

Supply Projection for Physician in Thailand over the next 25 years (1996-2020 AD)

Tida Suwannakij*, Nichakorn Sirikanokwilai*, Suwit Wibulpolprasert**.

* Bureau of Health Policy and Plan, Ministry of Public Health, Tiwanond Rd., Nonthaburi, Thailand 11000

** Assistant Permanent Secretary, Ministry of Public Health, Thailand.

Abstract

This paper projects the future supply of physicians in Thailand by using both the cohort analysis and the annual loss rate method. We found that the population of Thai physicians is in an expanding state. Thus the attrition rate is quite low at 1.21%-1.55% per year in 1995, with projected increase to 1.55-1.86% in 2020. The supply of physicians in the year 2020 will be 44,028 (annual loss rate-high loss) - 47,519 (cohort analysis-low loss). This means a physicians : population ratio of 1:1,601-1:1,484. If we look at the incremental ratio, i.e., the ratio of annual additional physicians to the additional population, we found that the ratio will increase from 1:1,036-1:928 in 1996 to 1:370-1:330, in 2020. Further researches on the physicians dynamic, and their real FTE are necessary to improve the projection and future planning.

Key Words : Physician supply, Cohort analysis, Annual loss, Population ratio, Attrition rate.

Introduction

One popular question among human resource planners and managers is the possible number of workforces in each cadre that a country will have in the future. This supply side projection is as important as, yet less tedious than, the demand or requirement side projection. As physicians are usually the leaders of the health team, the most expensive to produce and maintain, and also the creators of demand for health care, an appropriate supply and distribution of physicians is the prime concern of all policy makers, health managers, and planners in each country.

The attempt at projecting the future supply of health manpower started as part of the Health Manpower Development movement by the World Health Organization initiated in the early 1970s⁽¹⁾. Several manuals, training programs, and computer models have been developed to assist the Health Manpower Planning Processes^(2, 3).

The movement to project future supply and requirements of the health workforce in Thailand started since early 1970s⁽⁴⁾. Until now, there have been at least 8 big attempts⁽⁵⁾ to obtain these projections (Table 1). Most of the past attempts gave the wrong projections. For example in 1988, the Thai Medical Council and the National Economic and Social Development Board projected the 1995 supply of physicians at 13,243, and 13,645, respectively⁽⁶⁾. In 1995, the number of physicians was estimated at 16,344-17,374⁽⁷⁾, a difference of 3,000-4,000 or 22%-30%. This may be due to the fact that the supply projections when compared to the requirements, yielded a shortage of physicians, thus plans to increase production were developed and the final outcome of supply was a higher than expected. It may also be because the annual loss rate used in the calculation was 3% which is quite high in a state of expanding workforces⁽⁸⁾. In some cases, when the projection showed a balance of future supply and requirements, there was sudden surge of economic growth or downturn, thus deviating from the requirement figures. This situation occurred in Thailand during the rapid economic growth period between 1991-1997⁽⁹⁾.

In early 1997, there were severe shortages of physicians especially in rural Thailand. This is probably due to high demand in the expanding private health sector,

and some drop out of practising physicians to other business sectors. This shortage came to a peak in April 1997, when 126 new graduates resigned from the Ministry of Public Health (this is 22% of all new graduates)⁽¹⁰⁾. The Thai Medical Council promptly appointed a subcommittee to restudy the future supply of, and requirements for, physicians in Thailand in order to formulate appropriate policies and strategies.

This paper is a part of that study. It projects the supply of physicians in Thailand over the next 25 years

Table 1 Studies of Physician Supply and Requirements in Thailand

Year	Organizations	Method of Requirement Projection	Result
before 1972	NESDB	1 (1:5,000)	Need more physicians
1979	Coordinating Committee for Medical and Health Affairs	2	Increase production (200/year)
1986	Thai Medical Council	2	Shortage of 4,286 physicians in the year 2000
1986	NESDB	Past trend	Adequate supply in the year 2000
1992	Health Planning Division	1	Increase production (340/years)
1994	BHPP	1, 2, 3	Increase production for rural area (300/year)
1995-1996	BHPP+PBRI+HSRI	1, 2, 3	Adequate supply in 2015
1996	TDRI	3	Adequate supply in 2020

Note: 1 = Population ratio, 2 = Service target, 3 = Health demand

NESDB = National Economic and Social Development Board

BHPP = Bureau of Health policy and Plan, Ministry of Public Health (MoPH)

PBRI = Praboromrajchanok Institute for HRD, MoPH

HSRI = Health Systems Research Institute

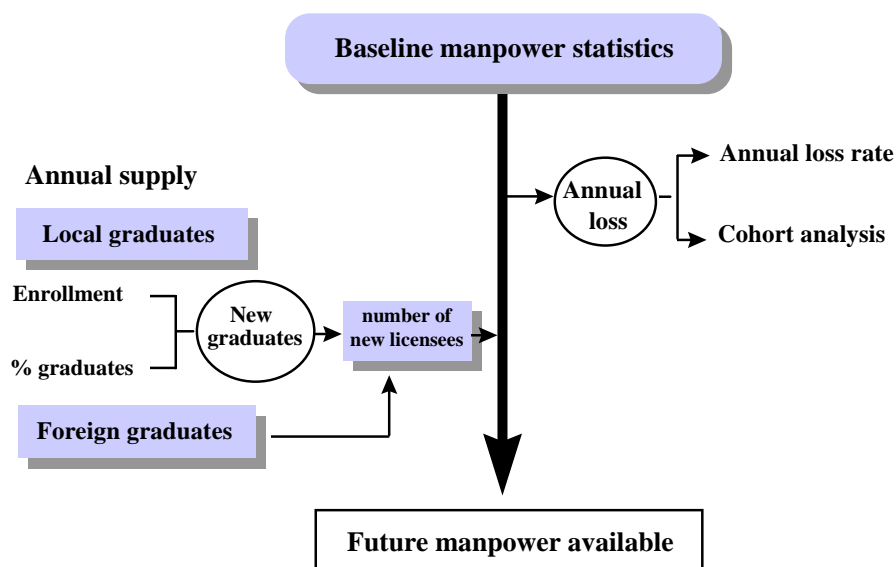
TDRI = Thailand Development Research Institute

Materials and Methods

1. Overall Supply Projection

Future supply of the health workforce can be determined by subtracting the future loss from the sum of the current workforce and the additional new workforce, including local production and foreign graduates, during the same period of time (Figure 1)⁽¹¹⁾.

Figure 1 Projection of HRH supply



2. Number of new licensees (new workforce)

2.1 Graduates from local public medical schools

These graduates will automatically receive licenses to practise from the Thai Medical Council⁽¹²⁾. Thus the annual new licensees from local graduates can be determined from the future admission plans and the graduation rate.

- (1) **Future admission plans.** The number of admissions of new medical students can be estimated from the future higher education plan of the Ministry of University Affairs and from each public medical school⁽¹³⁾.
- (2) **Graduation rates.** Historical figures from the existing medical schools are used. These figures are derived from questionnaires sent to each medical school.

2.2 Foreign graduates and graduates from local private medical schools

These graduates are required to pass the national licensing examination before being granted a license to practise. The historical figures from the Thai Medical Council will be used to project future supply from this group. Most foreign graduates were from the Philippines, India, and the USA. There is only one local private medical school, the Faculty of Medicine, Rangsit University. Established in 1989, it produced around 30 graduates per year.

3. Annual Loss of Physicians

The loss of physicians will be determined by both the annual loss rate and the cohort analysis.

3.1 Cohort analysis

The initial number of each cohort of physicians licensed in the same year, from 1947-1997, was determined from the Thai Medical Council Registrar. The number of future cohort from 1998-2020 was determined from figures in 2.1 and 2.2. The existing number of each cohort, from 1947-2020, was determined by assuming an annual loss rate in each cohort at 0.15% per year-0.6% per year. These annual loss rates mean

that at the end of 35 years, one year before retirement, there will be 95%-81% of physicians left in each cohort. It is assumed that, in the retirement year there will be 40% loss, with the rest loss within 10 years after retirement. In this last 10 years, the first 4 years will have a loss rate of 10% per year, and 30% per year in the final 5 years. These assumptions are derived from brainstorming among the experienced physicians, and also mean an average working life of about 40 years. These figures and assumptions are then used to build cohort analysis tables which give the figures of every years total active physicians. The figures from the cohort analysis tables will also give the annual loss rate of the total physician.

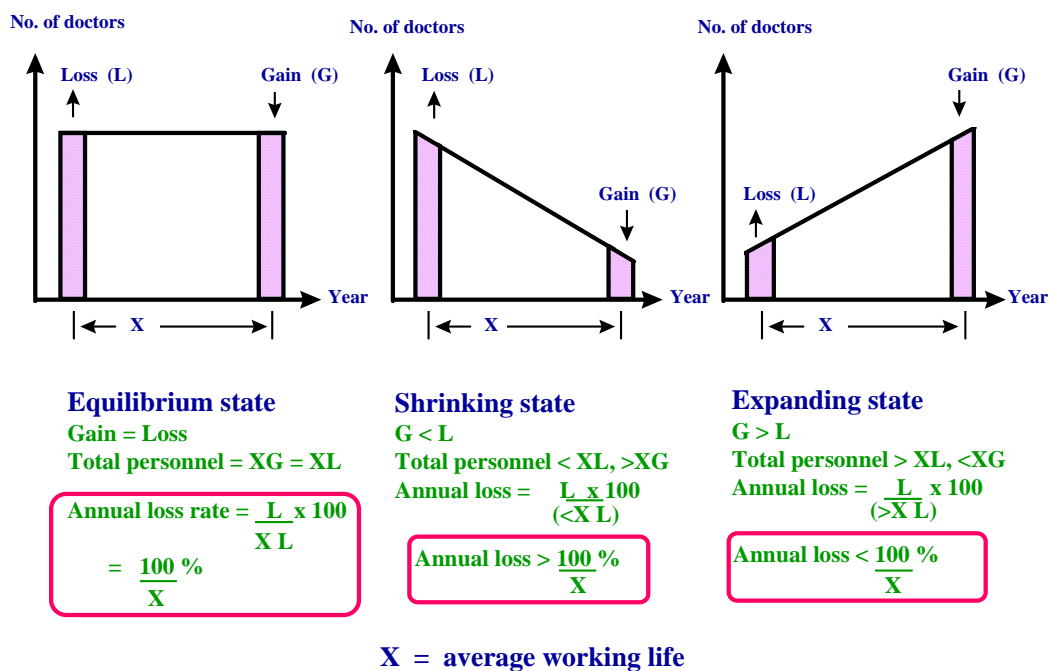
3.2 Annual loss rate

The future rate of annual loss of total physicians will be estimated from the cohort analysis table.

As the number of physicians in Thailand is in an expanding state, the annual loss rate should be lower than $\frac{100}{X}$, or lower than 2.5% (Figure 2).

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Figure 2 Annual loss rate of physicians in different states.



4. Current figures for practising physicians

Number of licensees practising in 1995, from the Thai Medical Council statistics, were used as the basis for the calculation. However, it must be subtracted by figures for emigrants, and for those that quit their practise. This number can also be estimated from the cohort analysis table.

5. Population Projection

Future population was derived from the estimates done by the Human Resources Planning Division, National Economic and Social Development Board. Those figures from the scenario of medium growth rate will be used in this study⁽¹⁴⁾.

Results

1. Number of Future New Licensees

1.1 Graduates from local public medical schools

This group is the majority of the new licensees. The historical graduate rates obtained from questionnaires sent to each medical school, are shown in Table 2.

Table 3 shows the number of graduates from 13 public medical schools estimated from the current medical students and future admission plans, with the graduate rates in Table 2. It is clear from Table 3 that the number of new graduates is undergoing an increasing trend.

Table 2 Average graduate rates of 8 public medical schools for students admitted between 1984-1988. (graduated between 1990-1994-includ those delayed graduation)

Schools	Total	Graduate		Non graduates		Delayed graduation	
		no.	%	no.	%	no.	%
Siriraj (SR)	909	885	97.40	24	2.60	76	8.40
Chulalongkorn (CU)	745	719	96.51	26	3.49	38	5.10
Chiang Mai (CM)	632	632	100.00	0	0.00	33	5.23
Ramathibodi (RM)	646	646	100.00	0	0.00	NA	NA
Khon Kaen (KK)	492	471	95.73	21	4.27	43	8.74
Song Khla (SK)	453	436	96.25	17	3.75	49	10.82
Sri Nakrarinviroj (SN)	170	157	92.35	13	7.65	13	7.65
Army (AM)	156	155	99.36	1	0.64	16	10.26
Total	4,203	4,101	97.60	102	2.40	268	6.40

Table 3 Estimated number of medical graduates from 13 public medical schools. (1996-2020) plus licensees from foreign and private medical schools graduate

Year	SR (97.4%)	RM* (99%)	CU (96.5%)	KK (95.7%)	CM* (99%)	SK (96.3%)	AM (99.4%)	SN (92.4%)	TU (97.6%)	BMA (97.6%)	NS (97.6%)	SU (97.6%)	WL (97.6%)	Total
1995	184	110	154	99	143	96	26	33	24	-	-	-	-	869
1996	166	115	156	98	124	106	26	42	25	-	-	-	-	858
1997	159	113	162	96	119	103	34	37	24	-	-	-	-	847
1998	174	117	172	96	145	121	32	59	44	-	-	-	-	960
1999	208	130	189	146	147	117	47	73	59	28	-	-	-	1,145
2000	221	145	169	124	146	117	64	70	60	32	-	-	-	1,148
2001	218	142	189	154	159	114	63	53	59	31	33	-	-	1,215
2002	222	149	161	159	182	113	62	55	81	43	28	-	-	1,254
2003	224	152	219	159	195	171	65	78	84	58	60	-	-	1,465
2004	224	180	241	159	174	150	60	78	87	29	59	-	-	1,441
2005	224	180	241	159	188	160	60	83	117	39	88	-	-	1,538
2006	224	180	251	159	188	169	60	83	117	59	88	-	-	1,577
2007	224	180	251	159	188	184	60	83	117	59	117	29	-	1,650
2008	224	180	203	174	188	184	60	139	117	59	117	29	-	1,673
2009	224	180	203	174	188	131	60	139	117	59	117	29	29	1,649
2010	224	180	203	174	188	131	60	139	117	59	146	29	29	1,678
2011	224	188	203	174	188	131	60	139	117	59	146	59	29	1,715
2012	224	188	203	174	188	131	60	139	117	59	146	59	29	1,715
2013	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745
2014	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745
2015	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745
2016	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745
2017	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745
2018	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745
2019	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745
2020	224	188	203	174	188	131	60	139	117	59	146	59	59	1,745

Note: () = Average graduate rate

SR = Siriraj RM = Ramathibodi CU = Chulalongkorn U.

CM = Chiang Mai U. KK = Khonkaen U. SK = Song Khla U.

AM = Army SN = Sri Nakhlarin U. TU = Thammasat U.

BMA = Bangkok Metropolitan Administration NS = Naresuan U.

SU = Suranaree U. WL = Walailaksa U.

* For long term projections we used 99% graduation rate rather than the 100% figure from the survey.

Table 4 New licensees from foreign graduates and private medical school graduates

Year	New licensees		Total
	Foreign graduates	Private medical schools	
1988	52	-	52
1989	53	-	53
1990	22	-	22
1991	38	-	38
1992	48	-	48
1993	45	-	45
1994	45	-	45
1995	46	21	67
1996	23	24	47
1997	20	29	49

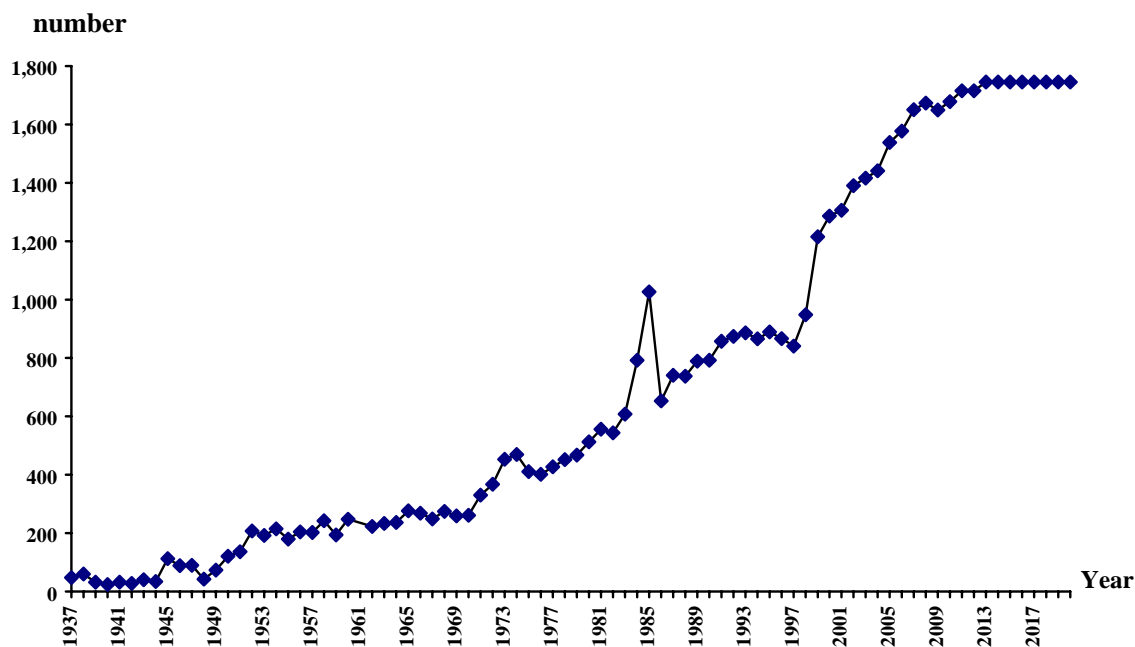
Source : Thai Medical Council

1.2 Foreign graduates and graduates from private medical schools

Table 4 shows the figures of this group of graduates who successfully passed the national licensing examination over the past decades. We predict a very small chance of setting up more private medical schools due to the current economic crisis. Thus we assume an average of 50 new licensees per year from these sources in the next 25 years.

The figures in Table 3, and Table 4 add up to the total new medical licensees used in Table 8, and shown in Figure 3.

Figure 3 Annual output of medical doctors



Source : Thai Medical Council

3. Overall Supply of Physicians

3.1 Cohort analysis

Table 5 shows part of the cohort analysis table for the assumed annual loss rate of each cohort at 0.45%. This annual loss rate means that 85% of the cohort will remain after 35 years, or at the year before retirement. Since we start the table from the cohort of 1947, those physicians licensed before 1947 will be excluded. The final year that the cohort of 1947 remained in practise was 1992 (1947+35 years+10 years). Thus the figures of overall supply of physicians in Table 5 are valid only from the year 1992 onwards.

Table 5 was created along with the next 3 tables using the annual loss rate of 0.15%, 0.3 %, and 0.6% which means that 95%, 90%, and 81% of the cohort, respectively, remain in the final year before retirement. And since there were around 1,000 emigrant physicians, mainly belonging to the cohort of 1962-1977, the overall supply of physicians from Table 5 has to be reduced by 1,000. The result are depicted in Table 6 which shows that there are 16,773-17,686, and 44,391-47,519 physicians in 1995, and 2020; or a physician population ratio of 1:3,541-1:3,324, and 1:1,588-1:1,484 ; respectively.

Table 5 Cohort analysis table for the assumed annual loss of 0.45% for each cohort (partially shown)

Cohort	Initial Number	Number in each year of each cohort													
		1947	1948 ..	1992 ..	1996 ..	2000	2001..	2005	2006 ..	2010	2011 ..	2015	2016 ..	2020	
1947	54	54	54	3	-	-	-	-	-	-	-	-	-	-	
1948	19	-	19	2	-	-	-	-	-	-	-	-	-	-	
1992	907	-	-	907	891	875	871	855	852	836	833	818	814	799	
1996	864	-	-	-	864	849	845	830	826	811	807	793	789	775	
2000	1,198	-	-	-	-	1,198	1,193	1,171	1,166	1,145	1,140	1,120	1,115	1,095	
2001	1,265	-	-	-	-	-	1,265	1,242	1,237	1,215	1,209	1,188	1,182	1,161	
2005	1,588	-	-	-	-	-	-	1,588	1,581	1,553	1,546	1,518	1,511	1,484	
2006	1,627	-	-	-	-	-	-	-	1,627	1,598	1,591	1,562	1,555	1,527	
2010	1,728	-	-	-	-	-	-	-	-	1,728	1,720	1,689	1,682	1,652	
2011	1,765	-	-	-	-	-	-	-	-	-	1,765	1,733	1,726	1,695	
2015	1,795	-	-	-	-	-	-	-	-	-	-	1,795	1,787	1,755	
2016	1,795	-	-	-	-	-	-	-	-	-	-	-	1,795	1,763	
2020	1,795	-	-	-	-	-	-	-	-	-	-	-	-	1,795	
Total number				16,227	18,731	21,952	22,915	27,550	28,839	34,047	35,364	40,527	41,760	46,401	
Annual loss rate of total physicians				1.35	1.36	1.37	1.34	1.23	1.26	1.32	1.30	1.39	1.40	1.75	

Table 6 Overall supply of physicians from cohort analysis.

Annual loss rate	Year					
	1995	2000	2005	2010	2015	2020
of each cohort at (0.15 %)	17,686 (1:3,324)	21,866 (1:2,854)	27,689 (1:2,349)	34,467 (1:1,951)	41,282 (1:1,673)	47,519 (1:1,484)
of overall physicians (%)	1.21	1.15	0.99	1.09	1.16	1.55
of each cohort at (0.30%)	17,492 (1:3,396)	21,402 (1:2,916)	27,111 (1:2,399)	33,745 (1:1,992)	40,390 (1:1,710)	46,443 (1:1,518)
of overall physicians (%)	1.32	1.26	1.11	1.20	1.27	1.65
of each cohort at (0.45%)	17,127 (1:3,468)	20,952 (1:2,978)	26,550 (1:2,449)	33,047 (1:2,034)	39,527 (1:1,748)	45,401 (1:1,553)
of overall physicians (%)	1.43	1.37	1.23	1.32	1.39	1.75
of each cohort at (0.60%)	16,773 (1:3,541)	20,515 (1:3,042)	26,007 (1:2,501)	32,370 (1:2,077)	38,690 (1:1,785)	44,391 (1:1,588)
of overall physicians (%)	1.55	1.49	1.35	1.43	1.50	1.86

Note: (1) figures in () are the physician : population ratio.

(2) Overall annual loss rate means the annual loss rate calculated from the total number of physician.

3.2 Annual loss rate analysis

3.2.1 Number of active physicians in 1995

Two methods, as shown in Table 7, are used to estimate the number of practising physicians in 1995, resulting in average figures of 16,663-17,579.

Table 7 Estimate of 1995 practising physicians

	From Medical Council Register	From Cohort Analysis Table
1. Registered physicians	20,291	-
2. Emigrants	1,000	1,000
3. Over 60years with non-practising	900	-
4. Existing physicians	18,391	-
5. Actively practise (90-95% of 4)	16,552-17,472	16,773-17,686

Average figures from Table 7 = **16,663-17,579**

Table 8 shows the overall supply of physicians from annual loss rate analysis at both high loss and low loss (the annual loss rates are from cohort analysis in Table 5).

Table 8 Overall supply of physicians by annual loss rate analysis

Year	Low loss		No. of new licensees (Table 3&4)	High loss	
	No. at beginning of the year	No. lost		No. at beginning of the year	No. lost
1996	16,663-17,579	202-213	935	16,663-17,579	258-272
2000	20,564-21,429	236-246	1,198	20,263-21,113	233-243
2005	26,126-26,945	259-267	1,588	25,526-26,320	345-355
2010	32,900-33,676	359-367	1,728	31,855-32,594	456-466
2015	39,788-40,523	462-470	1,795	38,217-38,904	573-584
2020	46,175-46,865	716-726	1,795	44,028-44,663	819-831

Figure 4 summarizes the overall supply of physicians at the lowest and highest estimates. Figure 5 shows the physician : population ratio using the same estimates.

Figure 6 shows the incremental physician to incremental population ratio. The ratio between the number of physicians to population increases from 1:1,036-1:928 in 1996 to 1:370-1:330 in 2020, respectively.

Figure 4 Overall supply of physicians, 1995-2020.

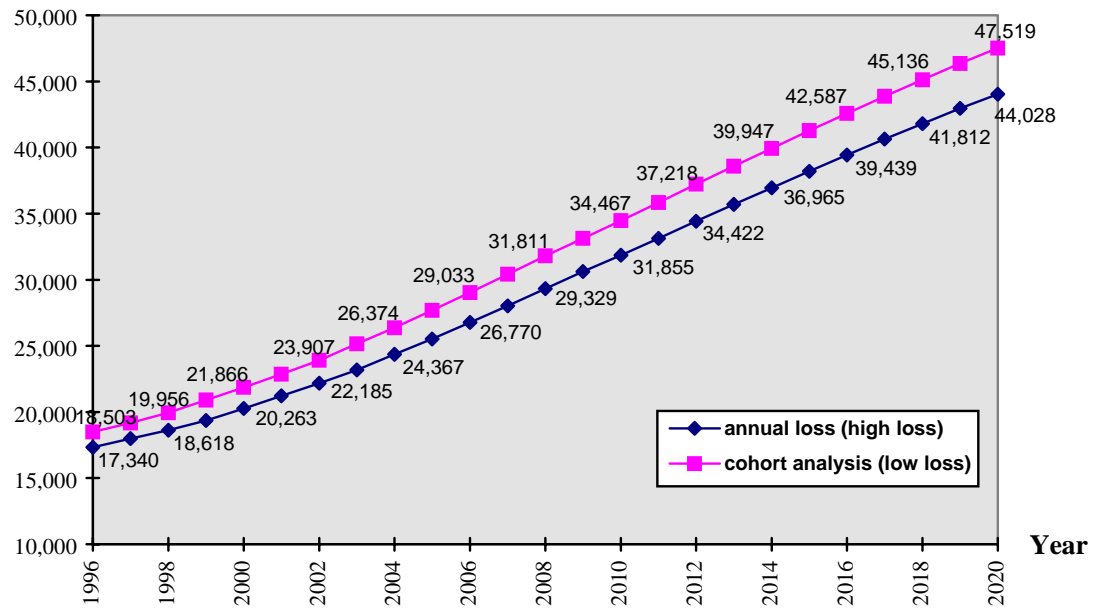


Figure 5 Estimates of populations: physician ratio, 1996-2020.

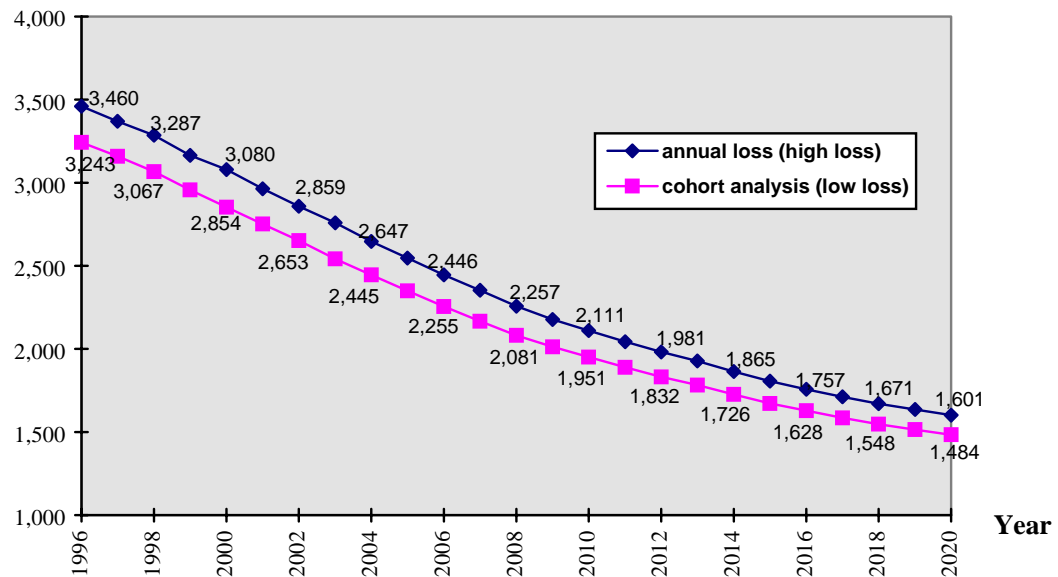
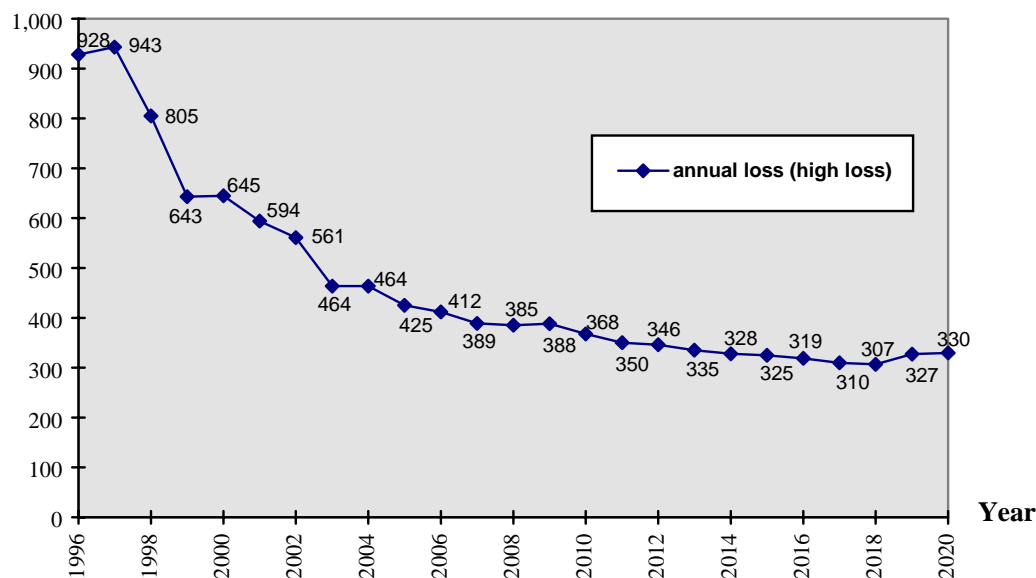


Figure 6 Estimate of incremental population : physician ratio 1996-2020.



Discussion

This study is the first extensive attempt at projecting future supply of physicians by using both the cohort analysis and the annual loss rate method. All previous attempts used only the annual loss rate of 3%, ignoring the fact of the expansion of physician workforce. Thus the previous attempts usually resulted in lower projections due to the high estimation of annual loss.

This study revealed that the population of Thai physicians is in an expanding state. Thus the attrition rate is quite low at 1.21% to 1.55% per year in 1995, with projected increase to 1.55%-1.86% in 2020. The supply of physicians in the year 2020 will be 44,028 (annual loss rate-high loss)-47,519 (cohort analysis-low loss). This means a physician : population ratio of 1: 1,601 to 1: 1,484. This ratio is comparable to the situation in 1993 of countries like Egypt (1:1,316), Tunisia (1:1,549), Iraq (1:1,659), and Pakistan (1:1,923), but is lower than Brazil (1:844), China (1:1,063), Singapore (1:714), and Korea (1:951)⁽¹⁵⁾. If we look at the incremental ratio, i.e., the ratio of annual additional physicians to the additional population, we found that the ratio will increase from 1:1,036-1:928 in 1996 to 1:370-1:330, in 2020. These are the ratios that will eventually affect the longer term projection of physician supply.

In early 1970's the WHO suggested an optimal doctor : physician ratio of 1:5,000 for developing countries. This optimal figure was later disregarded, as human-resources-for-health (HRH) planners learned that the optimal ratio depended much more on socio-economic status and health care delivery systems.

Before 1992, the physician : population ratio 1:4,500 was quite low for Thailand, but there was not much of a shortage because of low economic growth. The problems were mainly with inequitable distribution. However, with rapid economic growth during 1992-1997, there was a very rapid upsurge of both public and private hospitals in response to more demand for health services⁽⁹⁾. Thus, the ratio of 1:3,500 became a severe shortage, and Thailand was faced with problems of an overall shortage of physicians, maldistribution, as well as overspecialization. The current economic crisis

with severe negative impact on the private health sector has resulted in a sharp decrease in their requirement of physicians. This phenomenon helped to alleviate the problem of physician shortages especially in the rural public health services.

In carrying out this study we found several weaknesses in the information system that need to be strengthened for better HRH planning and management. First, we need to have a better database on the current practising situation of the Thai Physicians. This may be achieved through periodic surveys for revision of the medical council's database or periodic physician dynamic surveys, or preferably through a periodic relicensing system. The development of this database will not only give the current figures of practising physicians, but also provide figures for the overall annual loss rate and the annual loss rate of each cohort in the cohort analysis table. Second we need to have information on the real full time equivalent (FTE) of a physician. Empirical evidences suggested that most Thai physicians are working more than 7 hours a day and more than 5 days in a week with few vacations. Apart from having to be on-call for emergency services, they also practise for their private patients during non-official hours. If we consider a standard FTE of 7 hours a day and 5 days in a week, a Thai physician will be equivalent to more than 1 standard FTE. This is important as the supply projection usually gives the number of the physicians rather than the FTE of the physicians. This will be more important when the supply projection is compared to the requirement projection especially in the health demand method which project the requirement in FTE physicians.

Furthermore, this study deals only with the quantitative aspects of future physician supply. Of equal or perhaps more important are their quality in terms of clinical competency, communication, human interaction, and social skills and attitudes.

Conclusion

This paper is the most current attempt at estimating the future supply of the physicians in Thailand. It is the first time to systematically estimate the annual loss rate, and the first attempt to use the cohort analysis method. We found that the future (the year 2020) physician to population ratio is comparable to the current figures of the more developed countries, especially for the incremental ratio. This experience suggests further improvement in the database on physician practising status, the study on the real FTE, and the study on the qualitative aspects of the Thai physicians. We also believe that periodic projections to update the figures to the most recent situation will not only yield more appropriate projections but will also improve the information system and the projecting capacity of the Thai planners.

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