図表再掲

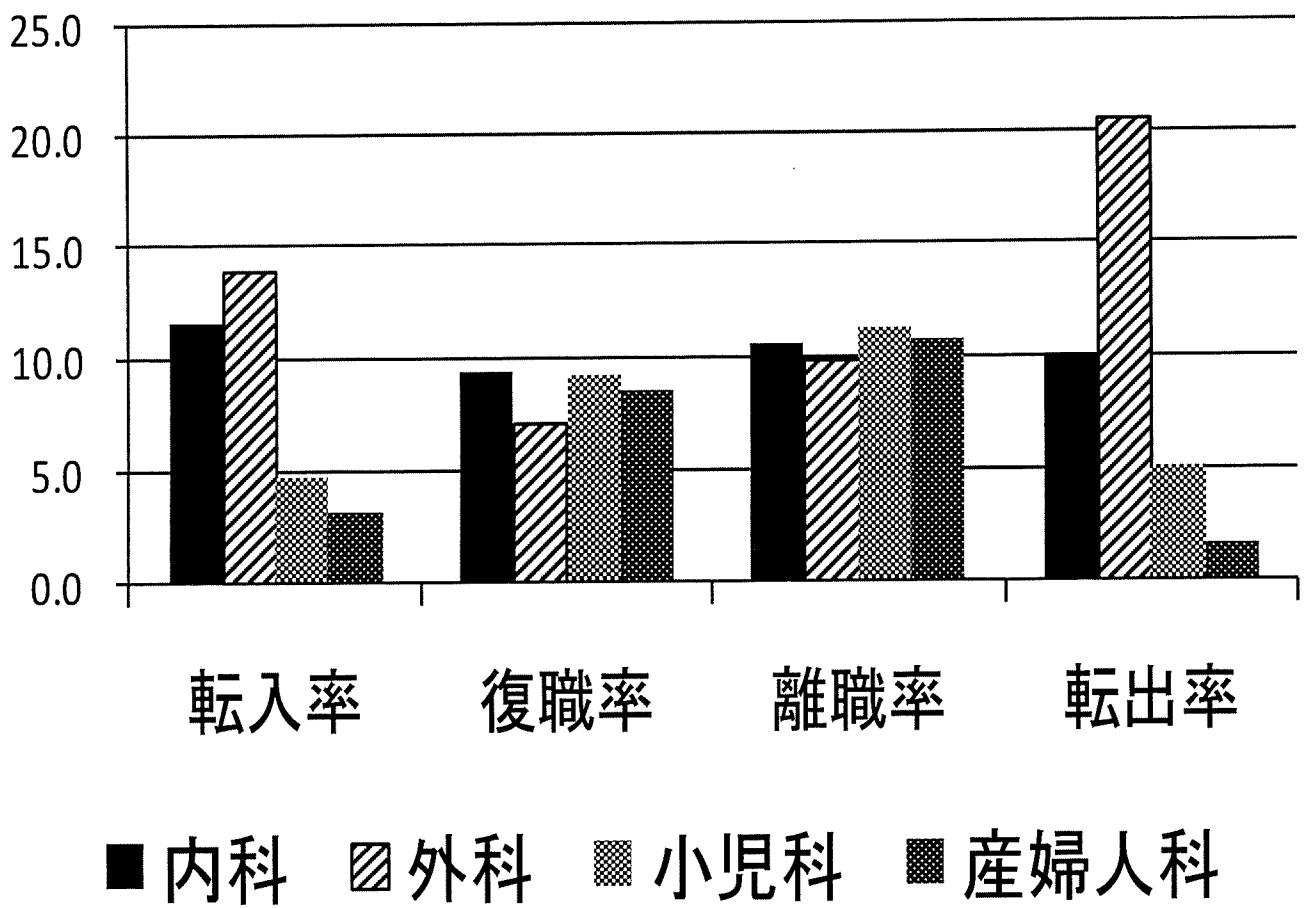

図 9. 女性医師の平均離職・復職・転科率（内科・外科・小児科・産婦人科　1984～2004）

分担報告書

外科系医師のキャリアパスに関する分析

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研究要旨
1972－2006 年の医師調査の縦断データを用いて，外科系医師の動態について分析を行った。外科系勤務医の開業医への転向，および現役引退に関連する要因を分析するために，1972 年，1982 年，1992 年登録の各コホート集団についてコックス比例ハザード回帰を実施した．開業医への転向および現役引退のどちらも，女性の方が有意に早い傾向が認められ，一般外科に比べて整形外科・脳外科・泌尿器科の方が遅い傾向が認められた．

A. 研究目的

近年，外科を志す医師の減少や，外科医の病院からの離脱傾向が指摘されている．

本研究では 1972－2006 年の医師調査の縦断データを用いて，外科系医師の動態について分析を行った。

B. 研究方法

医師が 2 年毎に届け出る「医師・歯科医師・薬剤師調査」のうち医師票について 1972 年から 2006 年の個票データが厚生労働省から提供された。提供されたレコードの件数は 4,302,844 件（医師数 390368 人）であった。1996 年の調査以降は，各医師が 1 つのみの「主たる診療科」を指定することになっている。これ以前の調査では「主たる診療科」が届け出られていないため，診療科の出現パターンを検討し，それぞれのレコードについて一つの診療科を「主たる診療科」として割り当てた。

対象となる外科系診療科として，外科，整形外科，形成外科，美容外科，脳神経

外科，呼吸器外科，心臓血管外科，小児外科，泌尿器科を選択した。

1976年，1986年，1996年，2006年における全科および外科系の総医師数，女性医師数，平均年齢等の推移を分析した。

次に，外科系勤務医の開業医への転向，および現役の外科系医師（active surgeon）の引退(retire)について，それらに影響する要因を世代間で比較分析した．すなわち，1972年，1982年，1992年に医師免許を取得した外科系医師の各集団について，性別・登録時の年齢・診療科の別を独立変数とするコックス比例ハザード回帰分析を実施した。

統計的分析にはSPSS13.0を用い，統計的有意水準は$p < 0.05$とした

C. 研究結果

1．記述統計

表1に1976-2006年における10年ごとの医師調査の記述統計をまとめる．医師総数は131,845人から277,923人（人口10万人あたりに116.6人から217.5人）に増加し，全外科系医師数は21,569人から59,622人（人口10万人あたり14.7人から34.8人）へと増加した。医師数全体に占める外科系医師数の比率は，2006年時点では21.5%であった。全外科系医師に占める女性医師数の割合は1.0%から5.1%に増加した．

外科系医師の平均年齢は一貫して全医師よりも低かった．しかし，全医師の平均年齢が1976年から2006年にかけてほぼ横ばいであるのに対して，外科系医師の平均年齢は41.5歳から46.9歳に上昇した。

1976年と2006年の長いスパンで見ると，全医師に占める病院勤務医の割合は44.7%から62.0%に増加した．しかし1996年と2006年の比較では，全医師については開業医対勤務医の比率に大きな変動はない一方で，外科系医師に限ると，1996年と2006年の間に開業医は21.7%から25.4%に増加，相対的に勤務医は78.3&

から 74.6%に減少した.

表 2 に 1972 年登録, 1982 年登録, 1992 年登録の各外科系医師数の内訳を示す. 外科系全体では女性医師は 1.1%から 5.5%に有意に増加, とくに一般外科と整形外科で有意な増加を認めた.

2．外科系勤務医からの離脱

外科系勤務医の開業医への転向, および現役の外科系医師の引退と関連する要因を分析するために, 1972 年登録, 1982 年登録, 1992 年登録の各コホートについて個別にコックス比例ハザード回帰を実施した結果を, 表 3 に示す. 3 つの集団すべてにおいて, 外科系勤務医の開業医の転向, および現役引退のどちらも, 女性の方が有意に早い傾向が認められた. (図 1)

外科系勤務医の開業医の転向については, 一般外科に比べて, 整形外科・脳外科・泌尿器科の方が転向する時期が遅い傾向が認められた. (図 2)

現役医師から引退する時期については, 医師登録時の年齢が高いグループほど早期に引退する傾向を認めた. 一般外科に比べて, 整形外科・脳外科・泌尿器科の方が引退の時期が遅い傾向が認められた. (図 2)

D. 考察

女性医師が増える中で, 外科系女性医師も少しずつ増加傾向にある. 外科系女性医師は, 男性医師にくらべて, 勤務医から開業医への転向, および現役引退の時期が顕著に早いことが, 本研究結果からも明らかとなった. 女性医師への待遇改善や再就職支援などが必要と考えられる.

診療科別で見ると, 一般外科の方が早期開業あるいは早期リタイアの傾向を認めた. このことは診療科間の労働負担の差を反映しているかもしれない.

F. 健康危険情報

なし

G. 研究発表

1. 論文発表

Hiroo Ide, Hideo Yasunaga, Soichi Koike, Tomoko Kodama, Takashi Igarashi and Tomoaki Imamura
Shortage of Pediatricians in Japan: a Longitudinal Analysis using Physicians' Survey data *Pediatrics International* 2009;51(5):645-649

Soichi Koike, Hideo Yasunaga, Shinya Matsumoto, Hiroo Ide, Tomoko Kodama, Tomoaki Imamura
A future estimate of physician distribution in hospitals and clinics in Japan *Health Policy* 2009;92(2-3):244-249

Soichi Koike, Shinya Matsumoto, Tomoko Kodama, Hiroo Ide, Hideo Yasunaga and Tomoaki Imamura
Estimation of Physician Supply by Specialty and the Distribution Impact of Increasing Female Physicians in Japan *BMC Health Services Research* 2009;9:180

Soichi Koike, Hideo Yasunaga, Shinya Matsumoto, Hiroo Ide, Tomoko Kodama, Tomoaki Imamura
Postgraduate training and career choices: An analysis of the Physicians Survey in Japan *Medical Education* 2010;44:287-297

Hiroo Ide, Soichi Koike, Tomoko Kodama, Hideo Yasunaga, Tomoaki Imamura
The distribution and transitions of physicians in Japan: a 1974-2004 retrospective cohort study *Human Resources for Health* 2009;7:73

Hiroo Ide , Hideo Yasunaga , Tomoko Kodama , Soichi Koike , Yuji Taketani and Tomoaki Imamura
The dynamics of obstetricians and gynecologists in Japan: A retrospective cohort model using the nationwide survey of physicians data *Journal of Obstetrics and Gynaecology Research* 2009;35(4):761-766

Koike S, Kodama T, Matsumoto S, Ide H, Yasunaga H., Imamura T
Residency Hospital Type and Career Paths in Japan: An Analysis of Physician Registration Cohorts *Medical Teacher* 2010 (In press)

Hiroo Ide, Soichi Koike, Hideo Yasunaga, Tomoko Kodama, Kazuhiko Ohe, Tomoaki Imamura
Long term careertransition in the surgical workforce of Japan: a retrospective cohort studyusing the Nationwide Survey of Physicians data from 1972 to 2006 *World Journal of Surgery* 2010 (In press)

2．学会発表

H. 知的財産権の出願・登録状況

（予定を含む）

なし

表 1. 1976 年-2006 年における全医師数・外科系医師数の推移

			1976	1986	1996	2006
All physicians						
Number			131,845	188,616	240,211	277,923
Per 100000 population			116.6	155.0	190.9	217.5
Female (%)			9.5	10.5	13.3	17.2
Surgeon						
Number			21,569	37,656	56,807	59,622
Per 100000 population			14.7	25.8	35.3	34.8
Surgeon in all physicians (%)			16.4	20	23.6	21.5
Female (%)			1.0	1.8	3.1	5.4
Active surgeons in total surgeons (%)			76.9	83.2	78.3	74.6
Average age (±SD)		All physicians	48(13.5)	46.8(15.2)	46.8(15.4)	48(15.1)
		Surgeon	41.5(11.9)	41(12.7)	43.6(13.3)	46.9(13.2)
		Active surgeon	38.4(10.5)	38.2(11)	40.1(11.3)	43.4(11.4)
Work place (%)	All physicians	Clinic	50.5	37.6	34.1	34.3
		Hospital	44.7	58.1	63.2	62
		Other	4.8	4.3	2.8	3.7
	Surgeon	Clinic	23.1	16.8	21.7	25.4
		Hospital	76.9	83.2	78.3	74.6

表 2. 1972 年登録，1982 年登録，1992 年登録の各外科系医師数の内訳

		Class of 1972	Class of 1982	Class of 1992
Total		840	1892	1976
Female (%)		1.1	2.5*	5.5**
General Surgeon		483	852	773
Female (%)		1.0	2.6	5.8**
Orthopedic surgeon		186	514	602
Female (%)		1.6	2.1	5.1**
Neurosurgeon		75	231	223
Female (%)		1.3	2.6	4.9
Urologist		87	174	198
Female (%)		0	0.6	3.5
Other surgeon		9	121	180
Female (%)		0	6.6	7.8
Average age at first registration (±SD)	Male	25.6(1.4)	26.4(2)	26.5(2.1)
	Female	25.3(1.3)	25.8(1.4)*	25.9(1.7)**
Number of physicians over 30 years at first registration		15	130**	151

** $p < 0.01$; * $p < 0.05$

表３．外科系勤務医の開業医への転向および現役引退に関連する要因分析：ハザード比

	Active surgeons to primary care surgeons			Active surgeons to retired surgeons		
	Class of 1972	Class of 1982	Class of 1992	Class of 1972	Class of 1982	Class of 1992
Sex	2.6 (1.2 - 5.8) *	3 (2.1 - 4.4) **	1.7 (1.2 - 2.4) **	2.1 (1.1 - 4.3) *	2.3 (1.6 - 3.2) **	1.7 (1.3 - 2.3) **
(reference; male)						
Age at first registration	1.6 (0.6 - 4.2)	1.4 (1 - 1.8) *	1.2 (0.9 - 1.8)	1.6 (0.9 - 3)	1.6 (1.3 - 2) **	1.6 (1.2 - 2) **
(reference; less than 30 years old)						
Surgical Specialty						
(reference; general surgery)						
Orthopedic surgery	0.2 (0.1 - 0.3) **	0.1 (0.1 - 0.1) **	0.2 (0.2 - 0.3) **	0.8 (0.7 - 1)	0.9 (0.8 - 1)	0.8 (0.6 - 0.9) **
Neurosurgery	0.3 (0.2 - 0.5) **	0.3 (0.2 - 0.4) **	0.5 (0.3 - 0.7) **	0.3 (0.2 - 0.5) **	0.5 (0.4 - 0.6) **	0.6 (0.4 - 0.8) **
Urology	0.3 (0.2 - 0.5) **	0.3 (0.2 - 0.4) **	0.2 (0.1 - 0.3) **	0.7 (0.5 - 1)	0.7 (0.5 - 0.8) **	0.6 (0.4 - 0.8) **
Other	1.3 (0.5 - 3.1)	1.1 (0.9 - 1.4)	1.2 (0.9 - 1.6)	0.8 (0.3 - 1.8)	1.1 (0.9 - 1.4)	1.2 (1 - 1.6)

** $p < 0.01$; *$p < 0.05$

図 1. 外科系医医師の離脱率：男女別

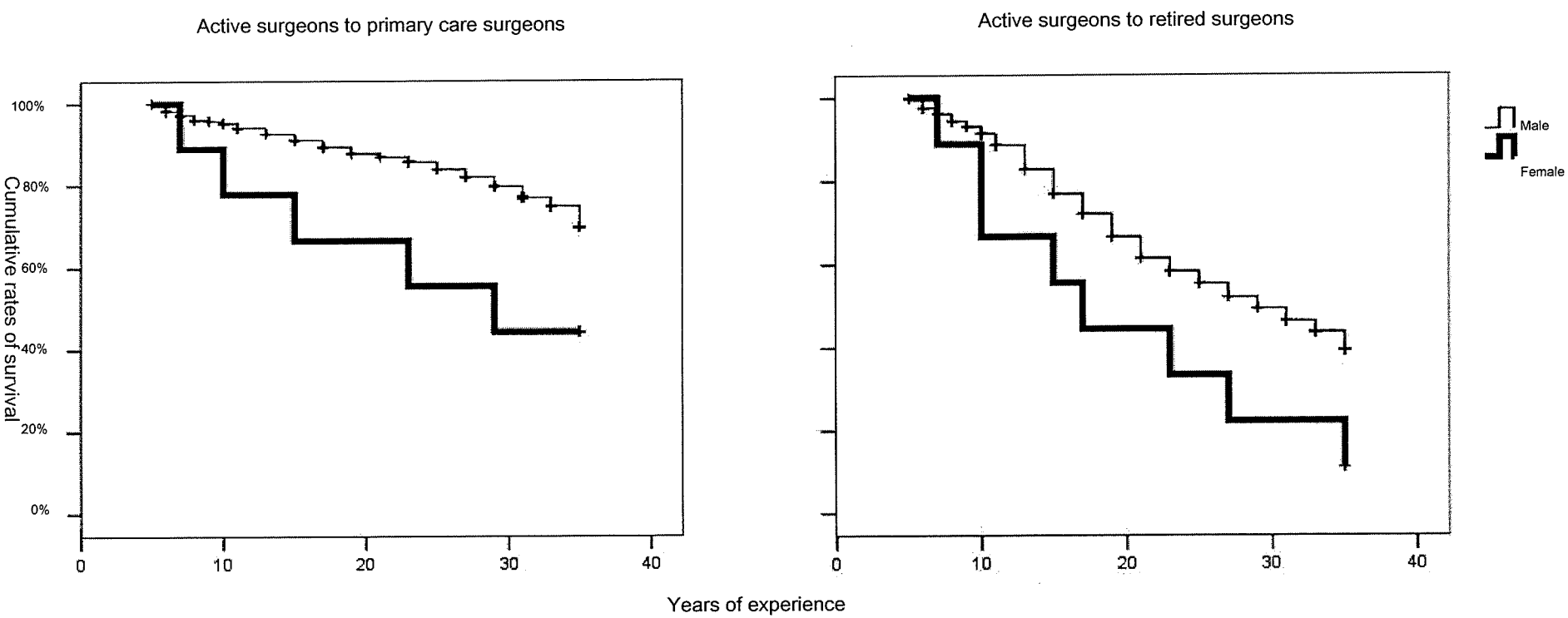
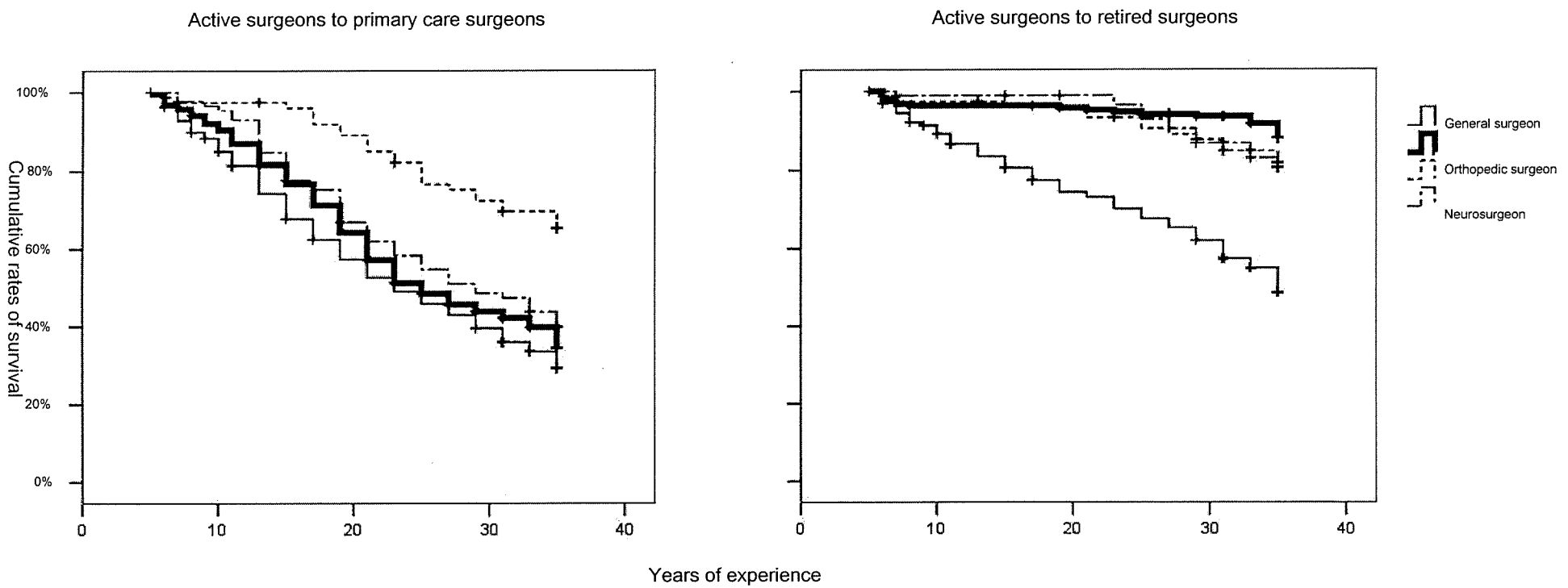


図 2. 外科系医師の離脱率：診療科別



Ⅲ. 研究成果の刊行に関する一覧表

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Hiroo Ide, Hideo Yasunaga, Soichi Koike, Tomoko Kodama, Takashi Igarashi and Tomoaki Imamura	Shortage of Pediatricians in Japan: a Longitudinal Analysis using Physicians' Survey data	Pediatrics Internatio nal	51(5)	645-649	2009
Soichi Koike, Hideo Yasunaga, Shinya Matsumoto, Hiroo Ide, Tomoko Kodama, Tomoaki Imamura	A future estimate of physician distribution in hospitals and clinics in Japan	Health Policy	92(2-3)	244-249	2009
Soichi Koike, Shinya Matsumoto, Tomoko Kodama, Hiroo Ide, Hideo Yasunaga and Tomoaki Imamura	Estimation of Physician Supply by Specialty and the Distribution Impact of Increasing Female Physicians in Japan	BMC Health Services Research	9	180	2009
Soichi Koike, Hideo Yasunaga, Shinya Matsumoto, Hiroo Ide, Tomoko Kodama, Tomoaki Imamura	Postgraduate training and career choices: An analysis of the Physicians Survey in Japan	Medical Education	44	287-297	2010
Hiroo Ide, Soichi Koike, Tomoko Kodama, Hideo Yasunaga, Tomoaki Imamura	The distribution and transitions of physicians in Japan: a 1974-2004 retrospective cohort study	Human Resources for Health	7	73	2009
Hiroo Ide , Hideo Yasunaga , Tomoko Kodama , Soichi Koike , Yuji Taketani and Tomoaki Imamura	The dynamics of obstetricians and gynecologists in Japan: A retrospective cohort model using the nationwide survey of physicians data	Journal of Obstetrics and Gynaecolog y Research	35(4)	761-766	2009
Koike S, Kodama T, Matsumoto S, Ide H, Yasunaga H., Imamura T	Residency Hospital Type and Career Paths in Japan: An Analysis of Physician Registration Cohorts	Medical Teacher			In press 2010

Hiroo Ide, Soichi Koike, Hideo Yasunaga, Tomoko Kodama, Kazuhiko Ohe, Tomoaki Imamura	Long term careertransition in the surgical workforce of Japan: a retrospective cohort studyusing the Nationwide Survey of Physicians data from 1972 to 2006	World Journal of Surgery			In press 2010

Ⅳ. 研究成果の刊行物・別刷

Pediatrics International (2009) **51**, 645–649 doi: 10.1111/j.1442-200X.2009.02839.x

Original Article

Shortage of pediatricians in Japan: A longitudinal analysis using physicians' survey data

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Abstract ***Background***: Currently, there is a shortage of hospital pediatricians in Japan. In the present study, using data from the Survey of Physicians, Dentists, and Pharmacists in Japan, we analyzed the dynamics and distribution of pediatricians, using a time series approach.

Methods: The total number of pediatricians, the ratios of hospital-working and female pediatricians, their mean age and geographic distribution in 1974, 1984, 1994, and 2004 were determined. The dynamics of pediatricians were analyzed by identifying the annual number of physicians participating in and withdrawing from pediatrics, and by following up withdrawal rates from pediatrics and movement rates from hospitals. The withdrawal rates of male and female pediatricians registered in 1992, 1994, and 1996 were also analyzed.

Results: The number of pediatricians per 10 000 children increased from 1.9 to 7.4 between 1974 and 2004. The percentage of women among pediatricians was significantly higher than that of women among all physicians in 2004 ($P < 0.01$). The numbers of physicians who withdrew from pediatrics increased from the periods 1985–1994 to 1995–2004. Younger pediatricians tended to leave pediatrics earlier than elder pediatricians. There were no differences in the withdrawal rates of pediatricians between men and women registered in 1992, 1994, and 1996.

Conclusions: It is anticipated that the number of pediatricians in Japan will decrease in the near future unless practical strategies are implemented to improve the early withdrawal of younger pediatricians and the current working conditions of female pediatricians.

Key words health manpower, pediatricians, physician shortage.

Introduction

Physician shortage is currently one of the major political issues in Japan. In particular, the shortage of pediatricians is a serious social problem. Experts claim that the pediatric medical system in Japan is in danger of collapse due to overwork of pediatricians, excessive requirements of patients and their families, and poor social support.[1] Wada *et al.* reported that the mean number of working hours for hospital pediatricians in Japan in 2004 was 55.9 h/week. In particular, physicians in their twenties worked excessively, around 43 extra hours during weekdays and 17.3 extra hours during weekends and holidays each month.[2]

The Ministry of Health, Labour and Welfare (MHLW) conducts a Survey of Physicians, Dentists and Pharmacists (SPDP) every two years, and provides descriptive statistics of the Survey. These statistics indicate that the total number of pediatricians in Japan has been increasing gradually. However, little is known about the trends and distribution patterns of pediatricians. To confirm the reality of this shortage of pediatricians, it is necessary to clarify how many graduates enter into pediatrics, how long current pediatricians have been in practice, and when pediatricians leave hospital work.

In the present study, we obtained all the individual data of the SPDP from the MHLW, and restructured the longitudinal data for each physician by retrieving their unique registration numbers, which were given to all physicians sequentially who passed the national examination in Japan. Using this retrospective data, we analyzed the dynamics of the pediatricians.

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Methods

Data acquisition

For this survey, the electronic files of all physicians during the period 1972 to 2004 were provided by the MHLW. Data cleaning

was performed to complete the data collection, and a total of 4 024 916 data (374 804 physicians) were obtained. All physicians were obligated to submit the survey information, and the submission rate was approximately 90%.[3] The survey items included the year their medical licenses were obtained, physician registration number, date of birth, sex, address of workplace, department, and occupation. The Privacy Act defines personal information as information that enables any other entity to identify a person, or that easily enables someone to do so using other sources of information. However, the data we used here did not include any personal information from which an individual could be identified.

Descriptive statistics

The total number of physicians, the number of physicians per 100 000 of population, mean age, percentage of female physicians, and the percentage of physicians working in hospitals in 1974, 1984, 1994, and 2004 were collected for analysis.

The total number of pediatricians, number of pediatricians per 10 000 children aged less than 15 years, mean age of pediatricians, percentage of female pediatricians, and the percentage of pediatricians working in hospitals were also determined. The population in each of the years studied was obtained from the Population Estimate carried out by the Statistics Bureau, Ministry of Internal Affairs and Communications.

Survey of trend in pediatricians

The number of physicians registered as pediatricians in 1974, 1984, 1994 and 2004, was defined as N1, N2, N3, and N4, respectively. In N1, the number of physicians who withdrew from pediatrics during the period 1975–1984 was defined as R1, and the number of physicians who continued to work in pediatrics was defined as C1. During the period 1975–1984, the number of newly graduated physicians who selected pediatrics was defined as F1 and the number of physicians who changed from other departments to pediatrics was defined as I1. Similarly, during the period 1985–1994 and the period 1995–2004, the number of physicians who withdrew from pediatrics, the number of physicians who continued to work in pediatrics, the number of new graduates, and the number of physicians changing from other departments to pediatrics were defined as R2, C2, F2, and I2; and R3, C3, F3, and I3, respectively. The relation between these variables is described in the following equations:

$$N1 = R1 + C1, N2 = C1 + F1 + I1$$

$$N2 = R2 + C2, N3 = C2 + F2 + I2$$

$$N3 = R3 + C3, N4 = C3 + F3 + I3.$$

The dynamics of pediatricians were analyzed by identifying each variable.

Withdrawal rate from pediatrics to other specialties

Pediatricians who obtained their medical licenses in 1972, 1982, and 1992 were defined as the Classes of 1972, 1982, and 1992, respectively. These three cohorts were followed up to determine the percentage of physicians who withdrew from pediatrics to other specialties.

Difference in withdrawal rates of younger pediatricians between men and women

The Classes of 1992, 1994, and 1996 were defined, and the numbers of male and female physicians withdrawing from pediatrics were investigated.

Withdrawal rate from hospitals

We chose pediatricians who obtained their medical licenses and began working in hospitals in 1972, 1982, and 1992. The percentage of pediatricians who moved from hospitals was determined.

Statistical analyses

We used *t*-tests to compare means between the two groups, and χ^2-tests to compare ratios between the two groups. Log–rank tests were used to compare differences in withdrawal rates. All statistical analyses were performed using statistical software SPSS ver.13.0 (SPSS, Chicago, IL, USA). A *P*-value less than 0.05 was considered significant.

Results

Statistical data

Table 1 shows the descriptive statistics in 1974, 1984, 1994 and 2004. The number of pediatricians increased gradually from 1974 to 2004. The number of physicians per 100 000 of the population almost doubled in 1974 to 2004, and the number of pediatricians per 10 000 children during the same period more than tripled.

The percentage of all physicians working in hospitals increased from 1984 to 2004, while the percentage of hospital pediatricians decreased. The percentage of female physicians increased from 1974 to 2004. During the same period, the percentage of female pediatricians also rose and the percentage of female pediatricians was significantly higher than that of female physicians in 2004 ($P < 0.01$). The mean age of pediatricians was significantly higher in 2004 (47.7 years) than in 1984 (42.2 years) ($P < 0.01$), but the mean age of all physicians was relatively stable during the study periods. Consequently, the mean age was the same for both pediatricians and all physicians in 2004.

Trend in pediatricians

Figure 1 shows the trend in pediatricians between 1974 and 2004. Up to 2004, the sum of the number of new graduates and the number of physicians who changed from other departments to pediatrics exceeded the number of physicians who withdrew from pediatrics ($F + I > R$). The number of new graduates was stable during the entire study period. As a result, the total number of pediatricians increased from 1974 to 2004.

When the time periods 1975–1984 and 1985–1994 were compared, the total number of pediatricians approximately doubled, and the percentage of pediatricians who continued practicing in pediatrics gradually increased. When the time periods 1985–1994 and 1995–2004 were compared, even though 63% of pediatricians in 2004 had stayed in pediatrics since 1994, the number of physicians who changed from other departments to pediatrics

Table 1 Statistical data

	1974	1984	1994	2004
All physicians				
Total	125 249	178 197	227 775	270 353
Number per 100 000 population	113	148	182	212
Female (%)	9	10	13	16
Age (average ± SD in years)	47.5 ± 13.0	46.8 ± 14.9	46.6 ± 15.4	47.6 ± 15.2
Working in hospitals (%)	43	56	62	62
Pediatricians				
Total	5364	8914	13 186	14 677
Number per 10 000 children (<15 years)	1.9	3.1	5.9	7.4
Female (%)	25**	24**	27**	31**
Age (average ± SD in years)	43.5 ± 13.0**	42.2 ± 13.6**	46.9 ± 14.9*	47.7 ±14.7
Working in hospitals (%)	57**	68**	58**	57**

*$P < 0.05$, **$P < 0.01$.
The reference values for comparison in the table were all physicians' values. SD, standard deviation.

decreased (I2 > I3), whereas the number of physicians who withdrew from pediatrics increased (R2 < R3). Moreover, the percentage of withdrawn pediatricians rose from 26% during 1985–1995 to 30% during 1995–2004, which was the same as that during 1975–1984.

Withdrawal rate from pediatrics to other specialties

Figure 2 shows the cumulative withdrawal rates from pediatrics to other specialties. Pediatricians in the Class of 1992 withdrew more rapidly than those in the Class of 1972 ($P < 0.01$). It took over 15 years for 10% of the Class of 1972 to leave pediatrics, but it took less than ten years for the same percentage of the Class of 1992 to leave; 43 of 333 young pediatricians of the Class of 1992 had already left pediatrics by 2004.

Differences in withdrawal rates of younger pediatricians between men and women

The percentage of women in each of these Classes was 35%, 45%, and 48%, respectively. Figure 3 shows the variation in withdrawal rates in men and women. For each class, no significant difference between male and female pediatricians was observed.

Withdrawal rate from hospitals

The number of pediatricians who worked in hospitals at the beginning of their career in the Classes of 1972, 1982, and 1992 were 200, 399, and 326, respectively. The log–rank test showed no significant differences in withdrawal rates among these Classes (Fig. 4).

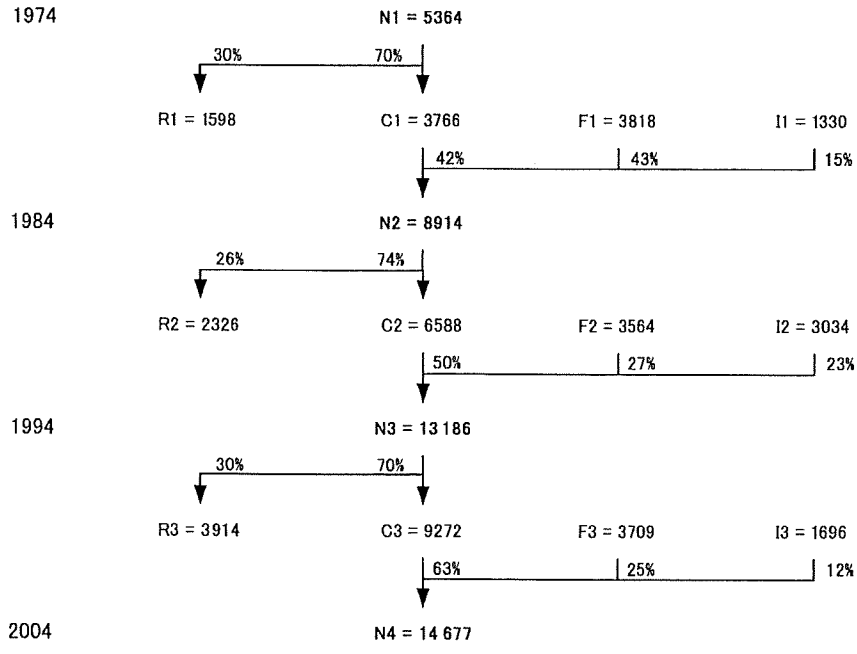

Fig. 1 Trend in pediatricians.
N1, the number of physicians registered as pediatricians in 1974; N2, the number in 1984; N3, the number in 1994; N4, the number in 2004.
R1, the number of pediatricians who withdrew from the department of pediatrics between 1975 and 1984; R2, between 1985 and 1994; R3, between 1995 and 2004.
C1, the number of pediatricians who remained in the department from 1974; C2, from 1984; C3, from 1994.
F1, the number of new graduates who chose pediatrics as their medical specialty between 1975 and 1984; F2, the number between 1985 and 1994; F3, the number between 1995 and 2004.
I1, the number of physicians who changed their specialty from other departments to pediatrics from 1975; I2, from 1985; I3, from 1995.

Fig. 2 Survey of withdrawal rate from pediatrics.
P-values for the comparisons between the Classes of 1972 and 1982, 1972 and 1992, and 1982 and 1992 were 0.698, 0.044, and <0.001, respectively. Thin line, Class of 1972 ($n = 205$); dotted line, Class of 1982 ($n = 406$); thick line, Class of 1992 ($n = 333$).

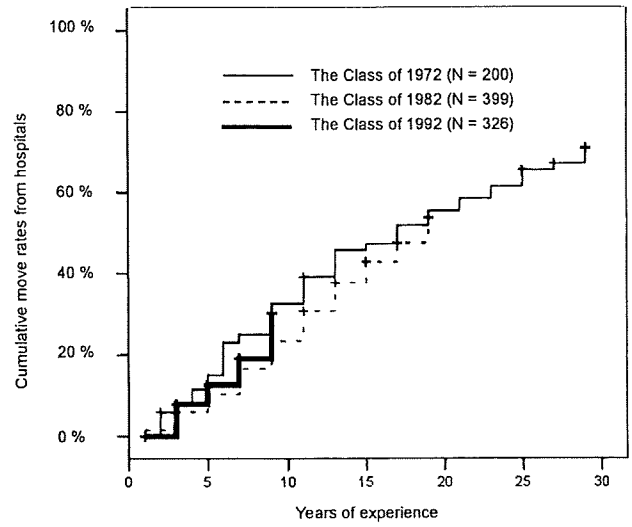

Fig. 4 Survey of movement rate of pediatricians from hospitals.
P-values for the comparisons between the Classes of 1972 and 1982, 1972 and 1992, and 1982 and 1992 were 0.254, 0.371, and 0.060, respectively. Thin line, Class of 1972 ($n = 200$); dotted line, Class of 1982 ($n = 399$); thick line, Class of 1992 ($n = 326$).

Discussion

A comprehensive trend in the pediatricians' workforce

Our study found a trend in the pediatricians' workforce over 30 years. We found that the withdrawal rate from pediatrics decreased during 1985–1994 and that the number of pediatricians has gradually increased. However, the withdrawal rate during 1995–2004 increased again. Moreover, in recent years, younger pediatricians have tended to leave pediatrics earlier. As a result, the average age of pediatricians is gradually rising.

A limitation in the present study is that it did not clarify the reasons why pediatricians recently decided to change their

Fig. 3 Survey of withdrawal rate from pediatrics of male and female pediatricians.
P-values for the comparisons between men and women of the Classes of 1992, 1994, and 1996 were 0.176, 0.711, and 0.249, respectively. Male pediatricians: thin line, Class of 1992 ($n = 218$); dotted line, Class of 1994 ($n = 199$); thick line, Class of 1996 ($n = 201$). Female pediatricians: thin line, Class of 1992 ($n = 115$); dotted line, Class of 1994 ($n = 166$); thick line, Class of 1996 ($n = 185$).

careers. Their actual motives for leaving pediatrics should be investigated, and an estimate of future workforce requirements will be necessary.[4–6]

Current problems of the distribution and roles of pediatricians

The actual number of pediatricians is increasing, and the number of pediatricians per 10 000 children during 1994 to 2004 has more than tripled (1.9 to 7.4). Nevertheless, Japanese pediatricians and society in general feel that the shortage of pediatricians is serious. There are several potential problems affecting the pediatrics workforce. First, the distribution of pediatricians among facilities in Japan is poor. The number of hospitals with a pediatric department is approximately 3500, and the average number of pediatricians per hospital is 2.4.[7] Centralization of pediatric hospitals is necessary, as has been proposed by the Japan Pediatric Society.[1] If centralization is not possible, other probable measures include concentrating the pediatric workforce to draw more pediatricians from clinics to hospitals and retain more pediatricians working in the hospital for longer periods unless they move hospitals to clinics.

Secondly, the role of hospital physicians and clinic physicians should be well-defined. Because free access is not restricted in Japan, patients are allowed to have their primary care at outpatient departments in hospitals, as well as in clinics. According to a survey conducted in 2005 by the Japan Pediatric Association, 61% of a hospital pediatrician's working time is devoted to primary care.[7]

Thirdly, training more family physicians will alleviate the current shortage of pediatric practice. In the USA where family physicians are trained, family physicians provide 25% of primary care office visits for children younger than 15 years.[8] Internists receive pediatric training in primary care and can provide a part of pediatric care.[9]

Increasing numbers of female pediatricians

Our results also showed that the number of female pediatricians is rising. Although the withdrawal rates of younger pediatricians were similar in female and male pediatricians, the increase in the number of female pediatricians has the potential to reduce net working hours in pediatric care because female physicians, including female pediatricians, leave their jobs temporarily due to maternity and childcare leave. This phenomenon has often been pointed out, and one previous study clearly captured this quantitatively.[10]

Policy makers should take measures to support female pediatricians so that participating in pediatric practice and raising their children are compatible. To make this happen, improvement of the working conditions for female pediatricians is necessary. For example, part-time job opportunities may be an attractive option. In the USA, the percentage of female pediatricians increased by 9% between 1993 and 2000, and the percentage of part-time female pediatricians increased from 24% to 28%.[11] A similar trend in the working hours of female pediatricians could appear in Japan. This measure would also be a quick-acting method rather than educating more medical students to be pediatricians.

Measures for the future pediatric workforce

Younger pediatricians are more likely to leave pediatrics earlier and the number of female pediatricians is increasing. Practical strategies should be implemented to improve the current conditions of the pediatric workforce, especially for younger pediatricians and female pediatricians. If this situation is not rectified, it is anticipated that the number of pediatricians in Japan will decrease in the near future.

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A future estimate of physician distribution in hospitals and clinics in Japan

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ABSTRACT

Objectives: To make future estimates of physician distributions in hospitals and clinics to better understand the impact of recent health policy changes in post graduate clinical education, and to discuss possible policy implications.
Methods: Analyze National Surveys Data conducted from 1972 to 2004. Multistate Life Table was used to make future estimations of numbers of physicians in hospitals and clinics.
Results: A typical Japanese physician's career would start from academic hospitals, and move through non-academic hospitals to clinics. After the introduction of the new post-graduate clinical training system in 2004, more medical school graduates started their careers at non-academic hospitals. Recently, the flow of physicians from academic hospitals to non-academic hospitals has been declining while the flow from academic hospitals to clinics has slightly increased. We also observed a shift of physicians from hospitals to clinics. From the data we estimated that the number of physicians working at clinics will be almost equal to those at non-academic hospitals in 2016, for the first time in 30 years.
Conclusions: It is important to discuss the appropriate sharing of roles, responsibilities, and cooperation among medical facilities in line with the observed changes of career paths and physician distributions

1. Introduction

The issue of physician distribution has always been a central issue in the health policy arena. However, no nation has found the key to solving the disparities between physician supply and demand [1]. In Japan, although the number of physicians working at hospitals and clinics has been increasing, the distribution of physicians in hospital and clinics is still unfavorable. Even after a considerable increase in the number of practicing physicians between 1980 and 1990 [2], the inequality in physician distribution did not improve.

The post-graduate clinical training system in Japan has changed several times since World War II. In 1946, a 1 year internship system to qualify for the national examination was introduced. In 1968, this intern system was moved to the post-graduate clinical training program wherein the Ministry of Health, Labour and Welfare (MHLW) strongly recommended clinical training after passing the national examination. Since then, most medical school graduates have started their careers at academic hospitals, and then moved to non-academic hospitals and clinics.

In 2004, a new health policy was introduced to mandate a 2-year post graduate clinical training for new medical school graduates [3–6]. Before the new system was intro-

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duced, most medical school graduates directly received post-graduate medical training in their medical schools' affiliated academic hospitals, and completed their program there. Most of the training programs had been dominated by a single specialty, whereas the new system mandated rotating specialty training for residents. Under the new system, an increase of the number of training programs offered in non-academic hospitals and the introduction of a system which matches applicants' needs and available training places at a national level caused a considerable change in the career patterns of Japanese resident physicians. As of 2008, 46.4% of post-graduate medical trainees were working in academic hospitals. This rate is considerably lower than that in 2003 when 72.5% worked in academic hospitals [7].

This study's objective is to make a future estimate of physician distribution in hospitals and clinics to better understand the impact of this change and to discuss possible policy implications, given the health policy transition for post-graduate medical education.

In the US, Human Resources and Service Administration Bureau of Health Professionals (HRSA-BHPr) at DHHS conducted a physician supply and demand projection. A recent projection is to 2010 [8] for 35 specialties. The HRSA-BHPr model was also used to project other health professionals [9–12]. The demand approach model was also applied for projection of specialty-specific demand for physician services in Japan [13]. Several government committees launched physicians' future estimates in Japan [14], with various approaches. However, to the best of our knowledge, in Japan, there has been no previous attempt since the new health policy on postgraduate clinical training system was introduced in 2004 to estimate physicians by type of medical facility, including academic hospitals, and by type of municipality.

2. Materials and methods

We obtained data from the National Surveys of Physicians, Dentists, and Pharmacists conducted from 1972 to 2004 from the MHLW. All the surveys were completed at the end of December in each survey year. The survey questionnaire included year of qualification, registration number, year of birth, gender, address and type of workplace, and specialty. Data provided from MHLW did not include the names of the physicians or names of the facilities. After data cleaning, a total of 4,024,916 data for 374,804 physicians were obtained for analysis.

To present the changes of the physicians' work places by registration year, the 1954, 1964, 1974, 1984, 1994 and 2004 registration cohorts were selected. By their type of facility (academic hospital, non-academic hospital, clinics, and others), line graphs of the participation rates were drawn based on the number of years since registration as a physician. The number of physicians "not reported" was obtained from the difference between the number of medical licenses issued by the MHLW [15] and the numbers reported. Because only data after 1972 was available and physicians who received their medical licenses prior to 1972 were included, some lines start some years after receipt of medical licenses.

To illustrate physicians' career transfer patterns in a certain period of time, those who have reported for both the 1992 and 1994 surveys and both the 2002 and 2004 surveys were selected to present the flow among the different types of facilities in the given 2 years of the survey period. In this analysis, pair data (1992–1994 and 2002–2004 data) were matched based on the physician registration numbers. In this analysis, only those who responded to both surveys were analyzed.

A Multistate Life Table was used to estimate the number of future physicians by facility type and category of municipality. The conventional life table deals with only "dead" or "alive" whereas Multistate Life Table deals with broader categories [16,17].

We defined 11 statuses for our estimation, 1 for academic hospitals; 4 for non-academic hospitals (in the 14 big cities, core cities, other cities, and towns/villages); 4 for clinics (in the 14 major cities, core cities, other cities, and towns/villages); 1 "others"; and 1 "not reported". Based on the status changes in the two most recent data (2002 and 2004 survey), we estimated the future numbers of physicians for the 11 statuses mentioned above. The number of physicians in 2004 was set as the base population and 2003 and 2004 new entrants were used to predict new entrants for the estimation period. "Types of municipalities" were defined based on Japanese administrative district categories, namely, 14 big cities (Tokyo special district and cities with populations above 500,000); core cities (cities with populations above 300,000); other cities; and towns/villages. Any mergers and changes in the categories of municipalities between 2002 and 2004 were unified into the municipalities as of 2004. The Multistate Life Table software "MSLT" [18] was used to create the Multistate Life Table.

3. Results

3.1. Physicians' career choice by facility type

Fig. 1 shows the number of physicians in each type of facility ("academic hospitals", "non-academic hospitals", "clinics", and "not reported") tracked by the number of years since their registration as a physician.

Those registered before 1994 generally started their careers as physicians at academic hospitals. They then gradually moved to other hospitals. Ten years after registration, nearly half of the physicians were working at hospitals. Thereafter, the number of these physicians working at clinics started to increase, and at 20–30 years after their registration, those working at clinics outnumbered those working at hospitals. Around this time, the number of physicians working at academic hospitals accounted for less than 10%. Thirty years later, the number of "not reported" cases started to increase. Fifty years later, nearly half of the physicians were "not reported".

Physicians registered in 2004 showed a different career pattern, they generally started their careers at non-academic hospitals rather than academic ones. In 2004, 39.2% worked at academic hospitals and 55.1% worked at non-academic ones.