Rural retention of physicians graduated from the collaborative project to increase rural doctors in Thailand: A cohort study

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Abstract

Background: In Thailand, the inequitable distribution of physicians between rural and urban areas has a major impact on access to care for those living in rural communities. The Collaborative Project to Increase Rural Doctors (CPIRD) was implemented in 1994 with the aim to attract and retain rural doctors. This study examines the impacts of CPIRD in relation to the retention in rural areas and Ministry of Health (MoH).

Methods: Baseline data of age, sex and year of entering the MoH was collected from 7,157 physicians graduated between 2000 to 2007. There were 1,093 graduated from the CPIRD track and 6,064 graduated through normal channels. Follow up data consisting of workplace, years spent in the rural districts and also within the MoH was retrieved from June 2000 to July 2011. The Kaplan-Meier method of survival analysis was used to interpret the data. Statistical data was analysed using the Cox proportional hazards ratios. The comparative risk of the CPIRD physicians leaving rural health facilities and the MoH compared to normal track physicians and predicted median survival were assessed.

Results: The females slightly outnumbered the males. Almost half of normal track (48%) and 33% of the CPIRD physicians left the MoH. The retention rate at rural hospitals was 29% for CPIRD compared to 18% for normal track. Survival curves indicated a dramatic drop after 3 years in service for both groups, but the normal track individuals decreased at a higher rate. Multivariate Cox proportional hazards modeling revealed that the normal track physicians have a higher significant risk of leaving the rural areas and the MoH at about 1.3 and 1.5 times the CPIRD physicians, respectively. The predicted median survival time in the
rural hospitals was 4.2 years for the CPIRD group and 3.4 for normal track. However, median survival time showed a decreasing trend in both tracks.

**Conclusion:** Though the project evaluation results showed positive impacts that CPIRD physicians are more likely to stay at rural hospitals longer than their counterparts, rural turnover has been increasing. There is a need for the MoH to review and improve upon the project implementations.

**Keywords:** Human resources for health, Physicians, rural retention, survival analysis.
Introduction

Human resources for health (HRH) are a crucial component of health systems required to deliver essential health to the populace. The effective mobilisation of the health workforce is essential in improving the performance of health systems and achieving key health objectives, particularly in low and middle-income countries [1]. The World Health Organisation (WHO) stated that there were approximately 57 countries with critical shortages of physicians, nurses and midwives; particularly in sub-Saharan Africa and South-East Asia [2]. The persistent maldistribution of physicians continues to have a major impact on access to care for those living in rural, remote or underserved communities in Thailand. This can be seen from the physician density in 2007 (defined as the number of physicians per 1,000 population) in Bangkok was ten times higher than in the northeast, the most rural region of Thailand [3]. The population in the rural areas has limited access to physicians; only 16.5% of the physicians work in rural areas where 54% of the population lives [4].

Over the past four decades, the Thai government has implemented several strategies to attract and retain physicians to work in rural areas [5]. These include: coercion measures, financial and non-financial measures as well as educational interventions.

Historically a low proportion of medical graduates worked in rural hospitals after qualification. To attempt to improve rural services, the government introduced a minimum period of three years compulsory public service in 1971. This forced the new graduates to work in MoH public services, particularly in rural hospitals for the first three years of their careers. Financial strategy implemented has been to increase the income of physicians posted to rural areas with a hardship allowance, non-private practice allowance, professional allowance and extra pay for overtime duties. This financial strategy has been implemented continuously since 1975. In 2008, the total income of newly graduated physicians working in rural hospitals was higher than that of new physicians working in urban areas by 10-15% [6].
difference of the total income based essentially on the degree of geographical remoteness and length of rural service time.

Non-financial incentives were also implemented. Career advancement was offered to senior physicians who had served in rural districts for a long time. From 1970, specialist training was made available to physicians working in rural areas. Other non-financial measures implemented included: infrastructure development, adequate medical supplies and equipment provision and the establishment of referral and consultation systems [5].

Educational interventions were among the prior approaches used by the government, especially to increase the medical production. The medical student intake was increased from 1,528 in 1997 to 2,282 students per year in 2013, to keep pace with the rising demand [3]. An important educational initiative was initially introduced in 1974 which favoured the recruitment of medical students from rural areas. This has grown to fruition in 1994 as the ‘Collaborative Project to Increase Rural Doctors–CPIRD’. This project aimed to increase the number of rural physicians by increasing the medical education opportunities for students with a rural background. The Ministry of Health (MoH) has collaborated with medical schools in developing and implementing the project. Each year, approximately 300 to 500 students are recruited into medical schools based on rural backgrounds and academic proficiency [7]. The students are trained at medical schools and MoH hospitals close to their hometowns and they are obliged to return to their home provinces after graduation. The six year curricula has been split into two parts; students spend the first three years for the pre-clinical science subjects at the medical schools, and then the final three years at regional or general hospitals within the MoH. Together with the graduates on a normal track, the CPIRD graduates are required to work within MoH, particularly rural hospitals for their first three years after graduation.
The rural medical education programmes to address rural physician shortages have been found to have significant effect on the recruitment and retention of physicians in rural areas in developed countries [8,9,10]. The rural medical education program included in these studies has been defined as the medical training program aiming to increase the likelihood of retaining their services in rural and remote areas once qualified [9]. The programmes focus on student selection based on rural background criteria. Some programmes combined rural selection with rural-orientated curricula, and/or hometown placement after graduation. The majority of these studies were conducted in developed countries. Some were from developing countries, but most of these had methodological limitations. Previous research has focused mainly on job satisfaction or intentions to leave the rural practice, rather than on actual observed behavior. Little was known about the success or otherwise of CPIRD in rural retentions against normal track physicians. Therefore, a rigorous study was required to assess the impacts of the CPIRD programme. This study was carried out to compare the MoH public services and rural retention of physicians graduated from the CPIRD track against normal track. The results generated by survival analysis of health workforce data will benefit rural health workforce planning and assist in the development of retention strategies for the future.

**Methods**

The study population was limited to physicians who entered the MoH after graduation. This cohort study used baseline data of age, sex and year of joining the MoH of all 7,157 graduates between 2000 and 2007. Physicians who graduated under CPIRD were labelled as ‘CPIRD’. The rest, not under CPIRD were labelled as ‘normal track’ or ‘non-CPIRD’. There were 1,093 physicians graduated from the CPIRD track and 6,064 graduated from the normal track. Follow up data consisted of workplace area, number of years spent in rural prac-
tice and the year of exit from the MoH. The data was collected between June 2000 and July 2011. Individual data on the physicians was originally obtained from the administrative data from the MoH information system. All medical physicians practicing in the MoH are obliged under civil servant regulations to record their career details here. The data was updated annually. By July 2011 all studied physicians had worked more than three years. To evaluate the longitudinal change with time in the rural/urban proportions of the physicians, information on workplace addresses during 2000 and 2011 was used. Follow-up rates were 100% for the entire study population.

This study defined rural areas as practice in non-metropolitan districts, where there are 742 community hospitals throughout Thailand [3]. All other facilities were considered as being in urban areas. Physicians were labelled as ‘rural retention’ if their current workplaces, as of July 2011, were at community hospitals.

Survival analysis methods were considered an effective tool used to measure physician turnover and retention in rural areas [11]. Survival analysis measures the time until an event occurs. In this study the event of interest is the time between taking up a MoH position until the time when a physician leaves a community hospital or the MoH. A ‘failure’ event was defined as a physician leaving a community hospital or the MoH, whilst a ‘censored’ event was defined as a physician remaining in a rural health facility or the MoH at the end of the study observation period. A ‘failure’ would be going for specialty training under urban facility quotas, however, a physician going for specialty training under rural facility quotas was considered as ‘censored’.

The Kaplan-Meier method of survival analysis was used to analyse the data. This technique enables employment data for all physicians who have worked in rural health facilities during the period of interest to be included in the analysis. Main outcome measurements were Cox proportional hazards ratios, comparative risk of CPIRD physicians leaving rural health facili-
ties and the MoH compared to normal track physicians and predicted median survival (the predicted time in years from the commencement of appointment until half the workforce had left).

**Results**

Thailand is geographically divided into 76 provinces and the Capital Bangkok. For administrative purposes, each province is divided into districts, sub-districts and villages. Community hospitals are health facilities providing secondary health services located at district level and they are categorised as rural health facilities. All other hospitals are located in urban areas. In a total of 878 districts there are 742 community hospitals (84%) and all of them are managed by the MoH.

The study population comprised 7,157 physicians who graduated and joined the MoH between 2000 and 2007. Of these, 1,093 graduated from the CPIRD track and 6,064 from the normal track. Table 1 illustrates that overall, female physicians slightly exceeded males. Almost half of them (45.9%) left the MoH, 33% of CPIRD compared to 48% of normal track, respectively. 34% of all physicians were still working at general or regional hospitals located at urban areas, with 20% at rural hospitals. The retention at rural hospitals was 29% for CPIRD physicians compared to only 18% for normal track physicians. Table 1 also shows the number of physicians entering the MoH by year. From 2000 to 2002 there were fewer numbers of CPIRD physician graduates due to limited student inputs; the number of graduated physicians has increased each year. There were approximately 200 new CPIRD physicians per year. The number of normal track physicians entering the MoH has gradually increased, ranging from 438 in 2000 to 884 in 2007.

(Table 1)
In the analysis of rural retention, 522 data sets of individual physicians were excluded as they were incomplete. These belonged to 49 CPIRD track and 473 normal track physicians. From the CPIRD, 7 physicians left the MoH and 42 currently work in general or regional hospitals. From the normal track 67 resigned from the MoH and 406 currently work in general or regional hospitals.

Throughout the 11 year period (June 2000-July 2011), 28,177.6 physician-years of observation time were analysed. The incidence rate of physicians who left rural areas was 17.6% of the physician-years, with overall median survival time (the length of time in years until half the physicians have left rural areas) of 3.7. CPIRD and normal track physicians have observation times of 4,316.3 and 23,861.3 physician-years, respectively. The incidence rate of physicians who left rural areas was lower for CPIRD compared to normal track at 14.9% (95%CI = 13.7, 16.1), compared to 18.2% (95%CI = 17.6, 18.7) physician-years, respectively. The incidence rate (per 100 physician-years) increased in both groups; the CPIRD track from 2.2% for the 2001 cohort to 17% for the 2007 cohort and normal track from 8.1% for the 2000 cohort to 28.3% for the 2007 cohort.

The predicted median survival (the length of time until half the workforce has left), revealed that the overall length of stay in rural areas was 4.2 years for CPIRD track physicians and 3.4 years for the normal track. However, median survival time decreased in the later cohorts. CPIRD track physicians had a median survival time of 8 years for the 2002 cohort and decreased to 3.9 years for the 2007 cohort. Normal track physicians had a high median survival time of 8.4 years for the 2000 cohort but to 3.1 for the 2007 cohort (Table 2).

(Table 2)

Survival curves in Fig 1 indicated that all cohorts dropped dramatically after three years in service. Later cohorts had a tendency to leave the rural areas earlier than the preceding ones. The first two intakes (2000 and 2001) greatly dropped after three years in service and
rural survival curves gradually declined to 25% during the 11 year project time. The 2002 cohort started to leave the rural areas after only two years in service and this dramatically increased after three years. The 2003 to 2007 groups began to leave after only one year in service and increasing after three years which less than half of them remained in rural areas at the fourth year in services.

(Fig 1)

Survival curves of rural retention of the CPIRD track and normal track physicians in Fig 2 indicate that over the eleven years of the study period (June 2000-July 2011), approximately 24% and 13% of CPIRD and normal physicians remained in rural areas, respectively. Survival curves of both tracks gradually declined after one year in service and there were approximately 80% of CPIRD physicians and 69% of normal physicians remaining in rural areas at the end of the third year. Both tracks significantly declined, and by the fourth year approximately 51% of CPIRD and 44% of normal physicians retained in rural areas.

(Fig 2)

Survival curves of MoH retention are shown in Fig 3. Results are similar to the rural retention and show a significant decline over the eleven year period. After one year both tracks gradually resigned from the MoH. Approximately 74% of normal track and 82% of CPIRD track physicians remained in the MoH in the third year. Then both tracks dropped dramatically until by the tenth year, 43% of normal and 57% of CPIRD track physicians were likely to be still employed by the MoH.

(Fig 3)

Multivariate Cox proportional hazards modeling revealed that CPIRD physicians have a significantly increased risk of leaving rural areas of 0.795 times compared to normal track phy-
sicians, or the normal track physicians have a significant risk of leaving rural areas 1.3 times compared with CPIRD track physicians. With MoH retention, the hazard ratio was 0.665 indicating that normal track physicians have a significant increased risk of leaving MoH 1.5 times (Table 3).

(Table 3)

Discussions

The study was limited by the nature of the administrative database, which was not created for research purposes. The availability of individual characteristics of physicians that might affect the MoH retentions and rural retentions was also limited; hometown of origin, socioeconomic background, etc. This analysis therefore failed to recognise individual characteristic factors. The majority of physicians enter MoH services after graduation, the study excluded those who worked with other agencies once graduation, the study therefore did not represent all physicians.

The study has accessed actual observations and carried out rigorous analysis to assess physician retention trends. The CPIRD approach combined three strategies to attract and retain physicians in the rural areas: selective admission criteria with a rural background, collaborative training between medical schools and MoH, and job placement in their home provinces once graduated. Three years of public service were obligatory for both CPIRD and normal tracks. The eleven years of longitudinal data revealed physician mobility trends. Most of the graduates completed the three year compulsory public service requirement. This supports the systematic review by Wilson et al [9] that coercive strategies addressed short-term recruitment needs. Retention however dramatically dropped once the three year compulsory
period ended. This suggested that compulsory public service alone did not have an impact on long-term rural job retention.

Some physicians moved away from the rural areas before the three year period. The main pull factor was to further their specialty training [12]. Though CPIRD track physicians remained in rural areas and the MoH services longer than the normal track physicians, both groups gradually left rural areas after only one year in service. The length of time until half the physicians left rural areas from the CPIRD group was longer than normal track. However, the rural retention of CPIRD and normal track physicians became comparable with increasing time.

The CPIRD physicians were favoured over normal track physicians in workplace choice once graduation. CPIRD physicians were assigned back to their home provinces preferentially before the normal track physicians were allowed to choose from the available workplaces. Normal track physicians may therefore leave rural areas earlier than their counterparts. This has sent some alarming signals to the government and those who were responsible for the CPIRD project to improve the project implementations.

This significant differentiation in the risk of leaving between CPIRD and normal track physicians was not surprising as similar results have been found in studies done in developed countries. A critical review of Wilson et al [9] indicated that of all the attempts to attract and then retain physicians in rural and remote areas, a well-defined selection (selection criteria evaluated included geographic origin and rural background) and education policy to optimise medical training programmes will have positive impacts on retention. In additional to the critical review, ranges of studies confirmed that recruiting medical students from rural com-
munities increases the likelihood that they will choose to work in a rural practice [10, 13], and this study is not exceptional.

Positive educational strategies were found to increase the number of physicians in rural practices. A systematic review of six well-established rural track training programmes aimed to increase the supply of rural physicians in the US, demonstrated that the number of graduates who practice in rural areas ranged from 53% to 64% [8]. The CPIRD project is a Thai purposive educational approach to attract and retain physicians in rural areas. The project has increased the number of physicians in rural practice and the results echoed the systematic review [8] and reiterated the results of some other studies [10, 14].

**Conclusion**

The Thai CPIRD project has combined three strategies: a rural admissions process, collaborative training between medical schools and the MoH, and return services to their home provinces once graduated, to attract and retain physicians in rural areas. Though the project evaluation results showed that CPIRD physicians are likely to stay in rural hospitals longer, rural turnover still has a tendency to increase. This has sent some signals to the MoH to review and improve upon the project implementations.
Abbreviations

CPIRD: The Collaborative Project to Increase Rural Doctors
IR: Incidence rate
MoH: Ministry of Health

Competing interests

The authors declare that they have no competing interests.

Contributions of authors

NP and LK worked on the conception and detailed design of the study. NP and SS collected and analysed the data. NP, LK and SS read and approved the manuscript.

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References


**Table 1** Physician characteristics by CPIRD and normal track.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total</th>
<th>CPIRD Track</th>
<th>Normal Track</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Male</td>
<td>3,378 (47.2)</td>
<td>457 (41.8)</td>
<td>2,921 (48.2)</td>
</tr>
<tr>
<td>- Female</td>
<td>3,779 (52.8)</td>
<td>636 (58.2)</td>
<td>3,143 (51.8)</td>
</tr>
<tr>
<td>Current workplace</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Community hospitals</td>
<td>1,430 (20.0)</td>
<td>316 (28.9)</td>
<td>1,114 (18.4)</td>
</tr>
<tr>
<td>- General/ regional hospitals</td>
<td>2,442 (34.1)</td>
<td>420 (38.4)</td>
<td>2,022 (33.3)</td>
</tr>
<tr>
<td>- left MoH</td>
<td>3,285 (45.9)</td>
<td>357 (32.7)</td>
<td>2,928 (48.3)</td>
</tr>
<tr>
<td>Year of MoH entry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 2000</td>
<td>444</td>
<td>6</td>
<td>438</td>
</tr>
<tr>
<td>- 2001</td>
<td>600</td>
<td>10</td>
<td>590</td>
</tr>
<tr>
<td>- 2002</td>
<td>755</td>
<td>32</td>
<td>723</td>
</tr>
<tr>
<td>- 2003</td>
<td>925</td>
<td>129</td>
<td>796</td>
</tr>
<tr>
<td>- 2004</td>
<td>992</td>
<td>143</td>
<td>849</td>
</tr>
<tr>
<td>- 2005</td>
<td>1,131</td>
<td>249</td>
<td>882</td>
</tr>
<tr>
<td>- 2006</td>
<td>1,163</td>
<td>261</td>
<td>902</td>
</tr>
<tr>
<td>- 2007</td>
<td>1,147</td>
<td>263</td>
<td>884</td>
</tr>
</tbody>
</table>

**Table 2** Median survival time (years) in rural areas of CPIRD and normal track physicians by year of entering the MoH

<table>
<thead>
<tr>
<th>Entering MoH</th>
<th>CPIRD track</th>
<th>Normal track</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physician-years</td>
<td>IR/100</td>
</tr>
<tr>
<td>2000</td>
<td>44.6</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>89.1</td>
<td>2.2</td>
</tr>
<tr>
<td>2002</td>
<td>199.0</td>
<td>7.5</td>
</tr>
<tr>
<td>2003</td>
<td>562.3</td>
<td>13.3</td>
</tr>
<tr>
<td>2004</td>
<td>632.5</td>
<td>14.7</td>
</tr>
<tr>
<td>2005</td>
<td>1,056.9</td>
<td>14.8</td>
</tr>
<tr>
<td>2006</td>
<td>903.8</td>
<td>17.7</td>
</tr>
</tbody>
</table>
Table 3 Predictors of physician retention in rural areas and the MoH resulting from survival analysis (Cox regression)

<table>
<thead>
<tr>
<th>Retention</th>
<th>Hazard ratio</th>
<th>SE</th>
<th>P-value</th>
<th>95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural retention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- normal track</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- CPIRD track</td>
<td>0.795</td>
<td>0.034</td>
<td>&lt;0.001</td>
<td>0.73, 0.86</td>
</tr>
<tr>
<td>MoH retention</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- normal track</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>- CPIRD track</td>
<td>0.665</td>
<td>0.036</td>
<td>&lt;0.001</td>
<td>0.67, 0.74</td>
</tr>
</tbody>
</table>

Fig 1 Physician survival curves of rural area retention by year of entering the MoH (2000 to 2007)

Fig 2 Physician survival curves of rural area retention by CPIRD and normal track physicians
Fig 3 Physician survival curves of MoH retention by CPIRD and normal track physicians