RESEARCH ARTICLE

CPIRD: A successful Thai programme to produce clinically competent medical graduates [version 1; referees: 3 approved]

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Abstract

The programme titled “Collaborative Project to Increase Production of Rural Doctors” (CPIRD) is a rural medical education project launched in 1994 in Thailand. This study aimed to compare the academic performances in medical study over five years and the pass rates in national medical license examinations (MLE) between students enrolled in CPIRD and two other tracks.
Grade point average (GPA) over five years and results of MLEs for four cohorts of students enrolled from 2003 to 2006 in Prince of Songkla University were collected from the registration department. A longitudinal analysis was used to compare the GPA over time for medical students enrolled in CPIRD and those from the national and direct regional tracks through generalized estimating equation (GEE) models. The MLE pass rates were compared using chi-square and fisher's exact tests as appropriate.
Female students dominated the CPIRD group. GPAs in the first three years in the CPIRD group were significantly lower than those of the other two groups, this disparity narrowed in the fourth and fifth years. For step one of the MLE (basic sciences), cohorts 2003 and 2006 of the CPIRD group had a significantly lower pass rate than the other two groups but there was no significant difference in cohort 2004 and cohort 2005. The CPIRD step two and three MLE pass rates were not significantly different from the national track in all cohorts and lower than the direct track only for step two in cohort 2003 and step three in cohort 2006. The step three pass rate of the CPIRD group in cohort 2004 was significantly higher than the other two tracks.
Despite weaker competency in basic science, the CPIRD was successful in forming clinical competency.

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Referee Status: ✔ ✔ ✔

	Invited Referees 1	2	3
version 1 published 18 Jun 2015	✔ report	✔ report	✔ report

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Introduction

In 2010, the World Health Organization (WHO) recommended sixteen interventions to improve health force retention in rural areas. These included education strategies to recruit students of rural origin, locating medical schools outside major cities, bringing students to rural communities and matching curricula with rural health needs[1].

Thailand is well known for its emphasis on rural health development[2]. Since 1972, all medical graduates must spend at least three years of compulsory service in rural areas. In the same year, the medical school of Prince of Songkla University (PSU) was established in southern Thailand, the most remote part of the country, in order to strengthen the local capacity in medical services. From the initial establishment period, PSU had two kinds of enrollment methods. The first is a national entrance examination (hereafter abbreviated to national track), which allows students from all over Thailand to sit the examination for a chance to study[3]. For geographic and socio-cultural reasons, this medical school in the south has not been a popular choice for candidates from high schools in other regions of the country. The local medical school compensates for this by using a second method of recruitment called the direct admission programme (hereafter abbreviated to direct track). This method recruits students from the southern regional provinces exclusively based on an institution-specific examinations[4], which take place a few months before the announcement of the national track examinations. This earlier announcement makes the programme popular to local candidates because they get admitted earlier and naturally have no difficulties acclimatizing to the different culture in the south of the country[4]. For decades, direct track students are known to have a better average academic performance than the national track students[4–6].

To further ensure adequate supply of medical doctors to the rural region, especially the potential insurgent areas of southern Thailand, a third track was introduced in 2003. Under the "Collaborative Project to Increase Production of Rural Doctors" (CPIRD), rural students from the region were recruited with a longer period (six years) of obligatory service in specific areas where there were a shortage of doctors. Later, the "One District One Doctor (ODOD)" programme was brought in as the fourth track[4]. ODOD students were not included in this analysis as the programme was considered too new.

Students of all tracks complete the first three years of medical study together. The national track and direct track students take their following three years of clinical study in university hospitals and CPIRD students in accredited regional and provincial hospitals of the Ministry of Public Health (MOPH)[4]. Grade Point Average (GPA) was used to assess the student's performance in all years and was based on the same standard set assessed by the regional medical university.

Since 2002, the Thai Medical Council has required all medical students who matriculated from the year of 2003 to pass all three parts of the Medical Licensing Examination (MLE) before getting their medical licenses[7]. The three steps of the MLE are taken at the end of the third, the fifth and sixth year, respectively. The first step of the MLE focuses on basic science knowledge, the second step on clinical science knowledge, and the third step on both knowledge and clinical skills evaluation. This is to standardize the basic competencies of graduate physicians and to assure health consumers have a standard health care service[8].

While the idea of recruiting medical students from rural areas and training them at hospitals close to the rural population is highly advocated based on the findings that it had positive implication on rural retention[9–12], but competency of graduates from such programmes have rarely been investigated.

The main objective of this study was therefore to compare the academic performance of the students recruited from different tracks as reflected by their GPA over five years and the pass rate at each step of the MLE.

Methods

Study site

Southern Thailand, where this study was conducted, is a region of the country with the highest levels of heterogeneity of the population and continuous ethnic unrest[13].

Study design

A retrospective cohort study based on the records of the performance of all medical students enrolled in 2003 to 2006 was used.

Dataset and ethical clearance

The data was retrieved from the student registry of Faculty of Medicine, PSU. All personal identification was encrypted. The study protocol was approved by the Ethics Committee of the Faculty of Medicine, PSU (Permit No: 56-317-18-5).

Data analysis for academic performance of GPAs and MLE results

All data analyses were performed using R version 3.1.3 (http://www.r-project.org) and Epicalc package 2.15.1.0 (http://CRAN.R-project.org/package=epicalc). A longitudinal data analysis was used to compare the GPA over five years for medical students enrolled in three different programmes through generalized estimating equation (GEE) models. The results for the pass rates in MLE were analyzed using chi-square and fisher's exact test as appropriate. Statistical significance was set at 5%.

Results

Dataset 1. Medical students academic performance and MLE results for four cohorts

http://dx.doi.org/10.5256/f1000research.6638.d49930

Admission indicates three different tracks including CPIRD, Direct track and National track; NLE indicates National License Examination; Yr1–Yr5 indicates First to Fifth year GPA.

Table 1 compares baseline characteristics of the students from the three tracks. Female students had a larger percentage in the CPIRD group compared with direct track and national track students. The number of students in the CPIRD increased from 19 in 2003 to 72 in 2006, whereas students from other two programmes remained stable.

Figure 1 shows how the GPA changed over five years of time. In the first three years, the mean GPA of students from three enrollment programmes was significantly different. Students from the direct track performed best. Followed by national track students. Students from CPIRD had lower GPAs than the others. However, the GPAs of the last two years from the three groups tended to converge. Table 2

Table 1. Student characteristics by the three enrollment programmes.

Characteristic		CPIRD N=171	Direct Track (N=208)	National Track (N=252)	Total (N=631)
Sex***					
	Female	119 (69.6)	98 (47.1)	148 (58.7)	365 (57.8)
	Male	52 (30.4)	110 (52.9)	104 (41.3)	266 (42.2)
Year of Enrollment***					
	2003	19 (11.1)	57 (27.4)	48 (19.0)	124 (19.7)
	2004	27 (15.8)	48 (23.1)	87 (34.5)	162 (25.7)
	2005	53 (31.0)	45 (21.6)	66 (26.2)	164 (26.0)
	2006	72 (42.1)	58 (27.9)	51 (20.2)	181 (28.6)

Numbers in bracket are percent unless otherwise stated. *** p-value <0.001, ** p-value <0.01, * p-value <0.05

CPIRD: Collaborative Project to Increase Production of Rural Doctors

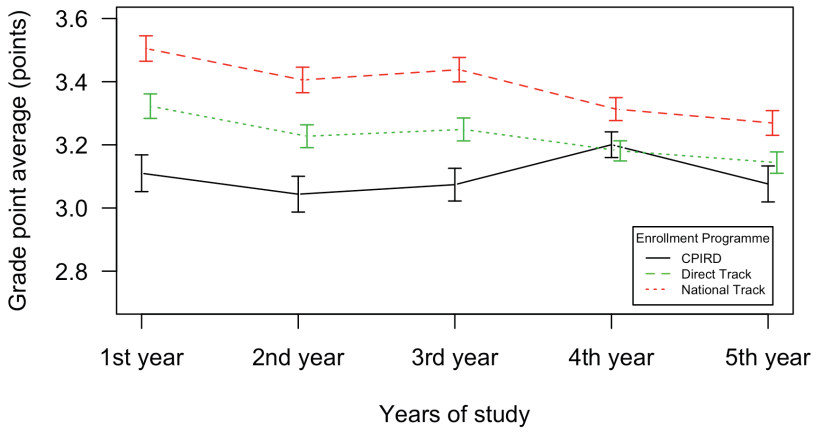

Figure 1. GPA over five years by three different programmes.

Table 2. Results of the generalized estimating equations analysis on the relationship between GPA and enrollment programmes.

	Coef.†	SE	p-Value
Year of study	0.009	0.009	0.320
Enrollment programmes (ref: CPIRD)			
Direct Track	0.482	0.037	<0.001
National Track	0.272	0.036	<0.001
Interaction terms Year: Direct Track	-0.065	0.011	<0.001
Year: National Track	-0.049	0.010	<0.001

† Coef: Coefficient; SE: Standard error

summarizes results of the GEE with 'year' as a continuous variable and 'track' as a categorical variable. Their interaction was statistically significant; therefore the interaction terms were included in the final model. Non-significant positive coefficient for the main effect 'year' indicates that the tendency of increment of average performance scores of the reference group (CPIRD) was not significant. The other two main effects 'direct track' and 'national track' were both significantly higher than that of CPIRD in the reference year (first year). Both interaction coefficients are negative indicating that over the years, the difference between the two tracks and CPIRD was reduced significantly.

Table 3 shows the association between enrollment programmes and results of the MLE for the four cohorts of students enrolled from 2003 to 2006. In step one of the MLE, CPIRD students were weaker than students in the other tracks for cohort 2003 and cohort 2006. In the remaining two MLE steps, CPIRD students' pass rate was not statistically different from that of the national track students. Direct track students had a higher pass rate only in step two of the MLE in cohort 2003 and step three of the MLE in cohort 2006 compared with CPIRD students. In fact, CPIRD had the highest pass rate in step three of the MLE in cohort 2004.

Discussion

CPIRD students had a lower GPA on average in pre-clinical years and lower pass rates of the MLE in basic science parts than students of the other two tracks. Their GPA tended to catch up with their peers in clinical years and the pass rate of the MLE in the clinical parts were more or less comparable with their peers.

The selection process of medical students in Thailand could explain the fact that CPIRD students had the lowest GPA in the first three years. Direct track students were those students in southern Thailand with good academic records who sat for the entrance examination at Prince of Songkla University. National track students selected Prince of Songkla University as an alternative choice because of its geographic distance from Bangkok. CPIRD students were those unable to get through by direct track examination and finally selected by the CPIRD route. As a result, direct track students had the highest academic performance in high school, followed by national track students, while CPIRD students were weakest[4]. The first three years was the pre-medical and pre-clinical study. It has been shown in other medical schools that the pre-clinical stage including second and third year, had a high correlation with the first year pre-medical stage[3]. The lower performance in these first three years for CPIRD students

Table 3. Association between enrollment programmes and results of medical license examinations stratified by cohorts.

	Step 1			Step 2			Step 3		
	Fail (N)	Pass (N)		Fail (N)	Pass (N)		Fail (N)	Pass (N)	
Cohort 2003			P-value			P-value			P-value
CPIRD	8	11	…	3	16	…	5	14	…
Direct Track	0	57	<0.01	0	57	<0.05	5	52	0.12
National Track	5	43	<0.01	2	46	0.26	9	39	0.72
Cohort 2004									
CPIRD	5	22	…	0	27	…	2	25	…
Direct Track	5	43	0.52	0	48	1	15	33	<0.05
National Track	22	65	0.64	5	82	0.46	31	52	<0.01
Cohort 2005									
CPIRD	19	34	…	3	50	…	2	51	…
Direct Track	8	37	0.08	1	44	0.73	2	43	1
National Track	18	48	0.42	1	65	0.46	10	56	0.08
Cohort 2006									
CPIRD	26	46	…	3	69	…	16	52	…
Direct Track	5	53	<0.01	2	56	1	5	53	<0.05
National Track	7	44	<0.05	2	49	1	7	42	0.31

N: the number of students … indicates referent group

reflected their weaker background and performance in science and thus these students need support to reduce the dropout rate[14,15].

A previous study suggested that CPIRD students had more opportunities to practice in regional hospitals and thus displayed more capable clinical skills in the fourth and fifth year[3]. In addition, the successful application of problem-based learning (PBL) in clinical study reduced the difference in academic performance and fostered a self-motivated study atmosphere among medical students[16].

The findings that the CPIRD students could perform as good as those normal tracks of students in step two and step three MLE has important implications. Good clinical education does not need to be confined to a conventional teaching hospital. Decentralized medical education requires enhancement of existing hospitals. The byproducts of this strengthening include increasing service capacity and quality of health services to local populations, which reduces the inequality problems due to geographical barriers. Other studies also reported that Thai CPIRD doctors were more likely to stay longer in rural areas than their peers[17,18]. Most low and middle-income countries (LMICs) have a serious rural–urban disparity of health service and the clinical education is mostly based in university teaching hospitals in large cities[19]. The experience from the Thai CPIRD should therefore be carefully reviewed for potential adaptation to other low LMICs.

Limitations

This was a retrospective study; other factors influencing academic performance could not be determined and taken into account. Examination questions and behavioral performance of the students may differ with time and place. However, the MLE were rigorously standardized national examinations and comparisons across student groups were made mainly within the same cohort. Thus, this limitation has been minimized.

Conclusion

The CPIRD was successful in creating clinically competent doctors despite lower GPAs in the pre-clinical year.

Data availability

F1000Research: Dataset 1. Medical students academic performance and MLE results for four cohorts, 10.5256/f1000research.6638.d49930[20]

Author contributions

YY was principal investigator of the study, conceptualized the research, collected the data, performed data analysis, and drafted the manuscript. VC, HS and CR conceived the study, assisted in development of data analysis, manuscript writing, and provided supervision and suggestions. All authors have seen and agreed to the content of the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Grant information

Financial support for data collection was obtained from the Epidemiology Unit at Prince of Songkla University under the support of the China Medical Board.

I confirm that the funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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This study is a part of the first author's thesis in partial fulfillment of the requirements for a Ph.D. in the Epidemiology Unit at Prince of Songkla University, Thailand.

Supplementary material

Data analysis using R and Epicalc.

Data analysis and output for Table 1, Figure 1, Table 2 and Table 3.

Click here to access the data.

References

1. Dolea C, Stormont L, Shaw D, *et al.*: **Increasing access to health workers in remote and rural areas through improved retention**. First expert meeting to develop evidence-based recommendations to increase access to health workers in remote and rural areas through improved retention. World Health Organization Geneva, 2009.
Reference Source

2. Wibulpolprasert S, Pengpaibon P: **Integrated strategies to tackle the inequitable distribution of doctors in Thailand: four decades of experience.** *Hum Resour Health.* 2003; **1**(1): 12.
PubMed Abstract | Publisher Full Text | Free Full Text

3. Pinyopornpanish M, Wongsawasdi L, Panjaisee N, *et al.*: **Comparison of the academic achievement of Chiang Mai graduate medical students which selected by quota, entrance and rural project.** *Chiang Mai Med Bull.* 2004; **43**(2): 77–86.
Reference Source

4. Putthasri W, Suphanchaimat R, Topothai T, *et al.*: **Thailand special recruitment track of medical students: a series of annual cross-sectional surveys on the new graduates between 2010 and 2012.** *Hum Resour Health.* 2013; **11**: 47.
PubMed Abstract | Publisher Full Text | Free Full Text

5. Suphanchaimat R, Boonthai N, Tangthasana S, *et al.*: **A survey of manual vacuum**

aspiration's experiences among the new medical graduates in Thailand. *Reprod Health.* 2013; **10**(1): 49.
PubMed Abstract | Publisher Full Text | Free Full Text

6. Ekpanyaskul C, Sithisarankul P, Wattanasirichaigoon S: **Overweight/Obesity and related factors among Thai medical students.** *Asia Pac J Public Health.* 2013; **25**(2): 170–80.
PubMed Abstract | Publisher Full Text

7. Wanvarie S, Sathapatayavongs B: **Logistic regression analysis to predict Medical Licensing Examination of Thailand (MLET) step1 success or failure.** *Ann Acad Med Singapore.* 2007; **36**(9): 770–3.
PubMed Abstract

8. Tangjitgamol S, Tanvanich S, Pongpatiroj A, *et al.*: **Factors related to the achievement of the National License Examination Part 1 of medical students in Faculty of Medicine Vajira Hospital, Navamindradhiraj University.** *South-East Asian Journal of Medical Education.* 2013; **7**(1): 51.
Reference Source

9. Rabinowitz HK: **Recruitment, retention, and follow-up of graduates of a program to increase the number of family physicians in rural and underserved areas.** *N Engl J Med.* 1993; **328**(13): 934–9.
PubMed Abstract | Publisher Full Text

10. Brooks RG, Walsh M, Mardon RE, *et al.*: **The roles of nature and nurture in the recruitment and retention of primary care physicians in rural areas: a review of the literature.** *Acad Med.* 2002; **77**(8): 790–8.
PubMed Abstract | Publisher Full Text

11. Curran V, Rourke J: **The role of medical education in the recruitment and retention of rural physicians.** *Med Teach.* 2004; **26**(3): 265–72.
PubMed Abstract | Publisher Full Text

12. Rabinowitz HK, Diamond JJ, Hojat M, *et al.*: ***Rural health research*: demographic, educational and economic factors related to recruitment and retention of physicians in rural Pennsylvania.** *J Rural Health.* 1999; **15**(2): 212–8.
PubMed Abstract | Publisher Full Text

13. The Deep South Relief and Reconciliation (DSRR) Foundation and the Rugiagli Initiative (tRI). **Healing Under Fire The Case of Southern Thailand.** Bangkok, 2014.
Reference Source

14. Suwanthawee T: **Problems and impacts on medical students and methods of prevention at the Faculty of Medicine of Ramathibodi Hospital, Mahidol University**. *Proceedings of the Thai Medical Education Conference*, 1995.

15. Lakakul A: **Backgrounds of medical students effect on academic achievement**. *Proceedings of the Thai Medical Education Conference*, 1995.

16. Udomratn P: **Psychiatric Education In Thailand: A Focus On Undergraduate Curriculum**. 2002.
Reference Source

17. Pagaiya N, Kongkam L, Sriratana S: **Rural retention of doctors graduating from the rural medical education project to increase rural doctors in Thailand: a cohort study.** *Hum Resour Health.* 2015; **13**(1): 10.
PubMed Abstract | Publisher Full Text | Free Full Text

18. Kiernan ML: **Reducing Inequities in Doctor Distribution: Literature Review, Thai Case Study and Policy Recommendations**.
Reference Source

19. Harris B, Goudge J, Ataguba JE, *et al.*: **Inequities in access to health care in South Africa.** *J Public Health Policy.* 2011; **32**(Suppl 1): S102–S23.
PubMed Abstract | Publisher Full Text

20. Yi Y, Chongsuvivatwong V, Sriplung H, *et al.*: **Dataset 1 in: CPIRD: A successful Thai programme to produce clinical competent medical graduates.** *F1000Research.* 2015.
Data Source

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Current Referee Status: ✔ ✔ ✔

Version 1

Referee Report 20 July 2015

doi:10.5256/f1000research.7131.r9407

✔ **Shama Virani**, **Katie Rentschler**
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CPIRD: A successful Thai programme to produce clinically competent medical graduates

This research describes differences in GPA and MLE scores of medical students that enter the program through three different mechanisms. These mechanisms seem to have an impact on initial scores, but become comparable at the end of the program.

Comments:

This paper is integral in future implementation of intervention programs designed to retain health forces in rural areas. Through this analyses, the authors have shown that clinical experience is as valuable as the curriculum.

Minor revisions are suggested below.

Page 1

- Is there a rationale as to why step one MLE scores of the CPIRD group was significantly lower for only cohorts 2003 and 2006 but not 2004 and 2005?

- Figure 1

  This figure shows that national track students have the best GPAs overall. It seems to contradict the statements in the introduction and discussion that mention direct track students do better than national track. It would be useful to address this discrepancy in the discussion.

Page 3:

- Is there information on how many students in CPIRD first try to attend medical school through the national or direct tracks?

- For the study site, please include the university where the study took place

Page 4:

- Is there any particular reason why the CPIRD group contains more females? Did this change over time? If so, it might be useful to include gender as a covariate in the model as this might influence the trajectory of the scores.

- Table 3: Please indicate the test used to obtain p-values in the table legend. It might also be useful to bold the “Cohort 2003”..etc to make the table a bit easier to read

Level of Interest: An article of importance in its field

We have read this submission. We believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Competing Interests: Non-financial competing interests Shama Virani: I have co-authored a paper with Dr. Hutcha Sriplung, although the content is not applicable to the current manuscript. My research with Dr. Sriplung is on cancer research. Katie M. Rentschler: No Competing interests

Referee Report 09 July 2015

doi:10.5256/f1000research.7131.r9408

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This manuscript generates concrete evidence to support the WHO 2010 recommendation focusing on the graduates' competencies. To disseminate this academic proof is important and useful for both national and global audiences. However, there are some minor points could be improved for paper quality, as follows

1. Table 1, please check 'Percentage' of the national track column. The total percent must be 100.0%.

2. As for the MLE pass rate, the 'Fail' was students who did not pass the exam on 'only the first attempt of that test', correct? Please describe more.

3. Discussion:

   Authors introductory mentioned the WHO global policy recommendations on increasing access to health workers in remote and rural areas through improved retention and want to prove the competencies or performance of that implementation. In order to link this evidence to policy recommendation, authors may consider to add some sentences using this key finding to support the global recommendation implementation, esp. Students from rural backgrounds and Clinical rotations in rural areas during studies which are the key characteristic of CPIRD. Further more, authors could also consider to mention the WHO recommendations on transforming and scaling up health professionals' education and training, 2013 which has recommended for targeted admissions policies to increase the socio-economic, ethnic and geographical diversity of students and the expansion of faculty through recruitment of community-based clinicians and health workers as educators, as well.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Competing Interests: No competing interests were disclosed.

Referee Report 01 July 2015

doi:10.5256/f1000research.7131.r9104

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The paper is concise and clear, providing evidence that medical students from Collaborative Project to Increase Production of Rural Doctors (CPIRD) tract finally watched up with medical students from local direct admission and national admission.

There are some points to improve the quality of this paper:

1. The text explaining the CPIRD programme in paragraph 3 of Introduction is not accurate. The obligatory service period of service is still kept constant at three years not six years as written. The One District One Doctor (ODOD) programme coerces 12 years of obligatory service.

2. Methods section should explain clearer on selection of students especially about drop-out between years. It's unlikely that there were no dropouts during the 6-year MD programme. How the study handle this issue? What bias is likely to occur? Please discuss.

3. The GPA presentation in figure 1 shows that students of the national tract best performed since the first year, but table 2 and text in result section explained that students of direct tract best performed. Please check.

4. Table 3 shows very high fail rate of step 3 exam as compared to others. There is no explanation how the systems interacted with this high fail rate.

I have read this submission. I believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Competing Interests: No competing interests were disclosed.