



Center for Health Workforce Planning
Issue Brief: Registered Nurse Supply, Demand and Shortage Projections in Iowa
August 1, 2004

Background

The adequacy of nurse supply varies throughout the United States, with a general consensus that at the national level there is currently a moderate shortage of registered nurses (RNs). In 2004, the National Center for Health Workforce Analysis in the Bureau of Health Professions, Health Resources and Services Administration (HRSA), said the current shortage of RNs will continue to grow in severity during the next two decades if current trends prevail, and that some states face a more severe shortage than do other states. The purpose of this report is to provide an overview of the HRSA supply and demand models as they apply to Iowa through 2020. Much of the content is extrapolated from a document prepared by HRSA and The Lewin Group in January 2004.

Nursing Supply Model (NSM)

The NSM produces annual, state-level projections of RN supply. Starting with the number of licensed RNs in 2000, the NSM adds the estimated number of newly licensed RNs, subtracts the estimated number of separations, and tracks cross-state migration patterns. The model projects the number of licensed RNs and applies labor force participation rates to estimate the number of RNs active in the health workforce. Nurses who report working full-time are counted as 1 FTE, while nurses who report working part-time or for only part of the year are counted as 0.5 FTEs.

The NSM has three major components:

- **New Graduates from Nursing Programs:** In 2000, approximately 71,100 RNs graduated from nursing programs (National Council of State Boards of Nursing, 2000). Approximately two-thirds of these graduates were prepared at the diploma or associate level, with the remaining one-third prepared at the baccalaureate level or higher. The number of graduates in 2000 shows a continuing decline compared to earlier years. Comparing state-level data from the National Council Licensure Examination for Registered Nurses (NCLEX-RN) with state-level estimates of the number of women age 20 to 44 creates the applicant pool for each state. The NSM applies algorithms to model the impact on the number of nursing graduates resulting from changes in RN compensation, working conditions, teaching capacity and tuition. Under the baseline scenario, the number of new nurse graduates is relatively constant through 2020 at the national level.

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- The Licensed Nurse Population:** The model starts with number of licensed RNs in each state, tracked by age and education level, as estimated using the 2000 National Sample Survey of RNs (NSSRN). RN supply is defined as the licensed RN population who provide nursing services or are seeking employment in nursing. The NSM addresses cross-state migration patterns by estimating the probability of leaving or entering the state as a function of RN age, education level and state of residence. The NSM tracks two types of education upgrades: RNs prepared at the diploma or associate level who earn a baccalaureate degree, and RNs prepared at the baccalaureate level who earn a masters or higher degree. The education level and age composition of the RN population has important implications for the current and future supply of RNs because labor force participation, cross-state migration and retirement patterns vary systematically by age and education level. For example, RNs prepared at the masters level or higher are more likely to migrate than are RNs prepared at the baccalaureate level, who in turn are more likely to migrate than are RNs with a diploma or associate degree. Younger RNs are more likely to migrate across states than are older RNs, reflecting factors such as greater transience among professionals early in their career as they seek employment after graduation.
- Permanent Separation from the Nurse Workforce:** The NSM constructs separation rates by combining mortality rates for women obtained from Minimo et al. (2002) and estimated rates of attrition for reasons of disability and retirement using data from the 1998, 1999, 2000 and 2001 Current Population Surveys (CPS). Anecdotal evidence suggests that many RNs who leave nursing retain their license even when they have no intent of returning to nursing. Nurses who change careers but continue to renew their license are accounted for in the NSM labor force participation and FTE rates.
- Nursing Supply Projections:** NSM baseline projections reflect the level of RN supply that is most likely to occur if current trends continue. At the national level, the number of licensed RNs is projected to remain relatively constant at about 2.7 million nurses between 2000 and 2020. The number of licensed RNs is projected to increase slightly through 2012, but then start declining as the number of retiring RNs exceeds the number of new graduates. The number of RNs who are active in nursing is projected to remain between 2.1 million and 2.3 million during this period, while the FTE supply of RNs is projected to decrease slightly from 1.89 million in 2000 to 1.81 million in 2020. At the state level, there is substantial variation in the growth or decline of the RN population between 2000 and 2020 based on the number of new graduates, net cross-state migration, and attrition from the RN population. FTE RN supply data projections for Iowa and the U.S. follow.

Table 1. Baseline FTE RN Supply for Iowa and the U.S. by Year: 2000 to 2020

	2000	2005	2010	2015	2020	% Change 2000 to 2020
Iowa	25,200	26,300	26,600	26,000	25,000	-1%
U.S.	1,890,700	1,942,500	1,941,200	1,886,100	1,808,000	-4%

Nursing Demand Model (NDM)

The NDM projects state-level demand for FTE RNs, licensed practical and vocational nurses (LPNs) and nurse aides/home health aides (NAs) through 2020. Nursing demand is defined as the number of FTE nurses that employers are willing to hire given population needs, economic considerations, the healthcare operating environment and other factors. Changing demographics are a key determinant of projected need for FTE RNs. The U.S. Census Bureau projects a rapid increase in the elderly population starting around 2010. Because the elderly have much greater per capita healthcare needs compared to the non-elderly, the rapid growth in demand for nursing services is especially pronounced for long-term care settings that predominantly provide care to the elderly. In addition to state-level U.S. Census Bureau projections of changing demographics, the NDM projects nurse demand as a function of changing patient acuity, economic factors, and various characteristics of the healthcare environment, such as managed care enrollment rates.

The NDM has two major components:

- Health Care Services:** The NDM projects demand for RNs in 12 employment settings. It projects demand for healthcare services for six of the 12 settings. Estimates of service utilization come from multiple sources including the American Hospital Association (AHA), the American Health Care Association (AHCA) and the Centers for Medicare and Medicaid Services (CMS). For five settings, demand is projected using RN-per-population ratios. Demand for nurse educators is projected assuming that nurse educators remain a fixed proportion of total RN demand in each state.

Table 2. Overview of the Nursing Demand Model

Setting	Healthcare Utilization Measure Projected	Staffing Intensity Measure Projected
Short-term hospitals: Inpatient Outpatient Emergency	Inpatient days Outpatient visits Emergency visits	FTE RNs/1,000 inpatient days FTE RNs/1,000 outpatient days FTE RNs/1,000 emergency visits
Long-term hospitals (psychiatric, rehabilitation, and all other hospitals)	Inpatient days	FTE RNs/1,000 inpatient days
Nursing facilities	Residents	FTE RNs/resident
Doctor's offices	NA	FTE RNs/10,000 population
Home health	Home health visits	FTE RNs/1,000 HH visits
Occupational health	NA	FTE RNs/10,000 pop. age 18-64
School health	NA	FTE RNs/10,000 pop. age 5-17
Public health	NA	FTE RNs/10,000 population
Nurse education	NA	FTE RN educators/total FTE RNs
Other healthcare	NA	FTE RNs/10,000 population

Analysis of healthcare utilization results suggest several scenarios that impact nursing demand. As Health Maintenance Organization (HMO) enrollment rates rise, the number of inpatient days at short-term hospitals, emergency room visits and nursing facility residents decline. As surgeries shift from inpatient to outpatient settings, the number of inpatient days in short-term hospitals fall and the number of outpatient visits and home health visits rise. An increase in the percentage of the population that is uninsured decreases demand for healthcare services in long-term hospitals and nursing facilities. The percentage of the population enrolled in Medicaid is positively correlated with higher utilization of healthcare services, including inpatient days, outpatient visits, emergency room visits and home health services. An increase in the proportion of the population that is non-white is associated with a slight increase in the use of outpatient services and long-term hospital inpatient days. An increase in the proportion of the Hispanic population is associated with a slight decrease in emergency department visits.

- Nurse Staffing Intensity:** The overall impact of staffing intensity must be considered in conjunction with healthcare utilization projections to fully comprehend the magnitude of additional RN FTE's required. Nurse staffing intensity is defined as the number of FTE nurses divided by some measure of workload specific to the setting. The NDM calculates base year values of nursing staffing intensity for each state and setting by dividing estimates of RN employment by estimates of healthcare utilization. Staffing intensity is projected considering nurse wages, HMO enrollment rates, hospital inpatient and outpatient surgeries, healthcare reimbursement rates, percent of population uninsured, percent of population Medicaid-eligible, per capita personal income, patient acuity levels and geographic location. In many instances, the impact of change may have a mixed effect on nurse staffing intensity. In percentage terms, the NDM projects the fastest growth will occur in settings that predominantly serve the elderly (e.g., home health and nursing facilities) and in hospitals outpatient settings. FTE RN demand data projections for Iowa and the U.S. follow.

Table 3. Baseline FTE RN Demand for Iowa and the U.S. by Year: 2000 to 2020

	2000	2005	2010	2015	2020	% Change 2000 to 2020
Iowa	27,100	28,600	30,000	31,800	34,100	26%
U.S.	2,001,500	2,161,300	2,347,000	2,569,800	2,824,900	41%

Future nurse demand will be determined, in part, by political decisions, changes in technology, changes in healthcare operating environment and changes in other factors that are hard to predict. Projection models such as the NDM are relatively simplistic simulations of a complex healthcare system that try to capture the major trends, so the RN demand projections are made with some level of imprecision. For example, managed care growth shifts may shift care to outpatient settings and increase inpatient staff intensity to reflect increasing levels of patient acuity. Raising RN wages 1% annually may decrease demand for FTE RNs by 10% in 2020 but provide employers greater

financial incentives to substitutes LPNs where possible. If the U.S. population grows 20% faster than projected by the Census Bureau, by 2020 the demand for FTE RNs would increase by 3%. Conversely, if the U.S. population grows 20% slower than projected by the U.S. Census Bureau, by 2020 the demand would decrease by 3%.

Assessing the Adequacy of Future Supply

- Comparing the baseline supply and demand projections suggests that if current trends continue, 64% of projected demand for FTE RNs in the U.S. will be met, as compared to 2005 when 90% of demand will be met. By 2015, every state is projected to experience some level of shortfall. State-level shortages are projected to vary substantially and market forces will create financial incentives for nurses to migrate to states with more severe shortages. FTE RN demand shortfall projections for Iowa and the U.S. follow.

Table 4. Baseline FTE RN Demand Shortfall for Iowa and the U.S. by Year: 2000 to 2020

	2000	2005	2010	2015	2020
Iowa	7% (-1,900)	8% (-2,300)	11% (-3,400)	18% (-5,800)	27% (-9,100)
U.S.	6% (-110,800)	10% (-218,800)	17% (-405,800)	27% (-683,700)	36% (-1,016,900)

Limitations of the Models

The NSM and NDM are independent models. The demand model makes projections without considering the potential supply of nurses, and vice versa. The future nurse workforce, in reality, will be influenced by the combination of supply and demand. Both models use HRSA’s National Sample Survey of RNs (NSSRN) to create estimates. Because the precision of estimates is proportional to sample size, estimates of demand for RNs in a particular setting within a state are less precise than state-level estimates, which in turn are less precise than national-level estimates. Because the NSM and NDM are scaled-down versions of complex systems, there are many determinants that are not included in the models that impact trends at the state level. The NSM models only the supply of RNs and does not consider LPNs and nurse aides, both categories of health workers that impact nursing demand and the applicant pool. Parts of both models are static. In the NSM, for example, the probability of cross-state migration is based on historical patterns that do not consider current state shortages. The NDM has limited ability to model substitution between types of nurses and between nurses and other healthcare workers. Similarly, it has limited ability to capture interaction of healthcare settings when some

settings might be viable substitutes (e.g. home health and nursing facilities) and others might be complimentary (e.g. increased use of outpatient services leading to the increased use of home health services).

Iowa's Response

The NSM and NDM are powerful tools for projecting RN supply and demand. They help quantify projected shortages as an aging population increases demand for nursing services at the same time an aging RN workforce and relatively fewer new nurses are entering the profession. However, the models were not designed to address all factors that impact Iowa's projected demand for nurses. For this reason, the state bears responsibility for identifying trends in demographics, economics, education, cross-state migration, healthcare utilization patterns, and strategies to recruit and retain health workers that impact Iowa's actual projected demand. Moreover, the state must correct a fundamental limitation of the models by integrating supply and demand projections for Iowa.

Iowa has taken two important actions to project the demand for registered nurses that are independent yet supportive of the NSM and NDM. The first positions the state to integrate RNs into a nationally recognized health professions tracking inventory maintained by the University of Iowa, Carver College of Medicine, Office of Statewide Clinical Education Programs (OSCEP). A pilot project, conducted in a 13-county area of north central Iowa, has begun to track the demographics, education and work effort of registered nurses in every work setting. Sustained funding will allow the tracking system to include all Iowa RNs within five years. Unlike the tracking processes that created the NSM, Iowa's RN Tracking System includes all actively licensed RNs, combines data collected by the licensure board with information provided by employers and nurses themselves, refines RN work effort by quantifying part-time employment, includes data about licensed nurses who are professionally inactive, and produces both supply and demand reports to meet the needs of a variety of stakeholders.

The second action provides new information about healthcare utilization patterns and demographics in Iowa. A project conducted by the Iowa State University Department of Economics assists health workforce planners to visualize and project the actual demand for care by service area and take action to assure the required workforce. A final report in July 2004 will include important information about U.S. Census Bureau population projections that impact the demand for nurses by setting (e.g. school and occupational health for a relatively small young population vs. nursing facilities and home health for a growing proportion of frail elderly). The project expands the work of the NDM beyond identifying the number of RNs employers are willing to hire to identifying the actual demand for healthcare services exhibited by the people who live, work and require end-of-life care in Iowa.

Conclusion

Iowa needs the valuable information provided by the NSM and NDM to predict the impact of national trends and compare shortfall projections at state and regional levels. The models project a shortfall of 9,100 RNs in Iowa by 2020, almost one fourth of Iowa's current actively licensed RN workforce. Alone, the models cannot not provide all the data required to project Iowa's

health workforce needs. It is the responsibility of the state to continuously identify, collect, analyze, trend and share supply and demand data, and implement new policies to sustain a competent, diverse health workforce.

The Center for Health Workforce Planning was created in the Iowa Department of Public Health, Bureau of Health Care Access, to assess and forecast health workforce supply and demand, address barriers to recruitment and retention, support strategies developed at the local level that prevent shortages, and engage in activities that assure a competent, diverse health workforce in Iowa. Funding for the center, fueled through the efforts of U.S. Senator Tom Harkin, is administered through the Bureau of Health Professions, Health Resources and Services Administration, U.S. Department of Health and Human Services.

http://www.idph.state.ia.us/hpcdp/workforce_planning.asp

References

American Hospital Association. *Hospital Statistics*. Various years.

Bureau of Health Professions. 2001. *The Registered Nurse Population, March 2000: Findings from the National Sample Survey of Registered Nurses*.

Fritz, M. 1999. *The National Demand-Based Requirements Forecasting Model*. 10th Federal Forecasters Conference, 1999: Papers and Proceedings.

Minino, AM; Arias, E; Kochanek, KD; Murphy, SL; and Smith, BL. 2002. Deaths: Final Data for 2000. *National Vital Statistics Reports*. Vol. 50(15).

National Center for Health Workforce Analysis. 2004. What is Behind HRSA's Projected Supply, Demand, and Shortages of Registered Nurses. Accessed January 2004.

National Center for Health Workforce Analysis. 2002. Projected Supply, Demand, and Shortages of Registered Nurses: 2000-2020. <ftp://ftp.hrsa.gov/bhpr/nationalcenter/rnproject.pdf>. Accessed November 2003.

National Council of State Boards of Nursing, Inc. *2000 Licensure and Examination Statistics*. Available from http://www.ncsbn.org/public/regulation/res/2000lic_exam_statistics_report_on-line.pdf.

Seago, JA; Ash, M; Spetz, J; Coffman, J; and Grumbach, K. 2001. Hospital Registered Nurse Shortages: Environmental, Patient, and Institutional Predictors. *Health Services Research*, 36(5): 831-852.

Spetz, J. 1999. The Effects of Managed Care and Prospective Payment on the Demand for Hospital Nurses: Evidence from California. *Health Services Research*. 43(5):993-1010.