A REAL TIME IMPACT EVALUATION OF THE DR. LEE JONG-WOOK—SEOUL PROJECT IN LAO PDR: FINAL REPORT

KDI SCHOOL
KDI School of Public Policy and Management

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

List of Abbreviations and Acronyms

CPX	Clinical Performance Examination
DTC	Disease Treatment Committee, Lao PDR
EDC/HP	Education Development Center for Health Professionals, UHS, Lao PDR
GPA	Grade Point Averages
ICA	International Cooperation Administration, USA
KDI	Korea Development Institute
KDI School	KDI School of Public Policy and Management
KOFIH	Korea Foundation for International Healthcare
KOICA	Korea International Cooperation Agency
MDGs	Millennium Development Goals
MEAC	Medical Education Assessment Consortium, Korea
MOH	Ministry of Health, Lao PDR
OB-GYN	Obstetrics and Gynecology
ODA	Official Development Assistance
OECD/DAC	Organization of Economic Cooperation and Development / Development Assistance Committee
OSCE	Objective Structured Clinical Examination
RUD	Reasonable Use of Drugs
SNU	Seoul National University, Korea
SNUCM	Seoul National University College of Medicine
STGs	Standard Treatment Guidelines
SWC	Sector-wide Coordination
UHS	University of Health Sciences, Lao PDR
WHO	World Health Organization

Executive Summary

Purpose and Design of Research

1. The Dr. LEE Jong-Wook—Seoul Project in Lao PDR is an ambitious development cooperation initiative funded by the Korea Foundation for International Healthcare (KOFIH) in 2010. Through this project the Lao University of Health Sciences (UHS) and the Seoul National University College of Medicine (SNUCM) are collaborating to upgrade the medical education capacity of the UHS faculty members. The ultimate objective of the project is to contribute to the overall improvement of the Lao people's health. The project in its current stage is a five-year collaboration with a plan in place to extend the program period to a total of nine years. Fully implemented, the project envisions retraining of about 80 of the 300 UHS professors at the SNUCM. The project also includes provisions to dispatch faculty advisors from SNUCM, and provide equipment and devices for education and research at the UHS.

2. The Impact Evaluation Lab of the KDI School of Public Policy and Management has been carrying out an evaluation study on the Dr. LEE Jong-Wook—Seoul Project since 2011 in collaboration with the partnering institutions and agencies both in Lao PDR and Korea; the UHS, the Lao Ministry of Health, the SNUCM, and the KOFIH. This volume is the final report of the collaborative efforts for assessment.

3. The collaboration has two main objectives: impact evaluation and real-time feedback to the partnering institutions and agencies. Given the three-year timeframe for the study, the impact evaluation team chose to focus on a series of intermediate outcome rather than the ultimate goal of improving Lao people's health. They are: learning outcomes for the UHS faculty members participating in the one-year exchange program at the SNUCM; the learning outcomes of the UHS students; and finally, improvements in the clinical practices of the young physicians upon their graduation from UHS. The first of these is to be monitored and assessed by the UHS and the SNUCM. The KDI School's Impact Evaluation Lab is to focus on the latter two measures.

4. For the students' learning outcome measurement, the evaluation team employs the test battery developed and maintained by the Medical Education Assessment Consortium (MEAC) of Korea. The questions in the test, designed to assess the test-takers' mastery of medical science and clinical knowledge, have been translated into Lao. In addition, the academic achievement scores at UHS (i.e., grade point average, or GPA) are also used to supplement the MEAC scores. For measuring the young physicians' clinical practices, we utilize Disease Treatment Committee (DTC) data collected by each central and provincial hospital in Lao. DTC data are composed of two sets of indicators: the Standard Treatment Guidelines (STGs) and the Reasonable Use of Drugs (RUD) guidelines. Baseline and two rounds of follow-up studies have been carried out to collect information on UHS student learning using the MEAC test battery, and physician practices using the DTC data from 2011, 2012 and 2014.

5. Thus, the impact evaluation strategy will compare the changes in the students' learning outcome measures over the years between the treatment and control groups. The treatment group consists of medical subjects or fields taught by the UHS faculty members returning from Seoul, and the control groups represent other subjects or fields. Note that the treatment or control group is not a clear-cut due to the integrated curriculum. That is, a subject or a field in medicine

is taught by a group of lecturers rather than one. In the analysis, the scale of intervention for a subject or a field is measured by the share of the Dr. LEE Jong-Wook—Seoul Project participants in total teaching team members and total team teaching hours.

Salient Findings from the Studies

6. It is revealed that teaching capacity of trained faculties measured by academic performance of students has indeed improved as a result of the Dr. LEE Jong-Wook—Seoul Project. In the standardized test of medical knowledge, the estimates indicate that the first two cohorts of trainees in the project account for the increase by 0.081 standard deviation in the test scores of basic medicine and by 0.059 standard deviation in the case of clinical medicine. These results imply that the project in the first two years reduced the gap in the test scores between UHS and Korean students by 4.9% in basic medicine and 1.9% in clinical medicine.

7. In addition, in the analysis of the 1-5th year students' school grade obtained before and after the LEE fellowship training periods, students achieved a relatively greater advancement in the subject courses, all taught by the LEE fellowship recipients, when compared to those taught by non-fellows, even after controlling students' gender, age, status, and instructors' teaching experience. The average grade of the students who took the courses taught by UHS faculty team including professors trained at SNUCM was higher by 0.2 points than other students (with the maximum GPA score of 4.0 points) even after controlling the fixed effects of courses and years offered.

8. According to the analysis of the DTC data, the doctors with more on-the-job experience do not appear to provide better health services, qualities measured by DTC indices. Further, doctors' DTC scores were lower, when hospitals are

located in remote provinces, especially in relatively poorer provinces. The evaluation team suspects that the hospitals in provinces, especially in poorer provinces, lack proper medical equipment and facilities such as laboratories, and/or adequate clinical protocols and management, which leads to lower DTC scores. Meanwhile, the analysis showed that practicing doctors' DTC scores are positively correlated with their academic achievement level at UHS at a statistically significant level. These findings, however, have been obtained from the analysis of doctors, who have not trained under the Dr. LEE Jong-Wook-Seoul Project. It could be tentatively concluded that improvements in the health service quality in Lao PDR could be more dependent on improvements in the quality of the pre-service academic program in the UHS than the current on-the-job in-service training program in hospitals. With the final impact evaluation to be made in the future, however, it remains to be seen whether the improved academic performance or pre-service training at the UHS really enhances the quality of the physicians' practice at hospitals, which could also be improved by provision of medical equipment and facilities in poorer provinces.

9. These findings highlight the significance of the Dr. LEE Jong-Wook—Seoul Project in the first three years. The results chain of improved teaching capacity of UHS faculty, higher achievement of students and advancements in clinical practice by graduates seems to indicate that these efforts are leading to better health care for the Lao people. As the project is implemented for a longer period, its impact is likely to be become larger through the spillover effects to non-participants and the accumulated knowhow on training by SNUCM. It remains to be seen how cost-effective the Dr. LEE Jong-Wook—Seoul Project is against other alternative projects, including the training program for medical professionals at province or district hospitals.

Recommendations

10. Given the strong effect of the project on students' learning outcome, it is highly recommended to scale up the project. One way is to secure more funding for the project, and another is to integrate the project with an existing program. In fact, EDC/HP at UHS has been established in order to build up the capacity of clinical practice and education. Strengthening the functions of EDC/HP would be an efficient way to expand training programs for UHS.

11. It is strongly recommended that the SNUCM measure the differences in medical knowledge and skills of the UHS faculty members before and after their training programs more rigorously. These differences will serve as a useful predictor for the changes in the academic achievement level of UHS students when taught by the faculty members who were trained by SNUCM.

12. It is also recommended that some relevant UHS faculty members trained at the SNUCM be assigned to the new Children's Hospital (financed by the KOICA) as teaching physicians.

13. It is recommended that the follow up project (the Second UHS-LEE Jong-Wook—Seoul project) finances the collection of the data on the academic achievement and clinical performance levels of the UHS graduates who learned from SNUCM-trained faculty members at public hospitals, so that a rigorous ex-post impact evaluation can be carried out in due course.

14. It is recommended that a follow up project by the government of Korea, either by KOFIH or KOICA, or by other foreign donors, should consider financing medical laboratories and equipment at public hospitals—especially in poor provinces—in addition to the improvement of clinical performance protocols and management.

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Chapter

01

A Real Time Impact Evaluation of the Dr. LEE Jong-Wook – Seoul Project in Lao PDR

A Real Time Impact Evaluation of the Dr. LEE Jong-Wook – Seoul Project in Lao PDR

1. Introduction

The main purpose of this chapter is to outline the overall scheme of a real time evaluation exercise, and lay out the design of baseline studies of the Dr. LEE Jong-Wook—Seoul Project in Lao PDR, as well as presenting some of the initial findings from the baseline study focused on the clinical practices by young physicians, or recent UHS graduates. The Dr. LEE Jong-Wook—Seoul Project was launched in 2010 and completed in 2013, with the possibility of a continuation thereafter. Conventionally, an evaluation study is an ex–post evaluation exercise after the completion of a project. However, one salient feature of this evaluation study is that the evaluation exercise is being carried out in parallel with the implementation of the project.

There are several developmental and environmental imperatives that force evaluators to take a real time evaluation approach (Thomas 2011, Lee 2011). Firstly, multiple players are involved in development assistance. Besides the traditional OECD/DAC (Development Assistance Committee) members, a rapidly increasing number of emerging bilateral donors and new international organizations are emerging, as well as numerous agencies from recipient countries. In addition, there have been an increasing number of development programs and projects financed by numerous donor agencies in any given developing country. Inevitably, these developments have made the causal chain more complex than ever before. Secondly, the rapid changes in today's

development world makes ex-post summative evaluations more likely to be irrelevant. Thirdly, today's evaluators face the multi-faceted and crosscutting nature of emerging development issues, such as climate change, pandemic diseases, and environmental degradation. The nature of these emerging issues also makes the causal chain more complex and broad, which poses new challenges for development evaluators. A traditional summative or ex-post evaluation would not help evaluators cope with the new development environment and make their evaluation results relevant to project staff.

A more effective solution to cope with the new challenges is to take a real time evaluation approach, which monitors and analyzes each stage of the whole project cycle from project design to preparation and throughout the implementation stages, providing pertinent feedbacks to project staff in a timely manner. For this reason, this evaluation study of the Dr. LEE Jong-Wook—Seoul Project took a real time evaluation approach.

This chapter is laid out as follows. We start with a description of the overall design of the real time impact evaluation study together with its methodology and data. Three approaches are proposed for the methodology of this study. Then, the progress with the first two approaches is briefly discussed, since other evaluation team members provide a more in-depth treatment in separate reports. A more detailed description of the progress in the third approach is presented, followed by an analysis of the baseline data (2010) obtained in 2011 and 2012. The paper concludes with a list of remaining tasks to be monitored, even after the completion of the project.

2. The Content of the Impact Evaluation Study

The objectives of the real time impact evaluation are two-fold. The first objective is to provide feedback, as the project is being implemented, to the agencies responsible for implementation (UHS, Ministry of Health of Lao PDR, Seoul National University College of Medicine (SNUCM), and the Korea Foundation for International Health (KOFIH) of the Republic of Korea, the funding agency), regarding the progress of the project and the

attainment of its intermediate outputs. On the basis of the feedback, the implementing agencies should be able to decide whether a modification of the project design during the implementation of the project is necessary.

The second major objective is to provide feedback to agencies and policy makers of both governments implementing the project, regarding the attainment of objectives on the basis of the assessment of the project's final outputs and outcomes. In this way, the accountability of the project entities (the donor, recipient, and other stakeholders) can be enhanced.

The project's final outcomes will be the overall improvement of the Lao people's health, who have been serviced by UHS graduates, who will be taught by UHS faculty members who were in turn trained in Korea through the fellowship. Therefore, the assessment of the final outcome should be made through a comparison of the health status outcomes of Lao people with and without the project.

Measurement and assessment of the health status of Lao people can be made using their morbidity and mortality rates. However, this will require a long and extended period of time (even after the termination of the project), and will be completed much beyond the current contract for this impact evaluation study. Therefore, for this real time evaluation study, intermediate outcome measures will be used.

3. The Methodology and Data

The methodology adopted for the real time impact evaluation of this project is based on the principles of the Paris Declaration for Aid Effectiveness. At the Second High-Level Forum on Aid Effectiveness in Paris (2005), more than 180 ministers of developed and developing countries responsible for promoting development, and heads of multilateral and bilateral development agencies, resolved to take far-reaching reform of the ways they deliver and manage aid by adopting the Paris Declaration for Aid Effectiveness. They also agreed on 12 action indicators and targets to be attained by 2010. OECD

claims that this Declaration builds on the lessons learned over many years about what works and what does not. It also claims that donors and recipients are committed to adopting the best policies and principles in aid management to increase the impact that aid has in reducing poverty and inequality, and increasing growth of developing countries (OECD 2009).

The Declaration incorporated five principles: development of country ownership of policies and strategies; alignment of donor aid to developing countries' priorities and systems in a predictable and transparent manner; donor efforts to harmonize aid practices; results-oriented aid management; and mutual accountability by both donors and recipients (Paris High Level Forum 2005). These five principles will be used as a basis for this impact evaluation study.

This study will first assess the design of the Dr. LEE Jong-Wook—Seoul Project against the policy and strategic statements of the Lao government and the need for calibration in design. This method is consistent with the Alignment Principle of the Paris Declaration on Aid Effectiveness (OECD 2005). The Paris Declaration exhorts all donors to align their aid programs and projects with the development policy/strategy/plan of a recipient developing country. The Lao government elaborated its development policies for all sectors in its Poverty Reduction Strategy Paper: National Socio-Economic Development Plan: 2011-15 (Committee for Planning and Investment 2008) and Seventh Five-Year Health Sector Development Plan: 2011-2015 (Ministry of Health 2010).

The second approach of this study is to assess the appropriateness of the design of the project against the aid activities of other donors for the Lao PDR health sector. This approach is consistent with the Harmonization Principle of the Paris Declaration on Aid Effectiveness (OECD 2005). Many donors are active in Lao PDR, and therefore all donors active in the health sector formed a Sector-wide Coordination (SWC) mechanism, co-chaired by the Vice Minister of Health and the government of Japan (represented by the ambassador). The SWC mechanism reviews existing aid activities for coordination and adjustment, and new initiatives by donors are expected to be submitted for the mechanism's considerations, in order to best avoid possible overlaps and conflicts.

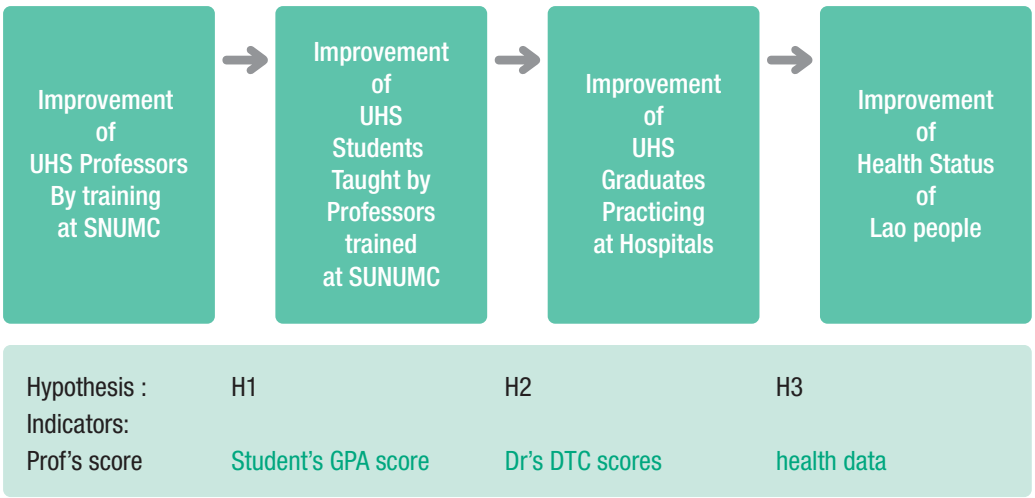
Therefore, the Dr. LEE Jong-Wook—Seoul Project should also be assessed against other donors' existing activities and new initiatives.

Results of the team members' explorations based on these two approaches (ownership and alignment) are discussed and presented in separate chapters. In sum, our conclusion is that the project is well-aligned with the Lao government's own strategy and policy. Regarding harmonization, however, there is much room for improvement. Both the Korean (and also Lao) agencies should explore ways to heighten effectiveness of the project through a more perspicacious harmonization with other donor-funded and Lao-initiated programs and projects.

A third and final approach of this study is to test several hypotheses for the purpose of assessing the effectiveness of the project. This approach is consistent with the Result-Based Aid Management Principle of the Paris Declaration (OECD 2005). The first hypothesis (H1) is whether UHS students taught by the professors who were trained in Seoul under this project (the treatment group) attain a higher level of academic achievements than the rest of the UHS students (the control group). For this purpose, the two groups' academic achievements will be tested during their study at UHS, and at the time near their graduation. The reason for this hypothesis test can be explained by the underlying assumption that UHS graduates with a higher level of academic achievements would also provide a higher level of quality health services to patients. This assumption is testable and should be tested, since it provides the link between the first hypothesis and the second, as stated below.

The second hypothesis (H2) is whether UHS graduates who were taught by the professors trained under this project (the treatment group) provide a higher level of quality health services than those who were not taught by the professors trained under the project (the control group). A fair comparison requires that both groups of graduates have the same years of practicing experience. For this purpose, those two groups of doctors who are approaching the end of their 1st year health service practice in central and provincial hospitals will be compared.

[Figure 1] The Chain of Project Interventions and their Impacts



The third hypothesis (H3) is whether UHS graduates who were taught by the professors trained under this project provide a higher level of quality health services (the treatment group) than those doctors who were not taught by the professors trained under this project, but have a longer period of on-the-job training and experience (the comparison group). For this purpose, those doctors who are at the end of their 1st (the treatment group), 3rd, and 5th (or more) year (control group) health service practice in central and provincial hospitals will be tested. The purpose of this test (H3) is to compare the relative effectiveness of pre-service training provided by the professors trained under this project with that of on-the-job training or learning-by-doing provided by the central and provincial hospitals. The result of this test will help assess the desirability of continuing with the UHS-type of Dr. LEE Jong-Wook—Seoul projects in the future, or propose alternative project designs, especially a project placing more emphasis on the on-the-job training of practicing medical doctors, instead of pre-service training, for future medical doctors. The literature indicates that on-the-job training or experience is often more effective than or as effective as formal, pre-service education in explaining wage differentials of workers (Mincer 1961, Lee 1982).

Investment in on-the-job training of practicing doctors might be more efficient in Lao PDR since only about half of UHS graduates started working as government officials in the last 10 years, and the other half undertook jobs unrelated to their health education. Moreover, even the half of all graduates who started working as government officials, only 70% worked for health service, and the remaining 30% worked on jobs unrelated to health service. The wastage of UHS investment projects has been high, even while acknowledging that it may be lower compared to the on-the-job training of practicing doctors (Thongphachanh, Inpong et al 2010).

For the purpose of this third approach, some select indicators of intermediate outcomes will be collected. Three types of indicators are considered:

Type 1 -- Indicators that reflect the learning achievement of UHS professors being trained by the SNU; these indicators are to be developed and applied by the SNU College of Medicine on the basis of its standardized examination or interview battery at the beginning and end of the training period.

Type 2 -- Indicators reflecting the improvement in learning achievements of UHS students. One of these indicators is the gross point average (GPA) of grades 1-6. Other indicators are expected to be developed, based on the Korean Medical Education Assessment Consortium's standardized examination battery for those students who are in the middle of their six-year study program at UHS.

Type 3 -- Indicators reflecting the diagnosis and treatment performance of the practicing doctors, who graduated from UHS and are working in central and provincial hospitals; these indicators will be applied to those doctors who are near the end of 1st, 3rd, and 5th (or longer)-year of health service practices. For this purpose, this study will use the (Lao) Disease Treatment Committee (DTC) indicators.

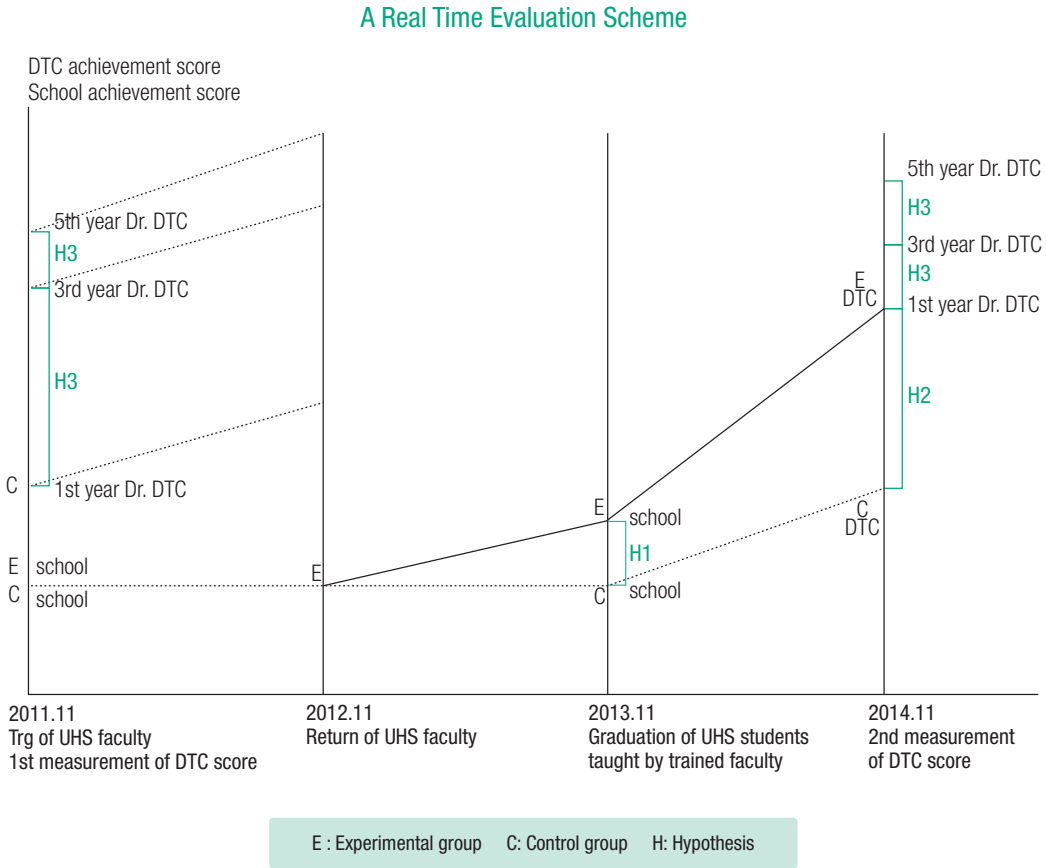
The DTC indicators were developed by the Ministry of Health with technical assistance provided by the Swedish government in 2002. They were formally instituted by the Lao Ministry of Health in all hospitals in 2006, after pre-implementation testing by some hospitals. Although the Ministry provided detailed technical guidelines (Ministry of

Health 2006), it has not enforced the system in all hospitals. It is left to each hospital as voluntary implementation. Moreover, the Ministry of Health has not collected the data from hospitals for compilation and analysis. Therefore, these DTC indicators have been collected systematically for the first time from all four central hospitals and 16 provincial hospitals under this evaluation study.

The DTC indicators are divided into two sets. One set is for the Standard Treatment Guidelines (STG), and the other for the Reasonable Use of Drugs (RUD) (Annexes I and II, respectively). For the purpose of this study, the DTC score is defined as a simple average of RUD and STG scores. The Ministry of Health Guidelines for the DTCs (2006) was provided for 25 important and frequent diseases in Lao PDR (Annex III). For this evaluation study, DTC data have been collected for the five most critical and often observed diseases chosen by each hospital. Each hospital is to establish a DTC to implement the guideline and collect the STG and RUD data on a monthly basis. A committee at each hospital is to analyze the data at the individual, department, and hospital levels. On the basis of the analysis, the Committee is to recommend that the Director of the hospital organize seminars, training courses, counseling for individuals and groups, and take other remedial actions. This evaluation study team consulted with several specialists in Lao PDR and Korea, especially faculty members of the SNU College of Medicine, for the adequacy of the DTC data to be used in this evaluation study. The judgment was that although they are not the best, they are reasonable indicators to measure the quality of medical doctors' health service practices.

A summary of the real time evaluation scheme, especially the third approach, is depicted in the following diagram [Figure 2].

[Figure 2] A Real Time Evaluation Scheme – The Third Approach



4. Progress in the First Two Approaches

Satisfactory progress has been made in each of the three methodological approaches. Since there was no in-depth appraisal document to justify the project, the evaluation team made efforts to improve its understanding of the background of the health sector project. It first undertook in-depth interviews with government officials and visited several health institutions at all three different levels: central, provincial, and district hospitals and

health centers. In addition, it randomly selected eight UHS students in two groups and four faculty members (two junior and two senior members) for interviews (The results are found in Annex 1 of Appendix).

On the basis of the interview results, the policy statements of the government of Lao PDR, and information on other donors' aid activities, the evaluation team proposed a restructuring of the current and programmed health projects financed by the government of Korea, including the Dr. LEE Jong-Wook—Seoul Project (Cho and Kim 2011). The objective and general direction of the restructuring is to increase the synergistic effects of the health projects financed by the Korean government, and to align them with the Lao government's emphasis on the construction of healthy villages based on the expansion and quality improvement of the primary health care network and personnel (Ministry of Health 2010, 2007, Perks et al 2006, World Bank 2010 and 2006). As a result of the restructuring proposal, the Children's Hospital provided by the Korea International Cooperation Agency (KOICA) started functioning as a teaching hospital in collaboration with the UHS, and some UHS faculty members trained under the Dr. LEE Jong-Wook—Seoul Project would be assigned to the hospital upon their return.

At the same time, KOICA's plans to follow up the Children's Hospital Project will include a component to provide in-service training for primary health care personnel working at the district hospitals and health centers, including those health centers to be strengthened under the Mother and Child Health Project, supported by the KOFIH and the WHO, World Bank, ADB, and the Government of Belgium. Therefore, the Dr. LEE Jong-Wook—Seoul Project also emphasized primary health care and other clinical specialties for the selection of the UHS faculty members to be trained in Seoul in November 2011. In 2010, UHS faculty members selected to be trained in SNUCM mostly majored in basic science. Also, the Dr. LEE Jong-Wook—Seoul Project would support the establishment of the Educational Development Center for Health Professionals (EDC/HP), established to strengthen the curriculum, teaching/learning materials, and teaching methods at UHS with finances from other donors in the future. Both the UHS-Dr. LEE Jong-Wook—Seoul Project and future projects would reinforce the improvement of educational quality at

UHS. As mentioned earlier, a fuller description of this proposal will be provided in a separate chapter.

5. Progress in the Third Approach

To pursue the third approach, a set of baseline data has been collected and analyzed. The Type 1 indicators (Achievement of the UHS faculty members being trained in Seoul) have been collected by the SNU College of Medicine staff between the beginning and end of the training program, as follows:

<Table 1> Achievement of Faculty Members Trained at SNUCM: 2010-2012

Assessment by Training Advisors		2010-2011 Training Program		2011-2012 Training Program	
		Beginning	End	Beginning	End
General Medical Knowledge*	Assessment of Knowledge	12.5%	14.3%	42.8%	57.1%
	Learning Achievement during the Program	37.5%	71.4%	71.4%	71.4%
Specialized Medical Knowledge*	Assessment of Knowledge	25.0%	14.3%	14%	14.3%
	Learning Achievement during the Program	75.0%	57.1%	71.4%	85.7%

*: Based on answers to questionnaires; % indicates the proportion of answers above 4 of the 5-point scale (Likert style) total answers.

Self-Assessment by Faculty Members Trained		2010-2011 Training Program		2011-2012 Training Program	
		Beginning	End	Beginning	End
General Medical Knowledge *	Assessment of Knowledge	62.5%	100.0%	14.3%	33.3%
	Learning Achievement during the Program	75.0%	100.0%	57.1%	66.6%
Specialized Medical Knowledge *	Assessment of Knowledge	12.5%	57.1%	0%	0%
	Learning Achievement during the Program	87.5%	100.0%	57.1%	83.3%

*: Based on answers to questionnaires; % indicates the proportion of answers above 4 of the 5-point scale (Likert style) total answers.
Source: SNUCM

Assessment was made separately by both training advisors and trainees based on answers to subjective questions. Since the assessment was not based on scientifically constructed objective medical questions, its validity is questionable. However, positive progress was indicated in each of the two training programs. More positive progress was indicated in the self-assessment of the trainees and in the specialized medical knowledge. Therefore, there are reasonable grounds to believe that the UHS faculty members trained through the project will make positive contributions to improving the academic achievement of UHS students in the future.

(1) Hypothesis 1 Test Data

For the test of Hypothesis 1 (that academic achievement of the UHS students taught by the UHS faculty members trained in Seoul under this project is greater than other students), the Type 2 data (academic achievements of the UHS students near graduation) were obtained and analyzed. Between May 2011 and January 2012, a group of the UHS students in fourth-sixth grades were tested with the academic performance test battery used for Korean medical students in the past. The May 2011 test was a pilot survey, and the January 2012 test was undertaken to establish the baseline, against which the impacts of the Dr. LEE Jong-Wook—Seoul project would be measured. This will be discussed in Chapter II.

The results will be used as the baseline for the control group to be compared with the scores of the UHS students who will be taught by the UHS faculty members trained in Seoul during 2010-2011 and 2011-2012 under the Dr. LEE Jong-Wook—Seoul Project (treatment group). The scores of the treatment group were collected in January 2013 and February 2014.

However, the 2013 scores of the treatment group will not be significantly different from the 2012 baseline data, and a set of the scores for the treatment group were collected in early 2014. The reason is that all UHS faculty members trained in 2010-2011 specialized in basic sciences, and therefore would not teach the UHS students in fourth-sixth grades. However, the UHS faculty members trained in 2011-2012 include clinical science

specialists who would be teaching UHS students in fourth-sixth grades when they return in late 2012. Therefore, their scores measured in early 2014 are more significant when compared with the control group (who were not taught by the UHS faculty members trained in Seoul under this project). The result of this analysis is discussed in Chapter II.

In addition to the sample survey data, a set of administrative data has been collected in 2013 for the test of the Hypothesis I. First, academic achievement (GPA) scores of all individual students enrolled in randomly selected courses, which were taught by the faculty members trained at SNUCM under the project fellowship component (treatment group), was compared with the GPA scores of all students enrolled in randomly selected courses, which were taught by the faculty members who were not trained at SNUCM (control group). However, the number of students who belong to the control group was too few to be satisfactory, since almost all selected courses were taught by a team of instructors, which included at least one faculty member who was awarded with the project fellowship. Second, the average scores of academic achievement (GPA) of all students enrolled in each course have been collected for all courses offered by UHS, except for language and social science courses. This administrative data enabled us to compare the average score of the courses taught by the project fellows (treatment group) and that of the courses taught by the non-project fellows (control group).

(2) Hypothesis 2 Test Data

For the test of the Hypothesis 2 (the quality of the health service practice as measured by DTC indicators) of the practicing doctors who graduated from UHS and taught by the UHS faculty members trained in Seoul under this project (treatment group) was better than other doctors of the same year or the previous years (control group). 2010 DTC data (June-December average) have been collected for two of four central hospitals, and 15 out of 16 provincial hospitals, a total of 17 selected hospitals out of a total of 20, in September 2011. Besides practicing doctors' DTC data, their academic achievement scores at UHS were also collected for a random sample of 16 doctors. These data will serve as a control group's baseline data. In addition, 2012 DTC data (January-June) was collected for 144 doctors (about 65% of the total number of doctors) from 17 of

19 provincial hospitals across 12 different disease groups. Among these 144 doctors, their academic scores at UHS could be retrieved for a random sample of 21 doctors. Therefore, the 2012 DTC data and academic scores of 21 doctors were combined with 2010 DTC data and academic scores of 16 doctors for analyses. Altogether, there are 37 doctors in the baseline dataset, of which 14 are first year practicing doctors, 8 are third year practice doctors, and 15 are fifth year practice doctors. Of the 37 doctors, 19 doctors work in central hospitals, and the rest work in provincial hospitals.

DTC data for the treatment group, who will graduate from UHS in 2013, is expected to be collected in late 2014. The 2011 and 2012 graduates were not taught by Seoul-trained UHS faculty members through this project. These faculty members, trained in 2010-2011, specialized in basic sciences, and therefore would teach only first to third year students in 2011 and 2012. Only UHS students graduating in late 2013 would be taught by some UHS faculty members specializing in clinical sciences and trained in Seoul under this project. Therefore, DTC data for the practicing doctors in 2010 and 2012 has been designated to serve as the control group data.

For the control group from 2010 and 2012, we have collected not only doctors' DTC data for the test of Hypothesis 2, but also retrieved their academic achievement scores (GPA) from UHS. These DTC and GPA data of the control group would serve a test of another useful corollary hypothesis: the academic achievement at UHS is a good indicator of the quality of the health service practices in hospitals after graduation. In other words, UHS graduates with higher academic achievement will provide a better quality health services in hospitals after graduation. If this hypothesis is rejected, the value of the pre-service training at the UHS has to be questioned. This corollary hypothesis test will provide a sound basis for the test of the Hypothesis 2, since it is based on two assumptions. First, the academic achievements of UHS students taught by the faculty members trained in Seoul under this project (treatment group) will be higher than UHS students who were not (control group). This assumption will be confirmed by the Hypothesis 1 test. Second, these students with a higher level of academic achievements will provide a higher quality of health services following graduation. We need to confirm this assumption with this corollary Hypothesis 2 test.

While the Hypothesis 1 can be tested during the three-year project implementation period, the corollary Hypothesis 2 cannot be. However, we can test the corollary Hypothesis 2 with the control group data. Once we obtain DTC data of individual practicing doctors, we can link them to their level of academic achievements (e.g. GPA) at UHS in the previous years and can test the positive relationship between the two sets of data, and confirm/deny corollary Hypothesis 2.

(3) Hypothesis 3 Test Data

To test Hypothesis 3 (the level of the health service quality of the practicing doctors taught by the UHS faculty members trained in Seoul is higher than that of other practicing doctors who have a longer period of experience but not taught by the UHS faculty members trained in Seoul), DTC data collected between 2011 and 2013 will serve as time series data for the control group. For the Hypothesis 3 test, the control group (third and fifth (or more)-year practicing doctors) data will be compared with 2014 DTC data for first year practicing doctors who graduated in 2013 and were taught by the UHS faculty members trained under this project in Seoul in 2010-2012.

The assumption behind the Hypothesis 3 test is that the level of health service quality of practicing doctors increases with on-the-job training or experiences (learning by doing). If the DTC scores of the third-year practicing doctors are higher than that of the first-year practicing doctors, the quality of health services must have improved by in-service (on-the-job) training of practicing doctors after graduation from UHS. On one hand, it can be hypothesized that the government's investment in practicing doctors could be more efficient than additional investment in the pre-service training of UHS students, provided that investment in the in-service training of UHS graduates is more effective than the same amount of additional investment in UHS pre-service training. On the other hand, it can be hypothesized that the government's additional investment in the pre-service training of UHS students (such as the Dr. LEE Jong-Wook—Seoul Project) is so efficient that the quality of health services provided by the new graduates from the UHS is higher than the health service quality of the more experienced practicing doctors who graduated from UHS before the additional investment was made under the Dr. Lee

Jong-Wook Project. The Hypothesis 3 test would confirm one of the two alternative hypotheses.

6. Analysis of 2010 DTC Data

During September 5-6, 2011, the 2010 (June-December average) DTC data of 17 hospitals (2 central and 15 provincial hospitals) were collected as baseline data for the control group. There were altogether 20 hospitals (4 central and 16 provincial hospitals) in Lao PDR. Although each hospital selected three to five important diseases, only few diseases are common to a majority of these hospitals. The most common disease is acute lung disease. Therefore, DTC data on acute lung diseases collected by 17 hospitals are presented below by region and poverty level.

(1) DTC Data on Acute Lung Disease by Hospital and Province

The average DTC score on acute lung disease of all hospitals is 7.97. The average DTC score for central hospitals is 8.25; however, the average DTC score of all 15 provincial hospitals is 7.93. The two averages are not different statistically. Therefore, the quality of health services offered by medical doctors does not seem to differ between central and provincial hospitals.

There is also a regional difference among provincial hospitals. The standard deviation of the DTC scores among provincial hospitals is 0.7. The average DTC score for the central region is 7.80, while the average for the northern region is 8.13, and the southern region is 7.72. However, these regional differences are not large enough to reject the null hypothesis that there is no difference between pairs of regions (i.e., Central vs. Northern; Central vs. Southern, and Northern vs. Southern regions) at the 10% level of significance.

The DTC scores are also negatively related to the poverty level among provinces. The higher the poverty level in the provinces, the lower the DTC score. The Pearson

correlation coefficient between the DTC scores of all hospitals and the poverty level of all provinces is -0.32. The coefficient between STG scores and the poverty index is -0.35. We can therefore conclude that the quality of health services offered by medical doctors is somewhat negatively correlated with the poverty level among provinces. The Lao government and the donor agencies already recognize the imbalances in the allocation of medical resources across regions as one of the major challenges (Ministry of Health 2007). This finding shows that regional imbalance also exists in the distribution of quality medical personnel across regions.

<Table 2> DTC Data on Acute Lung Disease by Region and Poverty Level: 2010

Region	Hospital	Acute Lung Disease			Poverty	Average by Region (Std.dev.)		
		DTC	STG	RUD	Level*	DTC	STG	RUD
Central Hospital	Mitthaphab					8.25 (0.35)	8.32 (0.04)	8.18 (0.63)
	Mother and Child	8.50	8.38	8.63	1.33			
	Setthatilath							
	Mahosot	8.00	8.26	7.73	1.33			
Central Provincial	Vientiane	8.25	8.00	8.50	1.73	7.80 (0.54)	7.73 (0.81)	7.87 (0.47)
	Khammouan	8.02	8.07	7.96	2.00			
	Savannakhet	7.90	8.30	7.50	1.38			
	Bolikhamxay	7.02	6.53	7.51	2.20			
Northern Provincial	Louangphrabang	8.70	9.30	8.10	1.78	8.13 (0.90)	8.25 (0.98)	8.01 (0.90)
	Xayabouly	8.05	8.25	7.85	1.67			
	Phongsaly	9.87	9.87	9.87	1.73			
	Louangnamtha	7.60	7.70	7.50	1.70			
	Bokeo	7.13	7.26	7.00	2.14			
	Houaphan	7.83	8.00	7.65	2.00			
	Xiengkhouang	7.75	7.40	8.10	2.43			
Southern Provincial	Salavan	7.75	7.40	8.10	1.36	7.72 (0.42)	7.63 (0.59)	7.89 (0.42)
	Champasak	8.29	8.30	8.27	2.17			
	Sekong**	7.30		7.30	2.00			
	Attapeu	7.55	7.20	7.90	1.86			

Region	Hospital	Acute Lung Disease			Poverty	Average by Region (Std.dev.)		
		DTC	STG	RUD	Level*	DTC	STG	RUD
Total	Average	7.97	8.01	7.97	1.84			
Central	Total	8.25	8.25	8.18	1.33			
Provincial	Total	7.93	7.97	7.94	1.88			

*Constructed as a ratio between the sum of the number of districts of extremely poor, poor, and non-poor to a total number of districts in each province. Poor and extremely poor are weighted by 2 and 3, respectively. Therefore, 1 represents that all districts are non-poor (Source: Committee for Planning and Investment (2006)).

**DTC data is only based on RUD data

(2) DTC Data and Experience of Practicing Doctors

Of the 17 hospitals that reported DTC data, only eight (three central and five provincial) hospitals provided DTC scores at the individual doctors' level. These eight hospitals show the DTC scores of individual doctors by years in practice, and therefore we can compare the DTC scores of doctors with different amounts of experience. However, since each hospital selected the most frequently observed and important five diseases prevalent among its population under its purview, the diseases selected for DTC scores are not exactly the same across all hospitals. Some overlap, but others do not. Therefore, we cannot compare the DTC score of doctors with different lengths of experience for all groups of diseases across hospitals. The overlapping groups of diseases are too few to compare for all doctors and across all hospitals.

To solve this dilemma, we carried out a hypothesis test of independent groups between the DTC score in the disease common among all hospitals (e.g. acute lung disease) and the DTC scores in all 26 diseases, for which some DTC scores were collected by each hospital. Luckily, the null hypothesis that the two groups of DTC scores are statistically equal was not rejected at the 10% significance level. Therefore, we have decided to analyze the DTC scores in all 26 diseases, for which only some DTC scores were collected by each hospital. We can compare the DTC scores of 40 doctors with different lengths of practice experience across 17 different hospitals and 26 disease groups. DTC scores were distributed by years of experience of doctors, as follows: 15

first-year doctors from eight hospitals, 11 third-year doctors from seven hospitals, and 14 fifth (or more) year doctors from five hospitals.

A preliminary analysis indicates that the DTC indices are positively correlated with the years of practice experience for the doctors. Doctors with more experience provide higher-quality health services. The mean DTC score of the first-year doctors is 7.72, while the mean DTC score of the third-year doctors is 7.88. The third-year doctors earned higher mean scores in both RUD and STG. The fifth (or more) -year doctors scored a higher mean DTC (in both RUD and STG) than first-year doctors. However, the mean DTC score of fifth-year doctors is equal (7.88) to that of third-year doctors (7.88). Fifth-year doctors scored higher in the STG than third-year doctors, but scored lower in the RUD.

However, the differences between the mean DTC scores of the first-year and third-year doctors, and between the first and fifth (or more) -year doctors are statistically insignificant at 5%. This means that the difference in the mean DTC scores among doctors with different practice years is statistically meaningless, and the scores are practically the same. It also means that doctors' clinical skills do not necessarily improve over their years of service and with their on-the-job training or experience.

Therefore, whether the doctors' quality of health care services increases with their years of service needs to be confirmed with a greater number of observations in disease types, hospitals, and doctors. If it is not confirmed, we should conclude that the difference in the quality of health services between doctors with different years of practice is insignificant. This means that the current in-service or on-the-job training programs are ineffective. For the future improvement of health service quality in Lao PDR, improving the quality of the academic programs at UHS could play a more important role than the current in-service training programs in hospitals, as long as a higher level of academic achievements leads to a higher quality of health services. This stresses the importance of verifying the linkage between the academic achievement at UHS and the quality of health services of the doctors upon graduation from UHS as part of testing Hypothesis 2.

<Table 3> DTC and Academic Score: 2010

Hospitals	Practice Score				Academic Score (GPA)			
	DTC*	RUD	STG	No. of Doctors	1-4th avrg	6th yr	1-6th avrg	No. of Doctors
1st year practice doctors								
Mother and Child	8.50	8.43	8.57	3	2.58	2.91	2.69	1
Setthatilath	8.55	8.47	8.63	3	2.96	3.33	3.03	2
Mahosot	7.46	7.24	7.68	1				
Luang Namtha	7.01	7.27	6.76	3	2.26	2.42	2.33	3
Houaphan	8.51	8.50	8.52	1				
Xien Khouang	6.65	6.87	6.43	2				
Champasak	7.75	8.05	7.45	1	2.28	3.13	2.41	1
Sekong	7.31	7.96	6.66	1	2.56	3.05	2.60	1
Average (Std. dev)	7.72 (0.74)	7.85 (0.64)	7.59 (0.91)	15	2.51 (0.37)	2.88 (0.48)	2.59 (0.39)	8
3rd year practice doctors								
Mother and Child	8.70	9.00	8.40	1				
Setthatilath	8.85	8.87	8.84	3	2.47	3.06	2.52	3
Mahosot	7.17	6.94	7.40	1				
Luang Namtha	7.62	7.87	7.37	2	2.63	2.86	2.44	2
Houaphan								
Xien Khouang	7.68	7.75	7.60	1				
Champasak	7.28	7.80	6.75	1				
Sekong	7.84	8.18	7.50	2	2.21	2.96	2.31	1
Average (Std. dev.)	7.88 (0.66)	8.06 (0.71)	7.69 (0.70)	11	2.48 (0.40)	2.98 (0.44)	2.46 (0.22)	6
5th year practice doctors								
Mother and Child								
Setthatilath	8.73	8.60	8.87	3	2.44	3.04	2.55	2
Mahosot	7.51	7.32	7.70	1				
Luang Namtha	7.71	7.81	7.60	7				
Houaphan								
Xien Khouang	7.98	8.15	7.80	1				

Hospitals	Practice Score				Academic Score (GPA)			
	DTC*	RUD	STG	No. of Doctors	1-4th avrg	6th yr	1-6th avrg	No. of Doctors
Champasak	7.49	7.76	7.22	2				
Sekong								
Average (Std. dev)	7.88 (0.51)	7.93 (0.48)	7.84 (0.62)	14	2.44 (0.55)	3.04 (0.44)	2.55 (0.54)	2

*DTC is a simple average of RUD and STG.

(3) Relationship between DTC and Academic Achievement Data

UHS uses three types of academic achievement scores. They are: grade point averages (GPA) of first-sixth years; the sixth year; and 1-4th years. Our hypothesis tests of independent groups between first-sixth years average scores and 1-4th years average scores confirms that we cannot reject the null hypothesis that they are the same group. In other words, first-sixth years average scores and 1-4th years average scores of the sample doctors are statistically the same (p=0.73). However, first-sixth years average scores and sixth-year scores are different statistically at the 1% significance level (p=0.0065). Also, 1-4th years average scores and - year scores are statistically different at the 1% level (p=0.0044). Therefore, we will examine the relationships between DTC and first-sixth years GPA first and between DTC and the sixth-year GPA later.

A. Using Academic Score: First-Sixth Years Average Score

The relationships between academic scores and practice scores will be analyzed by hospital location and the experience of practicing doctors.

i. DTC and Academic Scores in Central and Regional Hospitals

In 2012, we collected some additional information on doctors whose 2010 DCT scores were collected in 2011. Among the 40 doctors for whom DTC scores were collected, 16 doctors (about 8% of total doctors) were identified by their name and birth date. And

we have obtained their academic achievement scores at UHS. These 16 doctors were distributed to five hospitals (eight doctors in two central hospitals; eight doctors in three regional hospitals).

<Table 4> DTC and Academic Scores of Doctors in Central and Regional Hospitals: 2010

Category	Doctor ID	Academic score				Practice Score			
		1-6th average		6th average		DTC		RUD	STG
2 Central Hospitals	1	2.69	2.68 (0.36)	2.91	3.11 (0.39)	8.40	8.73 (0.23)	8.20	8.60
	2	2.71		2.94		8.45		8.40	8.50
	3	3.35		3.72		8.95		8.80	9.10
	4	2.62		2.97		9.00		9.10	8.90
	5	2.29		2.66		8.70		8.70	8.70
	6	2.65		3.56		8.85		8.80	8.90
	7	2.17		2.73		8.60		8.40	8.80
	8	2.93		3.35		8.90		8.70	9.10
3 Regional Hospitals	9	2.67	2.40 (0.24)	2.63	2.77 (0.43)	6.87	7.34 (0.31)	7.20	6.54
	10	2.06		2.09		7.10		7.10	7.10
	11	2.25		2.54		7.07		7.50	6.64
	12	2.70		2.37		7.57		7.54	7.60
	13	2.18		3.35		7.67		8.20	7.14
	14	2.41		3.13		7.75		8.05	7.45
	15	2.60		3.05		7.31		7.96	6.66
	16	2.31		2.96		7.40		7.70	7.10
Average		2.54		2.94		8.04		8.15	7.93

*Numbers in () are standard deviations.

Although an equal number of doctors were selected from central and regional hospitals, their average academic scores were different. Doctors working at the central hospitals had, on average, a higher achievement level (2.68) than those who were working for the regional hospitals (2.40). This difference is statistically significant at the 10% significance level (p=0.09).

Similarly, differences in the practice performance are observed between doctors in central and regional hospitals. The mean DTC score of the central hospital doctors was higher (8.73) than that of the regional hospital doctors (7.34). The differences in the practice scores between doctors in central and regional hospitals were also statistically significant at the 1% level (p-value=0.0000). Therefore, we can state that between doctors of central and regional hospitals, their DTC scores are positively correlated with their academic achievement scores. The difference in the DTC scores between central and regional hospitals may also be explained by factors other than the difference in academic achievement scores. Perhaps, the regional hospitals may not have as good in-service training programs as the central hospitals, or may have inferior equipment or facilities (e.g. laboratory). However, academic achievement score is nonetheless an important factor that explains the difference in the practice scores between doctors of central and regional hospitals.

ii. DTC Scores of Doctors with Higher and Lower Academic Scores

To verify the relationship between DTC and academic scores, we made another analysis. The 16 doctors, for whom academic scores were collected, were divided into two groups by academic score: those doctors with above the median academic scores (2.70), and those doctors with below the median academic scores, and then each group's average DTC scores were compared. First, each group's academic and DTC scores were statistically different from the other group's scores at the 1% level (p=0.003) and 10% level (p=0.064), respectively. Second, the higher achieving academic score group showed a higher average practice (DTC) score than the lower achieving academic score group. The higher achieving academic score group average was 3.00, compared with their counterpart group's average of 2.43. The average DTC score of the higher performing academic score group is 8.77, while it is 7.87 for the lower academic score group. Therefore, we can state that DTC and academic scores are positively correlated among all the doctors sampled.

The same positive relationship was observed between academic scores and STG scores. The two average STG scores of the two different average academic score

groups were not equal at the 10% significance level (p=0.0515). However, the relationship between academic scores and RUD scores was not positive. The two average RUD scores of the two different average academic score groups were statistically equal at the 10% significance level.

<Table 5> DTC and Academic Scores of Groups Divided by the Median Academic Scores: 2010

Academic scores	Group by Academic scores	Practice Scores					
1-6th avrg		DTC	DTC avrg	RUD	RUD avrg	STG	STG avrg
2.06	2.43 (0.23)	7.10	7.87 (0.74)	7.10	8.03 (0.62)	7.10	7.70 (0.94)
2.17		8.60		8.40		8.80	
2.18		7.67		8.20		7.14	
2.25		7.07		7.50		6.64	
2.29		8.70		8.70		8.70	
2.31		7.40		7.70		7.10	
2.41		7.75		8.05		7.45	
2.60		7.31		7.96		6.66	
2.62		9.00		9.10		8.90	
2.65		8.85		8.80		8.90	
2.67		6.87		7.20		6.54	
2.69		8.40		8.20		8.60	
2.70		7.57		7.54		7.60	
2.71	3.00 (0.32)	8.45	8.77 (0.28)	8.40	8.63 (0.21)	8.50	8.90 (0.35)
2.93		8.90		8.70		9.10	
3.35		8.95		8.80		9.10	

*Numbers in parentheses are standard deviations.

iii. Causal Relationship Between Academic and Practice Scores of All Doctors

To verify the seemingly positive relationship between academic scores and practice scores, we computed the Pearson correlation coefficient between the practice scores

(DTC) and the academic scores of all 16 doctors sampled. The result was 0.47, confirming a medium level correlation. Similarly, a medium level correlation was observed between academic achievement scores and STG at 0.47 (as well as RUD at 0.42).

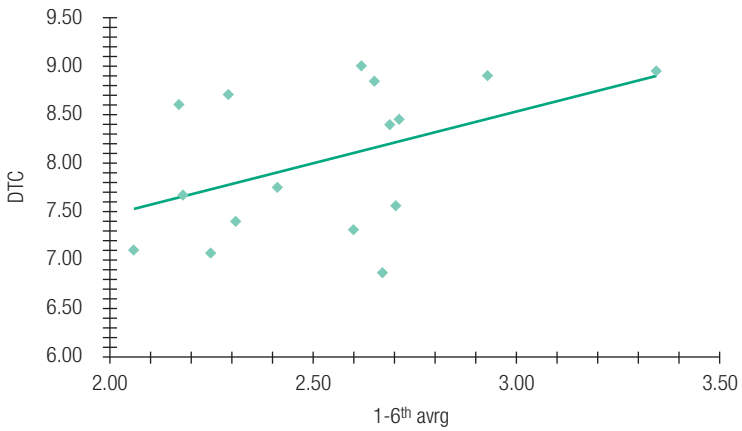
To check whether the variations in the practice scores (DTC) can be explained by the differences in academic achievement scores (GPA) of the 16 doctors (i), we ran a regression analysis between the two sets of scores.

$$DTC_i = a + b\ GPA_i + e_i \quad \cdots\cdots (1)$$

When we regressed the practice performance scores (DTC) on the academic achievement scores (first-sixth years GPA) of all 16 sample doctors, the estimated coefficient was 1.08, which was significant at the 10% level. The R square (coefficient of determination) was at 0.218 (Prob>F=0.068) ([Figure 3] and <Table 6>). A similar relationship is observed between STG and academic achievement scores with coefficient of 1.39 and R squared value of 0.22 at the 10% significance level, as well as with the RUD scores with coefficient of 0.77 and R squared value of 0.18, but not significant at the 10% level <Table 6>.

This is a good sign for our future test of the corollary Hypothesis 2, since the variations in the practice scores are explained by the differences in academic scores at a statistically significant level. When we collect the experimental group data in the future, we can expect that if UHS graduates who were taught by the faculty members trained at the SNUCM under the Dr. LEE Jong-Wook—Seoul Project have a higher level of academic achievement scores (Hypothesis test 1), they may also have a higher level of practice performance scores than other doctors who were not taught by the SNUCM trained faculty members (corollary Hypothesis 2), proving the effectiveness of the aid project.

[Figure 3] Relationship between DTC Data and Academic Scores of all Doctors: 2010



<Table 6> Regression Analysis of DTC and Academic Scores Among All Doctors: 2010

Dependent Variable	DTC		RUD		STG	
1-6 Years Score for all 16 Doctors	Coeff.	1.08*	Coeff.	0.77	Coeff.	1.39*
	t-value	1.98	t-value	1.74	t-value	1.99
Constant	5.3		6.18		4.41	
R-squared	0.22		0.18		0.22	
Adj. R-squared	0.16		0.12		0.16	
Prob > F	0.0683		0.1044		0.0665	

* Denotes significance at the 10% level.

iv. Relationship between DTC and Academic Scores of Doctors with the Same and Different Experience

The above analyses have been done for all 16 doctors with different years of practice experience as a group, and for whom academic achievement scores were collected. However, we have to do more analyses with different groups of doctors. First, we have to verify whether the same positive relationship exists between practice (DTC) scores and academic achievement scores even among doctors with the same period of practice

experience. In particular, we need to verify the relationship among doctors with first-year practice experience, since we will compare the experimental and control group doctors with the first-year practice experience for the Hypothesis 2 test. Second, we have to verify whether the same positive relationship between practice (DTC) scores and academic achievement scores exists between two groups of doctors with different years of practice experience. In the Hypothesis 3 test, we will compare the DTC scores of the experimental group doctors, who are in their first year practice and was taught by faculty members trained in the SNUCM under the aid project, with the doctors who are in their third (or fifth) year practice experience and were not taught by the faculty members trained under the aid project.

First, therefore, DTC scores of doctors with the first-year practice experience were compared with their academic achievement (first-sixth years) scores. And then the same analysis was done for the doctors with the third-year practice experience. We did not do the same analysis for the doctors with fifth (or more) year practice experience, since there were an insignificant number of observations <Table 7>.

<Table 7> Average DTC and Academic Scores of Doctors with Same Experience: 2010

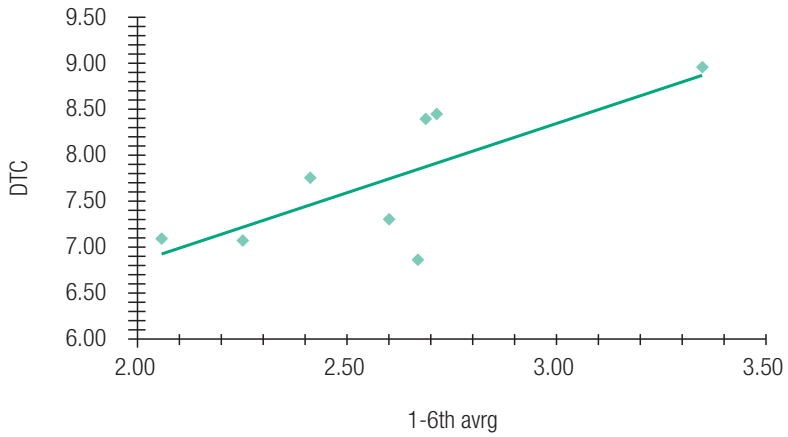
Category by experience	Academic score		DTC score	
	1-6 avrg	Average (std.dev.)	DTC	Average (std.dev.)
1st Year Doctors	2.69	2.59 (0.38)	8.40	7.74 (0.77)
	2.71		8.45	
	3.35		8.95	
	2.67		6.87	
	2.06		7.10	
	2.25		7.07	
	2.41		7.75	
	2.60		7.31	

Category by experience	Academic score		DTC score	
	1-6 avrg	Average (std.dev.)	DTC	Average (std.dev.)
3rd Year Doctors	2.62	2.46 (0.22)	9.00	8.20 (0.73)
	2.29		8.70	
	2.65		8.85	
	2.70		7.57	
	2.18		7.67	
	2.31		7.40	
5th Year Doctors	2.17	2.55 (0.54)	8.60	8.75 (0.21)
	2.93		8.90	

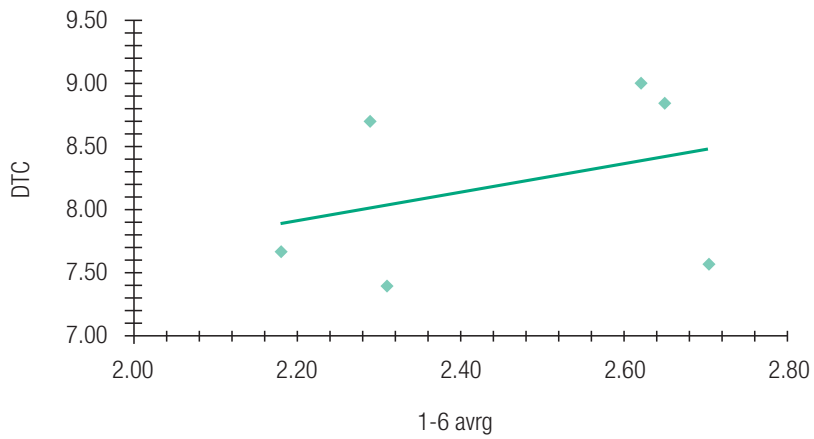
Among the first year practice doctors, there was a strong positive relationship between academic achievement and practice performance scores. The Pearson correlation coefficient was 0.75. Similarly, a strong correlation coefficient was observed between academic scores and STG at 0.68 (and RUD at 0.78). This level of correlation is much higher than among all doctors with different years of practice experience, as shown earlier (0.47, 0.47, and 0.42, respectively).

Regression analyses of the scores for the first year practice doctors also confirmed that variations in practice performance scores (DTC, RUD, and STG) were explained by the differences in academic achievement scores at the statistically significance levels of 5% or 10%. The R square was also high at around 0.5 with Prob.>F between 0.02 and 0.06 ([Figure 4] and <Table 8>). Again, this degree of positive correlation among doctors in the first year of practice is much higher than among all doctors with different years of practice experience. However, this positive relationship was not observed among third year practice doctors ([Figure 5] and <Table 8>). Perhaps there were too few number of observations.

[Figure 4] Relationship between DTC and Academic Score among 1st- year Doctors: 2010



[Figure 5] Relationship between DTC and Academic Scores among 3rd- year Doctors: 2010



<Table 8> Regression Analysis of DTC and Academic Scores of First and Third-Year Doctors: 2010

Dependent Variable	DTC		RUD		STG	
1-6th Years Score for Eight 1st –year Doctors	Coeff.	1.51**	Coeff.	1.21**	Coeff.	1.81*
	t-value	2.76	t-value	3.08	t-value	2.29
Constant	3.83		4.77		2.89	
R-squared	0.56		0.61		0.47	
Adj. R-squared	0.49		0.55		0.38	
Prob > F	0.0328		0.0217		0.0621	
1-6th Years Score for Six 3rd -Year Doctors	Coeff.	1.14	Coeff.	0.37	Coeff.	1.91
	t-value	0.75	t-value	0.26	t-value	1.12
Constant	5.40		7.44		3.36	
R-squared	0.12		0.02		0.24	
Adj. R-squared	-0.10		-0.23		0.05	
Prob > F	0.4958		0.8071		0.3243	

*and** denotes significance at the 10% and 5% level, respectively.

Second, to explain the variations in DTC scores properly, besides variations in first-sixth years academic scores, variations in the number of practice years and the practice province (central or provincial hospitals) should be considered. When DTC scores were regressed against multiple regressors (i.e., practice province and first-sixth years academic scores) among the first year doctors, the coefficient of the provinces is significant at the 5% significance level. However, the coefficient of the first-sixth years academic scores is insignificant even at the 10% level, as shown below <Table 8-A>. Similar results are obtained with the third year practice doctors <Table 8-B>. The peculiar situation of different locations between the capital and provincial hospitals, such as poverty, patients' education level, hospital facilities, and laboratory equipment, may have stronger effects on the DTC scores than the first-sixth academic scores.

<Table 8-A> Regression Analysis of DTC and Academic Scores of Eight First-Year Doctors: 2010

		DTC	RUD	STG
Province	coeff.	1.17**	0.54	1.79***
	Std. error	0.34	0.37	0.41
	P-value	0.018	0.206	0.007
GPA 1-6th	coeff.	0.41	0.70	0.13
	Std. error	0.45	0.50	0.55
	P-value	0.402	0.224	0.823
Constant	coeff.	6.23***	5.89***	6.57***
	Std. error	1.09	1.22	1.32
	P-value	0.002	0.005	0.004
Number of obs.		8	8	8
Prob > F		0.006	0.039	0.004
R-squared		0.87	0.73	0.89

****and ** denote statistical significance at the 1 and 5% level, respectively.

<Table 8-B> Regression Analysis of DTC and Academic Scores of Third-Year Doctors: 2010

		DTC	RUD	STG
Province	coeff.	1.28***	1.11**	1.45***
	Std. error	0.14	0.26	0.08
	P-value	0.002	0.024	0.000
GPA 1-6th	coeff.	0.19	-0.46	0.84**
	Std. error	0.33	0.64	0.19
	P-value	0.609	0.524	0.02
Constant	coeff.	7.10***	8.91***	5.28***
	Std. error	0.80	1.54	0.45
	P-value	0.003	0.01	0.001
Number of obs.		6	6	6
Prob > F		0.0047	0.0517	0.0005
R-squared		0.97	0.86	0.99

***, **, * denotes statistical significance at the 1%, 5%, and 10% level, respectively.

Third, when DTC scores are regressed against multiple factors among all doctors with different years of practice experience (EXP) and different practice locations (PROVINCE), the first-sixth years academic scores did not explain variations in DTC scores at even the 10% significance level.

$$DTC_i + a + b\ GPA_i + c\ EXP_i + d\ PROV_i + e_i \cdots\cdots (2)$$

Most of the variations in DTC scores are explained by variations in the practice experience and province (central or provincial hospitals) at the 10% and 1% significance levels, respectively <Table 8-C>. This result is obtained partly because a substantial part of the variations in DTC is explained by variations in practice experience and province, and partly because there was no systematic relationship between academic and DTC scores across the groups of doctors with different experience. There was no statistical difference in average academic achievement scores between two groups of doctors with first and third-year (and fifth-year) practice experience. Academic achievement scores of doctors with same years of practice experience were as follows: 2.59 for first-year doctors; 2.46 for third-year doctors; and 2.55 for fifth (or more) year doctors. These scores were not different statistically at the 10% significance level (p-value=0.4674). Likewise, there was no statistical difference in practice scores between the two groups of doctors with the first and third year practice experience. Their average DTC scores were: 7.74 for first-year doctors; 8.20 for third-year doctors; and 8.75 for fifth (or more) year doctors. However, these DTC scores are not different statistically at the 10% significance level (p-value=0.2803) <Table 9>. Therefore, the academic scores and the practice scores of the first-year and third-year practice doctors are not positively correlated. It is interesting to note that the variations in DTCs are explained by the variations in academic scores at the significant level <Table 8-C>, even when the two scores of the first and third-year doctors are not systematically correlated.

<Table 8-C> Regression Analysis of DTC and Academic Scores of All Doctors: 2010

		DTC	RUD	STG
Experience	coeff.	0.099*	0.078	0.122*
	Std. error	0.05	0.07	0.06
	P-value	0.078	0.304	0.056
Province	coeff.	1.201***	0.84***	1.567***
	Std. error	0.16	0.22	0.18
	P-value	0.000	0.003	0.000
GPA 1-6th	coeff.	0.314	0.244	0.382
	Std. error	0.23	0.33	0.26
	P-value	0.205	0.468	0.169
Constant	coeff.	6.416***	6.934***	5.896***
	Std. error	0.60	0.84	0.68
	P-value	0.000	0.000	0.000
Number of obs.		16	16	16
Prob > F		0.0000	0.0011	0.0000
R-squared		0.911	0.727	0.932

*** and * denote statistical significance at the 1% and 10% level, respectively.

A further analysis has been made to compare half of the first-year doctors with higher academic achievement scores and half of the third-year doctors with lower academic achievement scores. We find that the above average academic score of first-year doctors (2.85) is higher than the below average academic score of third-year doctors (2.26), which are statistically different at the 10% significance level (p=0.0298). We also find that the DTC score of the higher academic achievement group of first-year doctors (8.17) is higher than that of the lower academic achievement group of third-year doctors (7.92). However, we cannot reject the hypothesis that the average DTC score of the above average academic score group of first-year doctors (8.17) is statistically equal with the DTC score of the below average academic score group of third-year doctors (7.92) at the 10% significance level <Table 9>.

From this we can infer that even if the experimental group of the first-year practice doctors, who will be taught by the faculty members trained at the SNUCM under the aid project, improves their academic achievement scores to a level as high as the average first-year doctors of the 2010 sample, their DTC scores would not be higher than the DTC scores of the below average academic score group of the third-year practice doctors of the 2010 sample, who were not taught by the SNUCM trained faculty members. That is, Hypothesis 3 is rejected. However, it remains to be seen whether the experimental group of the first year doctors improves their academic achievement scores to a sufficiently high level. Then their DTC scores could be higher than that of the below average third-year practice doctors in 2010. This is exactly the purpose of the Hypothesis 3 test, and we can check the effectiveness of the aid project, depending on the results of the Hypothesis 3 test.

<Table 9> DTC and Academic Achievement Scores between First and Third-Year Doctors: 2010

Cumulative No. of Obs.	1st Year Doctors				3rd Year Doctors			
	Academic score		DTC score		Academic score		DTC score	
	1-6th avrg	Average	DTC	Average	1-6th avrg	Average	DTC	Average
2	3.35	2.85	8.95	8.17	2.70	2.66	7.57	8.47
4	2.71		8.45		2.65		8.85	
6	2.69		8.40		2.62		9.00	
7	2.67		6.87					
9	2.60	2.33	7.31	7.31	2.31	2.26	7.40	7.92
11	2.41		7.75		2.29		8.70	
13	2.25		7.07		2.18		7.67	
14	2.06		7.10					
Average		2.59		7.74		2.46		8.20

A caveat should be added to the above analyses and inferences. Since the number of observations is too few to make any definitive conclusions, the interpretations made in the preceding sections should be treated as tentative and provisional.

B. Using Academic Score: Sixth-Year Average Score

The above analysis of the positive relationship between practice (DTC) score and academic achievement (GPA) score was done on the basis of the first-sixth years average academic achievement scores. However, as we have seen earlier, the first-sixth years average academic scores are statistically different from the sixth-year academic achievement scores. Therefore, we have performed the same analyses of the relationship between practice (DTC) scores and academic achievement scores, as we have done above, on the basis of the sixth-year GPA scores.

i. DTC Data and Academic Scores in Central and Regional Hospitals

Doctors in central hospitals show higher academic and practice scores than the doctors in regional hospitals <Table 3>. On one hand, the average academic score of central hospital doctors (3.10) is higher than that of regional hospital doctors (2.76). However, statistically this difference is not significant at the 10% level (p-value=0.1195). On the other hand, the average DTC score of the central hospital doctors (8.73) is higher than that of the regional hospital doctors (7.34). This difference is significant at the 1% level (p-value=0.0000). Other measures of the practice scores (RUD and STG) also show a similar difference level. Therefore, we cannot state that the difference in practice scores between central and regional hospital doctors can be attributable to the difference in their academic scores. This phenomenon is different from the situation when we measured the academic achievement of doctors by the first-sixth years average GPA. The difference comes entirely from the fact that the average academic achievement scores of the doctors between the central and regional hospitals are not different at the statistically significant level when they are measured by the sixth year, instead of first-sixth years, academic score. In terms of the sixth-year academic score, the doctors of central and regional hospitals are homogeneous. Therefore, the difference in doctors' practice performance score between the central and regional hospitals can be explained by doctors' first-sixth year academic achievement scores, not by sixth-year academic scores. Perhaps, when the central hospitals hire doctors, they pay more attention to the first-sixth years academic achievement scores than the 6th year academic scores.

ii. DTC Data of Doctors with Higher and Lower Academic Scores

The 16 sample doctors were divided into two groups by the median 6-year academic achievement scores, and then their average DTC (RUD and STG also) scores were compared with their average academic scores. The average academic scores of the above and below the median score groups were 3.26 and 2.61, respectively. Their DTC scores were 8.23 and 7.85, respectively. First, we find the average academic scores of the two groups are statistically different at the 1% significance level (p=0.0004). Second, however, the average DTC scores of the two groups are not statistically different at the 10% significance level (p-value=0.3324). Likewise, the STG scores of the two groups are not statistically different, either (p-value=0.6382). Therefore, although we find a seemingly positive relationship between the DTC (or STG) and academic scores of the above median and below median academic score groups, the positive relationship is not statistically significant at the 10% level. This finding is different from the one obtained by using the first-sixth years average academic achievement scores. When first-sixth years academic scores were used, there was a positive relationship between practice scores (DTC or STG) and academic scores.

However, the difference in RUD scores of the two groups is statistically significant at the 10% level (p=0.077), and there are positive relationships between the practice scores (RUD scores in this case) and the sixth-year academic scores of the two doctors' groups divided by the median academic scores. There seems to be a close relationship between RUD practice scores and sixth-year academic scores, while there appears to be a close relationship between DTC (or STG) practice scores and first-sixth years academic scores.

<Table 10> DTC and Sixth-Year Academic Scores of Groups Divided by the Median Academic Scores: 2010

Academic score 6th yr	Group by Academic scores	Practice Scores					
		DTC	DTC Avrg	RUD	RUD Avrg	STG	STG Avrg
2.09	2.61 (0.28)	7.10	7.85 (0.77)	7.10	7.88 (0.61)	7.10	7.81 (0.96)
2.37		7.57		7.54		7.60	
2.54		7.07		7.50		6.64	
2.63		6.87		7.20		6.54	
2.66		8.70		8.70		8.70	
2.73		8.60		8.40		8.80	
2.91		8.40		8.20		8.60	
2.94		8.45		8.40		8.50	
2.96	3.26 (0.28)	7.40	8.23 (0.76)	7.70	8.41 (0.50)	7.10	8.04 (1.05)
2.97		9.00		9.10		8.90	
3.05		7.31		7.96		6.66	
3.13		7.75		8.05		7.45	
3.35		8.90		8.70		9.10	
3.35		7.67		8.20		7.14	
3.56		8.85		8.80		8.90	
3.72		8.95		8.80		9.10	

* Numbers in parentheses are standard deviations.

iii. Causal Relationship Between DTC Data and Sixth-Year Academic Scores Among All Doctors

To verify the seemingly positive relationship between DTC scores and sixth-year academic scores of all 16 doctors, the Pearson correlation coefficient was computed. It was strong at 0.56, which is higher than the 0.47 score observed earlier with the first-sixth years academic scores. A much stronger relationship is observed between other measures (RUD) of the practice scores and the sixth-year academic scores with the Pearson correlation coefficient at 0.69. When the STG scores are used, the correlation coefficient is weaker at 0.45, as when the first-sixth years academic scores were used.

The regression analysis also shows variations in DTC scores are explained by differences in sixth-year academic scores to a significant extent. The coefficient is 1.0 and is significant at the 5% level, with the R squared value of 0.32 (prob.>F=0.023). Similar results are observed with RUD and STG scores as dependent variables (<Table 10>). These results are similar to the ones obtained earlier by using the first-sixth years academic scores. The relationships seem to be a bit stronger in the case of RUD scores. We may therefore interpret that the relationship between academic scores and practice scores gets stronger when sixth-year academic scores and RUD scores are used. In other words, sixth-year academic scores may influence practice scores, especially the RUD scores, more than first-sixth academic scores.

<Table 11> Regression Analysis of DTC and 6th Year Academic Scores Among All Doctors: 2010

Dependent Variable	DTC		RUD		STG	
6th Year Score for all 16 Doctors	Coeff.	1.00**	Coeff.	0.97***	Coeff.	1.02*
	t-value	2.56	t-value	3.58	t-value	1.91
Constant	5.11		5.3		4.92	
R-squared	0.32		0.48		0.21	
Adj. R-squared	0.27		0.44		0.15	
Prob > F	0.0229		0.003		0.0775	

*, **, and *** denotes 1%, 5%, and 10% significance level, respectively.

iv. Relationship Between DTC Data and Sixth-Year Academic Scores of Doctors with the Same and Different Experience

The positive relationship between practice scores (DTC, RUD, and STG) and sixth-year academic scores were based on the data for all 16 doctors with different periods of practice experience. We need to verify whether this positive relationship exists among doctors with the same years of experience, and between groups of doctors with different years of experience.

First, we find that the practice scores and sixth-year academic scores of doctors in their first year practice were closely correlated. The Pearson correlation coefficient between DTC and sixth-year academic scores is 0.75, which is the same as the case when first-sixth year average scores are used. A similar situation is found with STG scores with the coefficient at 0.62 (compared with 0.68 when first-sixth year academic scores were used). However, the Pearson correlation coefficient between RUD and sixth-year academic scores is 0.90, which shows a much stronger correlation than the case when first-sixth year average scores were used (0.78). However, a similarly close correlation does not appear between practice and sixth-year academic score among doctors in their third year practice, as in the case with the first-sixth year academic scores.

The regression analyses also show that the variations in practice scores are explained by the differences in sixth-year academic scores among first-year doctors to a much more significant extent than to all 16 doctors as a group. Higher are regression coefficients, the R squared value, and the level of significance. These findings are similar to those observed when first-sixth year academic scores were used. An important difference is that the degree of positive correlation between practice scores and academic scores gets higher with sixth-year academic scores than with the first-sixth year scores. However, no significant relationship was observed between practice and academic scores among doctors in their third year.

<Table 12> Regression Analysis of DTC and Sixth-Year Academic Scores between First and Third-Year Doctors: 2010

Dependent Variable	DTC		RUD		STG	
6th Year Score for eight 1st –year Doctors	Coeff.	1.22*	Coeff.	1.11***	Coeff.	1.33*
	t-value	2.82	t-value	5.00	t-value	1.96
Constant	4.22		4.70		3.75	
R-squared	0.57		0.81		0.39	
Adj. R-squared	0.50		0.77		0.29	
Prob > F	0.0305		0.0025		0.0975	

Dependent Variable	DTC		RUD		STG	
6th Year Score for six 3rd -Year Doctors	Coeff.	0.44	Coeff.	0.63	Coeff.	0.25
	t	0.54	t	0.96	t	0.25
Constant	6.90		6.48		7.32	
R-squared	0.07		0.19		0.02	
Adj. R-squared	-0.16		-0.02		-0.23	
Prob > F	0.6165		0.3924		0.8165	

*, **, and *** denote 1%, 5%, and 10% significance level, respectively.

Second, to explain the variations in DTC scores properly, besides variations in sixth-year academic scores, variations in the number of practice years and the practice province (central or provincial hospitals) should also be considered. When DTC scores were regressed against multiple regressors (i.e., practice province and sixth-year academic scores) among the first year doctors, the coefficient of provinces is significant at the 1% significance level. Moreover, the coefficient of sixth-year academic scores is also significant even at the 5% level, as shown below <Table 12-A>. Among third-year doctors, the coefficient of provinces is also significant at the 1% level, but the coefficient of sixth-year academic scores is insignificant even at the 10% level <Table 12-B>.

<Table 12-A> Regression Analysis of DTC and Academic Scores of 8 First-Year Doctors: 2010

		DTC	RUD	STG
Province	coeff.	1.09***	0.49**	1.684***
	Std. error	0.19	0.16	0.32
	p-value	0.002	0.025	0.003
GPA 6th	coeff.	0.58**	0.83***	0.341
	Std. error	0.21	0.17	0.34
	p-value	0.039	0.004	0.367
Constant	coeff.	5.65***	5.341***	5.961***
	Std. error	0.57	0.46	0.94
	p-value	0.000	0.000	0.001

	DTC	RUD	STG
Number of obs.	8	8	8
Prob > F	0.0008	0.0011	0.0026
R-squared	0.941	0.935	0.9077

*, **, and *** denote the 1%, 5%, and 10% significance level, respectively.

<Table 12-B> Regression Analysis of DTC and Academic Scores of Third-Year Doctors: 2010

		DTC	RUD	STG
Province	coeff.	1.288***	0.992**	1.58***
	Std. error	0.13	0.22	1.88
	p-value	0.002	0.02	0.004
GPA 6th	coeff.	0.089	0.36	-0.1798
	Std. error	0.17	0.28	0.24
	p-value	0.628	0.285	0.502
Constant	coeff.	7.29***	6.776***	7.8***
	Std. error	0.49	0.81	0.70
	p-value	0.001	0.004	0.002
Number of obs.		6	6	6
Prob > F		0.0048	0.0337	0.008
R-squared		0.9715	0.8957	0.9601

*, **, and *** denote the 1%, 5%, and 10% significance level, respectively.

Third, when DTC scores are regressed against multiple factors among all doctors with different years of practice experience and different practice locations, the sixth-year academic scores did explain variations in DTC scores at even the 5% significance level. The coefficient of practice province and experience was statistically significant at the 1% and 10% levels, respectively <Table 12-C>. This result is obtained partly because a substantial part of the DTC variations can be explained by variations in practice experience and province, and partly because the academic score can also explain the variations in DTC scores across the groups of doctors with different levels of experience. This result is different when first-sixth year academic scores were used in the regression

analysis and holds true, despite the fact that no systematic relationship was found between academic and DTC scores between first-year and third-year practice doctors. Likewise, there was no statistically significant difference for academic achievement scores, or for practice scores between the two groups of doctors. The average academic achievement scores of doctors with the same years of experience were as follows: 2.88 for the first-year doctors; 2.98 for the third-year doctors. Although academic and practice scores are higher among doctors in their third-year of practice than among doctors in their first-year, these scores were not statistically different at the 10% significance level (p-value=0.6866) <Table 13>. The same findings were confirmed with first-sixth year academic scores. Likewise, the average practice (DTC) scores for doctors with the same years of practice experience were as follows: 7.74 for first-year doctors; and 8.20 for third-year doctors. However, these two average practice scores were not statistically different at the 10% significance level (p-value= 0.2803) <Table 13>.

<Table 12-C> Regression Analysis of DTC and Academic Scores of All Doctors: 2010

		DTC	RUD	STG
Experience	coeff.	0.077*	0.060	0.095
	Std. error	0.04	0.05	0.06
	P-value	0.083	0.24	0.125
Province	coeff.	1.179	0.72	1.639
	Std. error	0.12***	0.15***	0.17***
	P-value	0.000	0.000	0.000
GPA 6th	coeff.	0.388**	0.592***	0.1837
	Std. error	0.14	0.16	0.19
	P-vale	0.016	0.004	0.364
Constant	coeff.	6.134***	5.913***	6.355***
	Std. error	0.40	0.47	0.56
	P-value	0.000	0.000	0.000
Number of obs.		16	16	16
Prob > F		0.000	0.000	0.000
R-squared		0.932	0.863	0.9254

Further analyses were conducted to check any relationships existed between practice and academic scores across the groups of doctors with the first and third-year practice experience. Each group of doctors was divided into two subgroups by the median sixth-year academic score. Then the average academic score of the above median academic score group doctors in their first-year (3.21) is compared with the average academic score of the below median academic score group doctors in their third-year (2.66). Likewise, their DTC scores are compared between the above the median academic score group of doctors in their first-year practice, and those with below median academic score group doctors in their third-year of practice (8.12 and 7.89, respectively) <Table 13>. The above median doctors in their first-year practice appears to have achieved both higher average academic and practice scores than the below median doctors in their third-year practice. It seems to be that the two scores of the two groups are positively correlated and the differences in DTC scores can be explained by the variations in the academic scores of the two groups with different years of practice experience. The average academic scores of the two groups are statistically different at the 10% level (p=0.082) <Table 13>. However, DTC scores of the two groups are not statistically different at the 10% significance level (p=0.6992). Therefore, we cannot state that the academic and practice scores of the two-group doctors are positively correlated. This is also the same finding that was confirmed with the first-sixth year academic achievement scores. Therefore, the experimental group of doctors, who will be taught by UHS faculty members trained at the SNUCM under the aid project, will have to improve their academic scores substantially higher in order to exceed the practice performance score (DTC) of the below average academic achievement group of third-year practice doctors in 2010.

<Table 13> DTC Data and Sixth-Year Academic Scores between First and Third-Year Doctors: 2010

No. of Obs.	1st Year Doctors				3rd Year Doctors			
	Academic score		DTC Score		Academic score		DTC Score	
	6th yr	Average	DTC	Average	6th yr	Average	DTC	Average
1	3.72	3.21	8.95	8.12	3.56	3.29	8.85	8.51
2	3.13		7.75		3.35		7.67	
3	3.05		7.31		2.97		9.00	
4	2.94		8.45					
5	2.91	2.54	8.40	7.36	2.96	2.66	7.40	7.89
6	2.63		6.87		2.66		8.70	
7	2.54		7.07		2.37		7.57	
8	2.09		7.10					
Average		2.88		7.74		2.98		8.20

7. Analysis of 2010 and 2012 Pooled Data

In 2012, DTC data (January-June) was collected for 144 doctors (about 65% of the total number of doctors) from 17 of 19 provincial hospitals across 12 different disease groups. Among those 144 doctors, their academic scores at UHS could be retrieved for a random sample of 21 doctors. Therefore, the 2012 DTC data and academic scores of 21 doctors were combined with the 2010 DTC data and academic scores of 16 doctors for analyses. Altogether, there are 37 doctors in the baseline dataset, of which 14 are first-year practicing doctors, eight are third-year practice doctors, and 15 are fifth-year practice doctors. Of the 37 doctors, 19 doctors work in central hospitals, and the rest in provincial hospitals.

(1) DTC Data by Hospital and Region

<Table 14> A Descriptive Statistics for DTC Data: 2010 and 2012 Pooled

	Average DTC	Average RID	Average STG
Observations	144	144	144
Mean	7.7968	7.9772	7.6166
sample variance	0.3804	0.3253	0.7102
sample standard deviation	0.6167	0.5703	0.8427
Minimum	6.04	6	5.07
Maximum	9	9.1	9.1
Range	2.96	3.1	4.03
1st quartile	7.3950	7.5875	7.1000
Median	7.7300	8.0000	7.5900
3rd quartile	8.1225	8.3000	8.2500
interquartile range		0.7125	1.1500
	9.0000	8.0000	8.0000

<Table 15> DTC and Academic Achievement Data: 2010 and 2012 Pooled Data

Region	Provincial Hospitals	1st Year Doctors		3rd Year Doctors		5th Year Doctors		DTC Average	Academic Score	Poverty Index
		DTC	No. of Docs	DTC	No. of Docs	DTC	No. of Docs		No. of Docs	
Central Hospitals	Mahosot	8.00	16	8.26	11	8.32	24	8.35	2.92 (19)	1.33
	Mittapab									
	Mother & Child									
	Setthatilath									
Central Region	Bolikhamxay	7.80	8	7.66	6	7.41	11	7.49	2.79 (6)	1.83
	Khammoune									
	Odomxay									
	Savannakhet									
	Vientiane									

Region	Provincial Hospitals	1st Year Doctors		3rd Year Doctors		5th Year Doctors		DTC Average	Academic Score	Poverty Index
		DTC	No. of Docs	DTC	No. of Docs	DTC	No. of Docs		No. of Docs	
Northern Region	Houaphan	7.29	15	7.44	12	7.52	16	7.47	2.62 (8)	1.95
	Luangnamtha									
	Luangprabang									
	Xayabouly									
	Xienkhoung									
	Bokeo									
Southern Region	Attapeu	7.56	7	7.53	8	7.52	10	7.55	3.01 (4)	1.85
	Champasak									
	Salavan									
	Sekong									
Average		7.69	46	7.85	37	7.85	61	7.80	2.84(37)	1.92
Std. dev		0.57		0.59		0.66		0.62	0.40	0.29

(2) DTC Scores by Hospitals

The average DTC score of all doctors is 7.80 out of the possible maximum score of 10.0. The clinical performance of practicing doctors seems to be better at central hospitals than in provincial hospitals. The average DTC for central hospitals is 8.34, compared with 7.49 for provincial hospitals. These two average DTCs are statistically different at the 1% significance level (p-value=2.80E-08) <Table 15>. A similar difference in RUD and STG is observed between central and provincial hospitals at the same level of significance. Therefore, the quality of health services in central hospitals must be better than provincial hospitals.

Among provincial hospitals, there is no statistically significant difference in DTC scores across regions. The only exception is between Northern and Southern Regions at the 1% significance level (7.47 and 7.55, respectively). The average DTC score for the provincial hospitals in Central Region is 7.49 <Table 15>.

At the same time, DTC scores and poverty level for each region are inversely correlated to a considerable extent. The Pearson correlation coefficient is -0.47. This inverse relationship suggests that doctors' clinical performance may be improved, as the poverty index declines.

The negative relationship between DTC scores and poverty index across regions is getting stronger as doctors accumulate practical experience. The correlation coefficient between the poverty index and the DTC scores of first-year practice doctors is -0.84; however, it becomes -0.99 for third-year doctors, and -0.95 for fifth-year practice doctors. This suggests that as the practice experience accumulates, doctors' clinical performance level gets entrenched in impoverished regions.

Although it appears that the clinical performance (DTC) scores is positively correlated with the length of practice experience (7.69 for the first-year doctors; 7.85 for the third and fifth-year doctors), we cannot reject a null hypothesis that there are no differences among the average DTCs for different groups of doctors at the one percent significance level. Therefore, we can conclude that DTC scores may not be improved by increasing the length of practice experience for doctors in public hospitals.

(3) Academic Achievement Scores by Hospitals

The average sixth-year academic achievement score at UHS for the sample of 37 doctors is 2.84. Unlike the case for the DTC score, the difference in the average academic scores between doctors practicing in central hospitals and provincial hospitals is not conspicuous. The average academic score of doctors in Southern Region is even higher (3.01) than that of doctors in Central hospitals (2.90). From the UHS graduates' academic scores, UHS graduates must have been fairly evenly placed between central and provincial hospitals and across different provincial hospitals

However, as in the case of DTC scores, there exists a weak negative correlation between the doctors' academic score and the poverty index by region. The Pearson correlation coefficient between the sixth-year academic score at UHS and the poverty

index by region is -0.25, which is stronger than the relationship between the average first-sixth years academic score and poverty index by region (-0.20).

(4) Relationship between DTC and Academic Scores

In each region, DTC and academic scores seem to be weakly, but positively, correlated, except in the Central Region, where the relationship is negative. The Pearson correlation coefficient is 0.29 for the sixth-year academic score and 0.15 for the average first-sixth years academic score. The positive correlation is stronger in the poorer region (0.55 in Northern Region) than in the less poor region (0.22 in central hospitals) when sixth-year academic scores are used. This positive correlation suggests that DTC scores can be improved, as UHS academic scores are enhanced.

To test the hypothesis that higher academic achievement leads to higher DTC indices, we divided the 37 sample doctors, whose academic and DTC scores are available in the baseline dataset, into two groups by their median sixth-year academic achievement scores. Then we have compared the two groups' respective average DTC and academic scores. The average academic achievement scores for the above and below the median score group, respectively, are 3.15 and 2.92. The average DTC scores of the two groups are 7.98 and 7.92, respectively. Therefore, they seem to be positively correlated.

However, we need to confirm this conclusion statistically by carrying out a hypothesis test of two independent groups. First, we find the academic achievement scores of the two groups are statistically different at 1% significance level (p-value=2.42E-09). Second, the average DTC scores of the two groups are not statistically different at the 10% significance level (p-value=0.8091). Therefore, the seemingly positive relationship between DTC and academic scores of the two groups are not supported statistically at the 10% significance level, and based on the baseline dataset, we cannot argue that higher academic scores at UHS lead to higher DTC scores of its graduates in public hospitals. Perhaps the medical education and training programs at UHS were less than relevant or adequate quality.

<Table 16> DTC and Sixth-Year Academic Scores of Two Groups Divided by the Median Academic Scores: 2010-2012 Pooled Data

Academic Scores (GPA)		Practice Scores					
6th	6th avrg	DTC	DTC avrg	RUD	RUD avrg	STG	STG avrg
2.05		7.10		7.83		6.37	
2.09		7.10		7.10		7.10	
2.13		7.18		7.25		7.10	
2.37		7.57		7.54		7.60	
2.40		8.39		8.63		8.15	
2.41		6.83		6.56		7.10	
2.53		8.06		7.75		8.38	
2.54		7.07		7.50		6.64	
2.55	2.52	8.75	7.92	8.75	8.01	8.75	7.82
2.62	(0.233)	8.19	(0.789)	8.00	(0.767)	8.38	(1.006)
2.63		6.87		7.20		6.54	
2.65		8.88		8.88		8.88	
2.66		8.70		8.70		8.70	
2.68		9.00		9.00		9.00	
2.73		8.60		8.40		8.80	
2.76		7.81		7.38		8.25	
2.76		7.43		8.78		6.08	
2.78		9.00		9.00		9.00	
2.90		7.59		8.18		7.00	
2.91		8.06		7.75		8.38	
2.91		8.40		8.20		8.60	
2.93		9.00		9.00		9.00	
2.94		8.45		8.40		8.50	
2.96		7.40		7.70		7.10	
2.97		9.00		9.10		8.90	
2.98		8.44		8.00		8.88	
3.05		6.04		7.00		5.07	
3.05	3.15	7.31	7.98	7.96	8.12	6.66	7.85
3.13	(0.25)	7.75	(0.803)	8.05	(0.624)	7.45	(1.122)
3.15		7.12		6.83		7.40	
3.22		7.28		8.23		6.34	
3.24		8.00		8.00		8.00	
3.35		8.90		8.70		9.10	
3.35		7.67		8.20		7.14	
3.54		7.45		7.33		7.58	
3.56		8.85		8.80		8.90	
3.72		8.95		8.80		9.10	

* Numbers in parentheses are standard deviations.

To test the second hypothesis that practice experience, in addition to the academic achievement, may also lead to a higher clinical performance level, the sample of 37 practicing doctors, whose academic and DTC scores and years of practice experience are available in the baseline data, is divided into three groups by the years of practice experience. There are 14 doctors with one year or shorter practice experience, eight doctors with three years practice experience, and 15 doctors with five years and longer practice experience. Each group's average academic achievement (sixth-year grades) and clinical performance (DTC) scores are compared with those of other two groups, respectively, as follows:

<Table 17> Academic and DTC Scores of Doctors with Different Lengths of Practice Experience

	1st Year Doctors	3rd Year Doctors	5th Year Doctors
Average 6th Year Academic Score	2.88 (0.50)	2.90 (0.40)	2.78 (0.30)
Average DTC score	7.58 (0.65)	8.09 (0.67)	8.22 (0.86)

* Numbers in parentheses are standard deviations.

It appears that more practical experience leads to a higher clinical performance (DTC) score. To confirm this statistically, a hypothesis test has been performed. First, between the first-year and third-year doctors, we cannot reject the null hypothesis that the two academic scores are statistically the same (p-value=0.9564). Likewise, we cannot reject the null hypothesis that the two DTC scores are the same (p-value=0.0993). Therefore, we can state that there are no statistical difference in both academic and practice scores between the two groups, and a longer practice experience does not lead to a higher clinical performance.

Second, between third and fifth-year doctors, we cannot reject the null hypothesis that the two academic scores are statistically the same (p-value=0.4409). Likewise, we cannot reject the null hypothesis that the two DTC scores are the same (p-value=0.6972). Therefore, we can state that there are no statistical difference in both academic and

practice scores between the two groups, and a longer practice experience does not lead to a higher clinical performance level.

Third, between the first-year and fifth-year doctors, we cannot reject the null hypothesis that the two academic scores are statistically the same (p-value= 0.4917). However, we can reject the null hypothesis that the two DTC scores are the same (p-value=0.0330). Therefore, we can state that although academic scores are not different between the two groups, the clinical performance level is higher for the doctors with a sufficiently longer (five years or more) practice experience. This implies that if the UHS academic programs does not improve its students' clinical performance capacity, it will take at least five years for UHS graduates to improve their clinical performance in public hospitals through learning by doing or on-the-job training.

The statistical robustness of our tentative conclusion made above is supported by another study. For the robustness test, we have made another study where the academic score between the two groups are distinctly different, but the length of doctors' practice experience is shorter than five years. Namely, the first-year and third-year practice doctors are divided into two groups, respectively, by the sixth-year academic achievement at the UHS, and their clinical performance (DTC) scores are compared between first-year doctors with above the median achievement score and the third-year doctors with below the median achievement score, as follows.

<Table 18> DTC and Academic Scores of Doctors with Different Lengths of Practice

	Average Academic Score	Average DTC Score
Above Median 6th Year Academic Score 1st year doctors group	3.26 (0.28)	7.88 (0.63)
Below Median 6th Year Academic Score 3rd year doctors group	2.58 (0.17)	7.94 (0.57)

* Standard deviations in parentheses.

First, regarding the academic scores of the two groups, we can reject the null hypothesis that the two average academic scores of the two groups are the same (p-value: 0.016), and therefore the first-year doctors group has higher academic scores without any doubt whatsoever. Second, regarding the DTC scores of the two groups, we cannot reject the null hypothesis that the two scores are the same, and therefore the two groups' DTC scores are statistically treated the same (p-value: 0.8875). We can therefore conclude that with the current curriculum and teaching programs at UHS, two years of extra practice experience upon graduation is insufficient to improve the clinical performance of UHS graduates in public hospitals through learning by doing or on-the-job training as in the past. Indeed, five years on the job are required for a statistically significant improvement. To expedite the length of experience required for a statistically significant improvement in DTC scores that are less than five years, the UHS curriculum and teaching programs, especially the capacity of the teaching force, will have to be improved substantially.

(5) Causal Relationship between DTC and Academic Scores among All Doctors

To confirm the seemingly uncorrelated relationship between doctors' DTC index and academic scores (GPA), a causal relationship among them was investigated, using the ordinary least square (OLS) method. This OLS estimation model also includes, as control variables, a dummy variable indicating the location of hospitals (central hospitals=1; provincial hospitals=0), the poverty index of each province, the practice experience (years) of each doctor (i), and the year of DTC data collection (2012=1; 2010=0).

$$DTC_i = a + b\,GPA_i + c\,EXP_i + d\,POV_i + e\,LOCATION_i + f\,EXPERIENCE_i + gY2012_i + e_i \quad (3)$$

The result is shown in <Table 19>. As seen in the table, the variations in DTC indices are explained neither by academic score, nor by practice experience at the usual levels of statistical significance. The only variable that explains the variations in the DTC index to a large extent is the location dummy variable. The academic scores used in the estimation include both first-sixth years GPA scores and sixth-year GPA scores. However, the two

different measurements did not make any difference in the determination of the causal relationship. We therefore can tentatively conclude that before the launch of the Dr. Lee Jong-Wook project, the UHS academic achievement scores do not affect the doctors' practice performance in the public hospitals. In other words, academic education and training at UHS do not affect the efficiency of practicing doctors' clinical performance at public hospitals. This conclusion points to the need to improve the relevance and quality of the medical education at UHS. Also, we can add that the accumulated experience of practicing doctors hardly makes up for any shortcomings that are relevant to the academic education in the UHS to doctors' practice performance.

These findings from the pooled 2010 and the larger 2012 datasets are different from those of the smaller sample from the 2010 dataset. The 2010 dataset showed that the sixth- year academic scores and the practice experience explained the variations in DTC scores at statistically significant levels. The findings seem to be somewhat sensitive to the size of the sample that was analyzed. It is a challenge to find an unbiased and sufficiently large sample of doctors, along with their academic achievement and clinical performance data.

<Table 19> The Results of the Regression Analysis of the DTC on Academic Achievement for All Doctors: 2010 and 2012 Pooled Data

VARIABLES	(1) DTC 1	(2) DTC 2	(3) STG 1	(4) STG 2	(5) RUD 1	(6) RUD 2
GPA 6th	0.107		0.0229		0.191	
	(0.180)		(0.278)		(0.245)	
GPA 1-6th		0.0247		0.264		-0.216
		(0.214)		(0.334)		(0.252)
Poverty	-0.513	-0.542	-0.0212	0.0262	-1.018	-1.124
	(0.490)	(0.478)	(0.721)	(0.694)	(0.736)	(0.714)
Location	0.927***	0.930***	1.686***	1.676***	0.164	0.181
	(0.303)	(0.310)	(0.447)	(0.427)	(0.462)	(0.455)
Experience	0.0570	0.0536	0.0742	0.0780	0.0386	0.0279
	(0.0558)	(0.0543)	(0.0771)	(0.0764)	(0.0615)	(0.0555)

VARIABLES	(1) DTC 1	(2) DTC 2	(3) STG 1	(4) STG 2	(5) RUD 1	(6) RUD 2
y2012	-0.227**	-0.243**	-0.302*	-0.349***	-0.150	-0.133
	(0.110)	(0.115)	(0.163)	(0.126)	(0.182)	(0.193)
Constant	7.943***	8.246***	6.883***	6.203***	9.027***	10.32***
	(1.340)	(1.240)	(1.833)	(1.846)	(1.685)	(1.659)
Observations	37	37	37	37	37	37
R-squared	0.732	0.729	0.770	0.778	0.418	0.418

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Another challenge is how we should understand the statistically significant positive relationship between doctors' clinical performance in the hospitals (DTC indices) and the location of the hospitals (whether in the capital city or not). The doctors working for the central hospitals scored higher DTC scores than those working for the provincial hospitals, although their academic achievement scores made no statistically significant impact on DTC scores. We have run the same regression model for different groups of doctors with varying years of practice experience and have found that the location variable plays decreasing importance in determining DTC scores, as their practice experience increases. The absolute value of the coefficient of the location variable gets smaller, as doctors' practice experience rises (1.252 for first-year doctors, 0.703 for third-year doctors, and -0.548 for fifth-year doctors), and the level of significance also declines from the 1% significance level to 5% and then to less than 10% levels, respectively. Moreover, while the location variable plays a less significant role as the doctors' practice experience increases, the poverty index variable plays a statistically more significant role (insignificant for first-year doctors, significant at the 10% level for third-year doctors, and significant at the 5% level for fifth or more years doctors with negative coefficients). Since academic scores do not affect DTC indices, we cannot assert that academically superior UHS graduates are placed in more prosperous provinces, while academically poorer graduates are placed in poorer provinces. We can hypothesize, however, that doctors placed in provincial hospitals, especially in poorer provinces, may have inadequate or

insufficient hospital laboratories and equipment to follow the proper clinical protocols and technical guidance, on which DTC indices are based. Alternatively, the supervision and guidance system for hospital doctors placed in provinces, especially in poorer areas, may be inadequate.

<Table 20-A> The Results of the Regression Analysis of the DTC on Academic Achievement Among First-Year Doctors: 2010-2012 Pooled Data

VARIABLES	(1) DTC 1	(2) DTC 2	(3) STG 1	(4) STG 2	(5) RUD 1	(6) RUD 2
GPA 6th	0.492***		0.451		0.536	
	(0.127)		(0.313)		(0.309)	
GPA 1-6th		0.375**		0.733***		0.0194
		(0.139)		(0.207)		(0.321)
Poverty	0.463	0.395	0.615	0.752	0.302	0.0284
	(0.325)	(0.580)	(0.669)	(0.537)	(0.825)	(1.146)
Location	1.200***	1.252***	1.744***	1.747***	0.648	0.749
	(0.231)	(0.323)	(0.461)	(0.328)	(0.559)	(0.585)
y2012	-0.185	-0.197	-0.238	-0.328	-0.129	-0.0629
	(0.162)	(0.199)	(0.252)	(0.199)	(0.295)	(0.339)
Constant	5.105***	5.641***	4.602**	3.770**	5.616***	7.523**
	(0.782)	(1.244)	(1.619)	(1.378)	(1.129)	(2.630)
Observations	14	14	14	14	14	14
R-squared	0.890	0.835	0.839	0.901	0.503	0.352

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

<Table 20-B> The Results of the Regression Analysis of the DTC on Academic Achievement among 3rd Year Doctors: 2010-2012 Pooled Data

VARIABLES	(1) DTC 1	(2) DTC 2	(3) STG 1	(4) STG 2	(5) RUD 1	(6) RUD 2
GPA 6th	0.176		-0.285		0.635	
	(0.119)		(0.350)		(0.510)	
GPA 1-6th		0.312		0.276		0.344
		(0.343)		(0.596)		(1.178)
Poverty	-1.237*	-1.017*	-0.0113	0.242	-2.452	-2.269
	(0.447)	(0.364)	(0.832)	(0.807)	(1.642)	(1.401)
Location	0.603	0.703*	1.755**	1.837**	-0.542	-0.425
	(0.268)	(0.255)	(0.486)	(0.503)	(0.981)	(0.966)
y2012	-0.518*	-0.510**	-0.923*	-0.763	-0.109	-0.253
	(0.180)	(0.159)	(0.382)	(0.377)	(0.683)	(0.662)
Constant	9.309***	8.672***	8.045**	6.082**	10.56*	11.26**
	(0.756)	(0.853)	(2.173)	(1.597)	(3.369)	(2.384)
Observations	8	8	8	8	8	8
R-squared	0.967	0.965	0.958	0.950	0.572	0.430

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

<Table 20-C> The Results of the Regression Analysis of the DTC on Academic Achievement among 5th Year Doctors: 2010-2012 Pooled Data

VARIABLES	(1) DTC 1	(2) DTC 2	(3) STG 1	(4) STG 2	(5) RUD 1	(6) RUD 2
GPA 6th	-0.791		-0.781		-0.803**	
	(0.478)		(0.849)		(0.308)	
GPA 1-6th		-0.613		-0.629		-0.600
		(0.503)		(0.832)		(0.374)
Poverty	-3.166***	-2.992**	-2.885**	-2.715	-3.471***	-3.292***
	(0.823)	(1.132)	(1.270)	(1.499)	(0.426)	(0.791)

VARIABLES	(1) DTC 1	(2) DTC 2	(3) STG 1	(4) STG 2	(5) RUD 1	(6) RUD 2
Location	-0.615	-0.548	-0.0255	0.0403	-1.211***	-1.141*
	(0.540)	(0.749)	(0.775)	(0.974)	(0.362)	(0.563)
y2012	-0.400	-0.0662	-0.443	-0.109	-0.355	-0.0208
	(0.410)	(0.388)	(0.435)	(0.392)	(0.434)	(0.411)
Constant	15.98***	14.84***	15.19***	14.13***	16.82***	15.60***
	(2.266)	(2.506)	(3.755)	(3.568)	(1.414)	(1.824)
Observations	15	15	15	15	15	15
R-squared	0.728	0.701	0.716	0.701	0.591	0.553

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We still have another challenge. In the above causal analysis, we have demonstrated that the variations in DTC scores are not explained by academic achievement levels (1-6 year or 6th year grades) or by the lengths of practice experience. The academic score variable explains the variations in DTC scores positively only for first-year practice doctor group at the 5% and 1% statistical significance level, depending on sixth- year or first-sixth year academic scores. We can hypothesize that, before the launch of the Dr. Lee Jong-Wook Project, the UHS curriculum and teaching programs were too theoretical and neglected clinical performance skills. This hypothesis can be tested if the academic achievement of UHS students (GPA) improves when the capacity of UHS faculty members is enhanced by the project's fellowship training, and consequently if the UHS graduates' clinical performance level (DTC) improves as a result of the Dr. Lee Jong-Wook Project.

(6) The Impact of Dr. LEE Fellowship on UHS Students' Academic Scores

The analysis of pooled baseline data from 2010 and 2012 shows that academic achievement (GPA) at UHS does not have any statistically significant impact on the clinical performance (DTC) level of the UHS graduates working at the central and provincial hospitals. We have hypothesized that the reason for this finding is that the

UHS curriculum and teaching programs before this LEE Jong-Wook Seoul Project were implemented have been of less than a relevant and adequate quality. Therefore, we argued that when the UHS faculty members improve their teaching and research capacity through the fellowship training program under the LEE Jong-Wook SEOUL Project and subsequently improve the academic achievement level of their UHS students, they would be able to enhance the clinical performance (DTC) of the UHS graduates working at public hospitals in the years following graduation. We need to test the hypothesis that the LEE Jong-Wook Seoul Project indeed improved, through its fellowship training component, the academic achievement level of UHS students.

Since the education period at UHS takes at least six years, it would take a long period to test whether the UHS faculty members, trained under the LEE Fellowship, have indeed improved the clinical performance (DTC) levels of their UHS graduates. However, it takes relatively a shorter amount of time to test whether the UHS faculty members, trained under the LEE Fellowship, have really improved the academic achievement levels of their UHS students. We therefore have measured the impact of the LEE Fellowship training at SNUCM at the academic achievement levels of the UHS students through this real time impact evaluation. If this impact is positively proven, we can make an inference that UHS students would later enhance their clinical performance at public hospitals and eventually improve the health of the Lao people treated by them.

For this purpose, we have used a quasi-scientific research design. A majority of UHS faculty members who received the LEE Fellowship and were trained at the College of Medicine, Seoul National University, were taken as the treatment (experimental) group. And a group of other UHS faculty members who did not get the LEE fellowship training were taken as the control group. The academic achievement of the UHS students, both the treatment and control groups, before and after the LEE Fellowship, were compared to see which group improved their academic achievement level more between the two periods.

For this purpose, the difference-in-differences (DD) regression analysis method was used. UHS faculty members who got the benefit of the one-year LEE Fellowship

training in 2010-2011 and 2011-2012 were altogether 16 persons, of whom 10 were taken as a treatment group, and they taught 19 subject courses as a teaching team before (2008-2009, 2009-2010, and/or 2010-2011) and after (2011-2012 and/or 2012-2013) the Fellowship award. During the period under review, all courses offered at UHS were taught by the team teaching method. The remaining six faculty members did not teach either before or after the LEE Fellowship award, and therefore were excluded from the treatment group. The UHS faculty members who did not receive the LEE Fellowship were taken as the control group, and they taught 13 courses as a teaching team before and after the Fellowship award (excluding those courses offered for sixth- year students, in addition to language and social science courses). The courses taught by the control group were not selected in a completely random manner, since they were one of few courses offered both before and after the Fellowship award, and were not taught by the Fellowship beneficiaries as part of the teaching team before or after the Fellowship award. These courses tend to be taught by more experienced faculty members who were not considered for the LEE Fellowship, which was intended to improve the capacity of relatively young faculty members first. Moreover, the courses, or the teach team members that taught them, were not the same before and after the LEE Fellowship award. In fact, only one course was selected for the control group.

The model used for the difference-in-differences (DD) analysis method was as follows:

$$Grade_{ijt} = a + bTC_{ijt} + c\ F\text{-}Year_{ijt} + d\ (TC_{ijt} * F\text{-}Year_{ijt}) + f\ G_{ijt} + g\ S_{ijt} + h\ Age_{ijt} + k\ Experience_{ijt} + e_{ijt} \quad \cdots\cdots (4)$$

Where

$Grade_{ijt}$: The dependent variable represents academic achievement of i student (1-5th year students) for course j taken in year t (the official range is 0.0-4.0),

TC: a dummy variable representing the courses taught either by the treatment or control group (treatment group=1; control group=0),

F-Year: a dummy variable representing either before or after the LEE Fellowship year (before= 0 for 2008-2009, 2009-2010, 2010-2011; after=1 for 2011-2012, 2012-2013),

G: a dummy variable representing gender (male=1; female=0);

S: a dummy variable representing either regular status students or special status students (regular=1; special=0)

Age: Age of i student taking j course in year t,

Experience: teaching experience (number of years) of instructors teaching j course,

E: error term,

a: constant; and

b,c,d,f,g,h and k: coefficient of independent variables.

The key of this DD model is the coefficient "d" of the interaction term (TC*F-Year). If it is positive, the LEE Fellowship beneficiaries have made a positive contribution to the improvement of students' grades in the courses taught after the fellowship.

The model has been estimated with the pooled ordinary least square method since the data are not panel data in a strict sense. Each student observed in different years is also not identical.

The descriptive statistics are as follows:

<Table 21> Descriptive Statistics

All Samples (Treatment and Control)

Variable	Obs	Mean	Std. Dev.	Min	Max
tc	17598	0.969883	0.170914	0	1
f_year	17598	0.297591	0.457212	0	1
tc*f_year	17598	0.276736	0.447398	0	1
grade	17212	2.178422	0.854028	0	4
age	17068	23.00451	4.935232	14	51
gender	17598	0.443062	0.496762	0	1
status	17549	0.370904	0.483061	0	1
experience	17598	4.857787	2.140159	1	8
zscore	17212	0.021672	1.004739	-2.54118	2.16471

Treatment group only (tc=1)

Variable	Obs	Mean	Std. Dev.	Min	Max
tc	17068	1	0	1	1
f_year	17068	0.285329	0.451584	0	1
tc*f_year	17068	0.285329	0.451584	0	1
grade	16683	2.177576	0.854762	0	4
age	17068	23.00451	4.935232	14	51
gender	17068	0.443051	0.496761	0	1
status	17019	0.366943	0.481985	0	1
experience	17068	4.760214	2.099139	1	8
zscore	16683	0.020677	1.005604	2.54118	2.16471

Control group only (tc=0)

Variable	Obs	Mean	Std. Dev.	Min	Max
tc	530	0	0	0	0
f_year	530	0.692453	0.461914	0	1
tc*f_year	530	0	0	0	0
grade	529	2.205104	0.830863	1	4
age	0				
gender	530	0.443396	0.497255	0	1
status	530	0.498113	0.500469	0	1
experience	530	8	0	8	8
zscore	529	0.053063	0.977487	-1.36471	2.16471

The results of the estimation are summarized in the following table.

<Table 22> Estimation Results of the Difference-in-Differences Regression Analysis

Dependent Variable: Academic grade (GPA) of students in each of 20 courses

VARIABLES	(1)	(2)
TC	0.220*** (0.0672)	-0.243*** (0.0679)
F_year	0.338*** (0.0801)	-0.338*** (0.0800)
TC*F_year	0.292*** (0.0812)	0.294*** (0.0812)
Gender	0.0300** (0.0131)	-0.0302** (0.0131)
Status_Reg_Spc	0.220*** (0.0136)	0.219*** (0.0136)
Experience		-0.00676** (0.00310)
Constant	2.344*** (0.0676)	2.398*** (0.0721)
Observations	17,165	17,165
R-squared	0.018	0.018

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The coefficient of all variables is significant, except the Age variable, which was deleted by the computer program in the estimation process for possible multi-collinearity. During the whole period observed, male students have achieved less than female students, regular students performed better than special students, students taught by more experienced instructors performed worse, the grades of the treatment group have declined and the grades of all groups have declined after the fellowship period at the 1% significance level. However, when those factors have been controlled, the grades of the treatment group have been higher after the fellowship award, when compared with the period before the fellowship award and the control group, by 0.29 percentage points at the one percent significance level. Therefore, we can attribute the treatment group's higher grades to the Dr. LEE fellowship. We can also infer that the improvement in the

academic achievement of UHS students would be later transformed into a better clinical performance of UHS graduates placed in public hospitals, ultimately contributing to the improvement in the overall health of Lao peoples in general.

Nevertheless, we should address some caveats for this analysis. First, we can control the fixed effects of each course and year observed. Although each student's characteristics have been controlled, the specific effect of each course and year has not been controlled. Second, the number of subject courses taught by the control group can be increased. In this study, only one course has been taken as the control group. Since the characteristics of each student taking the courses taught by the control group are difficult to analyze, the average grade of each course taught by either the treatment or control group faculty members were observed. Third, the treatment group intervention can be redefined. In this study, we have defined the treatment intervention as subject courses taught by the Dr. LEE fellowship beneficiaries after 2010-2011. We assumed that all teaching members as an integrated whole would influence the students' course grades. However, each teacher conducts each session of the course separately and individually. And the size of each team varied depending on the courses. Therefore, each Dr. LEE fellowship beneficiary's contribution to the average grade of a treatment group course would be only a fraction of total improvement of the grades for each course. It would be more appropriate to capture the impact of the Dr. LEE fellowship beneficiaries' contribution only.

(7) Robustness of the LEE Fellowships' Impact on UHS Students' Academic Scores

Efforts have been made to fill the caveats of the basic model for the difference-in-differences analysis (equation 4) and test the robustness of its estimation.

First, the fixed effects of each course and year of observation have been controlled by adding both course dummy (J_{it}) and year dummy (T_{ij}) variables to the equation (4) for the difference-in-differences analysis.

$$Grade_{ijt} = a + bTC_{ijt} + c\ F\text{-}Year_{ijt} + d\ (TC_{ijt} * F\text{-}Year_{ijt}) + f\ G_{ijt} + g\ S_{ijt} + h\ Age_{ijt} + k\ Experience + m\ J_{it} + n\ T_{ij} + e_{ijt} \quad \text{……………………………………………….(5)}$$

This modification in the estimation model does not change the results significantly. The coefficient "d" of the interactive term changes from 0.29 to 0.33 with the same degree of significance. All other coefficients maintain the same sign and degree of significance, except that the gender variable coefficient has become more significant at the 1% level, the F-Year variable became statistically insignificant, and the TC variable was deleted due to possible collinearity. Therefore, robustness of our estimation of equation (4), without the course and year dummies, has been boosted by the dummies.

<Table 23> Estimation Results of the Difference-in-Differences Regression Analysis of Students' Achievement Scores (with course- and year-dummy variables)

VARIABLES	(1) with dummy	(2) without dummy
TC		-0.243*** (0.0679)
F-Year	-0.0724 (0.0843)	-0.338*** (0.0800)
TC*F-Year	0.328*** (0.782)	0.294*** (0.0812)
Gender	-0.0388*** (0.0133)	-0.0302** (0.0131)
Status	0.203*** (0.0139)	0.219*** (0.0136)
Experience	-0.0124 (0.0141)	-0.00676** (0.00310)
Constant	2.475*** (0.0599)	2.398*** (0.0721)
Observations	14,913	17,165
R-squared	0.074	0.018

Dependent variable is students' grade score in each of 20 subject courses. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Course and Year dummies are included in the regression, but are not reported in the table

Second, to increase the number of control group courses, the unit of observation has been changed from the grade of each student taking treatment and control group courses to the average grade of all students taking each of the treatment and control group courses. For each course offered by UHS before and after the LEE Fellowship award, the average grade was computed and compared between the treatment and control group courses.

$$\text{Average Grade}_{jt} = a + bTC_{jt} + c\ \text{F-Year}_{jt} + d\ (TC_{jt} * \text{F-Year}_{jt}) + f\ J_t + g\ T_j + e_{jt} \quad \cdots\cdots(6)$$

$$\text{Average Grade}_{jt} = a + bSFT_{jt} + c\ \text{F-Year}_{jt} + d\ (SFT_{jt} * \text{F-Year}_{jt}) + f\ J_t + g\ T_j + e_{jt} \quad \cdots\cdots(7)$$

$$\text{Average Grade}_{jt} = a + bSFH_{jt} + c\ \text{F-Year}_{jt} + d\ (SFH_{jt} * \text{F-Year}_{jt}) + f\ J_t + g\ T_j + e_{jt} \quad \cdots(8)$$

All UHS courses have been included (a total of 46 courses), excluding social studies and language courses, and have been divided into 24 treatment group courses taught by the Dr. LEE Fellowship beneficiaries and 22 control group courses taught by non-Fellows. However, the treatment group courses (TC) have been expressed not only by "1," if the course was taught by Dr. LEE Fellowship recipients (equation (6)), but also by the share of the Dr. LEE Fellowship recipients in the total number of team teaching members for each treatment course (SFT) (equation (7)), or the share of the hours taught by the Dr. LEE Fellowship recipients in the total team teaching hours for each course (SFH) (equation (8)). The average grades of treatment and control group courses have been observed in one year, each before the Fellowship award (either 2008-2009, 2009-2010, or 2010-2011) and after the Fellowship award (either 2011-2012 or 2011-2013), depending on the courses offered. The basic DD model with dummy variables to control the fixed effects of each course and year (equation 5) was used to confirm whether the grades of the treatment group courses rose more than those of the control group courses since the Dr. LEE Fellowship award. All other variables of the models are defined in the same way as equation (5). A summary of statistics is as follows:

<Table 24> Descriptive Statistics (When a treatment group is defined as the courses taught by Dr. LEE Fellowship awardees, it has a value of one; the control group has a value of zero.)

All Groups (both treatment and control groups)

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	92	0.5	0.50274	0	1
score	92	2.375611	0.380398	1.56936	3.36861
tc	92	0.521739	0.502264	0	1
tc*f_year	92	0.26087	0.441515	0	1

Treatment Group Only (TC=1)

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	48	0.5	0.505291	0	1
score	48	2.260593	0.245847	1.83958	2.85821
tc	48	1	0	1	1
tc*f_year	48	0.5	0.505291	0	1

Control group Only (TC=0)

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	44	0.5	0.505781	0	1
score	44	2.501085	0.457483	1.56936	3.36861
tc	44	0	0	0	0
tc*f_year	44	0	0	0	0

<Table 25> Descriptive Statistics (When a treatment group is defined as a positive share of the Dr. LEE Fellowship awardees out of the total number of teaching team members for each course, the control group has a value of zero.)

Both Treatment and Control Groups

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	92	0.5	0.50274	0	1
Grade	92	2.375611	0.380398	1.56936	3.36861
share_tch (SFT)	92	0.09622	0.117534	0	0.6
f-year* SFT	92	0.050284	0.103871	0	0.6

Treatment Group Only

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	48	0.5	0.505291	0	1
Grade	48	2.260593	0.245847	1.83958	2.85821
share_tch (SFT)	48	0.184422	0.100669	0.071429	0.6
f-year*(SFT)	48	0.096378	0.127877	0	0.6

Control Group Only

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	44	0.5	0.505781	0	1
Grade	44	2.501085	0.457483	1.56936	3.36861
share_tch (SFT)	44	0	0	0	0
f_year*SFT	44	0	0	0	0

<Table 26> Descriptive Statistics (When a treatment group is defined as a positive share of Dr. LEE Fellowship awardees' teaching hours out of the total number of team teaching hours for each course, the control group has a value of zero.)

Both Treatment and Control Groups

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	92	0.5	0.50274	0	1
Grade	92	2.375611	0.380398	1.56936	3.36861
share_hr (SFH)	78	0.084315	0.124387	0	0.37931
f_year*SFH	78	0.042157	0.097654	0	0.37931

Treatment Group Only

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	48	0.5	0.505291	0	1
Grade	48	2.260593	0.245847	1.83958	2.85821
share_hr (SFH)	34	0.193428	0.119819	0.033898	0.37931
f_year*SFH	34	0.096714	0.129674	0	0.37931

Control Group Only

Variable	Obs	Mean	Std. Dev.	Min	Max
f_year	44	0.5	0.505781	0	1
Grade	44	2.501085	0.457483	1.56936	3.36861
share_hr	44	0	0	0	0
f_year*SFH	44	0	0	0	0

The results of the analysis are presented in the following table.

<Table 27> Estimation Results of the Difference-in-Differences Regression Analysis of Average Grade of Courses

Dependent variable	Average Grade of Each of 46 Courses					
Independent Variables	(1) With Dummy	(2) without dummy	(3) With Dummy	(4) Without Dummy	(5) With Dummy	(6) Without Dummy
F-Year	-0.0127 (0.0816)	-0.0408 (0.107)	-0.00614 (0.0792)	-0.00663 (0.0991)	0.129 (0.103)	0.0100 (0.108)
TC	-0.273 (0.300)	0.370*** (0.106)				
TC*F-Year	0.201** (0.0920)	0.254* (0.149)				
Share of Fellow Teacher(SFT)			-1.684 (1.213)	-1.490*** (0.513)		
F-Year*SFT			1.068** (0.456)	1.131* (0.665)		
Share of Fellow Hour (SFH)					- -	-0.910* (0.508)
F-Year*SFH					0.671 (0.415)	0.892 (0.719)
Constant	2.653*** (0.148)	2.521*** (0.0762)	2.343*** (0.295)	2.465*** (0.0716)	2.006*** (0.170)	2.435*** (0.0760)
No. of Observation	92	92	92	92	78	78
R-squared	0.873	0.145	0.874	0.108	0.874	0.053

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Coefficients of course and year dummy variables are not presented in the table.

The results indicate that both interactive variables (F_Year*SFT and F_Year*SFH) have a positive coefficient, and the coefficient of F_Year*SFT is statistically significant at the 5% level, which means that the average grade in each of the treatment group courses rose more than that of the control group courses since the Dr. LEE Fellowship awardees have taught the courses post-2010. Since the data on the number of teaching hours is less complete than the number of teachers with Dr. LEE Fellowship awards for each course, the coefficient of F_Year*SFH is smaller than F_Year*SFT (1.068 vs. 0.671) and is not statistically significant at the 10% level. However, both variables' coefficients are positive and greater than the F_Year*TC (0.201) in the basic model case (equation 5), couching the robustness of the estimated coefficient in the basic model. Therefore, we can interpret that the Dr. LEE Fellowship awards have made positive contributions to the enhancement of UHS students' academic achievement level.

8. Conclusions and Recommendations

In early 2011, the KDI School research team launched a real time impact evaluation of the University of Health Sciences-Dr. LEE Jong-Wook—Seoul Project. The project, which was agreed upon in 2010 to be implemented over the next three years, was financed by the Korea Foundation for International Healthcare (KOFIH) under the auspices of the Ministry of Health and Welfare of the Korea and Lao PDR, respectively, and was executed by the Seoul National University College of Medicine (SNUCM) and the UHS. The purpose of the project was to improve the teaching and research capacity of UHS faculty members, thereby enhancing the clinical performance of the doctors practicing in the public hospitals, and ultimately to upgrade the health status of the Lao people.

For this real time evaluation, the study team adopted three approaches. First, it intended to evaluate the goals and objectives of the project against the government's national development and health sector policies and strategies. This approach was adopted to ensure that the project was owned by the government of Lao PDR, and was aligned with government's development policies and strategies, as emphasized in the Paris Declaration for Aid Effectiveness (2005).

Secondly, it attempted to evaluate the design of the project against the aid programs and activities of other Korean and foreign donor agencies. In this way, the KDI evaluation team tries to ensure donors' harmonization efforts, as stressed in the Paris Declaration for Aid Effectiveness.

Thirdly, it planned to evaluate the effectiveness of the project against the intermediate outcomes of the project in a quantitatively rigorous manner before the end of the project implementation. This is to ensure the results-oriented aid project management and mutual accountability of the aid donor and recipient, as suggested by the Paris Declaration. Since a separate report (the first year interim research report) was prepared for the first and second approaches, this paper focuses on the third approach.

This real time impact evaluation is based on the premise that the project's final outcome, i.e., improvement in the health status of Lao people, would be achieved through the enhancement of the clinical performance capacity of practicing doctors, which in turn will be attained through the advancement of the academic achievement scores at UHS. Therefore, the main focus of the real time impact evaluation is two-pronged. The first focus is to assess the advancement in the academic achievement scores of UHS students as a result of the Project's one-year Dr. LEE fellowship training of select UHS faculty members at SNUCM in Seoul. The second focus is to test whether the advancement in the academic achievement scores translates into the improvement in the clinical performance of UHS graduates practicing as doctors in public hospitals. The first focus can be achieved by using the dataset collected by the evaluation team during the project implementation time, with the cooperation of UHS administration. The second focus, however, cannot be tested with the project implementation data since the time elapsed is too short to evaluate the impact of the project, especially the advancement in academic achievement scores of UHS students as a result of the project input (i.e., Dr. LEE Fellowship awards to UHS faculty for training at SNUCM in Seoul), on the improvement of the clinical performance of UHS graduates practicing in public hospitals. Therefore, the second focus of the evaluation has to be made by using the baseline dataset.

Since it is too early to assess the final outcomes of the project, the evaluation team started with the establishment of a baseline dataset. Together with the UHS academic achievement records, the disease treatment committee (DTC) data of each central and provincial hospital is appropriate to monitor and evaluate the practicing doctors' clinical performance level and the outcomes of the project. The baseline dataset is composed of two sub datasets: the academic achievement and the clinical performance scores of a small sample of practicing doctors in 2010 and a fairly large sample of practicing doctors in 2012. The 2010 database was analyzed in detail during the second year interim research report. Therefore, this third and final year report adds analysis of the 2010 and 2012 pooled dataset. This pooled dataset covers both DTC scores of practicing doctors during 2010-2012 and their academic achievement scores at UHS when they were students. Hence, we can test whether the academically superior UHS students also perform better clinically at the public hospitals following graduation, even though the data were for the period before the Dr. Lee Jong-Wook project was launched.

In addition, during the project implementation, the evaluation team collected and compared the academic achievement (first-sixth years average and sixth- year) scores of UHS students, who were taught by the project's Dr. LEE fellowship recipients in 2012 or 2013 upon completion of their training at the SNUCM, and in 2008-2011 before undertaking the Dr. LEE fellowship training, and those scores of UHS students, who were taught by non-fellow UHS faculty members during the same time periods, respectively.

The project implementation dataset was examined to assess whether UHS students improved their academic achievement scores more in those subjects, which were taught by the UHS faculty members who benefitted from the project's Dr. LEE fellowship training at the SNUCM as part of the project implementation, than in other subjects, which were taught by other UHS faculty members who were not involved in the project's Dr. LEE fellowship training. For this purpose, analyses have been made on the correlation and causal relationships between the academic achievement and practicing doctors' clinical performance scores.

The pooled baseline data analyses have led to the following findings. First, there are statistically significant differences in DTC indices between central and provincial hospitals. Therefore, the quality of health services in central and provincial public hospitals would be significantly different, aggravating the income inequality and poverty gaps between regions.

Second, the DTC indices are somewhat negatively correlated with the poverty index of provinces and regions. This reinforces our argument that hospitals in the provinces, especially in the poorer provinces, offer poorer quality health services.

Third, the DTC indices appear to be positively correlated with the years of doctors' practice experience. The doctors with a longer on-the-job experience appear to provide better health services. However, the difference is statistically insignificant. This means that doctors hardly improve the quality of their health service performances while on-the-job or through in-service training in Lao PDR. Therefore, we can tentatively conclude that in order to improve the quality of health services in Lao PDR, improving the quality of the pre-service academic program in the UHS would play a more important role than the current on-the-job or in-service training programs in hospitals.

Fourth, regarding the question of whether academic achievement (grade) level at UHS led to an improvement in practicing doctors' clinical performance (DTC) level at the public hospitals, the relationship was tenuous and sensitive to the size of the baseline datasets. Both the 2010 smaller dataset and the 2010-2012 pooled larger dataset confirm the existence of a weak, but positive relationship between the two indicators. This positive correlation is particularly stronger for the doctors in their first year of practice than for other doctors with longer years of practice experience. Evidence of the positive correlation is robust since it is supported even when different measures of practice performance (RUD and STG scores) and academic achievement (first-sixth years average and sixth- year grades) are adopted.

Moreover, the positive correlation between academic achievement and clinical performance levels is reconfirmed by regression analyses with the 2010 dataset. The variations in practice performance levels among the first year practice doctors are

explained by the variations in sixth--year academic achievement scores, as well as differences in provincial poverty indices, at the 5% statistical significance level. Also, the variations in practice performance (DTC) of all doctors with different years of experience are explained by the variations in sixth--year academic achievement scores, as well as differences in the provincial poverty index, at the 5% statistical significance level. Therefore, we can tentatively conclude that if UHS improves its students' academic achievement levels, its future graduates' clinical performance levels at the provincial hospitals would surely be enhanced, and would ultimately contribute to the improvement in the health of Lao people.

However, the regression analyses with the 2010-2012 pooled larger dataset show that neither the practice experience upon graduation from UHS, nor the academic achievement level at UHS, affect the variations in the graduates' clinical performance (DTC) level in the public hospitals at the usual levels of statistical significance. Only the central hospital location variable, together with the provincial poverty index, explains the variations in the UHS graduates' clinical performance (DTC) level at public hospitals. This finding, however, is not evidence that academic achievement cannot affect UHS graduates' clinical performance (DTC) level following graduation, but rather should be interpreted as indication that the past and current curricula and teaching programs at UHS are at a less than relevant and adequate level. This finding points to the need for verifying the positive impact of the Dr. Lee-UHS project on the UHS students' academic achievement level, which in turn is assumed to enhance the clinical performance level of UHS graduates practicing in public hospitals.

Fifth, regarding the question of whether the project's Dr. LEE fellowship training of the UHS faculty members at the SNUCM has improved the academic achievement level of the UHS students, our difference-in-differences regression analysis shows a positive answer. In the analysis of the first to fifth-year students' academic achievement scores obtained before and after the LEE fellowship training periods, the UHS students did make a relatively greater advancement in the subject courses, which were taught by the LEE fellowship recipients, than in the subjects that were taught by the non-fellows, even after

controlling students' gender, age, status, and instructors' teaching experience. It remains to be evaluated in the future whether UHS students taught by the Dr. LEE fellowship recipients under the project would also perform better clinically in public hospitals upon graduation than those students taught by the non-fellows.

The evaluation team makes the following recommendations to the UHS and the Project financing and implementing agencies.

1. It is strongly recommended that the SNUCM measure the differences in medical knowledge and skills of UHS faculty members before and after their training programs under the aid project more rigorously. These differences will serve as a useful predictor for the changes in the academic achievement level of UHS students taught by the faculty members trained at the SNUCM.

2. It is also recommended that some relevant UHS faculty members trained at the SNUCM be assigned to the new Children's Hospital financed by the KOICA as teaching physicians.

3. It is recommended that the follow up project (the Second UHS-LEE Jong-Wook—Seoul project) finances the collection of data on the academic achievement level and the clinical performance level of UHS graduates who learned from faculty members trained at the SNUCM and working at public hospitals, so that a rigorous ex-post impact evaluation can be carried out in due course.

4. It is recommended that a follow-up project by the Korean government, either by KOFIH or KOICA, or by other foreign donors, should consider financing medical laboratories and equipment at public hospitals, especially in poor provinces, as well as improvement in clinical performance protocols and management. The current study shows that the clinical performance level in public hospitals is substantially affected by the location of the hospitals (central hospitals or provincial hospitals) and the poverty levels of different provinces. Financing the improvement in the management and facilities of provincial public hospitals will complement the current UHS-Dr. LEE Jong-Wook --Seoul project, which focuses

only on strengthening the capacity of the future practicing doctors at UHS. However, the future practicing doctors' capacity building at UHS alone would not be effective in improving their clinical performance level at provincial public hospitals (which is an intermediate objective of the project), without improvements to the management of the clinical performance system, medical facilities and equipment in the provincial public hospitals concurrently.

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Annex I. STG Indicators

N	Age	W	T	Illness History				Examination					Treatment given					
				Stool counted	Stool with Blood /mucus	Latest urinate	Treatment before	General status	Eye and Tongue dry	Skin contract	Frontal	Pouls	ORS	Liquid fruits /milk / rice	IV Fluid	Correctly quantity	Antibiotic used	Antispasmodic drug used
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		
Total																		
Multiplied																		
Score																		
%																		

Total Score:	Divided by Number of Patients	→

Annex II. RUD Indicators

	1	2	3	4	5	6	7	8			9	10
	Average Number of Drugs Used	Essential drug used	Written down generic name	Used drug available in Hosp.	Clearly and correctly written	Herbal used	Antibiotic used	% Reasonable used of antibiotic			Injected drug used	%Reasonable injected drug
								Quant	Durat	Reason		
1												
2												
3												
4												
5												
6												
7												
Total Drug Used												
Divided by	Number patients	Total Drug used	Total Drug used	Total Drug used	Total Drug used	Total Drug used	Total Drug used		Total antibiotic used		Total Drug used	Total injected drug used
Average%												
Score												

Annex III. Important and Frequent Diseases Selected for DTC

1 : Malaria
2 : Diarrhea
3 : Parasite
4 a: Pneumonia
4 b: Acerbity Pneumonia (In patient)
5 a: Dengue (In patient)
5 b: Dengue with blood (Out patient)
6 a: Tuberculosis 1
6 b: Tuberculosis2
7 a: Leprosy
8 a: Hepatitis A,B,C
9 : Typhoid
10 : Melioidosis
11 : Rickettsiosis
12 : Leptospirosis
13 : Chest pain
14 : Hypertension
15 : Abortion
16 : GEU
17 : Peritonite of pelvien
18 : Trauma cranien
19 : Hemorrhage digestive
20 : Stone Bladder
21 : Acute Kidney
22 : Meningitis
23 : Anemia
24 : Asthma
25 : Fracture in arm and leg

Chapter

02

Dr. LEE Jong-Wook—Seoul Project and the Performance of the UHS Medical Students

Dr. LEE Jong-Wook—Seoul Project and the Performance of the UHS Medical Students

1. Introduction

The goal of the Dr. LEE Jong-Wook—Seoul Project is to improve the quality of healthcare in Lao PDR by upgrading the capacity of faculty members at the University of Health Sciences (UHS), which is the sole institution for advanced medical education in the country. The project reflects the idea that focusing on the elites in the medical profession may be a highly effective strategy through the spill-over effects into primary and secondary health care and the ensuing rollout of new medical doctors. This idea originates from Korea's experience with the Minnesota Project, in which the professors at the SNU, including those at the College of Medicine, received training at the University of Minnesota from 1954 to 1961 with the support of the US government. Even though no rigorous quantitative evaluation of the Minnesota Project has been produced, it is widely believed that the project played a crucial role in dramatically improving the capacity of the medical profession for teaching, research, and practice in Korea.

For the purpose of evaluating the impact of the project, this chapter focuses on UHS students' learning outcomes. Its objective is two-folded. First, we present the status of medical knowledge among UHS students. This information is valuable enough in and of itself, since there is no quantitative and objective assessment of students' learning performance. Second, it aims to estimate the impact of the project in the first three years on students' learning outcome. Although it is quite a challenge to verify the causal

relationship, the statistical analysis is presented and a few possible interpretations are discussed given the limitations on the availability of data.

The academic performance of UHS students is likely to serve as a key outcome measure under the Project. The desired eventual outcome would be the improvement in health care service offered to the Lao public, and the overall improvement of their health status. However, if the faculty capacity building efforts do not lead to improved academic performance on the part of the students, it would be difficult to expect the Project to deliver positive results.

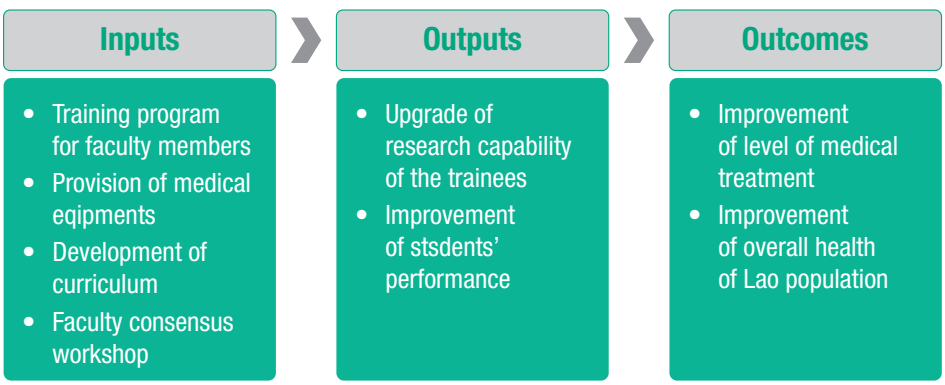
To assess the medical students' academic performance, it would be ideal to design a test battery from scratch, in view of their curriculum and the prevailing health environment in the country. However, development of such a test battery would be too expensive. Instead, we adopted an existing test instrument for medical students in Korea. The battery is taken from the test bank developed and maintained by the Korean Medical Education Assessment Consortium (MEAC), an alliance of medical schools in Korea. The performance gap detected through the battery between the UHS students and Korean medical students might be attributed to various factors such as differences in the curriculum and field conditions for medical practice. However, an improvement in the academic achievement of UHS students over time is likely to be captured by the battery. In addition, the performance records by Korean students should provide a useful benchmark against which we can compare the achievement level of the Lao students. Among other things, the test results and the changes thereof should help fine-tune the capacity building program for the participating UHS faculty members in the course of the Dr. LEE Jong-Wook—Seoul Project.

The rest of this chapter is organized as follows. Section 2 explains the framework of evaluation, and section 3 describes the intervention under the Dr. LEE Jong-Wook—Seoul Project. Section 4 explains the implementation of the Test of Medical Knowledge. Section 5 reports the results of the MEAC medical knowledge test, and section 6 performs a statistical analysis on the impact evaluation. Lastly, section 7 provides concluding remarks.

2. Evaluation Framework

The nature of the intervention of the Dr. LEE Jong-Wook—Seoul Project is to improve the capacity of faculty members at UHS in both teaching and research. It is expected that the project will directly advance the teaching skills and research capacity of trainees. Further, it is expected that the academic performance of students will improve. Ultimately, we can expect that the successful implementation of the project will contribute to an upgrade of medical treatment offered at hospitals and improving the overall health of the Lao population.

[Figure 6] Components in the Results Chain of Dr. LEE Jong-Wook—Seoul Project



The characteristics of the Dr. LEE Jong-Wook—Seoul Project place the project in the category of the training-of-the-trainers model in medical education. The conventional evaluation method for these programs is the survey of trainees and students of the trainees. For example, Green et. al. (2005) and Levine et. al. (2007) conducted a survey at the end of the program for educators in podiatric and geriatric medicine, respectively, where participants were asked to rate their levels of competence for each skills category before and after the program. Both of the studies also circulated follow-up surveys among the trainees after the program. Stratos et. al.(2006) evaluated the faculty development

program in end-of-life care using a survey of participants and their students at a seminar conducted by the participants.

While a survey has the advantage of providing a direct measure of program effects, there is some limitation in employing a survey for the evaluation of the Dr. LEE Jong-Wook—Seoul Project in addition to the reasonable skepticism one might hold regarding the subjective evaluation inherent in this approach. First, the curriculum of the program is not formalized yet, and perhaps more importantly, the program does not envision a single uniform curriculum to be applied to all participants. The purpose of the project is not to train a group of medical professionals in the same field. Rather, it is designed to provide training customized to each participant. In addition, the output of the project is not confined to medical knowledge, but it includes the motivation for teaching and research activity. Hence, it is not easy to specify a set of skills that all the participants are expected to learn. Secondly, the participants may have an incentive to overstate the effectiveness of the program, if they are afraid that a poor evaluation result might lead to an early termination of the program.

As an alternative to a self-reported survey, this report proposes to measure the impact of the project in terms of students' academic performance. In general, medical students' performance will be influenced by various factors including the teaching capacity of faculty members, the design of curriculum, the choice of textbook, physical environment, language for medical terms and students' motivation and ability.

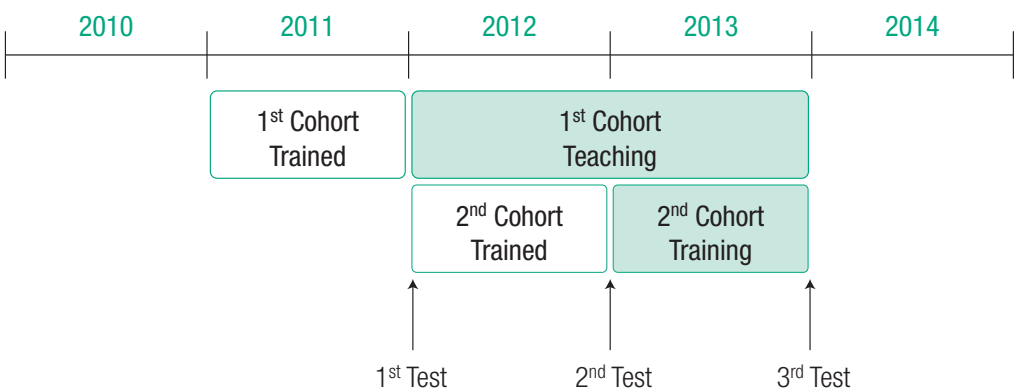
Performanc e= f(Faculty, Curriculum, Textbook, Enviroment, Language, Ability, etc)

On the condition that the information on these factors, as well as performance, is obtained, we can estimate the relationship among them using a regression model. The detail of the specification is presented in Section 6 below.

3. Description of Intervention

The first cohort of trainees under the Dr. LEE Jong-Wook—Seoul Project started a year-long program in November of 2010, and were engaged in teaching in 2012 after returning to UHS. The second group visited SNU in 2012, and were teaching by 2013. The first stage of the project has the duration of three years with possible renewal for up to six years. Three rounds of Test of Medical Knowledge were implemented in January of 2012, January of 2013 and February of 2014. The official academic year at UHS starts in September, and runs until June the following year. However, due to internal reasons, the academic years had been delayed. Year 2010-2011 ended in December of 2011, and the same schedule was applied to Year 2011-2012 and Year 2012-2013. Therefore, the timing of each round of the test coincided with the end of the academic year. Since the three rounds of tests allow us to analyze the consequence of the first and second cohorts of trainees, we focus on the first two cohorts in this chapter.

[Figure 7] Timing of Dr. LEE Jong-Wook—Seoul Project and Test of Medical Knowledge



In the UHS, the Faculty of Basic Science covers the curriculum of basic medicine and the Faculty of Medicine covers that of clinical medicine. There were eight trainees in each cohort, but the composition of specialties varied. The first cohort included five professors

in Faculty of Basic Science and three in Faculty of Medicine, whereas the second cohort had two professors in Faculty of Basic Science and six in Faculty of Medicine. Since the focus of the analysis is on the educational outcome, the scale of the project can be measured by the share of teaching hours delivered by the participants. We obtained the list of instructors for each course and their teaching hours, as well as the topic. The topic of lecture by each instructor is categorized according to the classification used for Test of Medical Knowledge so that the size of the intervention can be matched with the test scores for each subject and field later in the analysis.

<Table 28> reports the scale of Dr. LEE Jong-Wook—Seoul Project in terms of the teaching hours performed by the trainees at Faculty of Basic Science in year 2011-2012 (wave 2) and year 2012-2013 (wave 3). The total teaching hours by all lecturers in a year is 917 hours, of which 84 hours and 96 hours were delivered by the trainees in wave 2 and wave 3, respectively. The share of teaching by the trainees was 9.2% in wave 2 and 10.3% in wave 3. The scale of the project is measured for all the courses from grade one to three, and for the whole academic year including first and second semesters. In the area of basic medicine, the size of intervention is the largest in pathology at 28.6% and in pharmacology at 23.0%, and lowest in biochemistry, with parasitology at zero. The share of teaching by the trainees is the same in both waves for the subjects in basic medicine, with an exception of preventive medicine, for which the share increased from zero in wave 2 to 12.2% in wave 3.

<Table 28> Scale of Intervention by Subject in Basic Medicine for Year 2011-2012 (Wave 2) and Year 2012-2013 (Wave 3)

Grade	Subject	No. of Teaching Hours	Share by Trainees (%)	
			Wave 2	Wave 3
1~3	1.Anatomy	334	5.4	5.4
	2.Biochemistry	105	0.0	0.0
	3.Physiology	134	7.5	7.5
	4.Pathology	91	28.6	28.6
	5.Parasitology	24	0.0	0.0

Grade	Subject	No. of Teaching Hours	Share by Trainees (%)	
			Wave 2	Wave 3
	6.Microbiology	56	17.9	17.9
	7.Pharmacology	87	23.0	23.0
	8.Preventive Medicine	86	0.0	12.2
	Total	917	9.2	10.3

Note: The numbering of the subjects is identical to that in the summary of the Test of Basic Medicine by subject. The information on courses directly related to medical knowledge is presented here. The subject of 'preventive medicine' is a category in the Test of Clinical Medicine. The list of all the courses offered at the Faculty of Basic Science is shown in Appendix - Annex 2.

In <Table 29>, the categories of subject ramify into the fields in basic medicine. The highest share of teaching by the participants is observed in the fields of 'circulator' (48.9%), 'respirator' (24.6%), 'reproductive system' (22.2%) and, 'blood & blood forming organ' (20.5%), while no intervention is made in the fields of 'inheritance', 'immunity', 'genesis & differentiation', 'human response', 'musculoskeletal system', 'endocrine system', 'kidney & urinary tract', 'health care management.' The only change over wave 2 and wave 3 is found in the field of 'health promotion and disease prevention,' where the share of teaching increases from zero to 14.3%.

<Table 29> Scale of Intervention by Field in Basic Medicine for Year 2011-2012 (Wave 2) and Year 2012-2013 (Wave 3)

Grade	Field	No. of Teaching Hours	Share by Trainees (%)	
			Wave 2	Wave 3
1~3	1.Metabolism	77	6.5	6.5
	2.Inheritance	35	0.0	0.0
	3.Cell & Tissue	103	9.7	9.7
	5.Infection	35	5.7	5.7
	6.Immunity	16	0.0	0.0
	7.Genesis & Differentiation	23	0.0	0.0
	8.Human Response	22	0.0	0.0
	9.Musculoskeletal System	32	0.0	0.0

Grade	Field	No. of Teaching Hours	Share by Trainees (%)	
			Wave 2	Wave 3
1~3	10.Nervous System	105	6.7	6.7
	11.Blood & Blood Forming Organ	39	20.5	20.5
	12.Circulator	45	48.9	48.9
	13.Digestive System	62	3.2	3.2
	14.Respirator	57	24.6	24.6
	15.Endocrine System	66	0.0	0.0
	16.Kidney & Urinary Tract	51	0.0	0.0
	17.Reproductive System	63	22.2	22.2
	18.Health care management	14	0.0	0.0
	19.Health promotion and disease prevention	72	0.0	14.3
	Total	917	9.2	10.3

Note: The numbering of fields is identical to that in the summary of the Test of Basic Medicine by field. The information on those courses directly related to medical knowledge is presented here. However, the fields of `health care management', and `health promotion and disease prevention' are the categories in the Test of Clinical Medicine. The list of all the courses offered at Faculty of Basic Science is shown in Appendix - Annex 2.

The scale of the project is quite small in the area of clinical medicine, when compared to basic medicine. There were only two participants engaged in teaching in year 2011-2012 and there were six in year 2012-2013.[1] According to <Table 30>, the share of teaching hours by trainees across the courses for fourth and fifth-year students was only 0.6% in wave 2 and increased to 2.7% in wave 3. Among the subjects, the share increased 1.8% in wave 2 to 3.6% in wave 3 for 'obstetrics & gynecology', and it increased from 0.8% to 2.9% for 'internal medicine'. There was no teaching by trainees for 'pediatrics' in wave 2, but the share increased to 7.7% in wave 3. There was no intervention for other subjects.

1 Some participants of the Dr. LEE Jong-Wook—Seoul Project did not teach after completing the program. Two professors in internal medicine and one in pediatrics among the first and second cohort were not found in the list of instructors in wave 2 and wave 3.

<Table 30> Scale of Intervention by Subject in Clinical Medicine for Year 2011-2012 (Wave 2) and Year 2012-2013 (Wave 3)

Grade	Subject	No. of Teaching Hours	Share by Trainees (%)	
			Wave 2	Wave 3
4~5	1.Internal Medicine	372	0.8	2.9
	2.Surgery	96	0.0	0.0
	3.Pediatrics	78	0.0	7.7
	4.Obstetrics & Gynecology	109	1.8	3.6
	5.Psychiatry	49	0.0	0.0
	6.Other Fields	23	0.0	0.0
	7.Preventive Medicine	45	0.0	0.0
	Total	824	0.6	2.7

Note: The numbering of subjects is identical to that in the summary of the Test of Clinical Medicine by subject. Those courses that are not directly related to medical knowledge including French language are not presented. Some participants of the Dr. LEE Jong-Wook—Seoul Project in internal medicine and pediatrics did not teach courses in Year 2011-2012 or Year 2012-2013.

The size of intervention by fields in clinical medicine is presented in <Table 31>. Among the five fields taught by any trainees, the field of 'perinatal and neonatal disease' has the largest share of teaching at 41.9% in wave 3. The second largest share is 26.7% for 'clinical test' in both wave 2 and 3. The fields of 'major symptom and pathophysiology' and 'female genital disease' have the share of 9.5% and 8.3% in wave 3, respectively. Lastly, the share is 3.3% for 'gestational, puerperal, and postpartum disease' in both wave 2 and wave 3. It is clear that the scale of intervention is small, especially compared to the Minnesota Project.[2] However, one should bear in mind that our primary interest is to estimate the consequence of the change under the project, rather than the total size of the change.

2 Refer to Chapter 4 of the 1st year report of this volume or Lee (2006) for scale of the intervention under the Minnesota Project.

<Table 31> Scale of Intervention by Field in Clinical Medicine for Year 2011-2012(Wave 2) and Year 2012-2013 (Wave 3)

Grade	Field	No. of Teaching Hours	Share by Trainees (%)	
			Wave 2	Wave 3
4~5	101.Normal structure and function of the Human body	2	0.0	0.0
	102.Normal development, growth, and aging	20	0.0	0.0
	104.Major symptom and pathophysiology	76	0.0	9.5
	105.Physical examination and diagnosis	37	0.0	0.0
	106.Clinical test	11	26.7	26.7
	107.Treatment and complication	2	0.0	0.0
	108.Health promotion and disease prevention	18	0.0	0.0
	109.Health care management	29	0.0	0.0
	201.Nutritional and Digestive disease	65	0.0	0.0
	202.Injury and intoxication	5	0.0	0.0
	203.Neoplasm	14	0.0	0.0
	204.Blood and hematopoetic disorder	34	0.0	0.0
	205.Cardiovascular disease	40	0.0	0.0
	206.Musculoskeletal system and connective tissue disease	46	0.0	0.0
	207.Nervous system disease	62	0.0	0.0
	208.Allergic and Immune disorder	6	0.0	0.0
	209.Respiratory disease	44	0.0	0.0
	210.Infection and parasitic disease	20	0.0	0.0
	211.Endocrine and metabolic disease	28	0.0	0.0
	212.Kidney, Urinary, Male genital disease	52	0.0	0.0
	213.Genetic disorder and congenital deformation	14	0.0	0.0
	214.Perinatal and neonatal disease	9	0.0	41.9
	215.Dermatologic disease	13	0.0	0.0
	216.Disease of ear, nose, and throat	5	0.0	0.0
	218.Female genital disease	22	0.0	8.3
	219.Gestational, puerperal, and postpartum disease	61	3.3	3.3
	220.Psychiatric disorder	49	0.0	0.0
	Total	781	0.6	3.0

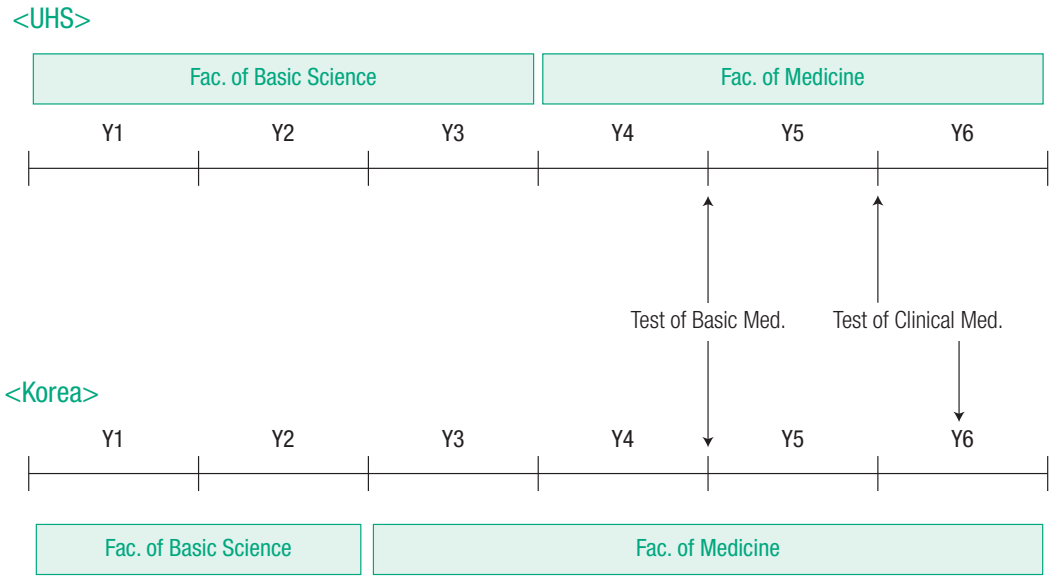
Note: The numbering of fields is identical to that in the summary of the Test of Clinical Medicine by field. Those courses that are not directly related to medical knowledge including French language are not presented. Some participants of the Dr. LEE Jong-Wook—Seoul Project in internal medicine and pediatrics did not teach courses in Year 2011-2012 or Year 2012-2013.

4. Implementation of the MEAC Medical Knowledge Test

The test of medical knowledge administered by the Medical Education Assessment Consortium (MEAC) in Korea was employed as a standardized test. The MEAC implements a test of basic medicine for second-year students in medical college, and a test of clinical medicine for fourth-year students. The level of the test questions is similar to the national exam for license and is designed to be comparable from year to year. The students at UHS were given the full set of the test in every round.

The first round of the test was conducted on January 17-19, 2012, the second round on January 26-27, 2013 and the third round on February 8-9, 2013. In the first and second rounds, the test took place during the registration period for the new academic year, whereas it was held two weeks after the semester began in the third round. The 2010 test, 2011 test and 2012 test of MEAC were taken as test questions for the first, second and third round, respectively. The test of basic medicine was given to fifth-year students who completed four years at UHS, and the test of clinical medicine to sixth-year students who completed five years at UHS. As can be seen in [Figure 8], the students taking the test at UHS are comparable to those in Korean universities in terms of curriculum. The test was conducted in the same manner as the one for Korean students in terms of time, and students were given both the English version and the Lao version of the test questions.

[Figure 8] Test of Medical Knowledge in UHS and Korean Universities



In the first round of tests, there were 260 questions for basic medicine and 480 questions for clinical medicine. While the number of questions in the test of basic medicine was the same for round 2 and 3, the test of clinical medicine had 430 questions in round 2 and 380 questions in round 3. In the test for clinical medicine, the field of health regulation (20 questions) was discarded since it is not relevant in Laos. It is highly likely that some of the questions are not relevant for students at UHS due to the differences in curriculum, learning environment or the prevalence of diseases in the two countries. Therefore, we asked faculty members at UHS to review the questions for relevance to their students' curriculum. As presented in <Table 32>, 78% of questions in Test of Basic Medicine and 89% in Test of Clinical Medicine were deemed as appropriate in the first round of tests. It is notable that the share of irrelevant questions was highest for biochemistry and pathology in basic medicine. The same group of professors also reviewed the test questions in the second and third rounds, and the percentages of relevant questions were similar to those in the first round. Although all the questions were given to students, only relevant questions were counted in the score for the analysis below.

In addition to test scores, the information on students' grades in the previous academic year was collected from the Faculty of Medicine at UHS. At the end of the test, a short survey was conducted in order to collect information of students' demographic, socioeconomic, and academic backgrounds.

<Table 32> Number of Relevant Questions in the Test of Medical Knowledge

Test	Subject	Wave 1		Wave 2		Wave 3	
		All	Rel	All	Rel	All	Rel
Basic Medicine	1.Anatomy	60	51	60	49	52	49
	2.Biochemistry	35	16	35	17	36	25
	3.Physiology	35	31	35	31	39	35
	4.Pathology	45	28	45	37	44	40
	5.Parasitology	15	13	15	14	14	11
	6.Microbiology	35	34	35	33	34	31
	7.Pharmacology	35	30	35	27	41	32
	Total	260 (100%)	203 (78%)	260 (100%)	208 (80%)	260 (100%)	223 (86%)
Clinical Medicine	1.Internal Medicine	237	227	155	153	143	130
	2.Surgery	70	63	70	53	48	44
	3.Pediatrics	45	42	62	60	48	44
	4.Obstetrics & Gynecology	35	30	63	52	50	45
	5.Psychiatry	45	40	34	33	35	34
	6.Other Fields	9	0	12	10	32	30
	7.Preventive Medicine	39	25	34	32	24	17
	Total	480 (100%)	427 (89%)	430 (100%)	393 (91%)	380 (100%)	344 (91%)

The participation rates in the first round were 36.4% for fifth-year students, and 52.4% for sixth-year students as shown in <Table 33>. The relatively low rates of participation are partly due to the fact that the test took place during the registration period, i.e., before the beginning of the academic year. Some students from other provinces had

not returned to campus yet. In the second round, the participation rate among fifth-year students rose to 89.7%, but that of sixth-year students fell to 24.5%.[3] It seems that the low participation rate among sixth–year students is partly due to the fact that they take more clinical training at hospitals than fifth–year students. The participation rate in the third wave was 82.9% among fifth-year students and 86.0% among sixth-year students.

<Table 33> Participation Rates of Test

Type	Year		Wave 1	Wave 2	Wave 3
Basic Medicine	5	Enrollment	385	351	368
		Participants	140	315	305
		Participation Rate	36.4%	89.7%	82.9%
Clinical Medicine	6	Enrollment	238	368	349
		Participants	120	90	300
		Participation Rate	50.4%	24.5%	86.0%

Note: The participation rate calculated as the percentage of students who completed the test. In Wave 3, there are 23 students who took the test of clinical medicine one week later.

A large difference in participation rates over three waves suggests that there is likely to be a sample selection issue. Students who took the test in the first round may not be similar to those participants in the second round in terms of characteristics, including ability or motivation. In order to gauge the degree of selection, the grades in the previous academic year between test participants and nonparticipants are compared.

According to the upper panel of <Table 34> that covers fifth-year students, not surprisingly, test participants have a higher GPA on average than nonparticipants in both wave 1 and 2, but the difference is statistically significant in wave 1 only. A statistical issue is whether the difference between participants and nonparticipants changed over time. The last column in <Table 34> shows that the difference is smaller in the second wave by 0.13, compared to the first wave, and that the difference-in-differences is not

3 In the second wave, the percentage of those who took the test was 54.3% among sixth–year students, but that of those who completed the test was 24.5%.

significantly different from zero at the 5% level. Therefore, it is inferred that the degree of correlation between GPA and the decision to participate in the test of basic medicine remains similar in the first two waves.

On the other hand, although it is still the case that test participants performed better than the nonparticipants in grades among sixth-year students in both wave 1 and 2, the difference increased over time. The lower panel of <Table 34> suggests that difference in GPA between participants and nonparticipants among sixth-year students in the second round is larger by 0.17 than in the first round, and that it is statistically different from zero at the 1% level. Therefore, it seems that the sample selection issue is more serious in the Test of Clinical Medicine.

<Table 34> Difference-in-Differences in GPA among 5th-year Students for Wave 1 and 2

Type	Round	Non-participants (A)	Participants (B)	Difference (B-A)
Basic Medicine (5th-year)	Wave 1 (C)	2.39	2.59	0.19**
	Wave 2 (D)	2.22	2.28	0.06
	Difference-in-Differences (D-C)			-0.13
Clinical Medicine (6th-year)	Wave 1 (E)	2.23	2.36	0.13**
	Wave 2 (F)	2.11	2.41	0.31**
	Difference-in-Differences (F-E)			0.17**

Note: For basic medicine, GPA is based on all subjects except "Community" and "Research Methodology". This is because the curriculum changed over waves. The test of a null hypothesis that the difference or the difference-in-differences is 0 is based on the t-statistic from a regression analysis. * $p<0.05$; ** $p<0.01$

Next the difference-in-differences in GPA between participants and nonparticipants in the Test of Basic Medicine over three waves is calculated for each subject. As can be seen in <Table 35>, the tendency that the participants have a better academic performance than the nonparticipants did not change much between wave 1 and 3 and between wave 2 and 3. This pattern is also found for a majority of 14 subjects. The exception includes French, gastrointestinal system and practice in OB-GYN between first and second rounds, and French between first and third rounds, and cardiovascular system between second and third rounds. Overall, the participants in the Test of Basic

Medicine in three rounds are comparable to each other in terms of the academic performance.

<Table 35> Difference-in-Differences in GPA by Subject among Fifth-year Students for Wave 1, 2 and 3

Subject	Wave 1 vs. 2	Wave 1 vs. 3	Wave 2 vs. 3
GPA	-0.13	-0.05	0.09
1. Clinical skill (3)	-0.27	-0.19	0.08
2. General CP (3)	-0.15	-0.07	0.08
3. Cardiovascular System (4)	-0.31	0.31	0.62**
4. Blood System (4)	0.02	-0.06	-0.09
5. Respiratory System (4)	-0.01	-0.03	-0.03
6. Gastrointestinal System (5)	-0.35*	-0.10	0.25
7. Renal System (5)	0.19	-0.02	-0.20
8. Social Science (1)	-0.03	-0.10	-0.07
9. French Language II (1)	-0.61**	-0.46*	0.15
10. Practice Internal Medicine (2)	-0.20	-0.17	0.03
11. Practice Surgery (2)	-0.20	-0.10	0.10
12. Practice Pediatrics (2)	-0.24	0.10	0.34
13. Practice OB-GYN (2)	-0.24*	-0.11	0.14
14. Practice District Hospital (2)	0.13	-0.10	-0.23

Note: The number of credits for each course is in parentheses. GPA is based on all subjects except "Community" and "Research Methodology". This is because the curriculum changed over waves. The test of a null hypothesis that the difference-in-differences is 0 is based on the t-statistic from a regression analysis. * $p<0.05$; ** $p<0.01$

Among sixth-year students, however, the correlation between test participation and academic performance is found to vary over years more often than among fifth-year students. <Table 36> indicates that the gap in GPA between participants and nonparticipants decreased between second and third rounds but that it did not change much between first and third rounds. At the subject level, more difference is found between the first and second rounds compared to other years. The difference in grade changed significantly for 8 out of 21 subjects between first and second rounds, whereas a significant change is found for three subjects between first and third rounds and between second and third rounds. While the change in test score in clinical medicine among sixth-year students over waves is likely to reflect the partial difference in academic ability

of participants, the selection problem seems to be less serious in the comparison of first and third rounds. Therefore, the statistical analysis on the Test of Clinical Test below focuses on the change between the first and third rounds.

<Table 36> Difference-in-Differences in GPA among Sixth-Year Students for Wave 1, 2 and 3

Subject	Wave 1 vs. 2	Wave 1 vs. 3	Wave 2 vs. 3
GPA	0.17**	-0.02	-0.19**
1. Social Science (1)	0.09	0.17	0.08
2. Musculo Skeletal System 1 (3)	0.41**	0.10	-0.31
3. Musculo Skeletal System 2 (2)	0.35*	0.09	-0.26
4. Endocrinology (3)	0.43**	0.21	-0.22
5. Neurology 1 (3)	-0.12	-0.39*	-0.27
6. Neurology 2 (3)	-0.08	-0.45*	-0.37*
7. Reproductive system 1 (3)	0.35**	0.09	-0.26
8. Reproductive system 2 (3)	0.19	0.23	0.04
9. Mental Health (2)	0.26	0.07	-0.19
10. Public Health (3)	0.26**	0.10	-0.16
11. Human Development 1 (3)	0.15	-0.14	-0.30*
12. Human Development 2 (2)	-0.01	-0.28	-0.26
13. French language 1+2 (1)	0.34*	-0.17	-0.51**
14. Medical Imagery (1)	0.19*	0.04	-0.15
15. ENT (1)	0.02	0.06	0.03
16. Mental Health (1)	0.06	0.01	-0.05
17. Dermatology (1)	0.23	0.31**	0.08
18. Rehabilitation Medicine (1)	-0.01	-0.07	-0.06
19. Ophtalmology (1)	-0.10*	-0.05	0.05
20. Laboratory (1)	0.01	-0.11	-0.12
21. Emergency (1)	0.01	-0.21	-0.22

Note: The number of credits for each course is in parentheses. The courses of 'Musculo Skeleton System 1 & 2 (Orthopedics, Muscle and Dermatology Disease)' were combined as one course in wave 1 (year 2010-2011), and are treated as two courses with the same grade in order to be compared with the courses in wave 2 and 3. The same case applies to 'Neurology 1 & 2' and 'Reproductive system 1 & 2.' The test of a null hypothesis that the difference-in-differences is 0 is based on the t-statistic from a regression analysis.
* $p<0.05$; ** $p<0.01$

5. Results from the MEAC Medical Knowledge Test

(1) Test of Basic Medicine

The results of the Test of Basic Medicine by subject are presented in <Table 37>. The percentage score declined slightly from 24.6% in wave 1 to 23.1% in wave 2 and then increased to 23.5% in wave 3. In order to adjust for the difficulties in each round, the test scores are standardized using the mean and the standard deviation in the distribution of Korean students' score. The reference group for Test of Basic Medicine is the second-year students in medical colleges in Korea participating in the MEAC test corresponding to three waves.[4] The standardized score in wave 1 was -2.12 and declined to -2.82 in wave 2 and decreased further to -2.97 in wave 3. The performance by subject fluctuates over time. Students achieved the highest standardized score in biochemistry in wave 1, but it was microbiology and parasitology that had the highest score in wave 2 and 3, respectively. On the other hand, students received the lowest score in pathology in wave 1 and 3, and anatomy was the weakest subject in wave 2. In terms of the changes over first and third rounds, the score in parasitology improved the most, while physiology and microbiology fell the most.

<Table 37> Results of Test of Basic Medicine by Subject

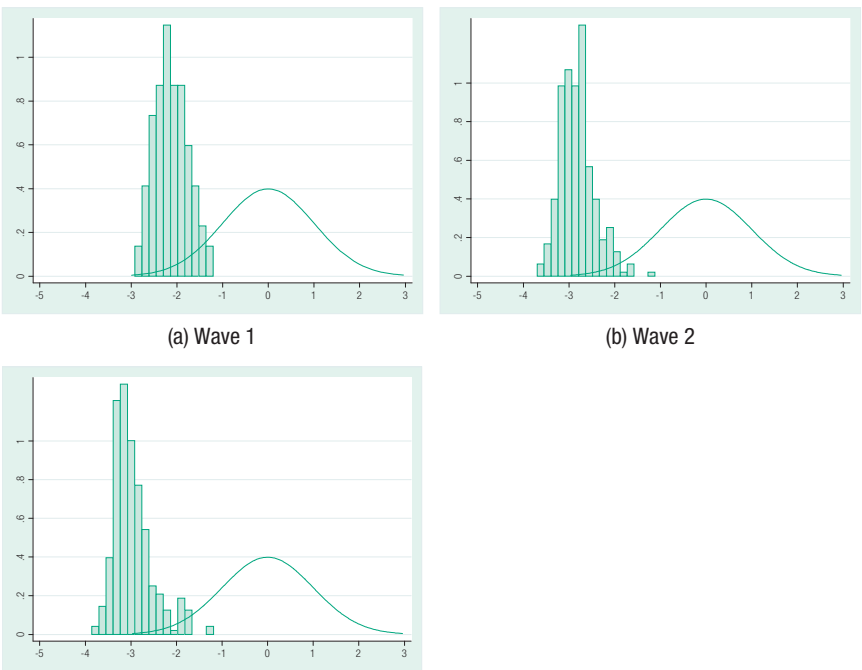
Subject	Percent Score			Std. Score		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
1. Anatomy	25.7	21.7	23.5	-1.72	-2.71	-2.33
2. Biochemistry	24.5	26.9	24.2	-1.21	-2.29	-1.46
3. Physiology	24.0	24.0	22.2	-1.44	-2.45	-2.75
4. Pathology	25.1	25.8	23.3	-2.24	-2.13	-2.96

4 There are 787 students from 25 medical schools in Korea who participated in the Test of Basic Medicine used for the first round. The reference groups for the second and third rounds are, respectively, 778 and 832 students from the same medical schools as for the first round.

Subject	Percent Score			Std. Score		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
5. Parasitology	22.0	20.6	28.0	-1.52	-1.95	-0.88
6. Microbiology	29.2	22.0	20.4	-1.60	-1.79	-2.85
7. Pharmacology	19.1	21.4	23.8	-1.52	-2.00	-2.33
Total	24.6	23.1	23.2	-2.12	-2.82	-2.97

The density distribution of standardized scores in basic medicine is displayed in [Figure 9]. Compared to that in wave 1, the distribution moved to the left in wave 2, and dispersed more than in wave 1. The distribution of scores in wave 3 moved slightly to the left with a more variation compared to that in wave 2.

[Figure 9] Distribution of Test Scores in Basic Medicine



(a) Wave 1

(b) Wave 2

(c) Wave 3

Note: The green curve indicates the density of standard normal distribution. The test scores by the UHS students are standardized with the mean and standard deviation of the score distribution by Korean students.

According to the results by field in <Table 38>, the highest performance in standardized score is observed in 'inheritance' in both wave 1 and 2, while it is observed in 'blood & blood forming organ' in wave 3. The lowest score is recorded in 'cell & tissue' in wave 1, in 'kidney & urinary tract' in wave 2 and in 'infection' in wave 3. The scores in 'cell & tissue' and 'musculoskeletal system' improved the most over the three waves, while those in 'infection,' 'genesis & differentiation' and 'neoplasm' declined the most.

<Table 38> Results of Test of Basic Medicine by Field

Field	Percent Score			Std. Score		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
1. Metabolism	23.0	28.8	21.2	-1.29	-2.19	-1.61
2. Inheritance	31.2	14.9	23.7	-0.32	-0.42	-1.40
3. Cell & Tissue	19.5	25.6	20.9	-2.12	-1.76	-1.19
4. Neoplasm	20.3	26.3	19.6	-1.58	-1.02	-2.70
5. Infection	26.5	20.6	23.0	-1.82	-2.17	-3.01
6. Immunity	25.0	23.3	20.6	-1.46	-1.14	-1.42
7. Genesis & Differentiation	37.5	20.6	23.4	-0.74	-1.06	-1.90
8. Human Response	23.3	26.3	29.0	-1.18	-2.12	-1.81
9. Musculoskeletal System	20.1	19.6	20.8	-2.08	-1.81	-1.03
10. Nervous System	22.3	20.3	22.5	-1.58	-2.24	-2.07
11. Blood & Blood Forming Organ	33.8	19.5	30.1	-0.44	-1.35	-0.90
12. Circulator	22.9	24.1	26.1	-1.07	-2.03	-1.44
13. Digestive System	25.6	23.3	22.7	-1.30	-1.39	-1.83
14. Respirator	21.4	22.1	18.3	-1.72	-1.69	-2.13
15. Endocrine System	33.3	28.4	26.6	-1.63	-1.84	-2.93
16. Kidney & Urinary Tract	23.0	19.1	18.9	-1.40	-2.55	-1.72
17. Reproductive System	23.4	26.5	29.3	-1.33	-1.94	-1.00
Total	24.6	23.1	23.2	-2.12	-2.82	-2.97

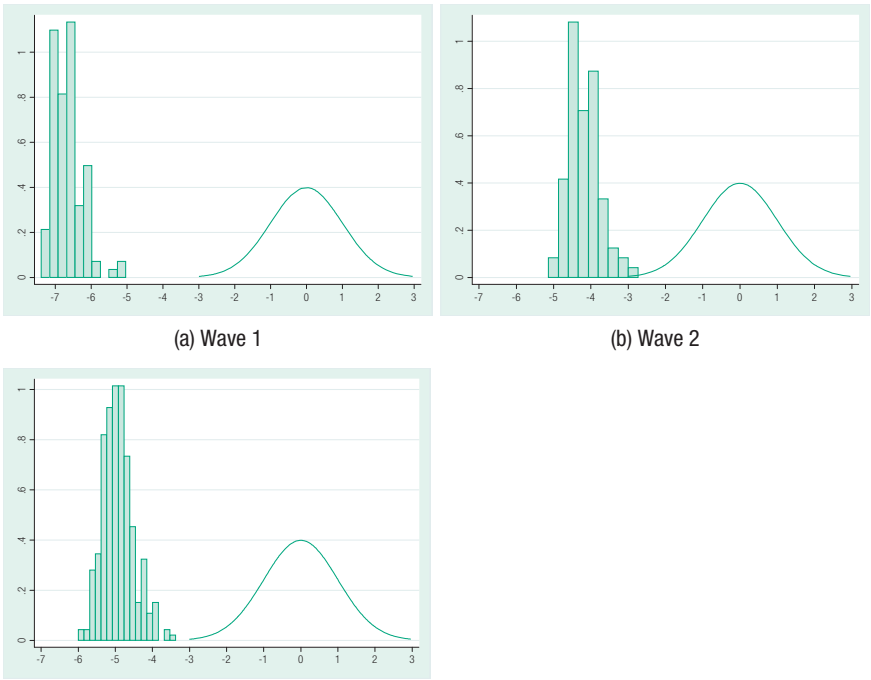
(2) Test of Clinical Medicine

The results of Test of Clinical Medicine are presented in <Table 39>. The percentage scores are slightly higher than those in Test of Basic Medicine and declined slightly from 25.4% in wave 1 to 24.9% in wave 2 and 24.0% in wave 3. However, in terms of the standardized score, the average score increased substantially from -6.66 in wave 1 to -4.20 in wave 2 and then fell little to -4.92 in wave 3. The largest improvement over three waves is observed in 'internal medicine' and 'obstetrics & gynecology,' whereas the smallest increase is found in 'pediatrics' and 'psychiatry.' In [Figure 10], it is clear that that the density distribution of test scores moved to the right with a slightly larger dispersion from wave 1 to wave 2. The distribution moved to the left slightly with more variation from wave 2 to wave 3.

<Table 39> Results of Test of Clinical Medicine by Subject

Subject	Percent Score			Std. Score		
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3
1.Internal Medicine	25.8	25.6	23.2	-6.69	-3.52	-4.20
2.Surgery	26.9	24.2	21.9	-5.23	-4.06	-3.57
3.Pediatrics	25.5	26.0	24.4	-4.57	-3.50	-3.59
4.Obstetrics & Gynecology	15.9	27.2	30.0	-5.85	-3.01	-3.84
5.Psychiatry	27.2	20.2	21.5	-4.86	-3.95	-4.19
6.Other Fields		31.1	26.3		-2.04	-3.27
7.Preventive Medicine	26.5	20.5	18.8	-4.52	-4.15	-3.60
Total	25.4	24.9	24.0	-6.66	-4.20	-4.92

[Figure 10] Distribution of Test Scores in Clinical Medicine



(a) Wave 1

(b) Wave 2

(c) Wave 3

Note: The green curve indicates the density of standard normal distribution. The test scores by the UHS students are standardized with the mean and standard deviation of the score distribution by Korean students.

The summary of test scores for clinical medicine by field is given in <Table 40>. In wave 1, the highest standardized score is found in 'genetic disorder and congenital deformation,' 'gestational, puerperal, and postpartum disease' and 'neoplasm,' while the lowest score is obtained in 'normal structure and function of the human body' and 'treatment and complication.' It should be noted that the each field of 'genetic disorder and congenital deformation' and 'gestational, puerperal, and postpartum disease' has only one question in wave 1, which implies that one needs caution in interpreting the score as a measure of knowledge. Therefore, the fields with less than four questions are discarded in the statistical analysis below. The relative performance is the highest in 'normal development, growth, and aging' in wave 2, and in 'genetic disorder and congenital deformation' in wave 3. On the other hand, it is the lowest in 'nutritional and

digestive disease' in wave 2 and 'psychiatric disorder' in wave 3. The standardized score increased over three waves in most of the fields, and the largest improvement is detected in 'normal structure and function of the human body,' 'treatment and complication' and 'kidney, urinary, male genital disease.' However, the score declined in a few fields including 'gestational, puerperal, and postpartum disease,' 'psychiatric disorder' and 'genetic disorder and congenital deformation.'

<Table 40> Results of Test of Clinical Medicine by Field

Field	Percent Score			Std. Score		
	Wave1	Wave2	Wave3	Wave1	Wave2	Wave3
General Medicine						
101.Normal structure and function of the Human body	20.9	19.6	34.4	-7.08	-2.67	-2.26*
102.Normal development, growth, and aging	25.4	31.4	35.2	-4.45	-0.62	-1.25*
103.Occurrence of disease and death	29.2	42.8	8.0	-4.16*	-1.04*	-1.15*
104.Major symptom and pathophysiology	17.1	14.1	17.3	-5.47	-2.98	-4.08
105.Physical examination and diagnosis	33.9	24.9	25.3	-3.17	-2.28	-2.77
106.Clinical test	21.0	38.6	24.4	-4.89	-1.41	-2.24
107.Treatment and complication	20.6	32.2	30.6	-6.69	-1.11*	-2.26
108.Health promotion and disease prevention	27.0	20.9	18.1	-3.66	-3.29	-3.32
109.Health care management	24.7	19.4	21.0	-3.81	-3.79	-1.85
110.Industrial environment	26.7			-3.10		
Special Medicine						
201.Nutritional and Digestive disease	28.4	28.2	27.9	-6.28	-4.12	-3.68
202.Injury and intoxication	19.5	15.9	19.5	-3.39	-1.60	-1.62
203.Neoplasm	26.9	31.1	24.2	-1.99	-1.19*	-1.24
204.Blood and hematopoetic disorder	25.4	24.0	25.4	-4.71	-2.12	-3.09
205.Cardiovascular disease	28.1	29.4	21.7	-5.83	-2.69	-3.47
206.Musculoskeletal system and connective tissue disease	24.2	22.3	15.6	-3.69	-2.45	-2.04
207.Nervous system disease	23.4	24.1	24.9	-2.36	-2.93	-2.40
208.Allergic and Immune disorder	24.4	30.0	24.4	-3.53	-2.28	-3.34
209.Respiratory disease	23.5	29.2	20.9	-3.75	-2.59	-3.75

Field	Percent Score			Std. Score		
	Wave1	Wave2	Wave3	Wave1	Wave2	Wave3
210.Infection and parasitic disease	17.9	25.3	23.2	-3.20	-3.27	-1.72
211.Endocrine and metabolic disease	23.5	24.2	18.0	-4.16	-3.57	-2.81
212.Kidney, Urinary, Male genital disease	33.3	21.2	27.1	-5.93	-2.92	-2.19
213.Genetic disorder and congenital deformation	7.5	19.1	18.0	-0.93*	-2.80	-1.13*
214.Perinatal and neonatal disease	25.8	27.2	22.5	-2.14*	-2.49	-1.65
215.Dermatologic disease		31.4	18.1		-1.81	-1.19
216.Disease of ear, nose, and throat		23.6	27.3		-1.35	-1.49*
217.Disorders of eye and adnexa		45.6	31.9		-0.75*	-1.43
218.Female genital disease		23.2	28.6		-2.63	-2.93
219.Gestational, puerperal, and postpartum disease	62.5	32.1	36.4	-0.92*	-2.40	-2.62
220.Psychiatric disorder	31.2	20.0	20.8	-4.00	-3.59	-4.37
Total	25.4	24.9	24.0	-6.66	-4.20	-4.92

Note: * indicates the fields with less than four questions.

6. Estimating the Effect of THE Dr. LEE Jong-Wook—Seoul Project on Test Scores

(1) Statistical Model

Based on the discussion on the production function of the academic performance in Section 2, the following regression model was considered:

$$Y_{i,j,t} = \alpha + \rho D_{i,j,t} + \beta X_{i,j,t} + \mu_i + \theta_j + \eta_t + \varepsilon_{i,j,t}$$

The dependent variable, $Y_{i,j,t}$, is the academic performance of an individual i at time t measured with a score in a standardized test for medical knowledge in subject j. The treatment variable, $D_{j,t}$, measures the scale of the intervention, or the share of the trainees among all instructors in subject j. A set of explanatory variables, $X_{j,t}$, includes all other observable characteristic of school and individuals. The unobserved individual-specific

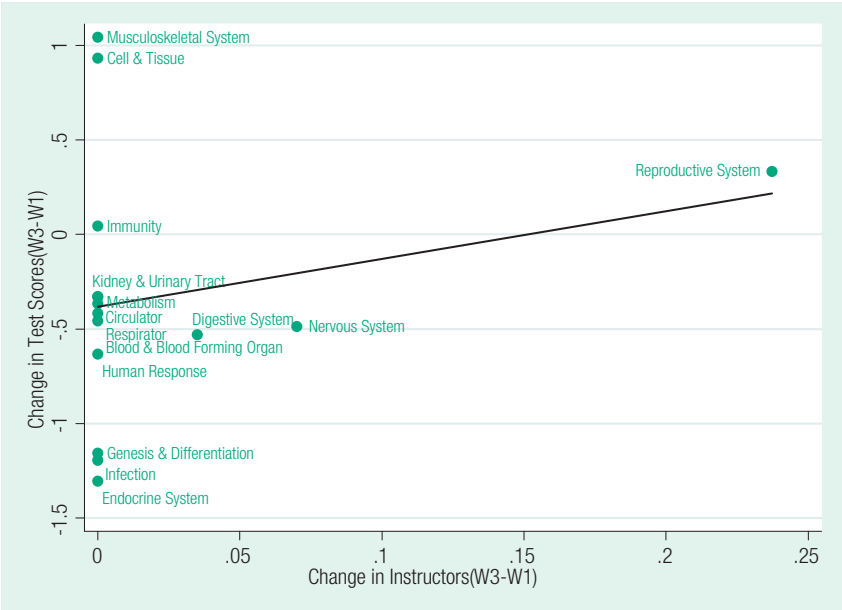
factors like ability or motivation is represented by μ_i. In addition, the subject-specific and time-specific factors are denoted by θ_j and η_t, respectively. Lastly, idiosyncratic noise is included as an error term $\varepsilon_{i,j,t}$.

In this statistical model, the treatment effect is measured by the estimate of the coefficient ρ. The major challenge is the measurement of both the performance and educational factors, and the potential correlation between the regressors and the unobserved individual characteristics, μ_i. Given the sample selection, the coefficient ρ may not be consistently estimated. With this limitation, we first estimate the equation for the whole set of subjects with subject fixed-effects removed. Then, we examine how sensitive the estimate is to the inclusion of various individual characteristics like GPA and household income.

(2) Test of Basic Medicine

Our empirical analysis is essentially to examine whether the test scores improved more in subjects or fields with more trainees as instructors. Since it is desirable to match the specialty of trainees and the test questions as closely as possible, we present the analysis at the level of field rather than subject in medical education. As a descriptive analysis, [Figure 11] presents a scatter plot between changes in the share of teaching by trainees, and changes in test scores for fifteen fields in Basic Medicine over wave 1 and wave 3. The field of neoplasm is dropped because it is not found in the curriculum of courses at UHS. Further, the field of inheritance is removed because it had less than three questions in the second round of test. The positive correlation in [Figure 11] suggests that there may be a positive impact of the project on the test scores. It is true that the positive correlation in [Figure 11] is mainly driven by a few observations, especially, the field of reproductive system. However, this is because there are only a few fields taught by trainees. Moreover, since the data in [Figure 11] are a population, an unbalanced sampling is not a concern. In order to verify the relationship, a regression analysis was conducted.

[Figure 11] Change in Instructors and Change in Test Scores by Field in Basic Medicine (Wave 1 to 3)



The data are constructed at the student-field level, which implies that one student contributes to data with fifteen observations on the scores for each field. The summary statistics on fifth-year students is provided in <Table 41>. The average test score for all three waves is -1.71 standard deviation, but there is some variation across waves. The average test score decreased from -1.41 standard deviation in wave 1 to -1.82 standard deviation in wave 2, and then increases slightly to -1.73 standard deviation in wave 3. The difference in test scores between wave 1 and wave 2 may reflect the fact that that the participation rate was relatively low in the first-round test. The share of school hours taught by trainees in each field is positive only in wave 3 at 0.023, or 2.3%, and is averaged to be 0.008 for all waves. Since the fifth-year students took the courses in basic science not last year but the year before, only those students in wave 3 were taught by the first cohort of trainees. The average age is 23.3 years, and 59% of students are female. The share of special students is 51%. Foreign language proficiency is in order of Thai, English and French. The proportion of students who reported to have the level

of language normal or above is 67% for Thai, 46% for English and 13% for French. The majority ethnic group is Lao, and 81% of students have mothers from Lao. Regarding the mother's education level, 11% of mothers have no schooling. The share of those with primary education and secondary education is 20% and 31%, respectively. Further, mothers with vocational training take up 18%, and those with university degree 20%. The average household size is 7.5 persons. As for the monthly household income, one third of students answered that it is above 2 million kip, where as 14% of them answered that it is between 1.5 to 2 million kip. On the other hand, 29% of the students responded that they do not know. The students in round 2 and round 3 exhibit characteristics generally similar to each other, while the tendency is less strong between round 1 and other rounds.

<Table 41> Summary Statistics of Test of Basic Medicine by Field (Mean)

Variable	All (N=9,600)	Wave 1 (N=1,875)	Wave 2 (N=4,260)	Wave 3 (N=3,465)
Test score (standardized)	-1.708	-1.414	-1.819	-1.730
Share of class hours taught by trainees	0.008	0.000	0.000	0.023
Wave 2	0.444	0	1	0
Wave 3	0.361	0	0	1
GPA	2.385	2.593	2.283	2.398
Age	23.297	22.160	23.570	23.576
Female	0.586	0.576	0.518	0.675
Special Students	0.506	0.512	0.426	0.602
English: normal or above	0.456	0.600	0.408	0.437
French: normal or above	0.133	0.232	0.088	0.134
Thai: normal or above	0.667	0.768	0.648	0.636
Mother's ethnic group: Lao	0.808	0.784	0.789	0.844
Mother's education: No schooling	0.114	0.040	0.113	0.156
Mother's education: Primary	0.198	0.264	0.208	0.152
Mother's education: Lower secondary	0.163	0.112	0.194	0.152
Mother's education: Higher secondary	0.147	0.152	0.127	0.169
Mother's education: Vocational	0.183	0.248	0.162	0.173

Variable	All (N=9,600)	Wave 1 (N=1,875)	Wave 2 (N=4,260)	Wave 3 (N=3,465)
Mother's education: University	0.195	0.184	0.197	0.199
Household size	7.494	8.256	7.060	7.615
HH exp.: below 0.5 mil. Kip (mth)	0.028	0.024	0.035	0.022
HH exp.: 0.5~1 mil. Kip (mth)	0.098	0.128	0.095	0.087
HH exp.: 1~1.5 mil. Kip (mth)	0.113	0.176	0.099	0.095
HH exp.: 1.5~2 mil. Kip (mth)	0.136	0.064	0.180	0.121
HH exp.: above 2 mil. Kip (mth)	0.334	0.336	0.345	0.320
HH exp.: do not know	0.291	0.272	0.246	0.355

Note: The unit of observation is a student-field level. There are 640 students and 15 fields in basic medicine, which amounts to 9,600 observations. One US dollars equaled 8,001 Kip as of January 1, 2014.

The results of the regression are presented in <Table 42>. The basic specification in column (1) suggests that the share of trainees among instructors increases the test scores and that the effect is statistically significant at the conventional level. Specifically, the estimate implies that the full change from zero to one in the share of trainees would increase the test scores by 3.26 times of standard deviation. In the sample, the share of trainees increased from zero in wave 1 to 0.023 in wave 3. Therefore, the increase in test scores attributed to the project is 0.074 (=0.023×3.26) standard deviation, which amounts to 4.4% of the gap between UHS and Korean students (1.71 standard deviation).

As discussed earlier, the participation rate of the Test of Basic Medicine was less than 40% in wave 1, whereas it was over 80% in wave 2 and wave 3. Although the correlation between participation and GPA among fifth-year students did not seem to change much over waves, the sample selection issue is potentially larger for wave 1. When the sample is restricted to wave 2 and wave 3 in column (2) of <Table 42>, the main result still holds. The point estimate indicates that the change in the share of trainee among instructors from zero to 100% leads to an increase in the score by 3.53 times of standard deviation. Considering the actual change in the share of trainees, the project contributed to an increase of 0.081 (=0.023×3.53) standard deviation in the score, which equals 4.7% of the difference between Lao and Korean students' average scores.

The magnitude of the estimated effect is rather larger than expected, since it implies that the gap between UHS and Korean students' performance in the test would completely disappear with all the lecturers trained under the Dr. Lee Jong-Wook–Seoul Project. Given that the scale of the project in terms of number of trainees is small, the results can be considered as a marginal effect in the early stage of intervention.

As for other individual characteristics, GPA turns out to be a strong predictor of performance on the Test of Basic Medicine. One more grade in GPA is expected to increase the test score by 0.29 of standard deviation. Older students tend to have lower scores than their younger counterparts, and special students tend to perform worse than regular students. Proficiency of French and English language turns out to be a good predictor of academic performance. On the other hand, mother's education and household size does not seem to have any significant effect on the test scores.

<Table 42> Effect of Intervention on Test Score of Basic Medicine at Field Level

	(1) All	(2) Wave 2 & Wave 3
Share of trainees among instructors	3.2585 (0.2860)**	3.5332 (0.3059)**
GPA	0.2898 (0.0235)**	0.2853 (0.0252)**
Wave 2	-0.3059 (0.0248)**	0.0120 (0.0209)
Wave 3	-0.3087 (0.0255)**	
Female	-0.0299 (0.0175)	-0.0251 (0.0196)
Age	-0.0044 (0.0020)*	-0.0038 (0.0021)
Special Students	-0.0607 (0.0174)**	-0.0526 (0.0193)**

	(1) All	(2) Wave 2 & Wave 3
English: normal or above	0.0454 (0.0179)*	0.0482 (0.0201)*
French: normal or above	0.0808 (0.0260)**	0.0596 (0.0311)
Thai: normal or above	-0.0318 (0.0183)	-0.0402 (0.0200)*
Mother's ethnic group: Lao	-0.0339 (0.0223)	-0.0410 (0.0249)
Mother's education: Primary	0.0242 (0.0320)	0.0180 (0.0344)
Mother's education: Lower secondary	-0.0028 (0.0337)	-0.0105 (0.0355)
Mother's education: Higher secondary	0.0151 (0.0348)	0.0148 (0.0373)
Mother's education: Vocational	-0.0205 (0.0335)	-0.0344 (0.0362)
Mother's education: University	0.0248 (0.0344)	0.0439 (0.0369)
Household size	-0.0030 (0.0020)	-0.0028 (0.0022)
R^2	0.22	0.23
No. of observations	9,600	7,725

Note: The dependent variable is the standardized test score, and the unit of the observation is a student-field level. All models include the household expenditure dummies and medical field dummies as explanatory variable. Standard errors are in parentheses. ** p<0.01, * p<0.05.

Given that there is a wide variation in students' scores in the test of medical knowledge, low-performing students may have benefited more or less from Dr. Lee Jong-Wook–Seoul Project more than high-performing students. This question is important because it can help answer questions concerning how to design medical education effectively. The level of lecture may be set high or low by the Dr. Lee Jong-Wook–Seoul Project

participants, which implies that targeted students would benefit more than others. Upon the same lecture delivered, the highly motivated students are likely to learn more than others. Further, the classroom environment is not very favorable to students based on our observation, which means that those students sitting in the front would follow the lectures better than others. On the other hand, if high-performing students learn regardless of the quality of lectures, then the project is likely to help low-performing students more than others. Therefore, a priori, it is not clear who would benefit most from the intervention.

Empirically, a quantile regression model is adopted to estimate the program's impact for those students whose score is placed at a particular level, and <Table 43> presents the results for the sample of wave 2 and wave 3. According to column (3), the change in the share of trainees among lecturers from zero to one would increase the score by 3.15 standard deviation for those students whose score is at the median of the distribution. The effect is slightly smaller than the average effect in <Table 42>. It turns out that the program effect is larger for the students with a relatively low score than for those with a high score. The effect is 3.48 standard deviation for 25th percentile, whereas it is 2.20 standard deviation for the 75th percentile. Nevertheless, a Wald test suggests that these two estimates do not significantly differ from each other. When we look at more extreme scores, the difference in the effects on the low and high performers becomes smaller. The effect for the 10th percentile is 3.01 standard deviation, and that for the 90th percentile is 2.46 standard deviation. Again the gap between these two estimates does not significantly different from zero. Therefore, we do not find any evidence that the project effect is uneven across students with different academic performance although it tends to be slightly larger for those students with a lower score than others. Interestingly, it is found that GPA does not predict the test scores for high performers. The effect of GPA on test scores is not significantly different from zero for the 90th percentile, while it is significant for all other percentiles. This suggests that GPA is of limited relevance as a measure of academic performance for those students with high achievement in the basic medicine.

<Table 43> Effect of Intervention on Test Score of Basic Medicine by Quantile (Wave 2+Wave 3)

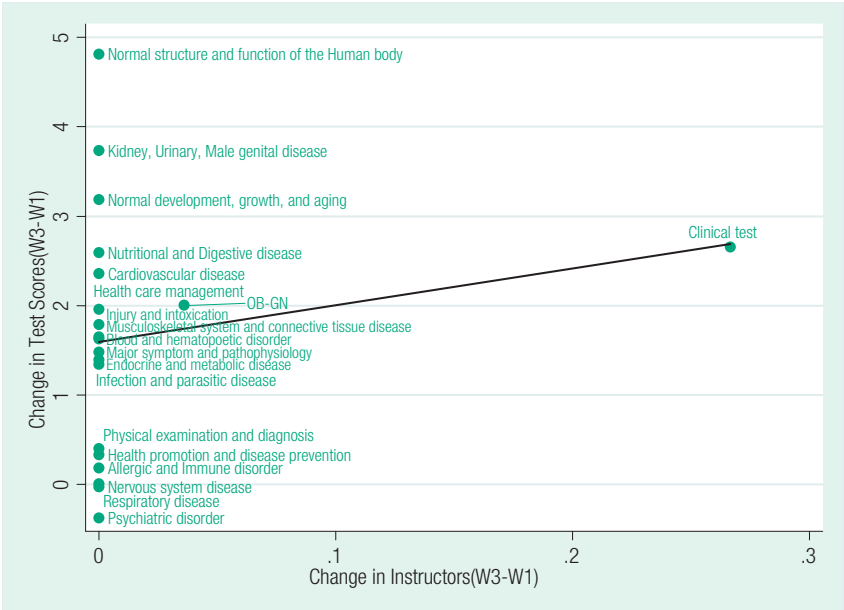
Percentile	(1) 10th	(2) 25th	(3) 50th	(4) 75th	(5) 90th
Share of trainees among instructors	3.0118	3.4848	3.1493	2.2017	2.4616
	(1.0146)**	(0.3084)**	(1.0208)**	(0.8343)**	(0.5666)**
GPA	0.2182	0.1543	0.2514	0.2499	0.1294
	(0.0467)**	(0.0493)**	(0.0372)**	(0.0442)**	(0.0695)
No. of observations	7,725	7,725	7,725	7,725	7,725

Note: The dependent variable is the standardized test score, and the unit of the observation is a student-field level. All models include as explanatory variable individual characteristics and medical field dummies as in <Table 42> Standard errors are in parentheses. ** p<0.01, * p<0.05.

(3) Test of Clinical Medicine

Next, the Test of Clinical Medicine is examined. There are 30 fields in total for the Test of Clinical Medicine. The share of teaching hours by trainees among the courses offered at the UHS Faculty of Medicine is matched with the test score for each field, and those fields with at least four questions in the Test in each wave are considered in the analysis. As before, the descriptive scatter plot between the change in the share of teaching by trainees and the change in the test scores by field is shown in [Figure 12]. The scatter plot exhibits a positive correlation between the two variables, which suggests that the test scores for those fields with a benefit from the project increased more compared to the average for other fields.

[Figure 12] Change in Instructors and Change in Test Scores by Field in Clinical Medicine



The summary statistics of the sample for the regression analysis are presented in <Table 44>. The mean of standardized test scores of clinical medicine is -3.12, and increased from -4.44 in wave 1 to -2.70 in wave 2, and then declined slightly to -2.79 in wave 3. The mean value of teaching share of the participants is 0.009, or 0.9 percent. The share of trainees in teaching hours increased from zero in wave 1 to 0.1% in wave 2 and further to 1.5% in wave 3. The scale of intervention was measured based on the curriculum in the previous year for each wave. The general characteristics of the sixth-year students sample are similar to those in <Table 41>. Students' GPA is 2.4, and students are 23.9 years old, on average. About 61% of the students are female and 44% are special students. About two-thirds of students answered that their level of Thai language is normal or above, and the share is a half for English and one-sixth for French. About 79% of students have mothers from Lao ethnic group, and 22% of students have mothers with university degree. In 43% of the cases, the monthly household expenditure is above 2 million kip. The students in wave 3 tend to be slightly older and less proficient in foreign languages and have mothers with less education than those in other waves.

<Table 44> Summary Statistics of Test of Clinical Medicine by Field (Mean)

Variable	All (N=8,800)	Wave 1 (N=2,040)	Wave 2 (N=1,680)	Wave 3 (N=5,080)
Test score (standardized)	-3.156	-4.444	-2.705	-2.787
Share of class hours taught by trainees	0.009	0.000	0.001	0.015
Wave 2	0.191	0	1	0
Wave 3	0.577	0	0	1
GPA	2.411	2.387	2.401	2.425
Age	23.914	22.814	23.095	24.626
Female	0.607	0.647	0.583	0.598
Special Students	0.436	0.529	0.405	0.409
English: normal or above	0.491	0.588	0.583	0.421
French: normal or above	0.166	0.284	0.274	0.083
Thai: normal or above	0.670	0.755	0.750	0.610
Mother's ethnic group: Lao	0.793	0.833	0.714	0.803
Mother's education: No schooling	0.089	0.059	0.060	0.110
Mother's education: Primary	0.259	0.294	0.250	0.248
Mother's education: Lower secondary	0.143	0.088	0.155	0.161
Mother's education: Higher secondary	0.120	0.118	0.083	0.134
Mother's education: Vocational	0.173	0.206	0.190	0.154
Mother's education: University	0.216	0.235	0.262	0.193
Household size	6.641	6.461	6.976	6.602
HH exp.: below 0.5 mil. Kip (mth)	0.043	0.029	0.048	0.047
HH exp.: 0.5~1 mil. Kip(mth)	0.120	0.098	0.131	0.126
HH exp.: 1~1.5 mil. Kip(mth)	0.098	0.049	0.119	0.110
HH exp.: 1.5~2 mil. Kip(mth)	0.139	0.137	0.190	0.122
HH exp.: above 2 mil. Kip(mth)	0.430	0.451	0.357	0.445
HH exp.: do not know	0.170	0.235	0.155	0.150

Note: The unit of observation is a student-field level. There are 440 students and 20 fields in clinical medicine, which amounts to 8,800 observations. One US dollars equaled 8,001 Kip as of January 1st, 2014.

The results of the regression estimation are shown in <Table 45>. According to column (1), the share of trainees among instructors has a positive impact on test scores, but the effect is not precisely estimated. However, when the sample includes only wave 1 and

wave 3 in column (2), a significant impact of the project on test score is found. The point estimate suggests that the change in the share of trainees out of instructors from 0 to 1 increases test scores by 3.90 standard deviation. Since the share of trainees increased by 0.015 over three waves, the change in the test scores due to the project is estimated to be 0.059 (=3.90×0.015) standard deviation. Given that the average test score is -3.16 standard deviation in the sample, the increase of the average score by 1.9% (=0.059/3.16) is attributed to the project. Since only a quarter of the enrolled students took the Test of Clinical Medicine in wave 2 compared to a half in wave 1 and 86% in wave 3, it appears that the results in column (2) are more reliable than those in column (1).

Like the case of Test of Basic Medicine, GPA is found to be an important predictor of test scores. When GPA increases by one, the test score is expected to increase by 0.39 standard deviation. Gender does not seem to matter, but older students performed less well than their younger counterparts. Special students scored higher than normal students, which is the opposite to the case of fifth-year students. Those students with a knowledge of French language also performed better than those who had no knowledge of French. Mother's educational background and household size are not found to have any significant impact.

<Table 45> Effect of Intervention on Test Score of Clinical Medicine at Field Level

	(1) All	(2) Wave 1 & Wave 3
Share of trainees among instructors	0.7290 (0.3748)	3.9069 (0.4454)**
GPA	0.3596 (0.0336)**	0.3853 (0.0380)**
Wave 2	1.7248 (0.0340)**	
Wave 3	1.6616 (0.0289)**	1.6183 (0.0290)**
Female	-0.0361 (0.0233)	-0.0325 (0.0255)

	(1) All	(2) Wave 1 & Wave 3
Age	-0.0054 (0.0028)	-0.0066 (0.0029)*
Special Students	0.0303 (0.0232)	0.0610 (0.0250)*
English: normal or above	0.0059 (0.0244)	-0.0003 (0.0266)
French: normal or above	0.0827 (0.0339)*	0.1148 (0.0389)**
Thai: normal or above	0.0318 (0.0243)	0.0367 (0.0260)
Mother's ethnic group: Lao	-0.0727 (0.0292)*	-0.0530 (0.0324)
Mother's education: Primary	-0.0004 (0.0437)	-0.0390 (0.0464)
Mother's education: Lower secondary	0.0112 (0.0485)	0.0165 (0.0514)
Mother's education: Higher secondary	-0.0030 (0.0509)	-0.0274 (0.0536)
Mother's education: Vocational	-0.0292 (0.0478)	-0.0502 (0.0510)
Mother's education: University	0.0145 (0.0477)	-0.0404 (0.0513)
Household size	-0.0024 (0.0030)	-0.0028 (0.0032)
R^2	0.50	0.55
No. of observations	8,800	7,120

Note: The dependent variable is the standardized test score, and the unit of the observation is a student-field score. All models include the household expenditure dummies and medical field dummies as explanatory variable. Standard errors are in parentheses. ** p<0.01, * p<0.05.

Next, we question whether the project effects operated evenly amongst all the students. The results of the quantile regression for the sample of wave 1 and wave 3 are

shown in <Table 46>. Column (3) indicates that the full change in the proportion of trainees among instructors from zero to 100% would increase the test scores by 4.71 standard deviation for those students whose score is at the median of the distribution. The effect at median is larger than that at the mean (3.91) in <Table 45>. Further, it was determined that the program effect was larger for the students with a lower score than for those with a higher score. The program effect is 7.36 standard deviation for the 25th percentile of the distribution, whereas it is 4.70 standard deviation for the 75th percentile. However, the Wald test does not reject the hypothesis that these two effects are the same.

This tendency is even more poignant for more extreme levels of scores than for the interquartile levels. The program effect is estimated to be 3.73 standard deviation for the 10th percentile of the distribution, but no significant effect can be found for the 90th percentile. Therefore, in the case of the Test of Clinical Medicine, the students around the median score benefited most from the project, and those with highest performance did not benefit very much. One possibility is that high performing students may have a strong motivation or learn from sources other than classes. Another is that the trainees target mainly the average students in delivering lectures. The effect of GPA on the test scores is of more or less the same magnitude for most students except those at the 10th percentile, for whom no significant effect is detected. Hence, GPA is a poor predictor of test scores in clinical medicine for low performers.

<Table 46> Effect of Intervention on Test Score of Clinical Medicine by Quantile (Wave 1+Wave 3)

Percentile	(1) 10th	(2) 25th	(3) 50th	(4) 75th	(5) 90th
Share of trainees among instructors	3.7342 (0.1999)**	7.3586 (1.8577)**	4.7093 (0.4214)**	4.7019 (0.2675)**	0.9018 (1.5799)
GPA	0.0000 (0.1055)	0.1881 (0.0886)*	0.1396 (0.0655)*	0.2260 (0.0736)**	0.1929 (0.0857)*
No. of observations	7,120	7,120	7,120	7,120	7,120

Note: The dependent variable is the standardized test score, and the unit of the observation is a student-field score. All models include as explanatory variable individual characteristics and medical field dummies as in <Table 2-17> Standard errors are in parentheses. ** p<0.01, * p<0.05.

7. Conclusion

This chapter presents the analysis based on the three rounds of Test of Medical Knowledge among UHS students. It hypothesizes that the Dr. LEE Jong-Wook—Seoul Project will improve the teaching capability of participants and that it will thus enhance students' medical knowledge. The main finding is that the teaching performance of the trainees who were a part of the Dr. LEE Jong-Wook—Seoul Project has improved in the areas of both basic and clinical medicine. The estimates indicate that the first and second cohort of trainees in the project accounts for the increase in the test scores of basic medicine by 0.081 standard deviation in case of basic medicine and 0.059 standard deviation in case of clinical medicine. The magnitude of the impact is equivalent to 4.9% and 1.9% of the gap in the test scores between UHS and Korean students in basic medicine and clinical medicine, respectively. Further, not all the students benefited from the project equally. In the case of basic medicine, the program effects are more or less similar to each other across students with different level of performance. In the case of clinical medicine, however, the project had a largest impact on the students around the median score, and it had no effect on those with the highest performance.

While the results suggest that the Dr. LEE Jong-Wook—Seoul Project had a substantial impact on students' learning outcome, there are a couple of limitations as an evaluation study. First, the students' participation rate in the test fluctuated over the years, which casts a doubt on whether the samples in different years are comparable to each other. Although the issue is less serious for the subset of the sample, one should keep in mind the potential bias due to the sample selection.

Second, the results suggesting that the gap between UHS and Korean students in the test score can be completely eliminated through a training program is quite striking. However, the estimates on the program impact should be interpreted as a marginal effect in an early stage of the intervention. The first and second cohorts of trainees account for only 10% of the lecturers in the faculty of basic science and for 3% in the faculty of medicine, when measured against their teaching hours. The impact produced by additional trainees is likely to get smaller as the project is rolled over.

Third, the relevance of test questions to the context of Lao Republic needs to be further reviewed. Although the analysis is based on a set of test questions deemed by UHS professors as relevant, the composition of the questions in terms of medical field and clinical practice may not reflect the curriculum at UHS as much as it does the curriculum at medical schools in Korea. Therefore, the change in test scores should be understood in relative terms rather than absolute terms.

Last but not least, the study evaluates the project only with respect to educational outcomes. The analysis on the research outcome and the clinical practice performed by trainees would give us a more balanced view on the project's impact. According to a study by Shin and Lee (2015), the participants of the Dr. LEE Jong-Wook—Seoul Project were observed to be more active both in teaching students and treating patients after than before the training. They report, on the other hand, that the change in research activity is limited mainly due to the lack of equipment and research funds. Their qualitative study is highly valuable in itself, but a quantitative analysis would be complementary.

The Dr. LEE Jong-Wook—Seoul Project has a clear objective of improving the capacity of medical professionals. However, its content is not predetermined, but regularly adjusted based on the needs at the time. Shin and Lee (2015) documents the contents of the training program in detail. An effective evaluation of the project requires both the full classification of the program contents and the measurement of outcomes on a regular basis.

The model of training health professionals in a leading institution as a way to improve the overall capacity of medical staff in a country has been in place since the 1960s. Given the strong effect of the project on students' learning outcome, it is highly recommended to scale up the project. One way is to secure more funding for the project, and another is to integrate the project with an existing programs. In fact, EDC/HP at UHS has been established in order to build up the capacity of clinical practice and education. Strengthening the functions of EDC/HP would be an efficient way of expanding the training program for UHS.

The training of trainers model can be applied to a different level in the medical system. Continuing Professional Development (CPD) program was developed by KOICA, SNUCM and UHS in order to train medical associates/assistants (MA), who are the main medical staff in charge of primary care in rural areas of the Lao Republic. CDP training program was implemented in the Luang Prabang province from 2012 to 2014. It included one-week training for medical faculty members at the province hospital and a ten-week training for MA by those medical instructors. A qualitative evaluation study reports that the CDP program improved the clinical practice by MA (SNUCM and SNUH, 2015). From the perspective of a national health care policy, the training of trainers model at different levels like Dr. LEE Jong-Wook—Seoul Project and CPD in Luang Prabang are likely to complement each other.

This chapter presents a case where the test of medical knowledge can be utilized in evaluating programs targeting learning outcomes among students in the context of developing countries. It has an advantage that the academic performance of students in the recipient country is compared to that of Korean students. To the extent that the test instruments can be readily employed in other context, the design of research has a potential of comparing ODA programs across different countries.

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Annex 1. Schedule for Test of Medical Knowledge at UHS

The Test of Medical Knowledge at UHS was implemented in the same manner as those MEAC tests of in Korea.

<Table A1> Test of Basic Medicine

Class	1st and 2nd Round		3rd Round	
	Time	No. of Questions	Time	No. of Questions
Orientation	08:30 - 09:00		08:30 - 09:00	
Class 1	09:00 - 10:10	60	09:00 - 09:50	38
Class 2	10:30 - 11:55	70	10:05 - 10:55	38
Class 3	-		11:10 – 12:00	50
Lunch	11:55 - 12:55		12:00 - 13:00	
Class 4	13:10 - 14:20	60	13:05 - 14:00	46
Survey	14:40 – 15:00		-	
Class 5	15:00 - 16:25	70	14:15 - 15:10	50
Survey	-		15:25 - 15:45	
Class 6	-		15:45 - 16:25	38

<Table A2> Test of Clinical Medicine

Day	Class	1st Round		2nd Round		3rd Round	
		Time	No. of Questions	Time	No. of Questions	Time	No. of Questions
1st	Orientation	8:30 - 9:00		8:30 - 9:00		8:30 - 09:00	
	Class 1	9:00 - 10:30	75	9:00 - 10:20	60	09:00 - 10:20	66
	Class 2	11:00 - 12:10	55	10:50 - 11:50	45	10:50 - 12:00	52
	Lunch	12:10 - 13:10		11:50 - 12:50		12:00 - 13:00	
	Survey	-		-		13:10 - 13:30	
	Class 3	13:20 - 14:45	60	13:00 - 14:35	65	13:30 - 14:45	52
	Class 4	15:15 - 16:40	60	15:05 - 16:40	65	-	
2nd	Orientation	8:30 -09:00		8:30 - 9:00		8:30 - 09:00	
	Class 5	9:00 - 10:20	58	9:00 - 10:35	65	09:00 - 10:35	70
	Class 6	10:50 - 12:10	56	10:50 - 12:25	65	11:05 - 12:40	70
	Lunch	12:10 - 13:10		12:25 - 13:25		12:40 - 13:40	
	Survey	-		13:25 - 13:45		-	
	Class 7	13:20 - 14:40	58	13:45 - 15:30	65	13:50 - 15:25	70
	Survey	15:10 – 15:30		-		-	
	Class 8	15:30 - 16:50	58	-		-	

Chapter

03

Summary and Recommendations

Summary and Recommendations

1. The Dr. LEE Jong-Wook—Seoul Project and Background

The Dr. LEE Jong-Wook—Seoul Project in Lao PDR is an ambitious development cooperation initiative funded by the Korea Foundation for International Healthcare (KOFIH) in 2010. Through this project the Lao University of Health Sciences (UHS) and the Seoul National University College of Medicine (SNUCM) are collaborating to upgrade the medical education capacity of the UHS faculty members. The ultimate objective of the project is to contribute to the overall improvement of the Lao people's health. The project is based on the premise that upgrading the clinical education and training of future health professionals represents a vital channel through which the ultimate goal can be attained in a sustainable manner, and the developmental process being owned by Lao professionals.

The project in its current stage is a five-year collaboration with a plan in place to extend the program period to a total of nine years. Fully implemented, the project envisions retraining of about 80 of the 300 UHS professors at the SNUCM. The project also includes provisions to dispatch faculty advisors from SNUCM, and provide equipment and devices for education and research at the UHS.

The project was inspired by the erstwhile collaboration between the SNUCM and the University of Minnesota under the aegis of the US ICA from 1954 to 1961. The project, known as the Minnesota Project in Korea, oversaw training of 77 SNUCM faculty

members in the US, and involved 11 University of Minnesota faculty advisors invited to serve in Seoul during the project period. It was widely reputed to have a transformative impact on medical education and practice in Korea.

Recently, there has been remarkable progress in reducing infant mortality and other ailments afflicting Lao PDR, through combined efforts from the international donor community and the Lao government. In spite of significant improvements, the maternal and infantile mortality rates remain high in Laos, and meeting the MDGs is clearly a priority goal in the Lao Government's National Health Strategy.

At the same time, the chronic dearth of qualified health workers is an acute problem. The WHO recommends a minimum of 2.5 health workers per 1,000 people; the ratio stands at 1.53 in Lao PDR. At the heart of the health professional deficit in Lao PDR lies the problem of deficient clinical skills training. Limited government budget means that only about 50% of the UHS graduates get employed in the state health sector, and that attrition is a serious issue as many doctors appointed in provincial and district facilities leave the medical profession. Those not retained mostly stop practicing, even though they could legally open their own private clinics, due to a lack of sufficient clinical experiences. Deficiency in qualified doctors also adds to the difficulties in training of lower level health professionals.

To address the human resource challenges in the health sector, the Lao government adopted in 2010 the Strategy for Health Personnel Development by 2020. The Strategy recognized five pillars for human resources development in the health sector, and envisioned "sufficient number of qualified, motivated, and facilitated health workers… by 2020" with separate numerical targets for 2015 and 2020. It is significant that the Strategy lists capacity building as the first among the five recognized pillars.

Both the Lao Ministry of Health and the UHS on one hand, and the international donor community on the other, recognized the need for investments into human resource development for sustained development of the health sector, in line with the Lao Government's long-term strategic plan. Indeed, there have been international engagements for this purpose. For instance, the Canadian government recently helped

the UHS with a curriculum overhaul. Even though the Dr. LEE Jong-Wook—Seoul Project is the largest of its kind in the history of the UHS, there has been numerous faculty exchange programs intended to help with faculty capacity building. Our sense is that these efforts have been insufficient and all too scattered to effectively enable the UHS into mobilizing its internal resources for sustained, long-term, strategic efforts for fundamental institutional transformation.

The Education Development Center for Health Professionals (EDC/HP) at the UHS was launched precisely to overcome this problem by serving as a vehicle for effective coordination of internal, as well as international engagement, for upgrading clinical training and education at the UHS. The ECD/HP was launched in 2011; the critical challenge remains where to find the financial resources to fuel the initiative.

Amidst high hopes, partnering institutions in Laos and Korea have been working enthusiastically to overcome many challenges. Nonetheless, one may still be reasonable and skeptical that difficulties lurking at every stage of the long results chain might endanger successful implementation. How fruitful will the intellectual collaboration be between the SNU and the UHS faculty members? Language barriers and differences in clinical practice conditions between the two countries should be substantial. How much of the learning would be successfully transmitted to the students at the UHS once the UHS participants return to Vientiane? The UHS faculty members themselves are well aware of the problems including poor physical infrastructure and student distraction and possibly low motivation due to limited job opportunities. How much of the learning absorbed by the students would be put to practical use in clinical practice? As things stand in Lao PDR, only about 50% of the UHS graduating class get jobs, and of these jobs, only 70% are directly related to the provision of healthcare services. Retention of healthcare professionals remains a severe challenge due to relatively low compensation and harsh working conditions, especially in the provincial areas. In view of these facts, would an engagement with practicing professionals in the field make better investment sense, compared to a pre-service training intervention such as the Dr. LEE Jong-Wook—Seoul Project?

2. Overall Research Design

The Impact Evaluation Lab of the KDI School of Public Policy and Management is collaborating with the partnering institutions and agencies both in Lao PDR and Korea, the UHS, the Lao Ministry of Health, the SNUCM, and the KOFIH to contribute to the institutions' respective efforts to monitor and evaluate findings. This volume is the final report of the collaborative efforts for assessment.

The collaboration has two main objectives: impact evaluation and real-time feedback to the partnering institutions and agencies. The three-year timeframe for the collaboration renders it impractical to trace the project's impact implementation for the ultimate goal: the improvement of the Lao people's health. In view of this limitation, the impact evaluation team chose to focus on a series of intermediate outcome measures. They are: learning outcomes for the UHS faculty members participating in the one-year exchange program at the SNUCM; the learning outcomes of the UHS students; and finally, improvements in the clinical practices of the young physicians upon their graduation from UHS. The first of these is to be monitored and assessed by the UHS and the SNUCM. The KDI School's Impact Evaluation Lab is to focus on the latter two measures.

For the students' learning outcome measurement, the evaluation team employs the test battery developed and maintained by the Medical Education Assessment Consortium (MEAC) of Korea. The questions in the test, designed to assess the test-takers' mastery of medical science and clinical knowledge, have been translated into Lao. In addition, the academic achievement scores at UHS (i.e., grade point average, or GPA) are also used to supplement the MEAC scores. For measuring the young physicians' clinical practices, we have consulted with the UHS and the Lao Ministry of Health and have concluded that each central and provincial hospital in Lao is required to establish and collect Disease Treatment Committee (DTC) data, which is composed of two sets of indicators: the Standard Treatment Guidelines (STGs) and the Reasonable Use of Drugs (RUD) guidelines. The Lao Ministry agreed to receive a collection of individual physicians' STG and RUD data at the nation's major hospitals for the purpose of this impact evaluation.

Baseline and two rounds of follow-up studies have been carried out to collect information on UHS student learning using the MEAC test battery, and physician practices using the DTC data from 2011, 2012 and 2014.

Thus, the impact evaluation strategy will compare the changes in the students' learning outcome measures over the years between the treatment and control groups. The treatment group consists of medical subjects or fields taught by the UHS faculty members returning from Seoul, and the control groups represent other subjects or fields. Note that the treatment or control group is not a clear-cut due to the integrated curriculum. That is, a subject or a field in medicine is taught by a group of lecturers rather than one. In the analysis, the scale of intervention for a subject or a field is measured by the share of the Dr. LEE Jong-Wook—Seoul Project participants in total teaching team members and total team teaching hours.

3. Salient Findings from the Studies

By an analysis based on the three rounds of tests of medical knowledge for UHS students, it is hypothesized that the Dr. LEE Jong-Wook—Seoul Project will improve the teaching capacity of participating faculty members and enhance the students' academic performance. Findings reveal that teaching capacity of trained faculties has improved in the areas of both basic and clinical medicine. The estimates indicate that the first two cohorts of trainees in the project account for the increase by 0.081 standard deviation in the test scores of basic medicine and by 0.059 standard deviation in the case of clinical medicine. These results imply that the project in the first two years reduced the gap in the test scores between UHS and Korean students by 4.9% in basic medicine and 1.9% in clinical medicine.

The project's Dr. LEE fellowship training of the UHS faculty members at the SNUCM has also improved the academic achievement levels of UHS students. In the analysis of the 1-5th year students' academic achievement scores obtained before and after the

LEE fellowship training periods, students achieved a relatively greater advancement in the subject courses, all taught by the LEE fellowship recipients, when compared to those taught by non-fellows, even after controlling students' gender, age, status, and instructors' teaching experience.

According to the analysis of the DTC data, the doctors with more on-the-job experience do not appear to provide better health services, qualities measured by DTC indices. Further, practicing doctors' clinical performance (DTC) scores are negatively correlated with the location of hospitals. When hospitals are located in remote provinces, especially in relatively poorer provinces, doctors' DTC scores was lower. The evaluation team suspects that the hospitals in provinces, especially in poorer provinces, lack proper medical equipment and facilities such as laboratories, and/or adequate clinical protocols and management, which leads to lower DTC scores. Meanwhile, the analysis showed that practicing doctors' DTC scores are positively correlated with their academic achievement level at UHS at a statistically significant level. These findings, however, have been obtained from the analysis of doctors, who have not trained under the Dr. LEE, Jong-Wook-Seoul Project. The evaluation team hopes that the relationship between the academic achievement scores and the clinical performance (DTC) scores would be positively correlated when the analysis is made with the newly trained doctors under the Dr. Lee, Jong-Wook-Seoul Project, since the academic achievement scores of UHS students have improved under the project. It could be tentatively concluded that improvements in the health service quality in Lao PDR could be more dependent on improvements in the quality of the pre-service academic program in the UHS than the current on-the-job in-service training program in hospitals. With the final impact evaluation to be made in the future, however, it remains to be seen whether the improved academic performance or pre-service training at the UHS really enhances the quality of the physicians' practice at hospitals, which could also be improved by provision of medical equipment and facilities in poorer provinces.

These findings highlight the significance of the Dr. LEE Jong-Wook—Seoul Project in the first three years. The results chain of improved teaching capacity of UHS faculty, higher achievement of students and advancements in clinical practice by graduates

seems to indicate that these efforts are leading to better health care for the Lao people. As the project is carried out for a longer period, its impact is likely to be become larger through the spillover effects to non-participants and the accumulated knowhow on training by SNUCM. It remains to be seen how cost-effective the Dr. LEE Jong-Wook—Seoul Project is against other alternative projects, including the training program for medical professionals at province or district hospitals.

4. Recommendations

Given the strong effect of the project on students' learning outcome, it is highly recommended to scale up the project. One way is to secure more funding for the project, and another is to integrate the project with an existing program. In fact, EDC/HP at UHS has been established in order to build up the capacity of clinical practice and education. Strengthening the functions of EDC/HP would be an efficient way to expand training programs for UHS.

It is strongly recommended that the SNUCM measure the differences in medical knowledge and skills of the UHS faculty members before and after their training programs more rigorously. These differences will serve as a useful predictor for the changes in the academic achievement level of UHS students when taught by the faculty members who were trained by SNUCM.

It is also recommended that some relevant UHS faculty members trained at the SNUCM be assigned to the new Children's Hospital (financed by the KOICA) as teaching physicians.

It is recommended that the follow up project (the Second UHS-LEE Jong-Wook—Seoul project) finances the collection of the data on the academic achievement and clinical performance levels of the UHS graduates who learned from SNUCM-trained faculty members at public hospitals, so that a rigorous ex-post impact evaluation can be carried out in due course.

It is recommended that a follow up project by the government of Korea, either by KOFIH or KOICA, or by other foreign donors, should consider financing medical laboratories and equipment at public hospitals—especially in poor provinces—in addition to the improvement of clinical performance protocols and management.

Appendix. Dr. LEE Jong-Wook-Seoul Project and Background

The Dr. LEE Jong-Wook—Seoul Project in Lao PDR is an ambitious development cooperation initiative funded by the Korea Foundation for International Healthcare (KOFIH), which was launched in 2010. Through this project the Lao University of Health Sciences (UHS) and the Seoul National University College of Medicine (SNUCM) are collaborating to upgrade the medical education capacity of UHS faculty members. (See Annex 1 attached at the end of this Appendix.) The ultimate objective of the project is to contribute to the overall improvement of the Lao people's health. The project is based on the premise that upgrading the clinical education and training of future health professionals represents a vital channel through which the ultimate goal of national health can be attained in a sustainable manner, while making the developmental process one that can be owned by Lao professionals.

Hope is running high for the success of the project both in Korea and Lao PDR. The project is inspired by, and modeled after, the Minnesota Project, famous in Korea for the transformative impact it reputedly had on the modernization of Korea's higher education during the aftermath of the Korean War. Under the aegis of the International Cooperation Agency (ICA), the University of Minnesota in the US and Seoul National University in Korea teamed up to work together. The Minnesota Project focused on curriculum modernization and upgrading teaching practices in three key areas: agriculture, engineering, and most importantly for the purpose of this report, medical education. The College of Medicine at SNU fully acknowledges the help that it obtained from the University of Minnesota. The top management and faculty are committed to the successful implementation of the Dr. LEE Jong-Wook—Seoul Project. It is their hope that this could in some way pay back part of the institutional debt they feel they owe the international community. Several leading news media in Korea have reported on the launch and the progress of the project. There is already a plan to get the project replicated in some other developing countries, anticipating the success of the Dr. LEE Jong-Wook—Seoul Project. Expectations are also high both at the Lao UHS and at the Lao Ministry of Health, the government ministry overseeing the operation of the UHS. Cooperation between the partnering institutions

in Lao PDR and Korea has been enthusiastic and the country is hoping to overcome its tremendous challenges.

Despite such high hopes, it is not taken for granted that the Dr. LEE Jong-Wook—Seoul Project will deliver the anticipated outcomes. To begin with, one might reasonably entertain some skepticism on whether the erstwhile Minnesota Project was itself really as successful as it was reputed to be. An archival research does reveal that participants in the medical education component of the Minnesota Project, on both sides of the Pacific Ocean, were indeed positive that the learning outcomes of the faculty trainees from the SNU College of Medicine and the later institutional transformation of the SNU College of Medicine were remarkable. Understandably, however, there was no attempt at a rigorous modern-style impact evaluation of the project in the course of the project's lifecycle. The glowing reports are based mostly on qualitative assessments carried out by participants and observers. One ironic piece of evidence, however, establishes how successful the Minnesota Project was in the transformation of medical education in Korea: the huge upsurge in the number of Korean physicians emigrating to practice in the US after passing the licensing exams there. The remarkable increase was a temporary phenomenon enabled by the combination of the dearth of gainful employment opportunities for the newly trained medical doctors in Korea, and the increase in the demand for physicians in the US due to the escalation of the Vietnam War. The brain drain eventually dwindled to a trickle with the economic development of Korea and the expansion of the national health insurance in the country. Such an upsurge would have been unthinkable in the absence of the remarkable development of Korea's medical education that benefitted from the Minnesota Project.

Even if one accepts the success of the Minnesota Project, one may still be cautious about difficulties lurking at every stage of the long results chain, which might endanger the successful implementation of the project's modern adaptation in the partnership between Korea and Lao PDR. How fruitful will the intellectual collaboration be between SNU and UHS faculty members? Language barriers and differences in clinical practice conditions between the two countries are substantial. How much of the learning would

be successfully transmitted to UHS students once they return to Vientiane? As noted in this report, physical and institutional infrastructure at UHS needs a comprehensive upgrade (See Annexes II and III attached to the end of this Appendix). Limited job opportunities once they graduate from medical school might distract the students' attention and undermine their motivation. How much of the learning, to the extent that it does get transmitted and absorbed by the students, would be put to practical use in clinical practice? As things stand in Lao PDR, only about 50% of the UHS graduating class get jobs, and of the jobs only 70% are directly related to the provision of healthcare services. Retention of healthcare professionals remains a severe challenge, due to relatively low compensation and harsh working conditions. In view of these facts, would an engagement with practicing professionals in the field make better investment sense, compared to a pre-service training intervention such as the Dr. LEE Jong-Wook—Seoul Project?

The challenges are indeed steep. Yet, most of these conditions, if not all, should be familiar to anyone who observed the Korean medical education and practice scene in the 1950s and 60s, or during the years of the Minnesota Project. That the Minnesota Project eventually proved successful gives us grounds to be cautiously optimistic. Of course, the Dr. LEE Jong-Wook—Seoul Project cannot be compared the Minnesota Project equally. While over 60% of teaching staff at SNUCM was trained under the Minnesota Project for seven years, less than 10% of the faculty at UHS were trained in the first three years of Dr. LEE Jong-Wook—Seoul Project. In the 1950s and 1960s, SNU and SNUH were one organization, but the UHS and five central hospitals are loosely connected entities. Nevertheless, the very real hurdles simultaneously mean that careful monitoring and evaluation of the project in progress, as well as flexible adaptation based on real-time feedback, will be critical to raise the likelihood of a satisfactory implementation of the project.

The Impact Evaluation Lab at the KDI School of Public Policy and Management is collaborating with partnering institutions and agencies in the Lao PDR and Korea, the UHS, the Lao Ministry of Health, the SNU College of Medicine, and the KOFIH. This

collaboration is intended to contribute to the institutions' own efforts at monitoring and evaluation. This volume is the third-year final report and assessment of the collaborative efforts.

The collaboration has two main objectives: impact evaluation and real-time feedback to partner institutions and agencies. The three-year timeframe makes impractical the tracing of the project's impact transmission down to the eventual outcome goal: i.e., improvement of the Lao people's health. In light of this limitation, the impact evaluation team decided to focus on a series of intermediate outcome measures. They are: learning outcomes for UHS faculty members participating in the one-year exchange program at the SNU College of Medicine; the learning outcomes of UHS students; and finally, improvements in the clinical practices of the young physicians from UHS. The first of these is to be monitored and assessed by UHS and the SNU College of Medicine.

The KDI School's Impact Evaluation Lab is to focus on the latter two measures. For the students' learning outcome measurement, the evaluation team has elected to employ the test battery developed and maintained by the Medical Education Assessment Consortium (MEAC) of Korea. The questions on the test, designed to assess test-takers' mastery of medical science and clinical knowledge, have been translated into Lao. For measuring the young physicians' clinical practices, we have consulted the UHS and the Lao Ministry of Health, and have discovered that each central and provincial hospitals in Lao is required to establish and collect Disease Treatment Committee (DTC) data, which is composed of two sets of indicators: the Standard Treatment Guidelines (STGs) and the Reasonable Use of Drugs (RUD) guidelines. The Lao Ministry agreed to release a collection of individual physicians' STG and RUD data at the nation's major hospitals for the purpose of this impact evaluation. Baseline studies have been carried out to collect information on the UHS student learning and physician practices in late 2011, 2012 and 2014.

Thus, the impact evaluation strategy will compare the changes in the students' learning outcome measures over the years between the treatment and the control groups. The treatment group consists of medical subjects or fields taught by UHS faculty members

returning from Seoul, and the control groups represent other subjects or fields. Note that the treatment or control group is not a clear-cut due to the integrated curriculum. That is, a subject or a field in medicine is taught by a group of lecturers rather than one. In the analysis, the scale of intervention for a subject or a field is measured by the share of the Dr. LEE Jong-Wook—Seoul Project participants in teaching hours.

Since the Dr. LEE Jong-Wook—Seoul Project aims to cultivate healthcare leaders in Lao Republic in the long-term. As such, it would be ideal to evaluate the project in terms of education capacity, research capacity and clinical practice capacity. Given the time constraint and data availability, the focus of the study is placed on education capacity. While this is a serious limitation to any evaluation study, measuring the change in the education capacity at UHS can nonetheless be a valuable first step toward understanding the effectiveness of the project for two reasons. First, teaching ability is likely to improve faster than research and clinical practice. Second, it is relatively easier to measure the education outcome quantitatively than research or clinical practice. Nevertheless, it should be noted that the results in this study reflect only the educational aspect of the project.

The three-year research project has so far produced interim reports after each year of study, in order to give real-time feedback to the agencies and institutions involved in the Dr. LEE Jong-Wook—Seoul Project, and the wider development community within and outside of Korea. This volume presents the results of the impact evaluation in the 3rd year and synthesize the evidence collected over the last three years. Appendix ends with four annexes. Four annexes included are: on the specific details of the Dr. LEE Jong-Wook—Seoul Project (Annex I); on the composition of the faculties, the curricula, and the physical learning environment at UHS (Annex II); on the results of the interviews that we have carried out with select groups of UHS students and faculty members (Annex III); and on major activities done during project implementation (Annex IV).

Annex 1. Description of the Dr. LEE Jong-Wook—Seoul Project

Under the Dr. LEE Jong-Wook—Seoul Project, UHS professors are invited to receive a training program for one year at the SNU College of Medicine. The first group of trainees was selected by the UHS, and started the program in November 2010. The group included five professors from basic medicine and three more from clinical medicine, and two of the latter subgroup participating in the program for six months. The first batch of trainees was expected to return to UHS in November 2011 and receive funding to purchase equipment and materials for research and education.[5] The second year of the program started in January 2012. There were two participants in basic medicine and six in clinical medicine during the second cohort. While there was an emphasis on basic science in the first year of the program, pediatrics was the major field in the second year. The fields of specialization of the trainees are presented in <Table 47>.

<Table 47> Fields of Specialization of the Trainees in 2010 and 2011 under the Dr. LEE Jong-Wook—Seoul Project

Category	Field of Specialization	2010-2011	2011-2012
Basic Medicine	Anatomy	1	1
	Microbiology	1	
	Pathology	1	
	Pharmacology	1	
	Physiology	1	
	Biostatistics		1
	Biochemistry		
Clinical Medicine	Pediatrics – Hematology	1	1
	Pediatrics – Neonatology		1
	Pediatrics – Allergy		1

5 Each trainee is expected to receive a grant of 30 million won (around US$ 25,700) upon completion of the program. The trainees who participated in the program for six months are expected to receive 15 million won (around US$ 12,800).

Category	Field of Specialization	2010-2011	2011-2012
	Obstetrics and Gynecology	1 (short-term)	1
	Internal Secretion	1 (short-term)	
	Internal Medicine – Endocrinology		1
	Internal Medicine – Respiratory Infection		1
	Public Health		
Total		8	8

Note: 'Short-term' refers to participation for six months.

The process of selecting the trainees for the second year was established in May 2011. Eight out of 15 applicants were selected as candidates after being interviewed by SNU College of Medicine faculty members. The final candidates were given a chance to take English and Korean Language courses in Vientiane. The preparatory language course was an additional feature of the project, introduced after the SNUCM found significant language barriers among the first-year training participants.

The planned duration of the project is a total of nine years, but currently, funds have been secured only for the first three years. The financing for the rest of the planned duration will depend on the evaluation of the project during the first three years.

As mentioned earlier, it should be noted that the Dr. LEE Jong-Wook—Seoul Project is modeled after the Minnesota Project. The goals are indeed ambitious. The project envisions the formation of a critical mass of competent and committed change agents for a comprehensive institutional transformation within the UHS and within the Lao medical profession in general. A similar change is perceived to have happened at the SNUCM as a result of the Minnesota Project. For this purpose, participants were selected in part based on their motivation and commitment. A faculty consensus workshop was organized at the UHS in May 2011, where approximately 40 faculty members of UHS discussed the fundamental problems at UHS and the goal of the Dr. LEE Jong-Wook—Seoul Project.

Annex 2. UHS Education System: Composition of Faculties, Curricula, and Physical Environment

The University of Health Sciences (UHS) is the sole institution of higher learning in medical education in Lao PDR, and is a part of the Lao Ministry of Health. Before the reorganization in May 2007, UHS was one division at the National University of Laos under the Ministry of Education.

Currently the university has seven divisions, including the Faculty of Basic Sciences and the Faculty of Medicine, the mainstay of medical education at the UHS. It should be noted that the Dr. LEE Jong-Wook—Seoul Project is mainly partnering with these two divisions, even though the future collaboration between the SNUCM and UHS might involve some other divisions as well.

UHS is a sprawling organization, consisting of many faculties and a fairly large student body. For the 2009-2010 academic year, the total student enrollment at UHS stood at 4,706 and the number of faculty members was 215. The durations of the degree programs and the number of the students and faculty members vary across the constituent faculties. The details are presented in <Table 48>.

It is noteworthy that the number of incoming students increased rapidly in recent years due to a number of policy initiatives by the government. For the 2010-2011 academic year, the class size of sixth-year students in the Faculty of Medicine was 161, whereas 1st-year students in the Faculty of Basic Science was around 400, for instance. The upsurge in the recent years in student enrollments explains why student enrollment figures are at odds with student intake per year times the duration of the program in the table.

<Table 48> Number of Students and Professors and Other Program Details by Faculty at the UHS

Faculty	Length of training	Degree/Diploma	Student Intake per Year	Student Enrollments (2009-2010)	Number of Professors
Basic Sciences	3 years or 1		~ 600	1,151	29
Medicine	6 years	Bachelor	~ 300	787	26
Dentistry	6 years	Bachelor	~ 100	558	47
Pharmacy	5 years	Bachelor	~ 100	734	28
Nursing	3 years	Higher level diploma	~ 100	692	28
Medical Technology	3 years	Mid-level diploma	~ 150	566	44
Post-graduate	1.5 or 3 years	Master Residency	~ 6-15	218	13
Total				4,706	215

Notes: 1) The length of basic sciences training varies for different faculties. For instance, the basic sciences education for those bound for the Faculty of Medicine run for three years, while the duration of the basic sciences program for pharmacy and dentistry students is one year. 2) Post-graduate study is responsible for training masters in public health and residency programs.

Source: UHS

UHS developed and adopted a new integrated curriculum for 2002 with the support of the Canadian government. The new curriculum aims at training doctors to be capable of "working in hospitals or any other community facilities in Laos, with adequate knowledge, skills and attitudes necessary to improve the health of the people".

Focusing on the Faculty of Medicine, <Table 49> presents the curriculum. It starts off with one year in foundation studies, and two additional years in preclinical sciences. The preparatory phase, accommodated by the Faculty of Basic Sciences, is then followed up with two years of study in clinical sciences, to be finished off by one year of clinical practice. The overall structure is similar to those adopted by schools in developed countries. However, interview results with faculty members and students reveal that the curriculum is not effectively implemented due to many capacity constraints, both physical and institutional in nature.

<Table 49> Curriculum for the UHS Students in the Faculty of Medicine

1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year
Lao language and culture	Introduction to medical science	Gastro-intestinal system	Basic research methodology	Health administration	Practice in community
Mathematics	Policy	Musculoskeletal-integumentary system	Clinical skill Part I	Muscle-osteo-dermatology	Practice in hospital
Medical Chemistry	Foreign language	Nervous system I, II	General clinical presentation	Neurology	Practice in Internal medicine
Physical Education	Blood and Immune system	Policy	Hematology and Immunology	Endocrinology	Practice in Surgery
Environment study	Cardio-vascular system	Foreign language	Cardiology	Foreign language	Practice in gyneco-obstetrics
Foreign language	Respiratory system	Endocrine and metabolism	Foreign language	Reproductive system	Practice in Pediatrics
Basic statistics	Renal and Electrolyte system	Reproductive system	Pneumology	Mental health	Practice in emergency care
Biology		Nursing skills	Urology	Human development	Thesis
Biophysics	Foreign language	Nursing practice in hospital	Gastroenterology	Field practice in community medicine	Final State Exam
General Psychology		French	Foreign language	Foreign language	
Policy					

Source: UHS

<Table 50> compares the curricula at UHS with the SNUCM in detail. Although the UHS curriculum includes fewer courses in the laboratory and in subspecialty disciplines than that of SNUCM, the basic structure of the integrated system is quite comparable. Interestingly, integrated courses on cardiovascular system and respiratory system are

placed throughout the program from the 2nd year to 5th year at UHS, while they are offered only in the 4th year at SNUCM. Again, it should be emphasized that the teaching capacity at UHS does not fully support the advanced the curriculum.

Under the current curriculum, 4th year students receive hospital training every morning, and take coursework in the afternoon. Likewise, 5th-year students spend every morning in the clinical training focusing on subspecialty areas, and conducting in-field community practice for a month. In the sixth year, students stay at the hospital all day, and are supposed to submit a final project (thesis). In addition, they need to pass the Objective Structured Clinical Examination (OSCE) and a Comprehensive Exam in order to graduate. The comprehensive exam consists of 200 multiple-choice questions. In theory, passing these exams is a requirement; in practice, however, interview results reveal that the requirement was bypassed.

<Table 50> Comparison of Curricula in the UHS and the SNUCM (2010)

Year	UHS	SNUCM
1	Mathematics Physics Chemistry Biology Basic Statistics General Psychology Policy 1 Lao Language and Cultural Foreign Language 1, 2 Environment Lao Study 1, 2	Calculus for Life Science 1, 2 Calculus 1, 2 Physics & Lab. 1, 2 Chemistry & Lab. 1, 2 (or Biology & Lab. 1, 2) Korean College English 1
2	Introduction to Medical Science Blood and Immune system Cardio-vascular system Respiratory system Renal and Electrolyte system Policy Foreign language	Introduction to Medicine Basic Organic Chemistry & Lab. Basic Medical Statistics and Lab. Genetics New Technologies for Medicine Introduction to Chemical Biology Cellular and Molecular Biology College English 2 Electives by Area

Year	UHS	SNUCM
3	Gastro-Intestinal system Musculoskeletal-Integumentary system Nervous System 1, 2 Endocrine and Metabolism Reproductive System 1, 2 Urinary system Nursing skills Nursing Practice in hospital Policy French Foreign language Social Science Community Development	Anatomy & Lab. Histology & Lab. Physiology & Lab. Biochemistry & Lab. Neuroanatomy & Lab. Embryology & Lab. Neurophysiology & Lab. Pathology & Lab. Microbiology & Lab. Patient-Doctor-Society 1, 2 Basic Immunology Preventive Medicine & Lab. Biomedical Engineering
4	Clinical Skill 1(History taking, Physical exam) General Clinical Presentation (Fever, Sore throat, Weight loss) Research Methodology Respiratory System Hematology-Immunology Cardiovascular System Gastro-Intestinal System Renal System Social Sciences French Practice in Internal Medicine Practice in Surgery Practice in Pediatrics Practice in OB-GYN Practice in District Hospital	Pharmacology & Lab. Parasitology & Lab. Clinical Immunology Oncology Neurosciences Nephrology and Urology Hematology Endocrinology Circulatory System Respiratory System Gastroenterology Medical Genetics Infectious Disease Patient-Doctor-Society 3, 4

Year	UHS	SNUCM
5	Endocrine System Public Health Psychiatry Reproductive System Muscle-Osteo-Dermatology Nervous System Human Developments Field Practice in Community Medicine Social Sciences French Practice in Ophthalmology Practice in Dermatology Practice in Otolaryngology(ENT) Practice in Radiology Practice in Psychiatry Practice in Rehabilitation Practice in Laboratory Practice in Anesthesiology-Resuscitation	Internal Medicine & Clerkship Surgery & Clerkship Obstetrics & Gynecology (OB-GYN) and Clerkship Pediatrics & Clerkship Psychiatry & Clerkship Orthopedic Surgery & Clerkship Radiology & Clerkship Nuclear Medicine & Clerkship Clinical Reasoning Neurology & Clerkship Laboratory Medicine Emergency Medicine & Clerkship Patient-Doctor-Society 5
6	Management of Hospital Social Sciences Final Project (Thesis) Practice in Internal Medicine Practice in Surgery Practice in Pediatrics Practice in OB-GYN OSCE Comprehensive Exam	Anesthesiology and Pain Medicine Dermatology Thoracic Surgery Neurosurgery Urology Otolaryngology Ophthalmology Plastic Surgery Laboratory Medicine Rehabilitation Medicine Radiation Oncology Community Medicine Family Medicine Advanced Clinical Medicine Research in Medicine Clinical Performance Training and Examination Occupational and Environmental Medicine Critical Care Medicine New Horizons in Medicine Integrated Clinical Medicine Patient-Doctor-Society 6

Source: UHS and SNUCM.

Now we turn to the physical and institutional infrastructure for learning at UHS. The current level of the educational environment at UHS can be described as minimal, with a real necessity for a major upgrade. The comparison between UHS and SNU is striking. There are 55 professors at the Faculties of Basic Science and Medicine at UHS, whereas there are 503 professors at the College of Medicine at SNU. The number of students per professor at UHS is about 39, which is much larger than that at the SNUCM, where the student teacher ratio is 1:3. UHS lacks classroom space, and the existing classrooms are inadequate for large classes since they have a flat floor. There are only a few laboratories, which lack proper equipment and tend to be+ too small. The library has a collection of about 4,000 books in different languages, and can accommodate only 50 students in the reference room at one time.

<Table 51> Comparison of Educational Environment at UHS and SNUCM (2011)

Category	UHS Faculty of Basic Science Faculty of Medicine	SNU College of Medicine
Number of Lecturers	278	503
Number of Students	1st year: around 400 2nd year: around 400 3rd year: around 500 4th year: 408 5th year: 256 6th year: 161	1st year: 164 2nd year: 162 3rd year: 161 4th year: 148
Classroom	There are a few large classrooms with an ascending floor.	There are 7 large classrooms that can accommodate more than 150 people and have an ascending floor.
Laboratory	There exist a few laboratories, but the equipment is limited and the size is small.	There are in total 32 laboratories: - MDL: 28 - Clinical Skill Center: 4 → OSCE: 3 → CPX: 1
Library	Collection: around 4,000 books Accommodation: around 50	Collection: 200,950 books It provides facilities for browsing theses and a large collection of academic journals. Accommodation: 566

Note: The number of professors at UHS includes all those who give lectures for students from grade 1 to 5.
Source: Department of Medical Education, College of Medicine, SNU.

Annex 3. Interview Results with UHS Students and Teaching Staff

This note summarizes the results of on-site interviews conducted with students and teaching staff, separately, at the University of Health Sciences (UHS) of Lao PDR in the UHS campus on May 17, 2011. The interviews were arranged with the help of the UHS, and were carried out by the KDI School Impact Evaluation team (Prof. Lee, Kye Woo for the whole interview time; Prof. Kim, Jungho, Ms. Choi, Eun Ji, and Mr. Bounmy Inthakesone for parts of the interviews).

The purpose of the interviews was to identify some weaknesses at UHS, to be improved with the help of foreign assistance, by helping design the assessment strategy and providing the basis for the real-time feedback to partnering institutions.

The interviews were conducted with a randomly selected group of 8 students divided into two groups, and 4 faculty members divided into two groups (two junior and two senior members).

The subjects covered in the interviews included various aspects of internal and external conditions in and around the UHS: student body, tuition and fees, teaching staff, curriculum, classroom facilities, learning materials, library, computer facilities, job prospects for graduates, compensation to medical doctors and their working conditions and other barriers to quality education.

I. Interview with 4th Year Students (a total of 8 students divided into two groups)

Student Body

- About 45% of students are regular students.
- Remaining 55% of students are special students.
- Regular students are selected on the basis of their entrance exam results.

- Besides the difference in the level of tuition and fees, there is no difference in the status of students between the regular and special students.

Tuition and Fees

- Regular students receive scholarships and therefore pay only 175,000 Kip per year. (1 USD equals to about 10,000 Kip)
- Special students do not receive scholarships and therefore pay about 1.2 million Kip per year for tuition and fees, meaning special students pay about 7 times more than regular students.

Teaching Staff

- They assessed the quality of professors as satisfactory; however, the quality of basic science courses is low since some professors are teaching courses in which they are not specialized. Before worrying about the quality of classes, the more urgent concern is over the short supply of professors in both basic sciences and specialized courses.
- Since full time faculty members are in short supply, UHS hires many part-time lecturers, especially in special courses. As a result, the class schedule is not fixed and subject to abrupt changes, depending on the convenience of the lecturers. Moreover, some courses, especially the specialized courses, are often offered as a team teaching sequence. Class schedule changes are more frequent in these courses taught by teams of faculty members.
- The quality of lessons in clinical practice needs improvement. UHS students take practice sessions during the 5th year of their study, and on a full-time basis, during the sixth year. Students are assigned by the school to one of four teaching hospitals in Vientiane, and to medical doctors at these hospitals as their clinical practice professor. However, the quality of the hospital service is poor in general, and it is hard for students to learn quality practice. The number of students assigned to each professor is too large for effective learning (about 32 students

are assigned to one professor). Sometimes, the professors are not available, and therefore students just observe patients. Students prefer Mahosot Hospital and Mother and Child Hospital among the four teaching hospitals, since the service quality is perceived to be higher.

Classroom Facilities

- The number of classrooms is too few compared with the number of students and subjects to be taught. The student body also has increased sharply over recent years.

Curriculum

- The curriculum requires improvement. One particular concern was the sequencing of the courses. Students believe that some subjects that are offered in the 3rd year should be taught earlier during the 2nd year, for instance.

Learning Materials

- The number and quality of learning materials is limited. Few books are available in the library. Most books, including textbooks, are in French, followed by Thai and then English. Most students in the University take French; however, their level of proficiency is too low to study the French books, which are also of old vintage. Both Thai and English books are relatively old and too few. They have no problems in reading Thai books. Although their English level is limited, they can read it with the help of the Internet or dictionaries. They wish to have more English books.

Library

- Library hours are severely limited: 1 or 2 hours in the morning and afternoon, respectively. The books are arranged on the shelves in a rather haphazard way so that it is often difficult to locate them.

Computer Facilities

- Computer facilities are severely limited, and Internet access is not available for general search or for access to databases on school computers. Only e-mail services are available.

Skill Labs

- Labs are poorly equipped and too small to be used by each group of students. Labs are not available for the 1st year students' use.
- The number and type of model bodies (mannequins) for teaching/learning are too few.

Job Prospects

- At present, they all know that only about 50% of the graduates will get medical jobs with government-run hospitals.
- The other 50% will have to get jobs with non-governmental organizations, such as NGOs, private enterprises or informal businesses. They understand that about 30% of graduates are working with NGOs.
- They mostly learn about the general picture of job prospects when they reach their 3rd year of medical school.
- Although most students learn about the uncertain job prospects by the 3rd year of UHS, they do not drop out, since they have already invested in UHS and believe that other opportunities might be available. Moreover, they are personally committed to helping and advising on the health of others, and are attracted to personal rewards that come with the medical field.
- Medical jobs with the government hospitals start on a probation basis and become regular official jobs only when vacancies emerge.
- Vacancies are made available normally every 1-3 years, but in some hospitals it might take up to 7 years, especially in the more popular urban hospitals.

- Most students want to work as medical doctors with government hospitals since the jobs are secure and provide generous fringe benefits.

- As an alternative to medical careers with government hospitals, doctors can take private clinic jobs since they remunerate better, require high competence, and provide better health services.

- Private clinic jobs cannot be an option right after graduating from the UHS, since one has to serve with government hospitals at least three years in rural areas and five years in urban areas before opening up a private clinic, and there are no private hospitals. Private clinical practice by government hospital doctors is allowed only after the official hospital hours (9:00-18:00).

Compensation for Medical Doctors

- The starting salary of contracted medical doctors with government hospitals is between 300,000 and 400,000 Kip per month. This means that even special students who pay 1.2 million Kip per year can recover the tuition and fees in less than three years, and explains partly why the competition for the entrance to UHS is considerable.

- However, the starting salary for the medical doctor is lower than that for other governmental officials, since medical doctors embarking on their careers are not regular government officials, but contracted workers.

- Most NGOs pay much better than the government.

Barriers to Quality Education

- In the order of importance, students listed the major barriers to quality education as follows: number of classrooms, availability of learning materials including library facilities, and number and quality of professors, and poor arrangements for teaching practice.

II. Interviews with Faculty Members (8 faculty members in two groups)

- The major topic of the interviews was discussing barriers to quality education in the UHS. The interviews were conducted in two sessions: one session with four junior faculty members who do not have any administrative responsibilities, and another session with four senior faculty members who do have administrative responsibilities. However, the results of the interviews were fairly similar. The only major difference was what they identified as the major challenge among the same perceived set of barriers to quality education. Therefore, this note combines the interview responses from two sessions.

Differences in Opinions Between Junior and Senior Professors

- In terms of importance and seriousness, junior professors emphasized issues concerning the teaching staff, followed by paucity of classrooms, and then the inadequate supply of teaching/learning materials. However, the senior professors with administrative responsibilities emphasized the issues of classrooms, followed by teaching/learning materials, and only then issues related to the professors. However, the general shape of the problems associated with each issue was more or less the same.

Learning Facilities

- Lack of balance between the size of the student body and the number of classrooms and hospital spaces is so serious that the quality of education is severely compromised. For example, currently about 300 students are enrolled in their 4th year. However, there are only two available classrooms: one room with an instructor can accommodate about 200 students, but the remaining 100 students have to sit in another room, listening to the teacher on audio. The same course cannot be offered in several sections, since both the available classrooms and teaching staff are limited. The 5th year students are taught in rented hospital rooms (at the cost of 2 million Kip per month).

- For fifth and sixth-year students, clinical courses are offered in the hospitals. However, training spaces including clinical labs are heavily crowded, since students from other programs, such as those pursuing their postgraduate degrees, are also using the same hospitals. Each group is composed of more than 30 students per teacher. Next year, this figure is expected to climb to 50 students per group. In other words, the size of the student body is increasing faster than the number of patients. Recently, therefore, provincial hospitals are being used for clinical training with 20 students per group. However, the quality of training has been inconsistent.

- The number of students has increased recently. The number of students enrolled in their 4th year was 200 in 2009; 250 in 2010; and 300 students in 2011. The optimum number of students for the current facilities is considered to be about 150 students. 160 students matriculated into the School in 2011. Perhaps, the size of the student body is getting normalized.

Teaching Staff

- Teaching staff is in short supply. More specialists are required, especially in the basic science fields of the medical science faculty and clinical teaching fields at hospitals. While the number of students has increased, the number of teaching staff has declined. There are a number of basic science volunteer teachers, who work for UHS, expecting that vacant positions will be made available in the future. Some volunteer teachers have worked without pay for several years.

- The number of clinical teaching staff is in short supply, too. Although both hospitals and the UHS belong to the Ministry of Health organizationally, they have difficulty with communication and cooperation. UHS cannot force the hospitals to assign more doctors for clinical teaching.

- There are no clearly established procedures for recruiting regular faculty members and volunteer teachers. Hiring is done on a non-open and non-competitive basis.

- Promotion processes and criteria are clearly spelled out; however, the actual implementation practices and operations are ambiguous.

- The quality of faculty members needs to be improved. In particular, faculty members responsible for basic sciences and clinical teaching courses need to improve their teaching methods and techniques to compensate for their short-term teaching experience.

- Teacher evaluation and promotion systems need to be reviewed, and adherence to the established criteria and processes should be enforced more rigorously.

- There is no quality control over students' learning. Students are promoted automatically. There is a graduation exam system, but all students graduate. In fact, only about 70% of students passed the graduation exam last year; however, the MOH allowed all students to graduate with equal qualification. Therefore, the graduation examination results served no useful purpose whatsoever.

Teaching Materials

- An integrated curriculum was adopted in 2004. However, there is weak coordination and cooperation between faculties. Each faculty offers the same or similar courses separately, and taking courses across faculties is not allowed. There are 7 faculties in the UHS: besides the faculties for post-graduate study, Medical Science, and Basic Sciences, there are Faculties of Nurses (3 year, BA); Technology (3 years, non BA); Pharmacy (3 year, BA); and Dentistry (6 years, BA). Furthermore, there are three separate curricula tracks for nurses: technical nurse, midwife, and community service. In theory, each of these faculties can share courses, teaching materials, and faculty members; however, there is no such practice yet.

- Clinical teaching at hospitals is of poor quality. Few skill labs are available for an increasing number of students.

- Access to the library, Internet, and books is extremely limited.
- Labs, model human bodies, and other teaching materials are limited.

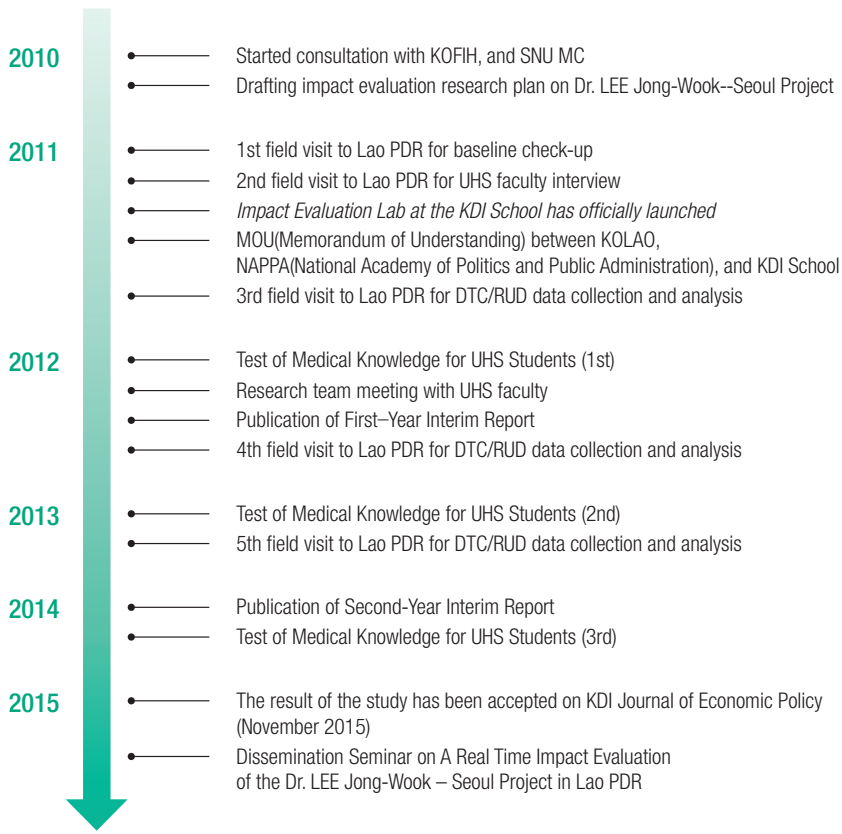
How can we evaluate the Dr. LEE Jong-Wook—Seoul's Impact?

- The ultimate test would be to determine improvement, if any, in the diagnostic procedures of the UHS graduates.

Annex 4. Major Project Activities of A Real Time Impact Evaluation of the Dr. LEE Jong-Wook– Seoul Project in Lao PDR

This note outlines the major activities done during the implementation period of A Real Time Impact Evaluation of the Dr. LEE Jong-Wook – Seoul Project in Lao PDR from 2010 to 2014.

[Figure 13] Major Timeline of of the Dr. LEE Jong-Wook– Seoul Project



The key facts about the activities done during the project implementation period can be summarized as below.

(1) Field Visit (1st) to Lao PDR (February 2011, Vientiane, Lao PDR)

- The main purpose of visit was to investigate and examine the current health status of Lao PDR as for the baseline check-up; to consult with relevant Line Ministries of Lao PDR and stakeholders/international organizations based in Vientiane for finalizing the research plan to be conducted.

- Research team was consisted of a total of 9 researchers; Dr. Kyungsoo Choi(Senior Research Fellow, KDI), Ms. Min Young Seo(Research Associate, KDI), Ms. Eunji Choi(Research Associate, KDI), Prof. Taejong Kim(KDI School), Prof. Kye-Woo Lee(KDI School), Prof. Won-Dong Cho(KDI School), Prof. Jungho Kim(Ajou University), Prof. Yongjin Kwon(Seoul National University), Ms. Jinyoung Hyun(Ph.D. Candidate, KDI School).

- During the 1st field visit, the research team had met several ministries, institutions, and local partners (See T<able 1-1> for the details). The research team particularly went through bilateral consultation for the impact evaluation of Dr. LEE Jong-Wook's Seoul Project with the faculty members of University of Health Science in Lao PDR.

<Table 52> Institutions Visited during the First Field Visit

Government	Ministry of Health of Lao PDR
	Embassy of the Republic of Korea to the Lao PDR
	KOICA(Korea International Cooperation Agency) Laos Office
International Organizations	Asia Development Bank (Lao PDR Mission Office)
	World Bank (Lao PDR Country Office)
	World Health Organization (Lao PDR Country Office)
Local Partner Institutions	University of Health Science (UHS)
	Mahosot Mother and Child Hospital
	Bolikhamxay Provincial Hospital
	National Academy of Politics and Public Administration (NAPPA)
Non-Governmental Organization	The Asia Foundation (Laos Country Office)

- During the consultation with Ministry of Health of Lao PDR, inter-organizational coordination between Korean aid agencies was advised to avoid potential overlaps among its on-going projects. MoH further advised the research team on current medical education system and health professional education system in Lao PDR. There are three educational entities designated for medical professional education. First, Public Health School provides 2-year training for technical nurses and primary health care workers. Second, College of Health Sciences offers 3-year training with higher diploma. And for the last, University of Health Sciences offers 4 to 6-year undergraduate degree program in Medicine, Nursing, and Pharmacy. In order to be a doctor in Lao PDR, one need to go through professional training in UHS along with internship at associated teaching hospitals, as well as pass the diploma examination at the end of the course.

[Photo 1] Bilateral consultation with MoH, Lao PDR

[Photo 2] Field visit to provincial hospitals

- During the bilateral meeting with the primary local partner and UHS, they expressed strong interest on the impact evaluation study as a unique opportunity to conduct a solution-oriented research in collaboration with overseas agency. Associate Dean Niranh Phoumindr of UHS further elaborated how they select candidates for one-year exchange program at the SNUMC, and later Associate Professor Outhip Sounthavong and Dr. Bouthavong(Vice Director of Cabinet) added his comment on the test for UHS students as for baseline survey. Based on the discussion between Korean research team and UHS faculty, both parties agreed to organize a joint workshop to develop concrete research plan and relevant indicators within a year.

- When research team visited Bolikhamxay Provincial Hospital, the team advised each central and provincial hospital in Lao to establish and collect Disease Treatment Committee (DTC) data, which is composed of two sets of indicators: the Standard Treatment Guidelines (STGs) and the Reasonable Use of Drugs (RUD) guidelines. This DTC data will be used as a common basis when MoH monitor and measure the quality of physician's practice on the ground. In order to serve main purpose of impact evaluation, the Lao Ministry was agreed to collect individual physicians' STGs and RUD data from major hospitals.

(2) Field Visit (2nd) to Lao PDR (May 2011, Vientiane, Lao PDR)

- The second field visit was to carry out a pilot test and a pilot survey with the third-year UHS students in preparation for the baseline study and to interview with students and professors of UHS.

- During the second visit, the research team successfully accomplished the pilot test and pilot survey with the entire class of the third-year UHS students. The team visited partner institutions to share information about Laos' health sector and discuss more specific plans for the project. Throughout the second visit, all the missions were accomplished such as consulting with officials from Lao government and development agencies, carrying out first research pilot test,

as well as signing MOU with NAPPA (National Academy of Politics and Public Administration). Furthermore, meeting with partner institutions enhanced the insights derived from the previous mission.

- One of the major results from the second visit is building clearer vision of how various Korea-sponsored ODA programs could be harmonized to enhance integrated impacts. One possibility is to fine-tune the project operation to deploy trainees at the KOICA Children's hospital, which is soon to be opened. Such a linkage could help the new hospital to function as a proper teaching hospital of the UHS, where integrate research, education, and practice in an organic way. A further linkage could be considered with a training program for provincial and district-level health workers on the drawing board at KOICA, utilizing the new hospital as the base. All these possibilities could be actualized, of course, with the consent among the relevant partnership institutions in Korea and Laos, and vigorous efforts would be necessary to facilitate the necessary coordination.

- All faculty members in the top management, including Dr. Menorath Sing the Vice Rector, were participated in the meeting with UHS. In the meeting, detailed logistics of the pilot test for four hundred of third-year students in the UHS and interviews with faculty members and students were discussed. The UHS explained that the Education Development Center (EDC) idea, proposed in Dr. Arie Rotem's commissioned report, has been approved and expressed the need for resources and support from external partners in realizing the EDC vision (quality assurance and standards; clinical training; equipment and teaching aids, etc.).

- The result of the UHS faculty interview is summarized in the table below.

[Figure 14] Summary of UHS Faculty Interview

UHS Faculty Interview

GR1 JUNIOR PROFESSORS

The most urgent problems of the UHS need to be solved:

- Computer lab, equipment, class material are old and not enough for experimentation
- Number of teachers are not enough
- Quality of current teachers needs to be improved
  As qualified / specialized teachers are working in NGOs and other places for higher salary and benefits, unqualified /nonspecialized teachers are teaching

Other problems

- Number of students increased while internship spots remain limited
- Computer lab: students can only check emails; web surfing is not possible
- Shortage of classroom due to the increasing number of students
- Weak inter-faculty collaboration

Lack of lab skills

- No lab opportunity to first year students
- Fifth year students need to go hospitals for practice

Job promotion

- There is a clear criteria in terms of requirements for promotion
- MOH's authority on promotion decision.
- The UHS send the list of candidates to MOH and MOH to make the decision

Increase in number of students

- For the question about the increasing number of student, interviewees answered that they do not know exactly since UHS is not solely decide number of student, but with MOH.

Comments on JWL-Seoul Project

1) Faculty of Basic Science is very important
   - strengthening faculty of basic science should be prioritized
2) Upgrade student quality
   - More than 60% of students do not study; it is very easy to pass exams and most assignments are take-home assignments
   - It is necessary to upgrade student quality by setting absolute criteria for pass/fail

3) Field experience

- Only 5th and 6th year students go hospital for practical skill learning. However, the lack of prior lab experience hinders their leaning process.
- It would be better to start from 1st year
- Integration of teaching and lab experience is necessary

Graduation examination

- In last year, among 205 students, only 70% passed the graduation. But, as MOH ordered to let all students to pass later, all students pass the graduation exam and become doctor.

After graduation

- 50% of graduates do not become medical practicing doctors. Instead, they set up their own business since it is easier way to earn money. Others engage in medicine sales. More than 30% choose to work for NGOs (salary is five times higher).

GR2 SENIOR PROFESSORS

Major problems of the UHS

- 1) Too many students for limited facilities (400 students this year/ 250 students last year/ 200 students year before last) – Optimal number = 150 students
  → This year, the UHS is trying to limit the number of students to 150. Last year, the number of 1st year students in basic science was 160.
- 2) Teaching quality
  Inadequate educational environment; For instance, 4th year students study in one big room which is big enough to accommodate 180 students. As lecture platform located in third floor, those who sit in second floor and fourth floor using audio system, which distract concentration.
  5th year students need to pay 2 million kip per month to hospital for using classing.
  → Lack of motivation to teacher due to the segregation of hospital and school.
- 3) Need to improve clinical teaching and regular seminars for teaching
- In order to improve the quality of teaching at the UHS, following is needed: 1) setting appropriate number of student to accommodate; 2) increasing adequate facilities; 3) improving teaching skills; 4) improving educational curriculum (which is currently in the process and will be finished in 4-5 months); 5) creating teaching material (books, IT)
  Other necessary measures to improve:

- EDC: currently in the process of creating evaluation mechanism of teachers and plan to purchase computers, etc.
  One problem: not enough classrooms and chairs for students
- Improve teaching skills of teachers in both school and hospitals
- Learning materials in both Thai or Lao languages so that student can learn by themselves (guidelines)

Some other info:

- 4th year students → practice in hospital in the morning, attend lectures in the afternoon
- 5th year students → go to different specialty by rotation\ in the morning, attend lectures in the afternoon
- 6th year students → full-time in hospital

UHS Goals:

- Educate students to be able to serve patients with common diseases, improve their capability to be able to work in all sectors with further dedication, as well as integrate themselves as life-long learners.
- To serve the community after graduation

After graduation:

- Most of them go to government
- After official hour, they work in the public hospitals and practice in private clinic

Q: How many doctors and nurses are there in each specialty?
A: Quota is going to take place from now on

Q: Is UHS responsible for producing only doctors?
A: No.

- 7 Faculties: faculty of nurses (3 years) – BA degree/ Faculty of technology (3 years): Not BA degree/Faculty of Pharmacy (3 years): BA degree/Faculty of dentistry (6 years): BA degree
- In other provinces, there are separate training institutions for nurse
- SNU trained faculty in basic science and medicine: they will teach nursing students, too (They will teach all faculties).
- Three curriculums exist for nurses: technical nurse, midwife, and community → train nurses from health centers: they come to Vientiane for three months in rotation and later when they go back to provinces, they are responsible for teaching

How to make an "Ideal UHS"?

- Skills lab in faculty of medicine
- Improving practical skills of students
- Creating learning material for students
- Strengthening MTU (medical teaching unit) function: Head of department manage teaching unit/ teaching staffs responsible for each group of students/medical students learn from residents and staffs → such system will establish good learning environment. Most urgent necessity is having seminars on clinical teaching methods since not everyone has teaching skill.

(1) During the interview with faculty, the research team asked specific field of change they want to see as a result of project in five years. The result of votes is as follow: Strengthening Teacher – 21

(2) Curriculum Development – 16

(3) Setting up Laboratory – 16

(4) Learning Resource Center – 15

(5) Improving Management – 14

(6) Facilities – 14

(7) ICT(Information & Communication Technology) – 4

(8) Research Capacity & Center – 4

(3) Activities for Data Collection: DTC/RUD Data Collection and Analysis

- In order to evaluate the young physicians' clinical practices using the DTC data from 2011, 2012 and 2014, the research team held three workshops on DTC/RUD Data Collection and Analysis in Vientiane, Lao PDR.

- Particularly the 3rd meeting for DTC/RUD Data Collection and Analysis was held on September 3-4, 2013 at Sengtavanh Hotel in Vientiane, Laos PDR. The meeting was sponsored by the KDI School of Public Policy and Management

in collaboration with the Curative Department from Ministry of Health (MoH). The total 16 provincial hospitals and 3 central hospitals were participated in this meeting. Most of participants were doctors who involved in DTC and RUD committee in each hospital and some of them are directors or deputy directors of the hospital.

- The main purpose of the third meeting was to collect data on DTC/RUD, particularly 5 diseases (Malaria, Dengue, Typhoid, Diarrhea, Lung Acute) from each hospital to measure the impact of Dr. Lee Jong-Wook's Seoul Project which is the ongoing real-time impact evaluation research of the Impact Evaluation Lab (IE Lab). The MOH would also like to make an agreement of the working system regarding DTC/RUD collection. The following are the detailed report of the meeting:

Day 1

- Starting from 8:30, the Deputy Head of Curative Department, Ministry of Health, Prof. Kye-Woo Lee, and Managing Director of Development Research Learning Network delivered the opening remarks. Prof. Taejong Kim, the Director of Impact Evaluation Lab, explained briefly on IE Lab's ongoing and upcoming evaluation projects and Dr. Sisouphanh from MOH who was in charge of organizing the meeting introduced 2-day meeting agenda to the participants. There was a photo session following by self-introduction of all participants. Starting from 10:30, there were 12 presentations on DTC/RUD by representatives from each hospital.
- In the afternoon session, there were 7 presentations from Provincial Hospitals. All presentations were also included how they've collected DTC/RUD data in different kind of diseases mentioned above, and what they have done and have not done yet. In addition, presenters shared their opinions on advantages and disadvantages in using DTC/RUD data.
- During the presentation, many questions were raised by not only participants themselves but also the Prof. Lee. They also had a chance to discuss what kind of difficulties they are facing with when collecting these data.

Day 2

- The team had a discussion on issues raised regarding DTC/RUD data during last sessions, and exchanged information among participating hospitals. The session was essential to get the complete data for the research. There were few misunderstandings on guide for collection provided by the MoH among participants. However, after the discussion session, participants agreed to collect more data followed by the guideline, and to send the updated data to the Curative Department within a week. Prof. Lee also shared his research outcomes by presenting the results from the first and second year of the DTC/RUD data collection and analysis. Through his informative presentation, the participants were able to have a chance to learn the importance of data collection and how we analysis these data to find research outcomes.
- After the workshop, the research team visited the UHS to have a meeting with a new Madame President, Dr. Somchit Boupha, and Dr. Bansa Oupathana, Dr. Niranh Phoumindr and Dr. Ketkesone Phraisisombath to explain the purpose of our visit, share our research outcomes and request for cooperation to get data for the research. The team had a brief introduction on our research during last 2 years to the new President to help her to recognize the importance of our research, and Dr. Ketkesone agreed that he would be a contact person for those requests on data.

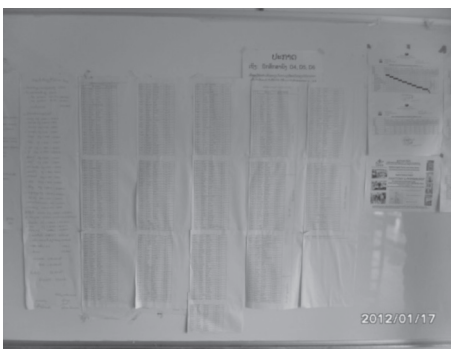
(4) Test of Medical Knowledge for UHS Students (1st in 2012, 2nd in 2013, 3rd in 2014)

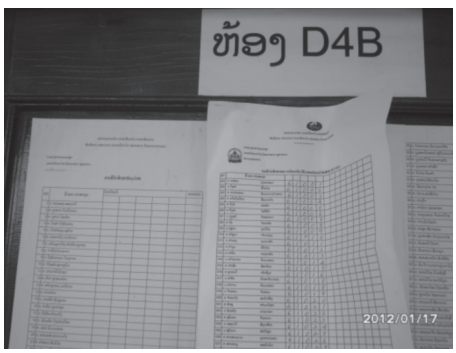
- During its implementation period, the research team conducted three medical knowledge tests for UHS students for measuring the impact of the Project on students' learning outcome using the Medical Education Assessment Consortium (MEAC) test battery of Korea. Thinking upon the given limits on data availability, one of a few advantages for using the test questionnaire from the MEAC was that the performance of Korean students can be a useful benchmark to interpret the result.

- For actual tests, the team firstly translated the MEAC test battery of 2010 to 2012 in Korean to English, and later translated it into Lao language. The team also

prepared all necessary logistical details for the test including OMR (Optical Mark Recognition) card answer sheet for processing test scores more easily. Before the test, the students need to identify themselves in the participant roster in order to take the exam, and each student fills out a unique ID number on the answer sheet.

[Photo 3] Notice for test: Roster of exam participants





- After the 1st test, the review committee actively worked to check adaptability of translated version of test in Lao. The committee is led by Prof. Sing Menorath (Vice-rector of UHS), with the following members, including Dr. Niranh houmind (Acting Dean of Faculty of Medicine), Dr. Vongphet Luangxay (Vice-Dean of Faculty of Medicine), Dr. Bouthavong Phengsisomboun (Vice-Director of Cabinet of UHS).
- Before conducting the first test in January 2012, the research team provided technical support to UHS faculty for supervising the three-day exam. This orientation session was held a day before the actual test so that the supervisors can be fully understand about the basic information on the test (including exam schedule), guidelines for supervising during the test, how to use answer sheets, and instructions for marking the answer sheets properly. [Figure 15] shows the content of materials for supervisor orientation.

[Figure 15] Orientation Materials for Exam Supervisors

I. Basic Information

1. Examinees

o Test of Basic Medicine: 5th grade in the Faculty of Medicine

- The number of students: 400

o Test of Clinical Medicine: 6th grade in the Faculty of Medicine

- The number of students: 265

2. Exam Schedule

o Test of Basic Medicine (Jan. 19th, 2012)

Class	Time	No. of Questions	Type of Answer Sheet
Orientation	08:30 - 09:00		
Class 1	09:00 - 10:10	60	A type
Class 2	10:30 - 11:55	70	A type
Lunch	11:55 - 12:55		
Class 3	13:10 - 14:20	60	A type
Class 4	14:40 - 16:05	70	A type

o Test of Clinical Medicine (Jan. 17th and 18th, 2012)

Day	Class	Time	No. of Questions	Type of Answer Sheet
Day 1	Orientation	8:30 - 09:00		
	Class 1	09:00 - 10:30	75	A type
	Class 2	11:00 - 12:10	55	A type & R type
	Lunch	12:10 - 13:10		
	Class 3	13:20 - 14:45	60	A type
	Class 4	15:15 - 16:40	60	A type
Day	Class	Time	No. of Questions	
Day 2	Orientation	8:30 - 09:00		
	Class 5	09:00 - 10:20	58	A type
	Class 6	10:50 - 12:10	56	A type & R type
	Lunch	12:10 - 13:10		
	Class 7	13:20 - 14:40	58	A type
	Class 8	15:10 - 16:30	58	A type

II. Guidelines for Supervising during the Test

1. All supervisors should come to a Central Operation Office 30 minutes before orientation and receive the following items

• Guidelines for Students

• Computer pens

• Answer Sheets (two types: A type & R type)

• Exam Questions (two versions: Lao version & English version)

• Survey Questionnaires

- Please distribute Guideline and explain it during the orientation.
- Please distribute Pens, Answer sheets 5 minutes before test begins.
- Please make sure that students mark their ID and class code, and then distribute Exam sheets.

2. Distribution of Guidelines for Students

o Test Schedule

Refer to the tables of the previous page. No student can enter to the examination room once examination has started.

o Types of Answer Sheets (only for Test of Clinical Medicine)

: Test of Clinical Medicine (2) & (6) need both A and R types.

The rest including Test of Basic Medicine need only A type.

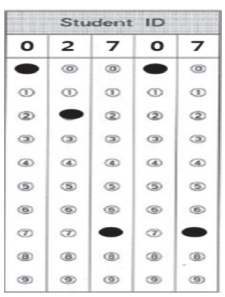
o Instructions for Marking

A. Follow a below example to mark a student ID.

"If your student ID is MMME 027/07, please mark 02707."

B. Class codes are given below.

Note class codes of R type answer sheet.



Class	Class Code
Class 1	01
Class 2	02
Class 3	03
Class 4	04

<Test of Basic Medicine> <Test of Clinical Medicine>

Class	Class Code
Class 1	01
Class 2	02 (A type) 09 (R type)
Class 3	03
Class 4	04
Class 5	05
Class 6	06 (A type) 10 (R type)
Class 7	07
Class 8	08

C. Use only a distributed computer pen for marking answers.

D. If there is an error in marking, do not use a correction tape or correction fluid. Please exchanges the answer sheets through supervisors.

o Version of Test Sheets

There are two versions of test sheets, Lao version and English version. Please note that Lao version does not have photos.

o Transcripts and Prizes

A report card on individual score will be sent to students within a month and a prize will be awarded to the students with excellent performance. The surveys will be conducted on Jan. 17th (for 5th graders) and Jan. 19th (for 6th graders) right after the last class.

o Lunch

A snack lunch will be served to all students.

3. Distribution of computer pens and answer sheets

- Please ask students to turn off their mobile phones before the test begins.

- Students must have nothing on their desk before the distribution.

4. Distribution of test sheets

Make sure that each student receives two versions of test sheet. In addition, check students receive correct papers in terms of quality of color pictures and the number of questions.

5. Supervisor Signature

When students are taking exams, write your signature on their answer sheets every class after confirming that they mark student ID and class code correctly.

6. Survey Questionnaires

Supervisors should conduct surveys on Jan. 19th (for 5th graders) and Jan.18th (for 6th graders) right after the last class.

7. Return of Answer Sheets and Questionnaires to Central Operation Office.

If there is any problem or question about the test, please send one supervisor to Central Operation Office.

- Besides, the research team also interviewed the first-batch fellows who have dispatched to Seoul National University to identify immediate subjective impact on their performance after the fellowship, and the summary of the interview is stated below.

[Figure 16] Summary of Interview with the First-batch Fellows of Dr. LEE Jong-Wook – Seoul Project

Name	Age	Position	Major	Period of Training
Dr. Somsouk Phanhkongsy (Head of delegation)	35	(Before) Lecturer (After the training) Promoted to Deputy Chief of Management and Administration	Micro Biology	1 Year
Dr. Phimmasone Sirimanotham	51	(Before) Deputy Chief of Obstetric Department of Mother and Child Health at Mahosot Hospital (After the training) Same position, but additionally appointed as a fetal sonography professor	Obstetric	6 months

1. Background of Trainees

- 8 Trainees in total(6 persons for 1 year, 2 persons for 6 months)
- 6 of them were regular full time staffs at UHS, two trainees were non regular faculty members(they are waiting for the quarter from Ministry of Health)

2. After the training, what is your position and mission? Are there any curriculum change?

- The positions for most of the trainees have remained same before and after the training, but one trainee (head of delegation) is promoted from a lecturer to a Deputy Chief of management and administration.
- There is no curriculum change yet, but the UHS gave the trainees the priority to choose and change the curriculum. All trainees are discussing which practices and subjects will be beneficial to students based on what we have learned from the training. We will change the contents of lectures soon.

3. So far, we have informed that the SNU has not decided who will be deployed for an advisor; do you have any information on this?

- We just know that the advisor will come, but we don't have any information who, when and how long he/she will stay. We have already prepared a faculty room for an advisor in the UHS

4. Regarding equipment and textbook support, who decides the equipment and has it been discussed?

- First, trainees, in discussion with their supervisors at UHS, make a list of what equipment should be supported, then the dean of UHS and SNU will discuss and make a final decision. We already made a list based on what we have learned and used at SNU, but we are not sure when they will arrive. We heard that there were some changes of donor companies in Korea.

5. SNU is planning to invite deans as a part of the training project in 2012, do you know about deanship?

- We have heard about the deanship but we have no further information.

6. How is the selection process for trainees participating in the Seoul-JWL project?

- The participants are recommended and appointed by their bosses, and then the SNU has an interview for the final decision. The process was the same for both the first and second groups.

7. Are you informed about the schedule for the video conference training in Laos?

- We have informed but we do not know about the specific schedule. We think that it may have some difficulties because of the poor internet connection at UHS.

8. Do you have any suggestions to improve this training project?

- Overall, we have learned a lot from this training at SNU. If I had 10 percent of the medical knowledge before the training, I think that I have gained over 60 percent of knowledge after the training. However, we had some difficulties to communicate with the SNU doctors and understand each other because they had no information about Lao medical situation and environment. In addition, there was limited information about how to research and collect data during the training. For instance, Lao doctors were unfamiliar with research methodology, particularly via internet, but there was not enough explanation.

(5) Dissemination Seminar in Vientiane (December 2015, Vientiane, Lao PDR)

- To commemorate the final report and to share the major takeaway lessons learned from the impact evaluation study, the KDI School, in cooperation with MoH of Lao PDR and UHS, convened a joint dissemination seminar in Don Chan Palace Hotel, Vientiane on December 21, 2015. Major audience was local health experts from 17 provinces including provincial chief of division in public health, chief of provincial hospital, medical doctor who is responsible for DTC(Disease Treatment Committee), public officials of MOH, and professors and experts from UHS.

- In the seminar, two additional sessions on continuing medical professional development project was presented. Professor Jwa-Seop Shin of Seoul National University presented on continuing professional training project to strengthen the capacity of provincial and district hospitals in Luang Pragang Province, while Dr. Penny Wittick and Dr. Tim Wittick of Melbourne University presented on the case of pediatrician capacity building project. Dr. Bansa Oupathana of UHS also added invaluable comments on achievements and challenges to improve training results from the perspective of a training institution.

국문 요약

KDI국제정책대학원 성과평가팀 (Impact Evaluation Lab)은 라오스 국립의과대학 (UHS: Lao University of Health Science) 교수들의 역량강화를 위하여 대한민국 보건복지부, 한국국제보건의료재단(KOFIH), 서울대학교 의과대학이 공동 추진해온 '라오스 이종욱-서울 프로젝트'의 효과를 측정하고 사업의 성과를 제고하기 위한 성과평가 연구를 2011년부터 수행해왔다. 본 연구는 개발원조사업의 집행과 병행하여 독립적인 평가기관이 실시간 피드백을 제공하고, 사업의 내용을 보완하여, 궁극적으로 사업의 성과를 향상시키는 것을 목적으로 하는 실시간 영향평가(Real-time impact evaluation)의 개념을 한국 개발원조사업의 평가에 최초로 도입한 성과평가 연구이다.

연구대상인 "라오스 이종욱-서울 프로젝트"는 故 이종욱 WHO (World Health Organization, 세계보건기구) 전 사무총장의 이름을 딴 개발도상국 보건의료인력 역량강화 프로젝트이다. 서울대학교 의과대학이 1950년대 중반 미국원조기관의 후원으로 미네소타대학교가 주도한 '미네소타 프로젝트'를 통해 구미 선진 의료기술을 접하고 국내 보건의료인력양성과 서울대학교병원의 현대화 기반을 마련했던 경험에서 영감을 받아 추진된 본 "라오스 이종욱 서울 프로젝트"는 한국형 국제의료원조의 모델로 평가받고 있다.

본 프로젝트를 통해 매년 선발된 약 10여명의 라오스 국립의대 교수들은 약 1년간 서울대학교 의과대학 및 서울대학교병원에 머물면서, 개인 전문과별 교육 및 한국어와 영어 교육, 의학교육과 리더십, 의학연구의 기초, 보건통계와 역학, 의료정책과 지역사회의학으로 이루어진 공통교육을 이수해야 하며, 연수효과의 지속성 확보를 위해 라오스 국립의대 교수진의 연수 수료 시 교육 및 연구 활동에 필요한 교재, 기기, 임상실험장비 등도 지원한다. 실시간 평가팀의 권고에 따라, 연수교수가

교과과정을 개편하고 교육방법을 개선하여 의대생들의 학습능력과 임상능력을 개선하도록 사후 지원을 포함하고 있으며, 연수교수의 일부는 한국국제협력단 (KOICA)이 지원하여 설립한 "아동병원"에서도 겸임교수로서 근무할 수 있도록 조치하여 한국원조기관 사이에 협조도 이루어지고 있다.

본 연구는 동 프로젝트를 통해 배출된 라오스 국립의대 연수교수단이 과연 향상된 능력을 가진 의대 졸업생들을 배출하는 데 기여하는가 여부(output)를 확인하고, 궁극적으로 진료역량이 향상된 의과대학 졸업생들에 의해 제공된 의료서비스로 인하여 라오스 주민의 보건상태가 개선되었는가 여부(outcome)를 확인하고자 하였다. 연구진은 해당 프로젝트를 통한 교수진 연수가 라오스 국립의대 재학생의 학업능력 향상에 기여했다는 가설을 세우고 이를 검증하기 위해 DID(Difference-in-Difference, 이중차분법)을 활용한 실증분석을 실시하였다. 서울의대에서 연수를 받은 교수의 강의를 들은 학생들의 성적과 연수를 받지 않은 교수의 강의를 들은 학생들의 성적을 교수 연수시기 이전과 이후로 나누어서 비교한 결과, 서울의대에서 연수를 받은 교수의 강의와 지도를 받은 의대학생들의 성적이 더 많이 향상되었다는 것을 확인하였다.

또한 라오스 국립의대 재학생의 학업능력을 객관적으로 측정하기 위해 한국 의학교육 평가컨소시엄(MEAC)에서 실시하는 기초의학 및 임상의학 종합평가 시험지를 라오어로 번역한 뒤 현지전문가의 검수를 거쳐 최종 평가시험지를 개발하였고, 연수교수단에게 교육받은 라오스 국립의대 재학생들과 그렇지 않은 학생들의 학업성취도를 비교 분석하였다. 그 결과 서울의대에서 연수를 받은 교수에게서 교육받은 의대생들의 성적이 더 많이 향상되었다는 것을 확인하여서, "라오스 이종욱 서울 프로젝트"가 긍정적인 사업효과를 가져왔다는 것을 증명하였다.

데이터 수집기간이 짧았던 본 연구의 특성상, 단기적인 결과로서 라오스 이종욱-서울 프로젝트가 라오스 국립의대 재학생의 성적향상에는 유의미한 영향을 주었음을 확인할 수는 있었지만, 장기적으로 이 결과가 라오스 국민의 보건상태개선에 영향을 주었는지 여부를 확인하기 위해서는 추가적인 연구가 필요할 것으로 보인다.