefore, in most of the analysis, data for the reported year (for example, 1996) are derived from graduates from the previous 4 years (for example, between 1992 and 1995). Only working RNs were included so that the sample will more closely represent conditions of the actual RN workforce, and sample weights from the NSSRNs were used to make the data representative of the U.S. population of RNs. In the case of part-time workers, RNs working less than 30 hours were given a weight of one-half relative to the full-time RNs.

Figure 2.
Age at Graduation for RNs by Education Program

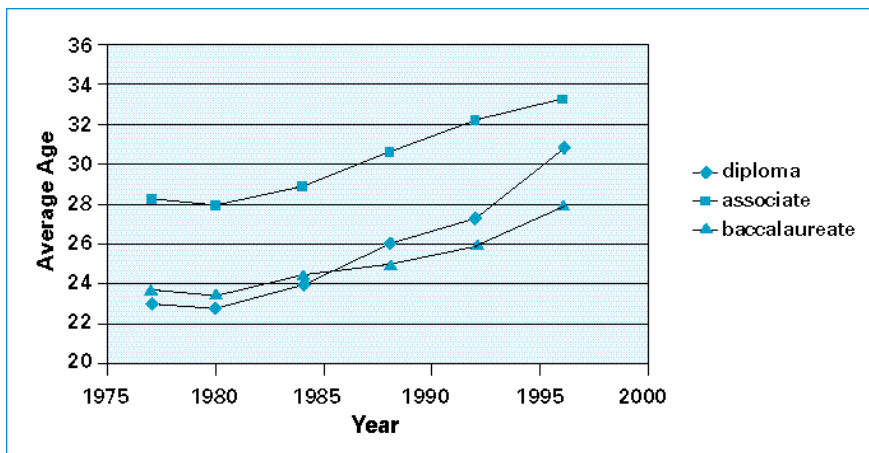
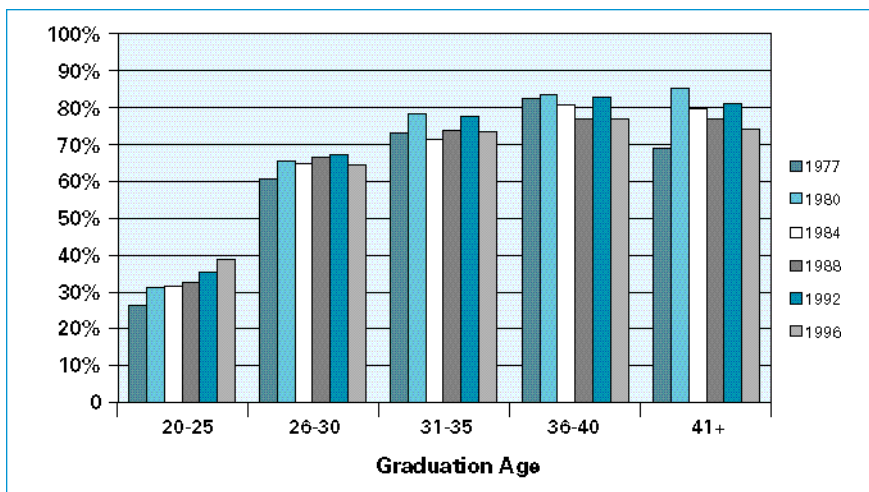


Figure 3.
Percent of Graduates Coming from Associate Degree Programs by Age at Graduation



Results

Analysis of the rise in associate degree graduates. What is behind the dramatic rise, observed in Figure 1, in the percentage of RN graduates coming from associate degree programs? One explanation is simply that associate degree programs have become increasingly available (see Table 2), and this in turn has drawn students to these programs. This explanation can be assessed by examining whether the proportion of graduates of all ages coming from associate degree pro-

grams has been increasing over time. An alternative explanation is that the shift toward older nursing students (see Table 1) has led to the rise in the associate degree programs because these 2-year programs are more popular with older students (see Figure 2). This explanation suggests that, within narrow age ranges (for example, 26-30), there should be no increase over time in the proportion of graduates from associate degree programs; instead, a shift in the age distribution of graduates toward the older

Appendix
Simulation Model of the RN Workforce

Using data on graduation rates, RN ages at graduation, and cohort sizes, a statistical model was developed to simulate the RN workforce over time. The goal of the simulations was to quantitatively assess the degree to which the aging of the workforce and the growth in the percentage of new graduates entering the workforce via associate degree programs can be attributed to two trends: (a) changes in the sizes of various cohorts and the propensity to enter the nurse workforce, and (b) later entry into the workforce within a cohort. The simulation model of the RN workforce was constructed such that the two effects could be isolated.

In a scenario testing the first effect (trends in the sizes of various cohorts and the propensity to enter the nurse workforce), graduation patterns were held constant. That is, the same percentage of every cohort was constrained to graduate in their 20s, as in their 30s (and so on) and only the sizes of the cohorts (the number of RNs eventually "produced" by a given birth cohort) were allowed to vary. The exact way in which the cohort sizes vary was taken from estimates of overall cohort effects derived in a study on the aging RN workforce (Buerhaus, Staiger, & Auerbach, 2000b). In that study, the RN workforce was estimated using least-square multiple regression controlling for life-cycle, population, and pure cohort effects. Table 3a shows the relative sizes of selected cohorts that were derived from this model and were used in the simulation.

In the simulation designed to test the second effect (later entry into the RN workforce within a cohort), cohort sizes were held constant. That is, the 1950 birth cohort was constrained such that it would eventually produce the same number of RNs as would the 1970 cohort, and only the graduation patterns of successive cohorts of RNs would change in the manner that they appear to be changing (newer

cohorts entering the workforce at progressively later ages). Actual workforce graduation trends (see Figure 5) were used to estimate the exact nature cohorts were graduating at later and later ages over time. The final percentages of each cohort graduating in various age groups that were used in the model are also shown in Table 3b (for selected cohorts only).

In both scenarios, the likelihood of a given graduate to have obtained an associate degree according to the age of the graduate was held fixed.

Snapshots of the simulated workforce were taken at various points in time under each scenario, and statistics collected on the average age of the workforce and the percentage of the current graduating "classes" who had obtained associate degrees. As reported earlier, the scenario in which cohort sizes only were changed, the workforce aged 3.3 years between 1980 to 1996 (75% of the observed actual aging), while the scenario in which age at entry into the workforce changed, the workforce aged only 0.71 years. Further, the accelerating pattern of the workforce aging under the changing cohort sizes scenario perfectly mirrored the actual aging of the RN workforce, whereas the slight aging under the delayed workforce entry scenario took place at a constant rate. Finally, the changing cohort size scenario matched the rise in the percentage of graduates obtaining associate degrees extremely well, resulting in exactly the observed rise of 15 percentage points from 1980 to 1996 that was observed in the true data.

From this simulation exercise, it is concluded that cohort effects are the driving reason for the increase in associate degree graduates. Moreover, cohort effects are the chief reason for the aging of the RN workforce, *not* the increase in associate degree graduates.

Table 3a.
Total Production of RNs from Selected
Cohorts, Relative to the 1955 Cohort

1935	24.8%	1960	92.0%
1940	29.2%	1965	83.0%
1945	40.7%	1970	65.3%
1950	66.3%	1975	53.6%
1955	100.0%		

Table 3b.
Percent of Cohort Graduating in Age Group

	20-22	23-25	26-30	31-35	36-40	41-45	46-50	51-64
1935	61.4%	9.4%	4.3%	4.3%	6.6%	6.6%	3.8%	3.8%
1940	54.2%	8.9%	6.9%	6.9%	7.8%	7.8%	3.8%	3.8%
1945	42.4%	11.4%	10.3%	10.3%	9.0%	9.0%	3.8%	3.8%
1950	35.7%	13.7%	11.0%	11.0%	10.5%	10.5%	3.8%	3.8%
1955	28.4%	15.0%	12.8%	12.8%	11.7%	11.7%	3.8%	3.8%
1960	22.2%	15.1%	14.8%	14.8%	12.8%	12.8%	3.8%	3.8%
1965	16.7%	17.8%	15.2%	15.2%	13.8%	13.8%	3.8%	3.8%
1970	13.1%	18.3%	15.8%	15.8%	14.7%	14.7%	3.8%	3.8%
1975	9.5%	19.1%	16.3%	16.3%	15.6%	15.6%	3.8%	3.8%

ages should be observed.

To evaluate these alternative explanations, the trend in the percentage of graduates obtaining associate degrees over time was examined, separating graduates by age category. As shown in Figure 3, there has been little change over time. For example, among those who graduated between the ages of 31 and 35 years, an RN is no more likely to have graduated from an associate degree program in 1996 than he/she was in 1977. This result holds true generally for *all* ages except for a small increase in the proportion of 20 to 25-year-old graduates obtaining associate degrees.

While the proportion of graduates from associate degree programs has been fairly constant within an age group, there has been a large shift in the age distribution of graduates toward older ages. As shown in Figure 4, there was a large decline over time in the percentage of graduates from the 20 to 25 age group, and a corresponding rise in the percentage of graduates from the older age groups, particularly among graduates over the age of 30. Based on the trends shown in Figures 3 and 4, the explanation for the rising proportion of associate degree graduates can be attributed to *an increase in the age* of graduates (the second scenario above) rather than to an increase in the success of associate degree programs in attracting graduates at various ages. That is, because older graduates are more likely to obtain associate degrees, whatever is causing the older mix of RN graduates has indirectly led to an increase in the percentage of graduates obtaining associate degrees over time. Thus, the question becomes: what is causing the older mix of RN graduates?

Analysis of the rise in graduation age. Why has the average age of RN graduates been increasing over the last 2 decades? The fact that the overall RN workforce has been aging at the same time (see Table 1) suggests that there may be

Figure 4.
Age at Graduation of RN Graduates Over Time

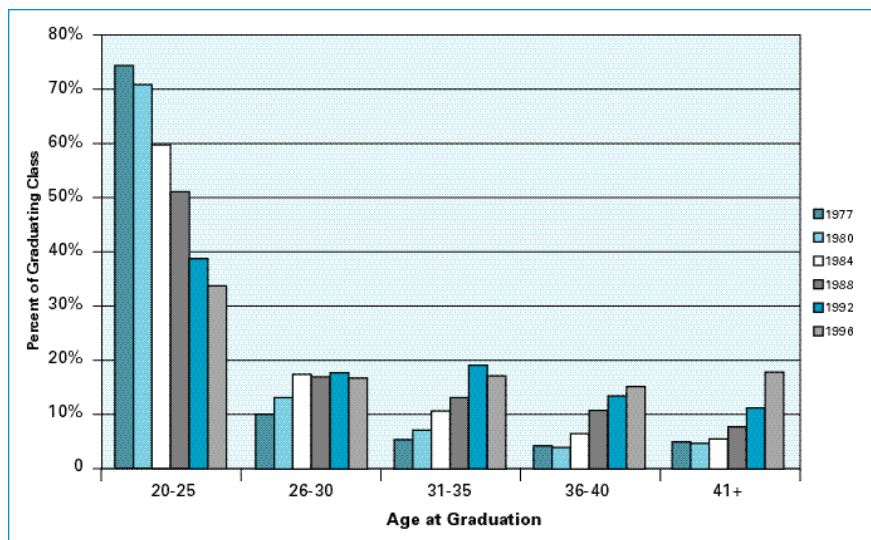
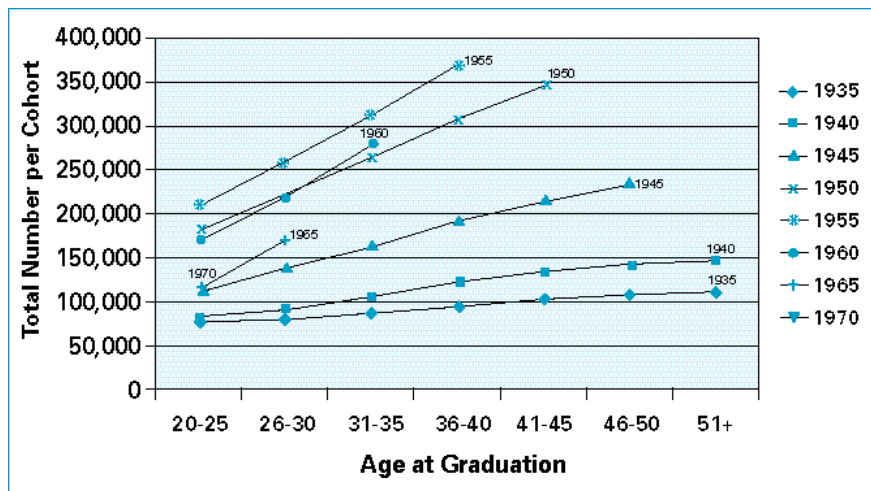


Figure 5.
Graduates from Nursing Programs by 5-year Cohort of Birth at Various Ages, Cumulative



a common explanation behind the two aging trends. Buerhaus et al. (2000b) found a dramatic decline in the propensity of younger birth cohorts (those born after 1955) to choose nursing as a career, as opportunities for women outside of nursing have expanded. This declining propensity of young women to go into nursing is the primary factor causing the aging of the RN workforce. A similar force could be causing the rise in gradu-

ation age of RNs if cohorts born in the 1950s (who are currently 40 to 50 years old) continue to enter nursing programs, while cohorts born in the 1970s (who are currently 20 to 30 years old) do not. (The term *cohort* refers to all the individuals born in any given year.)

Figure 5 provides a way to visualize the importance of changes across cohorts in determining trends in RN graduation

age over time. Each line in Figure 5 refers to a cohort of RNs born in the indicated 5-year interval, and shows the cumulative number of RN graduates observed by a given age from that cohort. For example, the curve "1950" shows the cumulative number of people born between 1950 and 1954 who had graduated from an RN education program by ages 25 to 45. Note that this line is incomplete because, at the time of the most recent survey in 1996, no one from the 1950-1954 cohort had yet been observed past the age of 45. In fact, the last point plotted for the 1950-1954 cohort (and for all other cohorts in the figure) is an extrapolation based on incomplete data, since only the 1950 cohort had actually reached the age of 45 at the time of the 1996 survey.

A key feature shown in Figure 5 is the dominance of the 1950s cohorts. By every age, the cohort born between 1955 and 1959 has produced more RN graduates than any cohort before or since. For example, the 1955-1959 cohort produced over 90,000 more graduates (or nearly *double*) by age 25 as did the cohorts born 10 years earlier (1945-50) and 10 years later (1965-70). Moreover, there is no strong evidence of "catching up" for the cohorts born in the 1960s (these cohorts continue to produce far fewer RN graduates by age 30 and 35 as compared to the 1955-1959 cohorts). Thus, it does not appear that these later cohorts are simply delaying the time at which they pursue a nursing education. Instead, as indicated in Figure 5, there has been a substantial decline in the propensity of recent cohorts to ever become RNs. As argued elsewhere (Buerhaus Staiger, & Auerbach, 2000b), this decline is most likely the result of expanded career opportunities for women outside of nursing and, therefore, is unlikely to be reversed in the near future.

As the RNs born in the 1950s moved through education programs and the nurse workforce,

they have exerted a dramatic impact on the age distribution. In the 1970s, these individuals dominated nursing education programs, mostly obtaining diplomas and baccalaureate degrees when they were in their early 20s. Not surprisingly, associate degree programs only accounted for one-third of new graduates at this time (see Figure 1). In contrast, in the 1990s enrollment in baccalaureate programs was shrinking (American Association of Colleges of Nursing, 1999) because they were drawing mostly from younger cohorts born after 1965, and these cohorts were not becoming nurses. At the same time, associate degree programs maintained enrollments because they were drawing mostly from older cohorts born in the 1950s, and these cohorts were still becoming nurses to the same extent as earlier cohorts. As a result, associate degree programs accounted for nearly two-thirds of new graduates by the mid-1990s. To borrow a metaphor from demographers, the 1950s cohorts reflects the "rat" passing through the belly of the snake, where the snake is the age distribution of recent RN graduates. As the large 1950s cohort ages over time, so goes the age distribution of RN graduates — and also the age distribution of the RN workforce.

Another important feature seen in Figure 5 is that the lines corresponding to each 5-year cohort born since 1950 are approximately parallel. Thus, while the number of RN graduates in their early 20s has fallen off sharply since the 1955-1959 cohort, the additional number of graduates being added at older ages (after age 25) has remained fairly constant. In other words, the decline in the propensity of recent cohorts to become RNs has occurred entirely at young ages; after age 25 these cohorts show a similar propensity to become RNs as did the cohorts born in the 1950s. These results suggest that despite increased career opportunities for women

over the last 30 years, nursing continues to be an attractive option for women (and men) choosing a career at older ages.

EXAMINING the growth in the percentage of graduates of associate degree programs from a cohort perspective suggests that a decline over the last 2 decades in the propensity to become an RN at young ages is the key reason behind the rising proportion of nursing graduates from associate degree programs. But how much of the trend toward associate degrees can be attributed to changes over time in the number of young people becoming RNs?

Results from simulation models (see appendix for details) showed that simply changing the total number of RNs graduating from each cohort at all ages, while holding constant both graduation trends (the same proportion of each cohort graduates by age 25, by age 35, etc.) and the proportion with associate degrees at each age, reproduces the entire increase in the proportion of new graduates receiving associate degrees between 1980 and 1996. Thus, observed trends in the proportion of new RN graduates receiving associate degrees can be almost entirely explained by changes across birth cohorts in the propensity to enter nursing.

Concluding Comments

It has been suggested that the increase in associate degree programs over the years is a major cause of the rising average age of RNs. Stated differently, the large expansion of these programs over the past several decades made it easier for women in mid or late career to decide to become RNs where, without these programs, they would have been unable to make such choices. The analysis reported here shows that in recent years a growing proportion of new RNs have graduated from associate degree programs. However, rather than the presence of associate degree programs driving

the aging of the RN workforce, the exceptional size of the cohorts of women born in the 1950s and early 1960s who would eventually become RNs explains the rising demand for these programs. These large cohorts of women were in their 30s in the 1980s and in their 40s in the 1990s. But because the shorter to complete associate degree programs attract the majority of people entering nursing in their 30s and 40s, the burst of associate degree graduates in the 1980s and 1990s reflects underlying large cohort effects.

This result also implies that since the cohorts of women born *after* the 1950s are smaller in population size, and also less likely to enter nursing as a profession even when controlling for population size (due to a greater abundance of career opportunities when they were in their career-forming years as compared to their predecessors), the trend of ever larger numbers of new RN graduates in their 30s is likely to fade during the years ahead. This fading, however, will probably not be as dramatic as the decline in new RNs in their early 20s entering the nurse labor market. Although the nursing profession may have lost much of its appeal to other careers from the perspective of a college bound 18-year-old embarking on a new career, it remains a good option for women in their late 20s and 30s who may find the 2-year associate degree program an enticing entry into a new career.

The next article in this series on changes in the RN workforce will include an assessment on the effect of expanding career opportunities for women on the rapid aging of the RN workforce, emphasizing the adverse impact on enrollment in nursing education programs and the inability of the profession to replace the large number of RNs born in the baby-boom generation (1946-1960) who are nearing retirement.

To comment, join the discussion
at the Nursing Economic\$
Leadership Forum:
ajj.com/jpi/nec

REFERENCES

- American Association of Colleges of Nursing. (1999, January 25). *Nursing school enrollments lag behind rising demand for RNs, AACN survey shows*. Washington, DC: Author.
- Buerhaus, P.I., Staiger, D., & Auerbach, D. (2000a). Why are shortages of hospital RNs concentrated in specialty care units? *Nursing Economic\$, 18*(3), 111-116.
- Buerhaus, P.I., Staiger, D., & Auerbach, D. (2000b). Implications of an aging registered nurse workforce. *The Journal of the American Medical Association, 283*(22).
- McBride, A. (1996). Professional nursing education today and tomorrow. Commissioned paper in Wunderlich, G., Sloan, F., & Davis, C. (Eds.). *Nursing staff in hospitals and nursing homes. Is it adequate?* (pp. 333-360). Washington, DC: National Academy Press.
- U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions. *Table 109: Number of Health professions students, graduates and schools, selected academic years 1949-50 to 1996-97 and projections for 1999-2000 (continued)*, p. 16.