Statewide Health Coordinating Council Texas Center for Nursing Workforce Studies Advisory Committee

The attached report was presented to the Legislature and published on November 1, 2006. This report was prepared pursuant to a Legislative mandate to study the supply and demand for Registered Nurses in the state and to recommend a target number of RNs and Nurse graduates needed to increase the supply to meet the demand. In part, the report recommends the Legislature appropriate fifty-two (52) million dollars for the biennium to increase graduates by approximately twenty-one thousand (21,000). The report also recommends adjustments to current faculty salaries. Final appropriations for these salaries is yet to be determined.

The Supply of and Demand for Registered Nurses and Nurse Graduates in Texas

REPORT TO THE TEXAS LEGISLATURE
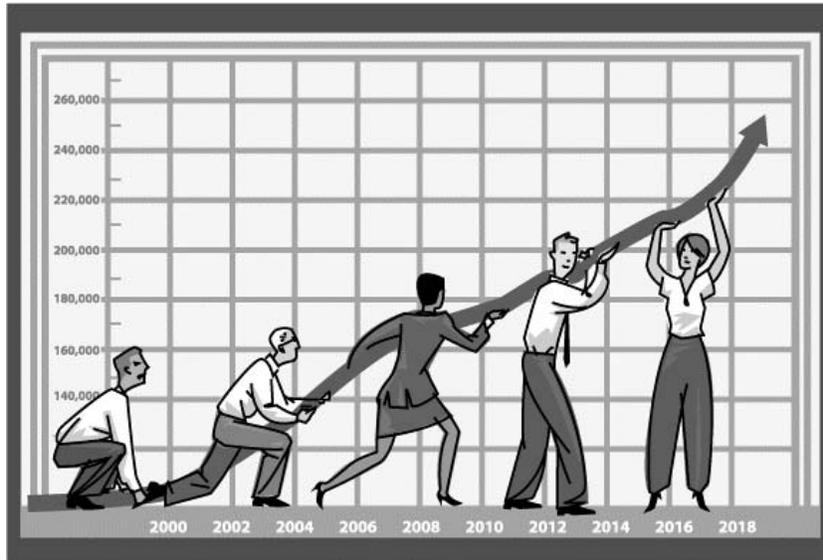
Texas Center for Nursing Workforce Studies

Texas Department of State Health Services
Center for Health Statistics
and the
Statewide Health Coordinating Council
Texas Center for Nursing Workforce Studies Advisory Committee

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Executive Summary

Texas is facing an unprecedented nursing shortage where the gap between supply and demand grows wider each year for the coming decade. Using the well established Supply and Demand forecasting models of the U.S. Health Resources and Services Administration (HRSA), the future landscape of nursing in Texas can been seen clearly. Factoring in Texas population projections, per capita healthcare use, trends in healthcare market conditions, economic conditions, patient acuity, and nursing staffing intensity equations, nursing demand is projected. The supply model considers U.S. and international graduates (11 percent of the Texas RN workforce is internationally educated), education upgrades, cross-state migration, nurse aging, death/disability, and career changes. The HRSA model for Texas projects that the demand will rise by 86 percent by 2020, while the supply will grow by only 53 percent with strategies already in place. Texas will be 71,000 FTEs short of the nurses it will need.

Texas produced a total of 6,300 new graduates of initial entry nursing programs in its 84 nursing programs in 2005. For supply to meet demand, the number of new graduates needs to grow to 9,700 in 2010, to 18,000 in 2015, and to 25,000 in 2020. Overall, this is a four-fold increase.

To reach the 2010 target, as well as in the years beyond, significant increases in enrollment must occur in 2008. A large investment of capital and human resources is also required. Because there is an overabundance of qualified applicants seeking admission to nursing programs, the key factors to increasing enrollment are obtaining a sufficient number of nursing faculty and competitive faculty salaries. Funding estimates of increasing graduates indicate that an additional $52 million during the 2008-2009 biennium would be required.

This calculation is based on current funding levels and does not include increases to existing nursing faculty salaries. Incremental increases in funds to match increases in enrollees will be needed to meet the target number of graduates in subsequent years. In addition, it is

recommended that current funding in the Professional Nursing Shortage Reduction Program and the Tobacco funding remain dedicated to nursing education for the foreseeable future.

To give nursing schools sufficient time to plan for increased enrollments, assuming funds are made available, a plan was constructed of incremental increases in graduates over time. If this plan is followed, it would balance the supply and demand for registered nurses in Texas by 2020. The plan begins with a 25 percent increase in the class entering in 2008, rising to 50 percent the following year, then to 75 percent, 90 percent, 100 percent, and finally to 125 percent for the class entering in 2016 and thereafter.

To ensure accountability, additional funding must be given to professional nursing programs based on their ability to successfully meet performance standards such as maintaining a high completion rate, meeting the targeted number of RN graduates needed, and maintaining a successful level of pass rates on the licensing examination. Increase in financial support and incentives in the form of scholarships, traineeships, student loans and work study programs need to be provided to encourage initial entry students to graduate on time and to recruit more RNs to continue their education and obtain a graduate degree to qualify for teaching positions. Focus on re-assigning faculty duties that could be accomplished through assistive personnel and regionalizing central functions such as criminal background checks and certain application/admission services should be considered.

Strategies such as increasing accelerated tracks for applicants with degrees in other fields, actively pursuing distance education methodologies, maximizing simulation experiences in the laboratories, and developing partnerships with health care organizations should be expanded.

Strategies other than increasing graduates are necessary and must be implemented within the healthcare industry simultaneously, including encouraging older nurses to delay retirement, improvement in the workplace, competitive wages, and hospitals attaining national/state designation for excellence in nursing retention.[1] Multiple strategies within the health care

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[1] Such programs are the American Nurses Credentialing Center's Magnet Recognition Program® at: http://www.nursingworld.org/ancc/ and the Texas Nurses Association's Nurse-Friendly™ Designation Program at: http://www.texasnurses.org/index.htm

industry are necessary, and more concerted efforts are needed to encourage retention of nurses in the workplace.

The supply and demand projections from 2005 through 2020 show a continuous, long-term, critical nursing shortage in Texas. Now is the time for Texas to take action to close this gap. To provide the level of healthcare needed for the citizens of Texas now and in the future, Legislators, state and regulatory agencies, educational institutions, the healthcare industry, and healthcare and professional organizations must make a long-term commitment.

BACKGROUND AND PURPOSE

The 79th Legislature of the State of Texas enacted Senate Bill 132 to study the supply and demand for registered nurses in the state and to recommend a target number of registered nurses and nurse graduates needed to increase supply to meet demand.

The 79th Legislature charged the TCNWS with:

- Performing an analysis to determine, for each academic year, a target number of graduates from the state's professional nursing programs.

- Recommending goals for increasing the number of graduates from those programs.

- Calculating the levels of public and private funding needed to achieve the target number and goals.

The Legislature further stated the analysis must include assessments and projections concerning:

- The number of registered nurses (RNs) working in this state and the number of registered nurses needed in this state.

- The number of professional nursing program graduates needed to address any difference between the numbers.

UNDERSTANDING THE SUPPLY AND DEMAND MODELS

TCNWS used the Health Resources and Services Administration (HRSA) Supply and Demand forecasting models to project future supply and demand needs for RNs in Texas. The HRSA Models are made up of two self-contained programs, the Nursing Supply Model (NSM) and the Nursing Demand Model (NDM)[2]. A more detailed description of the Supply and Demand Models can be found in Appendix B. The TCNWS made adjustments to the data in the NSM to create the "Texas Model," a model that more accurately projects the supply of RNs and RN

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[2] Biviano, M., Fritz, M.S., Spencer, W. and Dall, T. *What is Behind HRSA's Projected Supply, Demand, and Shortage of Registered Nurses?* September 2004. Can be found online at:
ftp://ftp.hrsa.gov/bhpr/workforce/behindshortage.pdf

graduates in Texas. A more detailed description of the adjustments made to the NSM to create the Texas Model can be found in Appendix D.

The projections in *Part I. Comparing RN Supply and Demand* (Tables 1 and 2 and Figure 1) reflect supply and demand from 2005 through 2020 in the absence of any major interventions that may be used to increase supply.

The HRSA supply model was adjusted to include actual Texas data. Projections for 2000 and 2005 were then compared with TCNWS actual Texas data from those years. (More information about how the supply model was adjusted can be found in Appendix D.)

Accuracy of the Texas Model

- The adjusted baseline model (Texas Model), the model used before any scenarios were run, was highly effective in predicting supply by underestimating actual FTE RN supply in Texas by just two percent in 2000 and five percent in 2005.

- The projections for BSN graduates are exact because graduation data for BSNs were entered directly into the model for years 2000 through 2005.

- Diploma and Associate Degree (ADN) graduate projections were accurate, coming within one percent of the actual data.

Projecting Baseline RN Supply and Demand

In the absence of any major intervention, the following reflects supply and demand for registered nurses in Texas from 2005 through 2020. According to the Texas Model:

- FTE RN demand increases from approximately 143,000 in 2005, to 266,000 in 2020, representing an 86 percent increase in demand.

- The total supply of FTE RNs is expected to increase from approximately 128,000 in 2005, to approximately 195,000 in 2020, representing a 53 percent increase in supply, a level insufficient to meet demand.

- Texas needed an additional 15,000 FTE RNs to meet demand in 2005. It will need approximately 71,000 by 2020.

After projecting baseline RN supply and demand, an intervention was applied to the Texas Model. The intervention included an incremental increase in the number of initial RN licensure

graduates from Texas schools of nursing starting in 2010 and continuing through 2020. The incremental increase in graduates gradually increased RN supply each year until RN supply met health care demand in 2020. This intervention allowed TCNWS to project the additional number of RN graduates needed each year, as well as the additional number of RNs needed each year, in order to increase RN supply to meet demand by 2020.

Things to Consider When Reading the Report

- The RN population projections in Part I and Part III (Figure 3 and Table 6) of this report are provided as full-time equivalency (FTE) RNs. An FTE is the effort expended working 2,080 hours per year, and for this study, FTEs are operationally defined as counts of the number of full-time and part-time RNs working in nursing. Full-time RNs are counted as 1.0 FTE and part-time RNs are counted as 0.5 FTE. (FTEs are described in more detail in Appendix A: Key Terms and Definitions.)

- The data provided in Parts I and III are not head counts of the number of RNs needed but the number of FTEs needed to meet demand. Therefore, the number of FTEs projected is smaller than the actual number of RNs needed for three reasons: 1) not all RN graduates go to work as nurses in Texas, 2) not all who do, work full-time, and 3) a significant number of graduates will be needed to replace those who leave the nurse workforce each year. For example, if there were two RNs, one of whom worked full-time (1.0 FTE) and the other part-time (0.5 FTE), these two RNs would count as 1.5 FTEs.

- The RN projections in Part II and Part III (Figure 2 and Table 4) of this report are provided as actual (head count) RNs. A head count is the total number of RNs working in nursing regardless of their employment status. In other words, one full-time and one part-time RN are counted as two individuals.

- This report focuses on the number of additional graduates needed to balance supply and demand in Texas by 2020. The report does not focus on the number of additional enrollees needed, as has been the focus of other reports.

The data presented in this report reflect projections of registered nurse supply and demand between 2005 and 2020 and are approximations of what the landscape of nursing in Texas will look like between now and the future. It is important to consider when interpreting the data in this report, that projections become less accurate the further out they predict; therefore, it is expected that these projections will be calculated again as further data becomes available for input into the models.

Part I. Comparing Baseline RN Supply and Demand

The projections in *Part I. Comparing RN Supply and Demand* (Table 1 and 2 and Figure 1) reflect supply and demand from 2005 through 2020 in the absence of any major interventions to increase supply or decrease the demand for registered nurses in Texas. The data in this section are reported as FTE RNs, not head counts.

The supply model was adjusted to include actual Texas data, and once this was done the projections for 2000 and 2005 were compared with TCNWS actual Texas data from those years. The Texas model, the model used before the intervention model was applied, did an excellent job of predicting supply, underestimating actual FTE RN supply in Texas by just two percent in 2000 and five percent in 2005. The projections for BSN graduates are exact because graduation data for BSNs were entered directly into the model from 2000 through 2005. Diploma and associate degree (ADN) graduate projections were also very close, coming within one percent of the actual data.   More information about how the supply model was adjusted can be found in Appendix D.

RN demand, supply, the shortage of RNs and the percent increase in supply needed to meet demand for each year is illustrated in Table 1. Column <u>one</u> is the year in which the supply and demand of RNs is projected. Column <u>two</u> lists the number of nurses needed in this state from 2005 through 2020. Column <u>three</u> lists the number of nurses working in this state between 2005 and 2020. Column <u>four</u> represents the difference between demand and supply. Column <u>five</u> represents the percent increase in the RN population needed in order to increase supply to meet demand. This column does not represent percent increase in graduates needed. This intervention will be introduced in Part III. Target Number of Nursing School Graduates. The data presented in this column is representative only of the percent increase in supply needed for each year.

The total supply of FTE RNs increases from approximately 128,000 in 2005, to approximately 195,000 in 2020, representing a 52 percent increase in supply. FTE RN demand increases from

approximately 143,000 in 2005, to 266,000 in 2020 representing an 86 percent increase in demand. The model is projecting that Texas needed to increase RN supply by approximately 14 percent, or 15,000 FTE RNs, to meet demand in 2005, and this percent increase will grow to approximately 36 percent, or 71,000 FTE RNs, by 2020.

Texas Center for Nursing Workforce Studies				
TABLE 1: **PROJECTED SUPPLY OF AND DEMAND FOR RNs** **IN TEXAS,** **THE TEXAS MODEL** **~Estimated Shortage of FTE RNs~**				
(1)	*(2)*	*(3)*	*(4)*	*(5)*
Year	FTE RN Baseline Demand	FTE RN Baseline Supply	FTE RN Shortage	% Increase Needed to Meet Demand
2005	142,598	127,658	-14,940	11.70%
2006	148,320	131,330	-16,990	12.94%
2007	154,295	135,052	-19,243	14.25%
2008	160,710	138,912	-21,798	15.69%
2009	167,226	142,843	-24,383	17.07%
2010	173,971	146,892	-27,079	18.43%
2011	180,978	151,102	-29,876	19.77%
2012	188,756	155,416	-33,340	21.45%
2013	196,815	159,875	-36,940	23.11%
2014	205,294	164,431	-40,863	24.85%
2015	213,951	169,099	-44,852	26.52%
2016	223,285	173,922	-49,363	28.38%
2017	233,014	178,885	-54,129	30.26%
2018	243,287	184,043	-59,244	32.19%
2019	254,086	189,380	-64,706	34.17%
2020	265,601	194,973	-70,628	36.22%

Source: Health Resources and Services Administration, Supply and Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: September 2006
Notes: TCNWS supply data reflect FTEs calculated using only active RNs (those RNs who are currently working full- or part-time in nursing).

The widening gap between RN supply and demand in Texas is depicted Figure 1. Because of Texas' aging population, including its aging nursing workforce, demand will increase

significantly by 2020 while supply will not increase sufficiently each year to keep up with demand.

Texas Center for Nursing Workforce Studies

Source: Health Resources and Services Administration, Supply and Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: August 2006
Notes: TCNWS supply numbers reflect FTEs calculated using only active RNs.

Factors Impacting the Supply of and Demand for Registered Nurses

The demand for nurses will continue to increase through 2020. Factors such as the increase in the Texas population at a more rapid rate than other states, the aging of the population, the increase in uninsured and underinsured citizens needing health care, and the increase in the level of care needed for those who are critically and chronically ill will have a profound effect on demand for well qualified and educated registered nurses.

The Health Professions Resource Center summarized the following factors contributing to the RN shortages in Texas:[3]

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[3] King, B., Kishi, A. and Gunn, B. Health Professions Resource Center and the Texas Center for Nursing Workforce Studies. *Highlights: The Supply of Registered Nurses in Texas – 2005.* (Publication pending).

- The aging nursing workforce, low spousal unemployment and the global nature of the nursing shortage compound the usual factors contributing to nursing shortages.[4]

- A key factor in nursing schools is the availability of nursing faculty. They, like nurses in healthcare delivery, are aging. Within the next 5-15 years, 70 percent of the Texas nursing faculty are expected to retire.[5] Thus, for some schools, in spite of having qualified student applicants available, they may not have faculty to teach them.[5]

- There is an abundance of applicants to Texas schools of nursing each year and a number of qualified applicants who are not admitted. In 2005, there were a total of 12,250 qualified applicants who were not offered admission into an initial RN licensure program. This represents 54 percent of the qualified applicants applying for admission into nursing programs in 2005.

FTE RN baseline supply by highest degree obtained from 2005 through 2020 is depicted in Table 2. The estimated numbers of FTE RNs from 2005 through 2020 reflect projections based on current trends in the absence of any interventions. Column <u>one</u> is the projection year. Column <u>two</u> through <u>four</u> show the supply population broken down by highest degree category. Column <u>five</u> represents total supply and will equal the data presented in column three of Table 1. The HRSA Supply Model collapses Diploma and Associate Degree nurses (ADN) into one group. These data cannot be reported separately, and with only two diploma programs in Texas, this combination is not deemed significant. Therefore, the majority of the RN population in the group will have an associate degree as their highest degree obtained.

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[4] Nevisijon, B. and Erickson, J. The nursing shortage: Solutions for the short and long term. *Online Journals of Issues in Nursing.* January 2001. Available online at: http://www.nurisngworld.org/ojin/topic14/tpc14_4.htm.

[5] Kishi, A. The Texas Center for Nursing Workforce Studies. *Increasing RN Graduates: Admission, Progression and Graduation in Texas Schools of Nursing 2004.* Austin, Texas: July 2005. Available online at: http://www.dshs.state.tx.us/chs/cnws/default.shtm.

Texas Center for Nursing Workforce Studies			
TABLE 2: **ESTIMATED TEXAS BASELINE FTE RN SUPPLY** **BY HIGHEST DEGREE OBTAINED,** **THE TEXAS MODEL**			
FTE RN Baseline Supply			
(1) Year	*(2)* Diploma/ADN	*(3)* Baccalaureate	*(4)* Masters +	*(5)* Total[*]
2005	69,584	48,991	9,083	127,658
2006	71,588	50,392	9,350	131,330
2007	73,621	51,810	9,621	135,052
2008	75,737	53,273	9,902	138,912
2009	77,883	54,772	10,189	142,843
2010	80,112	56,294	10,486	146,892
2011	82,435	57,873	10,793	151,102
2012	84,821	59,472	11,123	155,416
2013	87,305	61,100	11,470	159,875
2014	89,865	62,730	11,836	164,431
2015	92,512	64,372	12,215	169,099
2016	95,266	66,035	12,621	173,922
2017	98,114	67,730	13,040	178,885
2018	101,078	69,471	13,494	184,043
2019	104,157	71,258	13,964	189,380
2020	107,380	73,118	14,476	194,973

Source: Health Resources and Services Administration, Supply Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: September 2006
Notes: TCNWS supply data reflect FTEs calculated using only active RNs.
[*] Adding across degree categories may not equal totals due to rounding.

Part II. Target Number of Registered Nurses

An intervention model using incremental increases in the number of graduates each year starting in 2010 was used to increase RN supply to meet demand by 2020. The projected results of this intervention and the total number of RNs working in nursing needed each year to meet demand by 2020 is illustrated in Table 3. It is estimated that, in 2010, Texas will need approximately 161,000 RNs working in this state. Texas will need approximately 212,000 RNs working in nursing by 2015 and 293,000 RNs by 2020. The data reported in this table are the actual (head count) number of RNs needed, not FTEs.

Column <u>two</u> of Table 3 lists the number of RNs expected to be working in nursing each year in the absence of any intervention. Column <u>one</u> is the projection year. Column <u>three</u> represents the number of RNs added to the baseline when the effect of an intervention was applied. In this case, the intervention was an increase in the number of graduates produced each year. Column <u>four</u> gives the actual number of RNs needed each year to meet demand by 2020. The data provided in this column include the proposed incremental increases in graduates that will be described more fully in Part III. This intervention will not take effect until 2010 and the increase in the RN population will not appear until 2011.

	Texas Center for Nursing Workforce Studies		
	TABLE 3 **NUMBER OF REGISTERED NURSES NEEDED IN TEXAS, 2005-2020**		
(1) Year	*(2)* Number of RNs at Baseline	*(3)* Additional Number of RNs Needed[*]	*(4)* Total Projected Supply of RNs Needed to Meet Demand
2005	140,129	N/A[**]	N/A
2006	144,150	N/A	N/A
2007	148,259	N/A	N/A
2008	152,551	N/A	N/A
2009	156,929	N/A	N/A
2010	161,442	0	161,442
2011	166,181	1,828	168,009
2012	171,045	5,646	176,691
2013	176,048	11,622	187,670
2014	181,150	17,826	198,976
2015	186,354	25,567	211,921
2016	191,754	33,580	225,334
2017	197,285	42,810	240,095
2018	203,018	52,339	255,357
2019	208,921	64,697	273,618
2020	215,084	77,428	292,512

Source: Health Resources and Services Administration, Supply and Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: September 2006
Notes: Data presented are headcounts, not FTEs. This means the data presented are the actual number of nurses needed. TCNWS supply numbers reflect headcount data calculated using only active RNs. Data for the nursing population are calculated for March of each year. Therefore, data for 2010 does not take into account graduates from that year and the increase in graduates will impact the nurse population in the following year.
* The data from column 3 have been added to the data from column two (Number of RNs at Baseline) to determine the number of nurses needed each year in order to increase RN supply to meet demand (column four).
** N/A means the results of any supply-side intervention would not be reflected in increased number of graduates before 2010.

Part III. Target Number of Nursing School Graduates

The number of graduates needed each year to increase supply to meet demand by 2020 is depicted in Table 4. The following factors are considered when determining the number of graduates needed each year: 1) not all nursing graduates will become active RNs, 2) not all nursing graduates will work full-time in nursing, and 3) nursing graduates will not only add to the RN workforce each year but will also replace those RNs who leave the workforce during any year.

Column <u>one</u> of Table 4 is the projection year. Column <u>two</u> represents the baseline number of graduates projected in the absence of any intervention. Column <u>three</u> represents the additional number of RN graduates needed each year in order to meet the target number of graduates for each year depicted in column four. Column <u>four</u> represents the number of graduates projected with the intervention applied and provides the number of graduates needed each year in order to increase supply to meet demand by 2020. Table 5 represents the percent increase applied to the baseline projections.

In 2005, Texas had approximately 6,300 graduates from Texas schools of nursing leading to initial RN licensure. In order to increase RN supply to meet demand by 2020, a total of approximately 9,700 nurse graduates need to be produced in 2010; approximately 18,000 in 2015 and almost 25,000 nurse graduates need to be produced in 2020.

To account for the time required to educate these new graduates, the incremental increases in graduates do not take effect until 2010, allowing time for new graduates to enter the workforce. Enrollment increases need to occur in 2008 in order to increase the number of graduates beginning in 2010. These graduates are not counted in the RN population until the following year. This means the increased number of graduates in 2010 will not appear in the RN population projections until 2011. The proposed incremental increases in graduates begin gradually and increase over time to give schools of nursing time to plan for large increases in enrollment and to implement strategies to improve completion rates. Completion rates differ

from graduation rates in that they measure the percentage of full-time students who complete the nursing curriculum within a two-year period. Graduation rates measure the percentage of students who complete the pre-requisite/Core Curriculum requirements (normally one to two years depending upon type of program) and the nursing curriculum (approximately two years).

Texas Center for Nursing Workforce Studies			
TABLE 4 **BASELINE AND ADJUSTED SUPPLY OF** **GRADUATES, 2005-2020**			
(1) Year	*(2)* Baseline Supply of Graduates	*(3)* Additional Number of Graduates Needed	*(4)* Total Supply of RN Graduates Need
2005	6,291	N/A[*]	N/A[*]
2006	6,495	N/A	N/A
2007	6,842	N/A	N/A
2008	7,189	N/A	N/A
2009	7,539	N/A	N/A
2010	7,889	1,828	9,717[**]
2011	8,237	3,828	12,065
2012	8,586	6,007	14,593
2013	8,934	6,265	15,199
2014	9,284	7,833	17,117
2015	9,631	8,146	17,777
2016	9,981	9,402	19,383
2017	10,326	9,747	20,073
2018	10,678	12,624	23,302
2019	11,026	13,059	24,085
2020	11,376	13,494	24,870

Source: Health Resources and Services Administration, Supply Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: September 2006
Notes: Data reported are the actual number of new graduates produced at baseline and if incremental increases occurred, not FTE RNs.
[*] N/A means the results of any supply-side intervention would not be reflected in increased number of graduates before 2010.
[**] Represents a 50 percent increase in the number of graduates from the 6,495 graduates in 2006.

An incremental percent increase was applied to the baseline population of projected BSN graduates. The percent increase for each year is illustrated in Table 5. The baseline number of projected graduates for each year in which the intervention was applied (2010 through 2020) was multiplied by the proposed percent increase for that year to determine the number of graduates to enter into the model for the projections. A table describing how the percent increase was applied to the number of graduates is provided in Appendix D.

Texas Center for Nursing Workforce Studies	
TABLE 5 **PROPOSED INCREMENTAL INCREASE IN GRADUATES**	
(1)	*(2)*
Year	Percent Increase
2010	25%
2011	50%
2012	75%
2013	75%
2014	90%
2015	90%
2016	100%
2017	100%
2018	125%
2019	125%
2020	125%

Source: Health Resources and Services Administration, Supply and Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: September 2006
Notes: A table describing the calculations used to project increases in the number of graduates is provided in Appendix D.

The total number of Texas initial RN licensure graduates between 2005 and 2020 at baseline, and if an incremental increase in the number of graduates occurred beginning in 2010 is provided in Figure 2. Actual Texas data were entered into the baseline model for 2000-2005. TCNWS analyzed the actual Texas graduation data from 2000-2005 with a regression program called

Curve to project the number of graduates from 2006-2020. A more detailed description of how data were entered into the model can be found in Appendix D.

In addition to the likelihood that projections become increasingly less accurate over time, it is important to note this discrepancy will lead to an increasingly inaccurate estimate of new graduates as the model predicts out further. However, TCNWS will continue to monitor and make adjustments to the model based on actual supply data. Thus, projections within a 5-year period will be updated to be more accurate estimates.

FIGURE 2
TOTAL NUMBER OF TEXAS RN GRADUATES AT BASELINE AND
IF INCREMENTAL INCREASES OCCUR, 2005-2020
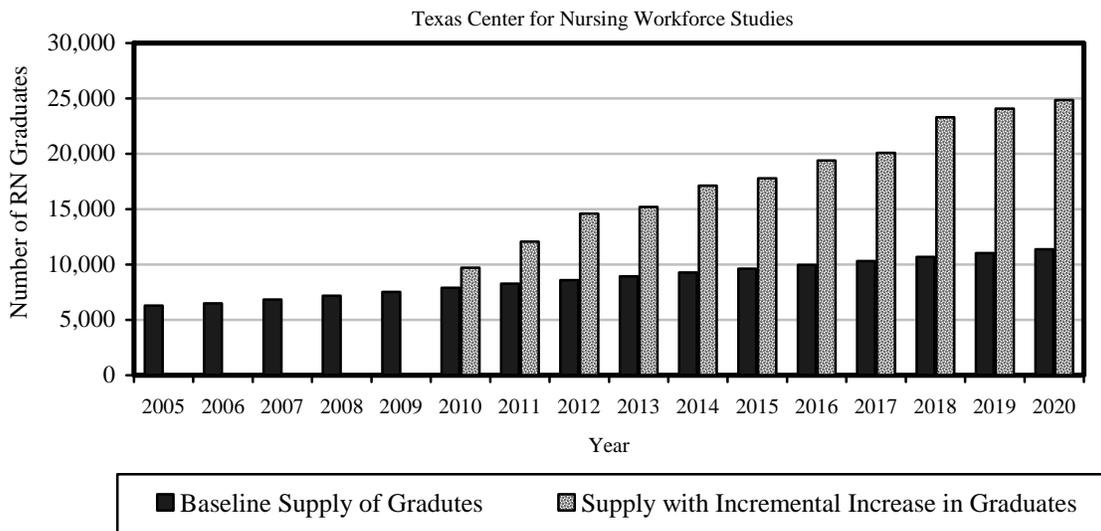
Texas Center for Nursing Workforce Studies

Legend: ■ Baseline Supply of Gradutes ▨ Supply with Incremental Increase in Graduates

Source: Health Resources and Services Administration, Supply Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: August 2006
Notes: Data reported are the actual number of new graduates produced at baseline and if incremental increases occurred, not FTE RNs.

The baseline supply of and demand for RNs (before the intervention was applied), and supply with a projected incremental increase in graduates is illustrated in Figure 3.

FIGURE 3
PROJECTED SUPPLY OF AND DEMAND FOR FTE RNs IN TEXAS:
INCREASING GRADUATES
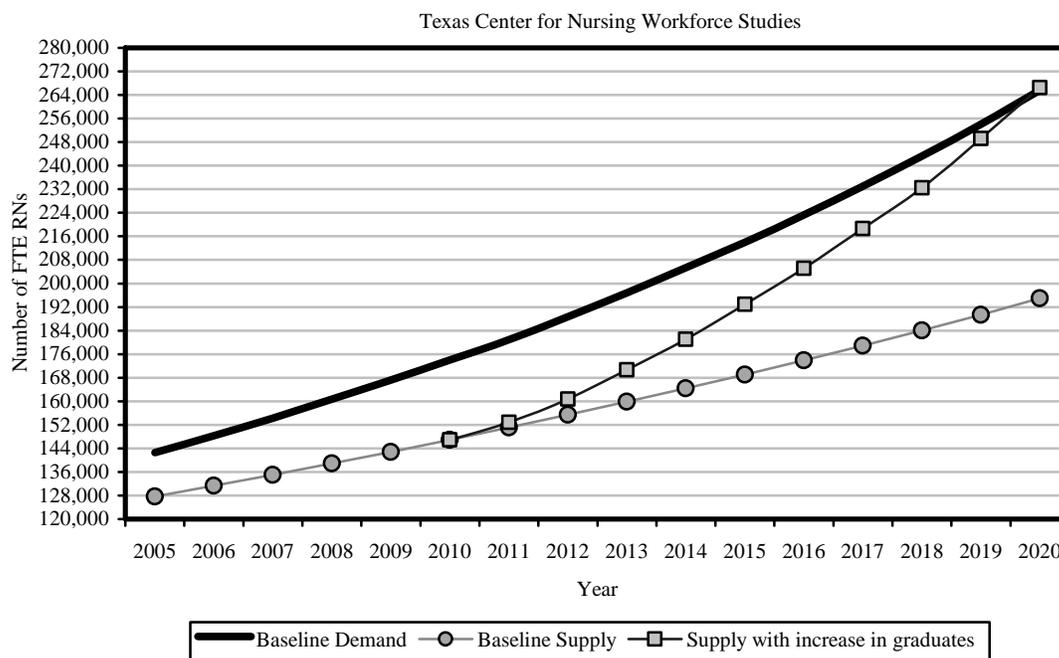
Texas Center for Nursing Workforce Studies

Source: Health Resources and Services Administration, Supply and Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: September 2006
Notes: TCNWS supply numbers reflect FTEs calculated using only active RNs.

Table 6 illustrates what the supply of RNs in Texas would be if there was an incremental increase in the number of graduates from Texas schools of nursing each year. Columns <u>one</u> through <u>four</u> are identical to those in Table 1 and show supply and demand in the absence of any intervention. Column <u>five</u> of Table 6 gives the supply projections with incremental increases in graduates each year. Column <u>six</u> is the shortage or surplus of FTE RNs after this scenario has been taken into account, and column <u>seven</u> is the additional percent increase in supply needed to meet demand after the intervention was applied. The RN head count data from Part II was calculated using the FTE data from column five of this table.

	Texas Model - Baseline			Intervention Model		
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
	FTE RN	FTE RN				% Increase
	Baseline	Baseline	FTE RN	FTE RN	FTE RN	Needed to Meet
Year	Demand	Supply	Shortage	Supply	Shortage	Demand
2005	142,598	127,658	-14,940	N/A[*]	N/A	N/A
2006	148,320	131,330	-16,990	N/A	N/A	N/A
2007	154,295	135,052	-19,243	N/A	N/A	N/A
2008	160,710	138,912	-21,798	N/A	N/A	N/A
2009	167,226	142,843	-24,383	N/A	N/A	N/A
2010	173,971	146,892	-27,079	146,892	-27,079	18.43%
2011	180,978	151,102	-29,876	152,807	-28,171	18.44%
2012	188,756	155,416	-33,340	160,686	-28,070	17.47%
2013	196,815	159,875	-36,940	170,711	-26,104	15.29%
2014	205,294	164,431	-40,863	181,031	-24,263	13.40%
2015	213,951	169,099	-44,852	192,872	-21,079	10.93%
2016	223,285	173,922	-49,363	205,106	-18,179	8.86%
2017	233,014	178,885	-54,129	218,585	-14,429	6.60%
2018	243,287	184,043	-59,244	232,516	-10,771	4.63%
2019	254,086	189,380	-64,706	249,228	-4,858	1.95%
2020	265,601	194,973	-70,628	**266,519**	**+918**	**0%**

Table heading:

Texas Center for Nursing Workforce Studies

TABLE 6
PROJECTED SUPPLY AND DEMAND:
INCREASING NURSING SCHOOL GRADUATES
~Estimated Shortage of FTE RNs~

Source: Health Resources and Services Administration, Supply and Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Texas Department of State Health Services
Date: September 2006
Notes: TCNWS supply numbers reflect FTEs calculated using only active RNs.
* N/A means no intervention was applied to the model for those years.

Part IV. Strategies for Increasing the Number of Graduates

Included in this report are high priority recommendations and strategies to increase the number of registered nurses and nursing graduates to meet the healthcare needs in Texas. To increase RN graduates, recommendations and strategies are offered to help with increasing enrollment; improving completion rates; and increasing capacity in nursing programs through effective and efficient use of financial, technical and human resources.

In order to address the nursing shortage in Texas and to develop a nursing workforce that can meet the healthcare demand needs through 2020, complex strategies, in addition to increasing the number of new graduates, need to be developed and implemented. The solutions need to be long-term and directed at both recruitment and retention of nurses.

The TCNWS and TCNWS Advisory Committee realizes that, in order to increase the supply of nurses to meet demand by 2020, additional strategies such as retention of nurses including matured, experienced nurses also need to be implemented. A comprehensive strategic action plan that includes retention strategies is available on the TCNWS website at http://www.dshs.state.tx.us/chs/cnws/. In order to effectively address the nursing shortage, a commitment and partnership should be established among healthcare consumers, the Legislature, state and regulatory agencies, educational institutions, healthcare industry, and healthcare and professional organizations. There are no simple solutions to the nursing shortage. The comprehensive strategic action plan reflects the scope and complexity of what actions need to be taken to insure that there are enough nurses to provide healthcare to all citizens of Texas.

Recommendations and Strategies:
Increasing the Number of RN Graduates in Texas

The Texas Center for Nursing Workforce Studies' (TCNWS) Advisory Committee recommends the following high priority strategies to increase the number of RN graduates in Texas:

1. Recommend that the Texas Legislature appropriate $52 million in new funds to the Texas Higher Education Coordinating Board (THECB). The THECB will distribute new funds among professional nursing programs to increase the capacity of the state's nursing programs that prepare students for initial RN licensure.

   Rationale: In order to meet the projected target number of graduates in 2010 and 2011, $51,936,122 of additional funding is needed over the next biennium (FY 2008 – FY 2009) to distribute among the 84 initial RN licensure programs in Texas. This funding will allow the professional nursing programs to have the resources necessary to:
   - Increase the number of nursing faculty positions.
   - Increase the number of initial RN licensure graduates by 50 percent between 2006 and 2010.
   - Implement strategies to increase completion rates of initial RN licensure graduates.

The following recommendations include strategies for distributing the new funds to increase the capacity of the state's nursing programs that prepare students for initial RN licensure.

   A. Allocate a portion of the new funds to increase the amount available under the Professional Nursing Shortage Reduction Program. This program provides financial incentives to schools that increase the number of graduates from their professional nursing programs.

   Rationale: Increasing the supply of RNs in Texas is of paramount importance. Although both enrollment and completion rates have been increasing in professional nursing programs, the completion rates need to continue to improve. Nursing students not only need to graduate from a nursing program but also need to pass the licensing examination (NCLEX-RN) to become a registered nurse. These two performance standards should be used to provide a financial incentive to those nursing programs that show evidence that a large portion of their nursing students successfully graduate and are able to pass the NCLEX-RN.

   B. Use a portion of the new funds to provide additional student financial aid for both undergraduate and graduate students successfully pursuing professional nursing degrees in Texas.

i. Financial aid and financial incentives could be in the form of reduced tuition, loan repayment programs for graduates who practice nursing or teach in a nursing program, traineeships, grants, tuition rebates, and financial assistance not only for tuition but also for other educational expenses.

ii. Financial assistance could also be provided to undergraduate and graduate nursing students who are not eligible for qualified financial aid programs due to their lower-than-minimum required credit hour enrollment or their need for assistance with living and educational expenses.

iii. Recipients of traineeships or grants for their graduate degree in nursing could be required to teach full-time for three years or part-time for six years in a professional nursing program in Texas following completion of the traineeship/grant.

Rationale: In the THECB's 2006 study on *Strategies for Increasing Student Completion Rates in Initial RN Licensure Programs*, 54 to 62 percent of the nursing students who participated in this study reported working between 11 and 40+ hours per week while going to school. If nursing students were able to receive financial support, it would attract a higher caliber of students to the nursing programs, would allow students to reduce the number of hours they work per week, and would allow the students to focus more on their nursing education in order to successfully complete the program on-time. Nursing programs also need to increase the number of students enrolled in their graduate programs, more specifically to prepare graduate students to become nurse educators. In the past, traineeships and financial aid helped to recruit more nurses to continue their education at the masters and doctorate levels.

2. Recommend that the Texas Legislature establish a separate line item appropriation for the purpose of increasing existing nurse faculty salaries to be competitive with salaries earned by masters and doctorally prepared RNs in the practice sector.

Rationale: To increase student capacity in initial RN licensure programs, there needs to be concerted efforts to recruit and retain nursing faculty. In order to do this, nursing faculty salaries need to be competitive with salaries that nurses with comparable educational preparation and experience make in clinical practice areas. In TCNWS' report on *Highlights: Recruitment and Retention of Nursing Faculty*, the faculty salaries in professional nursing programs in Texas were reported to be non-competitive with the salaries of nurses with comparable educational preparation and experience who work in clinical practice areas. The perception that faculty salaries were insufficient was the most frequently cited reason that qualified faculty applicants declined faculty positions. It is also the most frequently cited reason for the turnover of faculty members who left nursing programs to work in higher paying positions.

3. Recommend that the Texas Legislature continue to dedicate tobacco fund earnings from the Permanent Fund for Nursing, Allied Health, and Other Health-Related Education Program to nursing education through fiscal year 2011.

> **Rationale:** The grants from this fund have helped professional nursing programs develop innovative public-private partnerships to recruit and retain nursing students and faculty. Further dedicating funds to nursing education will allow nursing programs to continue to develop innovative strategies to increase capacity while minimizing cost.

Part V. Cost of Increasing the Number of Nursing Graduates

The TCNWS collaborated with the Texas Higher Education Coordinating Board (THEBC) to estimate the cost of increasing the number of enrollments and graduations from programs leading to initial RN licensure in Texas. These estimates only project cost through 2013 (three biennia) and represent only a portion of the total cost of balancing RN supply and demand by 2020.

Projections of the annual cost associated with targeted enrollments through 2013 and targeted graduations through 2015 are provided in Table 7, Funding Projections Using General Revenue Formula Funding Rates. The cost estimates are adjusted for expected inflation.

Column one is the enrollment year. Column two shows the projected total number of enrollees required each year to produce the targeted number of graduates. Column three identifies the estimated annual funding level needed to educate and graduate the increasing number of enrollees. Column four is the projected level of state general revenue funding for programs leading to initial RN licensure, assuming no major interventions in either the supply of or demand for registered nurses. Column five shows the annual increases needed to produce the targeted number of graduates. Column six is the year some portion of those students enrolled two years earlier are expected to graduate, and column seven is the target number of graduates required each year to balance projected supply and demand by 2020. Students enrolled in a University or Health-Related Institution are admitted into the nursing program for their junior and senior years. Therefore, only the last two years are considered in these funding projections.

The combined graduation and enrollments targets and funding estimates in the table take into account the differences in general formula funding rates among nursing programs at community colleges, four-year general academic universities and health-related institutions. These include the share of statewide enrollments they enroll, completion rates and the cost of graduating those enrollees.

The targeted number of graduates to be produced annually, and current and projected completion rates, determine the number of nursing students that must be enrolled (two years earlier) to produce the target number of graduates and the associated cost of those enrollments.

Texas Center for Nursing Workforce Studies						
TABLE 7						
FUNDING PROJECTIONS USING GENERAL REVENUE						
FORMULA FUNDING RATES -						
ENROLLMENT YEARS 2008 - 2013 AND GRADUATION YEARS 2010 - 2015						
~Community Colleges, Universities and Health-Related Institutions~						
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Enrollment Year	Target Enrollees	Target Funding	Current Funding	Increase in Funding Needed	Graduation Year	Target Graduates
2008	17,216	$96,574,407	$81,335,141	$15,239,266	2010	9,717
2009	21,378	$124,669,275	$87,972,420	$36,696,856	2011	12,065
2010	21,941	$132,993,874	$87,561,820	$45,432,053	2012	14,593
2011	22,852	$143,208,490	$93,446,489	$49,762,001	2013	15,199
2012	22,562	$148,175,326	$93,929,848	$54,245,479	2014	17,117
2013	23,433	$158,775,263	$99,806,417	$58,968,847	2015	17,777
		$749,668,490	**$503,952,758**	**$245,715,732**		

Cost estimates for the 2008-2009 biennium reflect current completion rates. Rates for each of the two remaining biennia are increased by 10 percent each year, except for those of health-related institutions which were increased by 10 percent in the first of the two remaining biennia, but capped at 85 percent in the second on the premise that the majority of schools of nursing would be unable to increase their completion rates much beyond this point.

This projected higher completion rates will decrease the number of enrollees and estimated level of funding needed to meet the target number of graduates for each year. More information about completion rates from Texas' schools of nursing can be found in the Texas Higher Education Coordinating Board's study on *Strategies to Increase the Number of Graduates from Initial RN Licensure Programs* that will be available this fall.

It is also important to note that the annual targets for the number of graduates to be produced in Table 7, column 7 do not include persisters defined as students not graduating within two years

of initial enrollment, but still enrolled in programs leading to initial RN licensure. While the numbers of persisters who subsequently graduate are not likely to be large, they will increase the number of graduates; however, they are not included into the projected numbers in column 7.

Finally, these projected cost estimates are based on current formula funding levels rolled forward to 2013, adjusted for expected inflation. They do not include any additional state funding earmarked for increasing nurse faculty salaries.

The Coordinating Board estimates that an additional $52 million in funding is needed in the 2008-2009 biennium to produce the 22,000 graduates from programs leading to initial RN licensure targeted for the 2010-2011 biennium. The investment in providing additional funding for professional nurse education will produce long-term benefits in increasing the supply of RN graduates to meet healthcare demands in Texas. The cost of taking no action to address the nursing shortage will be even greater in terms of increased mortality in healthcare facilities, increased healthcare costs due to expensive temporary labor and overtime, decreased access to healthcare for Texas citizens, and other adverse and tragic outcomes.

- **How many RNs are working in this state and how many are needed in this state?**

There is a widening gap between RN supply and demand in Texas. RN demand is projected to increase by 86 percent between 2005 and 2020 while RN supply is projected to increase by only 52 percent between these years. The RN shortage is projected to increase from approximately 15,000 RNs in 2005 to approximately 71,000 RNs in 2020. This means that the percent increase in RN supply needed to meet demand will increase from almost 12 percent in 2005 to a little over 36 percent in 2020. In 2005, Texas had an estimated 140,129 RNs working in nursing. It is projected that approximately 293,000 RNs will be needed in 2020 to meet demand.

- **What is the target number of graduates from the state's professional nursing programs needed to address any difference between supply and demand?**

A large increase in graduates is needed in order to increase supply to meet demand by 2020. An incremental increase in graduates was applied to the baseline model starting gradually with a 25 percent increase in graduates and growing to a 125 percent increase in graduates by 2020. Approximately 10,000 nurse graduates are needed in 2010, 18,000 in 2015, and 25,000 nurse graduates are needed in 2020 to increase RN supply to meet demand by 2020.

- **What are the strategies for increasing the number of graduates from professional nursing programs?**

To increase the number of RN graduates, enrollment and completion rates will need to increase in professional nursing programs. To increase enrollment and completion rates, additional funding for professional nursing programs is needed to obtain the necessary resources to increase capacity. This could be accomplished by special line item funding targeted for use by professional nursing programs to use for such things as increasing faculty salaries. Then additional funding can be given to professional nursing programs based on their ability to successfully meet performance standards such as maintaining a high completion rate, meeting

the targeted number of RN graduates needed, and maintaining a successful level of pass rates on the licensing examination. More professional nursing programs need to seek partnerships with healthcare organizations, businesses and foundations to obtain financial, human and physical resources needed to expand capacity in their programs. Increase in financial support and incentives in the form of scholarships, traineeships, student loans and work study programs need to be provided to encourage pre-RN licensure nursing students to graduate on-time and to recruit more registered nurses to continue their education and obtain a graduate degree in nursing education.

There needs to be collaboration and partnership with the Legislature, the Texas Higher Education Coordinating Board, Board of Nurse Examiners, educational institutions, healthcare facilities, and healthcare and professional organizations in order to develop and implement innovative strategies to increase the number of RN graduates in Texas. Some examples of innovative strategies to increase the number of RN graduates include:

- Developing more accelerated tracks for students with degrees in other majors besides nursing.

- Using distance education methodologies to improve access to professional nursing programs.

- Collaborating with nursing education programs and healthcare facilities to share faculty, educational and clinical resources, and computerized technology for (a) simulated patient care educational experiences, (b) scheduling of use of clinical facilities and (c) streamlining the selection and admission of applicants among nursing programs in a region of Texas.

For additional information about the factors that impact on the supply and demand for nurses and new graduates in Texas, the following reports and white paper briefs can be accessed on the Texas Center for Nursing Workforce Studies' website at: http://www.dshs.state.tx.us/chs/cnws/:

- Reports by the Texas Center for Nursing Workforce Studies:
  - Increasing RN Graduates: Admission, Progression and Graduation in Texas Schools of Nursing 2004
  - Texas Hospital Nurse Staffing Survey: 2006
  - Comprehensive Strategic Action Plan to Increase the Number of RNs and Nursing Graduates to Meet Health Care Needs in Texas

- White paper briefs highlighting nursing workforce issues:
  - The Supply of Registered Nurses in Texas – 2005
  - Highlights of the Texas Hospital Nurse Staffing Survey – 2006
  - Highlights of the 2006 Expansion of Hospital Beds Survey
  - Admission, Enrollment and Graduation Trends in Professional Nursing Programs in Texas
  - Recruitment and Retention of Nursing Faculty
  - Recruitment and Retention of Nurses in the Nursing Workforce
  - Strategies to Retain Older, Experienced Nurses in the Workforce
  - Internationally Educated Nurses in Texas
  - Economic Implications of the Nursing Shortage

- **What are the levels of public and private funding needed to achieve the target number and goals?**

The TCNWS collaborated with the Texas Higher Education Coordinating Board (THEBC) to develop funding projections for increasing the number of nursing graduates. These funding projections only project cost through 2013 (three biennia) and do not represent the total cost of balancing RN supply and demand by 2020.

265,601 FTE RNs translates to 292,512 actual RNs demanded. In order to meet this demand, Texas schools of nursing need to produce 198,181 graduates by 2020 and 21,782 graduates during the 2010-2011 biennium. Over the next biennium (FY 2008 - FY 2009), the additional funding required to meet the target number of graduates in 2010 and 2011 will be $51,936,122 for the three types of nursing schools.

Based on the data provided in this report, increasing the number of graduates from professional schools of nursing alone will be an incredible challenge. Therefore, it is important to consider other methods of increasing supply to meet demand to supplement the need for additional funding. There are three ways to increase RN supply. The first is to increase RN entry into the labor force, the second is to retain RNs already in the nursing workforce, and the third is to increase the number of part-time RNs working full-time. Other strategies should be considered such as strategies to retain RNs already working in nursing, and strategies to delay RN retirement. A Comprehensive Strategic Action Plan that reflects strategies to recruit and retain nurses in the nursing workforce can be found at the TCNWS' website at:

http://www.dshs.state.tx.us/chc/cnws/

Part VII. Conclusion

For the purpose of developing RN supply and demand projections for Texas, the TCNWS used the HRSA models because they are the most comprehensive models available that take into consideration many of the important components affecting supply of and demand for nurses. A more in-depth description of HRSA's Nursing Supply and Demand Models can be found in Appendix B.

In this report, baseline supply and demand projections were calculated for Texas RNs for the years 2005 through 2020. The supply projections for 2000 – 2005 were compared with TCNWS actual Texas data for these five years. The projections were fairly accurate in predicting RN supply with a variance of two percent in 2000 and five percent in 2005. The baseline supply and demand projections were done in the absence of major interventions that may be used to increase supply.

An intervention model was calculated to determine how increasing the number of graduates from Texas Schools of Nursing using incremental increases in graduates each year would affect supply projections and how many new graduates are needed to meet demand.

The supply and demand projections through 2020 show a continuous long-term, critical nursing shortage in Texas. This is an opportunity for Texas to implement strategies to address this nursing shortage. In order to provide the level of healthcare needed for the citizens of Texas now, and in the future, a long-term commitment is needed from Legislators, state and regulatory agencies, educational institutions, the healthcare industry, and healthcare and professional organizations.

APPENDIX A:

KEY TERMS AND DEFINITIONS

Active RNs:
These are registered nurses who are employed in Texas and are working in nursing. The Health Professions Resource Center (HPRC) collects licensing data annually from the Texas Board of Nurse Examiners (BNE.) HPRC data for all RNs employed in nursing from 2000 to 2005 were considered to be the most reliable data available and therefore, were used as the baseline data for the forecasting models. HRSA defines active as all RNs working in nursing or seeking employment in nursing.

Activity Rate:
The proportion of the nurse population within a specific age group that is employed in nursing.

Baseline:
Data entered for the base year. Projections provided by the model with actual Texas data but with no interventions applied.

Base year:
The initial year of data from which all calculations for projected data are made. For the purposes of this study, the base year in the supply model is 2000 and the base year in the demand model is 1996. However, HRSA adjusted the base year data of the demand model to reflect 2000 census data. Therefore, demand projections for 2000 are accurate based on actual demand data provided by the 2000 Census.

Full-time Equivalency (FTE):
An FTE is the effort expended working 2,080 hours per year, and for this study, FTEs are operationally defined as counts of the number of full-time and part-time RNS working in nursing. Data are presented here as either head counts or numbers of full-time equivalent (FTE) nurses. RNs who identified themselves on their RN license application or renewal for the Texas Board of Nurse Examiners, as part-time employees were defined as 0.5 FTE RNs, and those who identified themselves as full-time employees were defined as 1.0 FTE RNs. Two part-time employees equal one FTE. All FTEs were added together to calculate the number of RN FTEs.

Scenario:
Projections are calculated with adjustments made to the baseline model using hypothetical situations where some change is made regarding the nursing workforce. The HRSA models include projections for situations that include an increase in graduates from professional nursing programs, a delay in RN retirement or an increase in RN wages.

Figure 4:

Overview of the Nursing Supply Model (NSM)
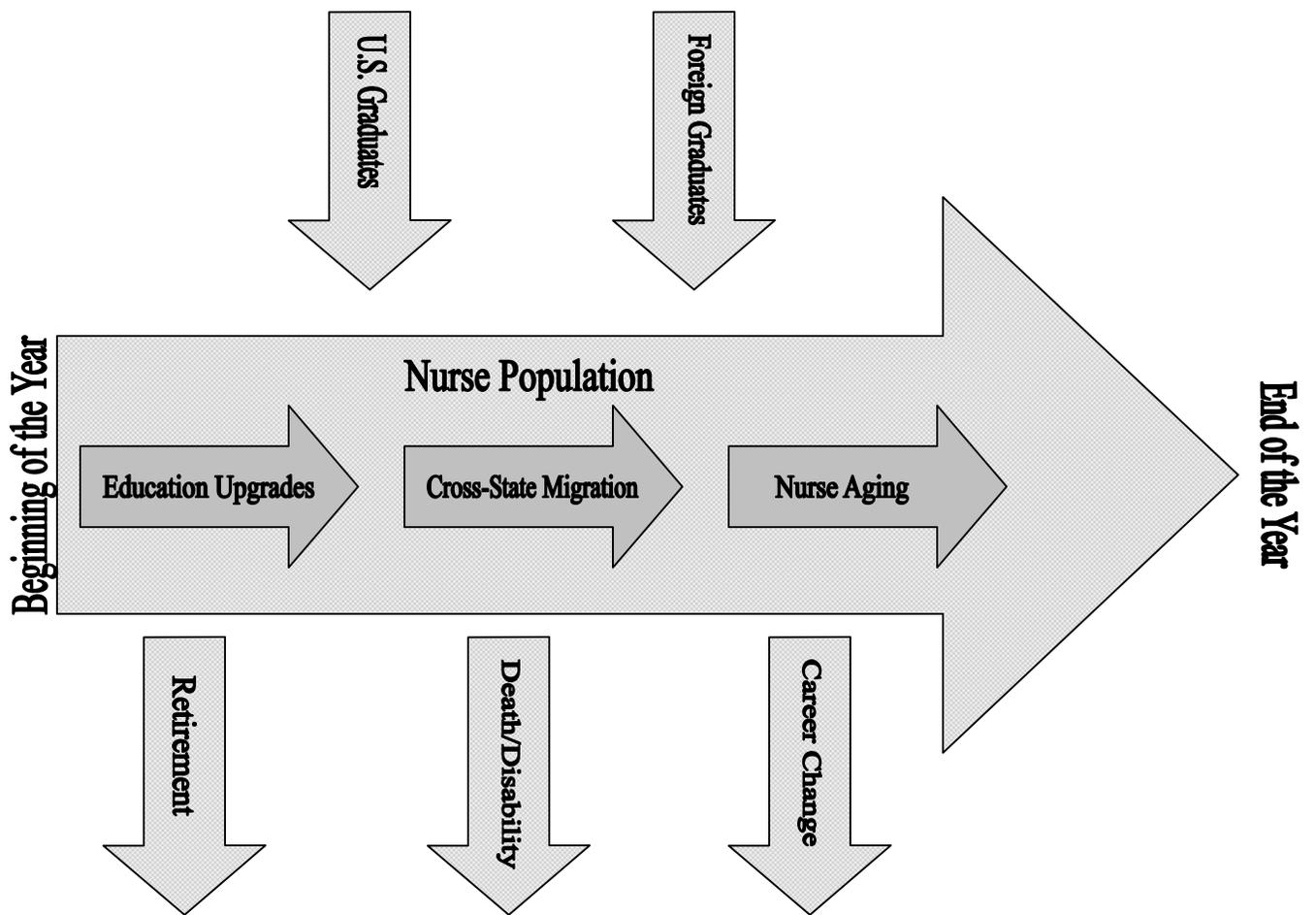
Figure 5:

Overview of the Nursing Demand Model (NDM)

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┌─────────────────┐   ┌─────────────────┐   ┌─────────────────────┐
│  Per capita     │   │   Population    │   │ Trends in healthcare│
│ healthcare use  │   │   Projections   │   │  market conditions, │
│                 │   │                 │   │ economic conditions,│
│                 │   │                 │   │  patient acuity, etc.│
└─────────────────┘   └─────────────────┘   └─────────────────────┘
         │                     │                       │
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         │                     │              │                 │
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┌─────────────────┐      ┌─────────────────┐   ┌─────────────────────┐
│  Healthcare use │ ◄─── │  Healthcare use │   │   Nursing staffing  │
│   projections   │      │    equations    │   │ intensity equations │
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         │        Nurse Demand Projections         │
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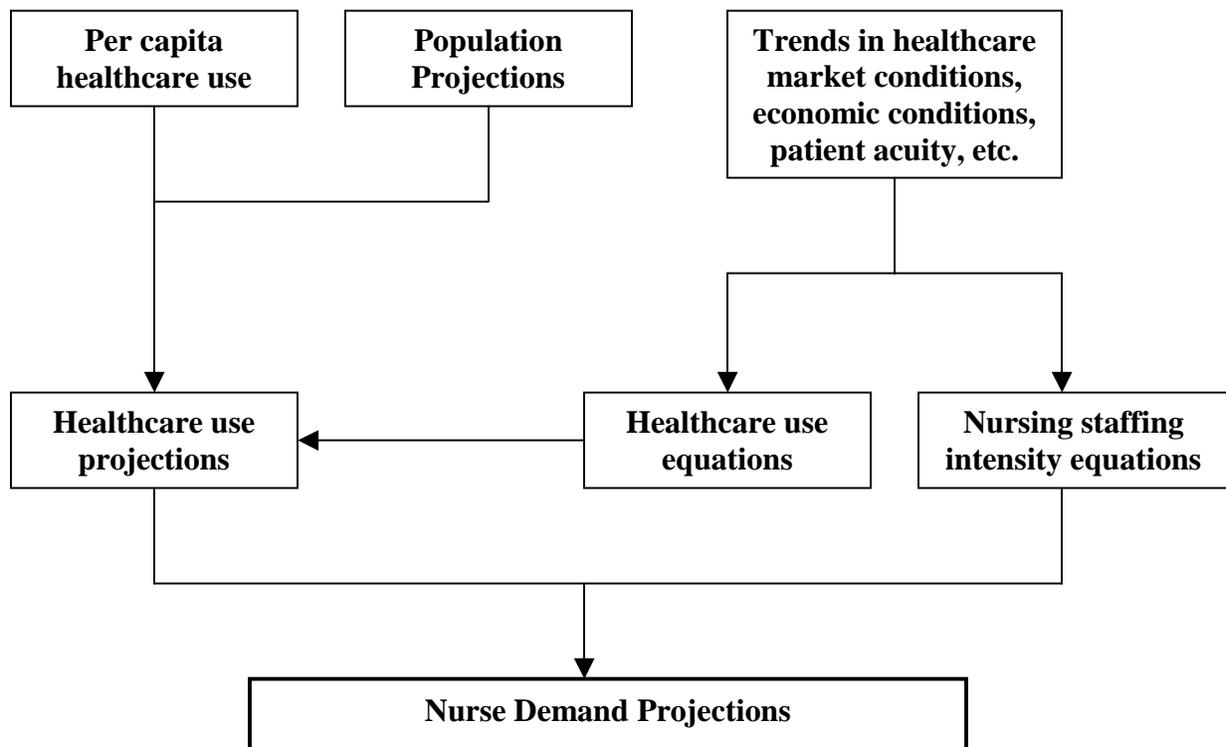
The Nursing Demand Model (NDM)

The model used to project the demand for registered nurses is the Nursing Demand Model (NDM). The NDM combines empirical analysis with input from healthcare experts regarding how the health care system operates and the role of nurses in the delivery of care.

The NDM forecasts future demand for healthcare services in six settings: general hospitals (including inpatient, outpatient and emergency departments), short-term hospitals, non-general hospitals, long-term hospitals, skilled care facilities (such as nursing homes) and home health.

The workload measures used to model demand for healthcare services are inpatient days (for inpatient settings in short-term and long-term hospitals); visits (for short-term hospital, outpatient and emergency department settings, and for home health); and skilled care facility residents. Data limitations prevented the modeling of State-level estimates of the demand for ambulatory care in physician offices, occupational settings, at schools, and in public health clinics.

To forecast future healthcare demands of the population and where patients are likely to receive services, the NDM first divides the population into 32 subgroups based on age, sex, and urban or rural location. For each subgroup, the current national per capita use of health care services was estimated for each of the six delivery settings. The NDM then applies these national rates to each State's population to obtain initial estimates of demand for healthcare services at the State level. Then, the NDM multiplies this initial extrapolation of healthcare utilization with a scalar that inflates or deflates the initial extrapolation to incorporate the projected impact on utilization of trends in the healthcare operating environment, economic conditions, and the overall health of the population.

To forecast the level of nursing services that patients will require and the mix of nurses to provide those services, the NDM forecasts future nurse staffing intensity. Staffing intensity is defined in terms of FTE nurses per unit of healthcare services provided for the six delivery settings where future healthcare use is estimated (e.g., FTE RNs per 1,000 inpatient days at short-term hospitals). Staffing intensity is defined in terms of FTE nurses per population in the delivery settings where future healthcare use is not estimated (e.g., FTE RNs in public health per 10,000 population). Forecasts of future nurse staffing intensity are based on extrapolations of current staffing intensity and take into account projected trends in the healthcare operating environment, in acuity, and in economic conditions that affect staffing intensity.

Twenty-four equations in the NDM quantify the relationship between healthcare utilization and its determinants and between nurse staffing intensity and it determinants. Twenty of these equations were estimated using multiple regression analysis with State-level data from 1996 through 2000, although most regression equations were estimated using a subset of these years based on data availability. Six equations describe the relationship between healthcare utilization and its determinants for the six healthcare settings modeled. Eighteen equations describe the relationship between nurse requirements and its determinants for each nurse type in each setting modeled. In four settings, poor data or poor regression results led to the decision to model future requirements using an alternative approach. RN and LVN requirements in the "all other" category are modeled as a fixed ratio of FTE nurses per population. RN requirements in the

"school health" category are modeled as a fixed ratio of FTE RNs per population age 5-17. RN requirements in nurse education are modeled as fixed percentages of total RN requirements in the other 11 settings.

The Nursing Supply Model (NSM)
The model used to project the supply of registered nurses captures the age-specific dynamics of the flow of nurses in and out of licensure and the work force, their progression from one educational level to another, and their state-to-state migration. Data are developed for each state on: (1) the population of nurses – all those with licenses to practice on a given date; (2) the supply – all those employed or available for employment (if sufficient positions are not available at the time being considered); and (3) the full-time equivalent supply that expresses employment independently of full- or part-time status. The United States Summary is an aggregation of the state data.

Projections of first-time licensees from United States schools are derived from projections of graduates. For these current projections of graduates from each of the three main types of basic nursing programs – diploma, associate degree, and baccalaureate – statistical regression models were used to determine those factors most likely to predict the numbers of graduates. Historical data on graduations, from the National League for Nursing annual surveys of schools of nursing, provided the trend information on the number of graduates from each type of program. Independent variables representing the availability and attractiveness of nursing as a career were considered for each of the models. These included measures of job availability, salaries, and health care expenditures. Also considered were data on the female population within the age groups found among nursing students and in the proportion of female high school graduates enrolling in higher educational institutions.

In order to capture the changes brought about by registered nurses taking additional education after their initial entry into nursing, statistical regression models were developed to project annual graduations from post-RN baccalaureate and master's degree programs. National League for Nursing annual survey data provided the historical data on graduations used in the models. Projections of graduations from post RN baccalaureate programs were based on graduations from basic AD and diploma programs and data from the National Sample Survey of Registered Nurses on the length of time between when nurses graduated from the generic program and the baccalaureate program. Similar variables on prior education graduations and intervening time were used in projecting post-RN master's degree graduates.

New licensees represent additions to the nurse population. Of critical importance to determining the overall nurse population in any one year is a measure of those who no longer have licenses as registered nurses. Most of the population consists of those who have entered nursing over a period of years and have continued their licensure. Losses to the RN population occur through death, failure to renew licenses, or in some instances, disciplinary action that would revoke all licenses. The model accounts for death by using measures derived from the life tables of white females developed by the National Center for Health Statistics. However, there is no direct measure of nurses who fail to renew their licenses. Therefore, "net losses" are derived. They

measure the net change in the RN population that is caused by those who drop all licenses minus those RNs who become relicensed after having dropped all their licenses.

To identify the supply of registered nurses, "activity rates" are developed using data from the National Sample Survey of Registered Nurses on the proportion of the nurse population within a specific age group that is employed in nursing.

The derivation of the full-time equivalent RN supply was dependent upon data in the March 2000 National Sample Survey of Registered Nurses that identified the nurses working full-time and those working part-time and the number of scheduled hours for each nurse. A ratio was developed of the number of nurses within each age group cohort who were working on a full-time basis plus the full-time equivalent of those working on a part-time basis to the total number of working nurses. The full-time equivalent for part-time nurses was determined by the ratio of average scheduled hours of part-timers to average scheduled hours of full-timers.

U.S. Department of Health and Human Services, Health Resource and Services Administration, Bureau of Health Professions, National Center for Health Workforce Analysis. July 2002. "Projected Supply, Demand and Shortages of Registered Nurses: 2000-2020." (ftp://ftp.hrsa.gov/bhpr/nationalcenter/rnproject.pdf).

APPENDIX C:

THE DEMAND MODEL

The year 1996 is the base year, or initial year, of data collected and entered into the demand model. Data are presented here as numbers of full-time equivalent (FTE) nurses. RNs who identified themselves as part-time employees are defined as 0.5 FTEs and those who identified themselves as full-time employees are defined as 1.0 FTEs. Two part-time employees equal one FTE. All FTEs are added together to calculate the number of RN FTEs.

Results

Currently, no adjustments have been made to the demand model. HRSA based the model primarily on data from the 1996 Sample Survey of Registered Nurses (SSRN.) It is determined that adjusting the demand model is not currently feasible given time constraints, the usability of the model and the limited demand data currently available in Texas. The HRSA Demand Model projects a 79 percent increase in demand for RNs between 2006 and 2020.

Texas Center for Nursing Workforce Studies	
TABLE 8: **HRSA NDM ESTIMATED TEXAS DEMAND FOR FTE RNs, 2005-2020**	
Year	FTE RN Demand
2005	142,598
2006	148,320
2007	154,295
2008	160,710
2009	167,226
2010	173,971
2011	180,978
2012	188,756
2013	196,815
2014	205,294
2015	213,951
2016	223,285
2017	233,014
2018	243,287
2019	254,086
2020	265,601

Source: Health Resources and Services Administration, Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Texas Department of State Health Services
Date: July 2006

Making the Model Texas Specific: Adjustments Made to the Model
The year 2000 is the base year, or initial year, of data collected and entered into the supply model. Data was taken from the Texas Board of Nurse Examiners (BNE) 2000 licensure files. Six variables in the model required adjustment: initial number of registered nurses (RNs), initial number of graduates, activity rates, FTE rates, the population of women age 20-44, and the total Texas population.

Initial Number of Nurses
The supply model calls for population data (all licensed RNs in the state) and activity rates (the percentage of RNs who are actively working in nursing.) Because Texas only reports RNs who are actively working in nursing, and does not have reliable data available for all licensed RNs, data from this "active" RN population was entered into the total population tables. Activity rates were increased to 100 percent to ensure that all RNs in the population tables were counted as "active" RNs. After these adjustments were made, including adjusting the activity rates and FTE rates, there was a 3 percent deficit in the population data and a 5 percent deficit in the FTE RN data by 2005 when comparing the models' forecasts to our actual BNE licensure data for 2005.

Initial Number of Graduates
The initial number of diploma/associate degree graduates and baccalaureate graduates were adjusted to reflect the actual number of diploma/ADN and BSN graduates in Texas in 2000.

Activity Rates
Because the HPRC reports mainly the number of active nurses in Texas, all activity rates were increased to 100 percent so that the population figures and activity figures would equal each other.

FTE Rates
FTE rates are calculated for each age year and highest degree obtained (Diploma/ADN, BSN, Masters plus). FTE rates were calculated by summing the FTEs for each age year and then dividing by the number of RNs in that age category. This number was then converted to a percent. (If an RN was working full-time in nursing, they received a 1.0, and if they were working part-time in nursing, they received a 0.5.) Default FTE rates were used for the Masters plus RNs because of small sample size.

Population of Women age 20-44
The population of women age 20-44 was replaced with the BSN graduate data from 2000 to 2005. TCNWS then used a regression program to project the number of BSN graduates from 2006 through 2020. Once these data were entered into the model, the projections for the number of BSN graduates were exact for 2000 through 2005. The number of Diploma

and ADN graduates was adjusted using an elasticity of 0.8, for every one percent increase in the population there was a 0.8 percent increase in the Diploma and ADN population. This elasticity was chosen based on a comparison of projected Diploma/ADN and actual Diploma/ADN graduates for 2000 through 2005. An elasticity of 0.8 produced the most accurate projections. The projections for 2006 will be checked as soon as this information becomes available from the BNE.

Total Texas Population
Using projections from the Texas State Demographer, the Texas population data were adjusted. The original HRSA projections modeled a 27 percent increase in the population of Texas from 2000 to 2020, while the projections from the Texas State Demographer modeled a 48 percent increase. Below is a description of where the Texas State Demographer data comes from. This description was retrieved from the State Demographers website, http://txsdc.utsa.edu/.

> Population data for Texas are provided by the Texas State Data Center (SDC), Population Estimates and Projections Program. The user of the data presented here should be aware that HHSC and Texas Department of State Health Services use population data from two State Data Center programs, **Estimates** and **Projections.** Briefly, **estimates** through 1999 are based on revisions of 1990 census data to reflect currently available data on births, deaths and other public information. Population **estimates** for 2001 through 2003 are based on 2000 census data. **Projections** extend from 2004 through 2020; they are produced using a model of projected births and deaths, rather than actual records. Both estimation and projection models use estimates of migration rates. These estimated migration rates are produced by the SDC using several migration scenarios. This results in more than one projection series. HHSC has designated the "2000 - 2002 Scenario 1.02" to be the standard for HHSC agency population projections.

Intervention Model: Increasing the Number of Graduates

An intervention to increase the number of graduates from Texas professional nursing programs was applied to the baseline number of BSN graduates in order to increase RN supply to meet demand. The baseline number of BSN graduates for each year was increased by the percent increase for that year and these new data were entered into the model. The model then calculated the number of Diploma/ADN graduates projected.

Column <u>one</u> of Table 8 is the projection year. Column <u>two</u> represents the number of BSN graduates (with the proposed intervention applied) entered in the model in the Excel spreadsheet under the column for the population of women age 20-44. Column <u>three</u> represents the baseline number of BSN graduates originally used in the projections. Column <u>four</u> represents the percent increase applied for each year and column <u>five</u> represents the calculation used to determine the data provided in column two.

(1)	(2)	(3)	(4)	(5)
YEAR	# OF BSN GRADUATES INPUT INTO MODEL	BASELINE PROJECTION OF BSN GRADUATES	% INCREASE APPLIED	EQUATION TO DETERMINE ADJUSTMENT MADE TO THE POPULATION DATA
2010	3,630	2,904	25%	2,904 X 1.25 = 3,630
2011	4,563	3,042	50%	3,042 X 1.50 = 4,563
2012	5,567	3,181	75%	3,181 X 1.75 = 5,567
2013	5,808	3,319	75%	3,319 X 1.75 = 5,808
2014	6,570	3,458	90%	3,458 X 1.90 = 6,570
2015	6,832	3,596	90%	3,596 X 1.90 = 6,832
2016	7,470	3,735	100%	3,735 X 2.00 = 7,470
2017	7,744	3,872	100%	3,872 X 2.00 = 7,744
2018	9,027	4,012	125%	4,012 X 2.25 = 9,027
2019	9,338	4,150	125%	4,150 X 2.25 = 9,338
2020	9,650	4,289	125%	4,289 X 2.25 = 9,650

**TABLE 9:
CALCULATIONS USED TO ADJUST POPULATION DATA:
CREATING THE INTERVENTION MODEL
~Proposed Incremental Increases in Graduates~**

Source: Health Resources and Services Administration, Demand Model
Prepared by: Texas Center for Nursing Workforce Studies, Texas Department of State Health Services
Date: October 2006

ORGANIZATIONAL DESCRIPTION

The following is a description of the key organizations that were instrumental in the development and production of this report.

Center for Health Statistics

The Center for Health Statistics is the Department of State Health Services' focal point for the collection, analysis, and dissemination of useful health-related information to evaluate and improve public health in Texas. The mission of the Center for Health Statistics is accomplished by:

- Evaluating existing data systems for availability, quality, and quantity;
- Defining data needs and analytic approaches for addressing these needs;
- Adopting standards for data collection, summarization, and dissemination;
- Coordinating, integrating, and providing access to data;
- Providing guidance and education on the use and application of data;
- Providing data analysis and interpretation; and
- Initiating participation of stakeholders while ensuring the privacy of the citizens of Texas.

The Center for Health Statistics is organized into two branches to address health-related information needs in Texas:

- The Health Information Resources Branch (Research and Methods Section, Community Assessment Section, and Data Management and Dissemination Section).
- The Health Provider Resources Branch (Health Professions Resource Center, Hospital Data Section, and Texas Center for Nursing Workforce Studies).

Health related and health professions workforce information and reports produced through the Center for Health Statistics are available at the following website:

http://www.dshs.state.tx.us/chs/

Statewide Health Coordinating Council

In accordance with Chapter 104-105 of the Health and Safety Code, the purpose of the Statewide Health Coordinating Council (SHCC) is to ensure health care services and facilities are available to all citizens through the development of health planning activities. The Statewide Health Coordinating Council is a 17-member council with four ex-officio members and 13 members appointed by the governor. SHCC meets quarterly and oversees the Health Professions Resource Center and Texas Center for Nursing Workforce Studies (TNCWS) in the Center for Health Statistics as well as the Texas Center for Nursing Workforce Studies Advisory Committee (TNCWSAC). Information on such things as the State Health Plan, telemedicine and telehealth, primary care and health professions workforce issues, and tracking of selected legislation are available at the following website: http://www.dshs.state.tx.us/chs/shcc/

Texas Center For Nursing Workforce Studies Advisory Committee

In response to the passage of House Bill 3126 from the 78th Regular Legislative Session, a Texas Center for Nursing Workforce Studies (TCNWS) and a Texas Center for Nursing Workforce Studies Advisory Committee (TCNWSAC) were established in 2004. The TCNWSAC was added to the structure of the Statewide Health Coordinating Council and serves as a steering committee for the TCNWS. This is a 21-member committee with representation from nursing and healthcare organizations, employers of nurses, state agencies, nurse researchers, nurse educators as well as a consumer member. A list of the members of the TCNWSAC follows on page v.

The TCNWSAC is charged with the following responsibilities to:
- Develop priorities and an operations plan for the TCNWS.
- Review, critique and develop policy recommendations regarding nursing workforce issues.
- Identify other issues concerning nursing professionals in Texas that need further study.
- Critique and analyze reports and information coming from the TCNWS before dissemination.

Texas Center for Nursing Workforce Studies

The Texas Center for Nursing Workforce Studies (TCNWS) was established under the governance of the Statewide Health Coordinating Council (SHCC). Administrative oversight is provided by the Department of State Health Services, Center for Health Statistics. The TCNWS serves as a resource for data and research on the nursing workforce in Texas. The TCNWS is charged to collect and analyze data and publish reports related to educational and employment trends of nursing professionals; the supply and demand of nursing professionals; nursing workforce demographics; migration of nursing professionals; and other issues concerning nursing professionals in Texas as determined necessary by the TCNWSAC and SHCC.

One of the roles of the TCNWS includes collaboration and coordination with other organizations (such as the Board of Nurse Examiners, the Texas Higher Education Coordinating Board, Regional Center for Health Workforce Studies at the Center for Health Economics and Policy (RCHWS-CHEP), Texas Nurses Association, Texas Hospital Association, and regional healthcare organizations and educational councils) that gather and use nursing workforce data. The coordination is needed in order to avoid duplication of efforts in gathering data; to avoid overloading employers and educators with completing a large number of duplicative surveys; to share resources in the development and implementation of studies; and to establish better sources of data and methods for providing data to legislators, policy makers and key stakeholders.

The TCNWS is currently working on several statewide studies that should provide current and pertinent supply and demand trends on nursing workforce in Texas. More information about the TCNWS and TCNWSAC and published reports and information on nursing workforce are available on the TCNWS website: http://www.dshs.state.tx.us/chs/cnws/