

# Access to treatment for people living with epilepsy: initiating a national control program in Lao Peoples' Democratic Republic

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## **1. Rationale**

In Lao Peoples' Democratic Republic (Lao RDP), as in many developing countries epilepsy is a neglected chronic condition. Since 2003 the Francophone Institute of Tropical Medicine (IFMT, Vientiane, Lao PDR) (1) ([www.ifmt.org](http://www.ifmt.org)) and the Institut d'Epidémiologie Neurologique et de Neurologie Tropicale (IENT, Limoges, France) in close collaboration Lao Institutions such as the National Institute of Tropical Health (NIOPH), Ministry of Health (MOH), and provincial and district health authorities, and with the financial support of a research grant from the French Ministry of Foreign Affairs (project CORUS number 02-811-052) have carried out several studies on epilepsy and people living with epilepsy (PWE) in Lao PDR. The overall aim was to build up the scientific bases for guiding an appropriate future intervention.

This recent work has lead to considerable understanding of this neglected condition, and provides sufficient information for an adequate launch of an intervention.

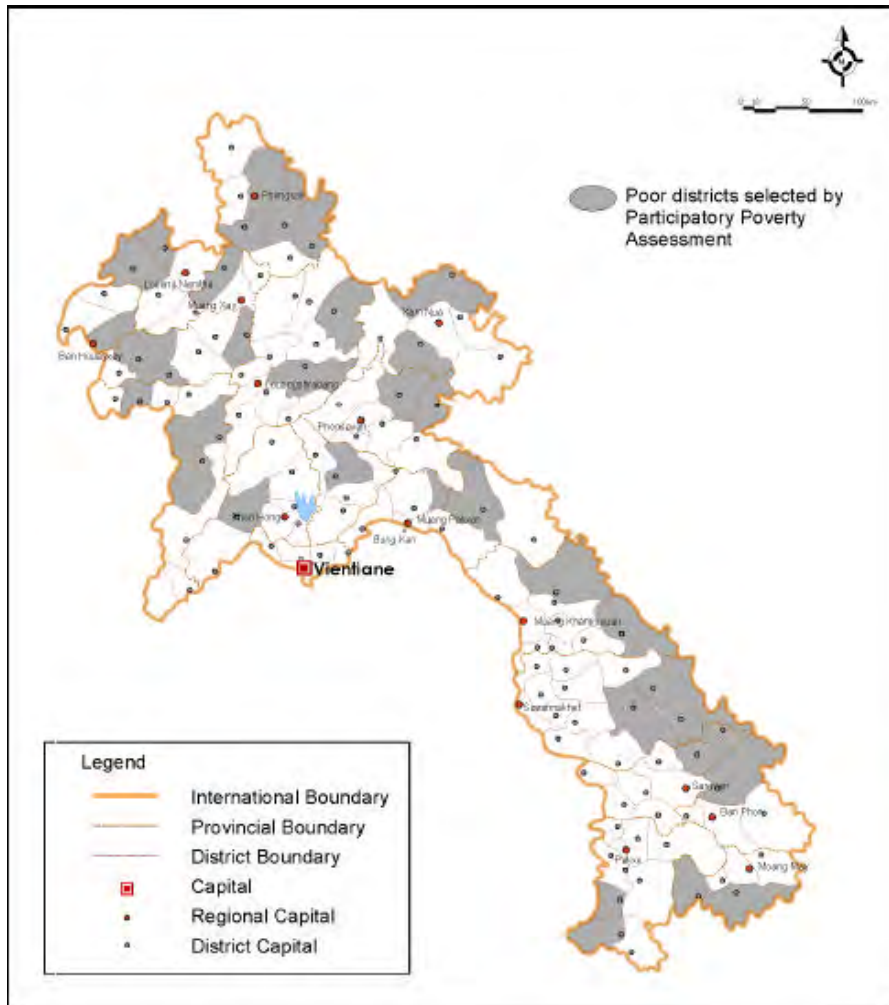
### ***1.1 General information on Lao PDR***

Lao PDR is a landlocked country, sharing borders with Vietnam and Cambodia (the former Indochina) and also with Thailand, China, and Myanmar (Burma) (Figure 1). The population of 5.6 million people (2005) is living mostly rural areas (87.8%). It is a multi-ethnic (some 45 different ethnic groups), and very scattered population. Lao PDR has the lowest population density of all Southeast Asian countries (24 inhabitants/km<sup>2</sup>). Half of Lao population is below 20 years of age. The average household size is 5.9 persons, and life expectation at birth is 61 years (National Census 2005). The GDP is 490 USD per capita, and the health indicators are among the lowest in the region. The Lao PDR is a poor country. It ranks 133rd out of 177 nations on the Human Development Index (2004). Maternal mortality is 530 per 100,000 births. General hygiene conditions are very low. Less than 30% of households have access to safe drinking water. In rural areas sanitation facilities are virtually absent. Despite improved coverage in latrine and water supply services, health remains a

serious problem. The improved services were often not sustained or poorly maintained, while hygiene received inadequate attention(2)

Estimated per capita health expenditure is USD 12. About 60% are covered out-of-pocket of household budget, 30% originate from international donors and 10% from the Lao Government. In the annex further health indicator of Lao PDR and neighbouring countries are provided.

Figure 1 Lao Map



## *1.2 Epilepsy in Laos: What do we know?*

On 21 January 2008 a workshop organized by IFMT brought together researchers and health professional from Laos and abroad. The workshops' aim was to increase awareness on epilepsy and PWE in Lao PDR, and the current low access to treatment. In the second part of the workshop options for building-up a national program for PWE were discussed.

Below the main findings of studies conducted in the last years on epilepsy and PWE are summarized. A list of publications is given in chapter 5. In addition conclusions of the discussions on the control program are provided.

In a rural district close to Vientiane, the prevalence of PWE was investigated within a population of 4310 people. A prevalence of 7.7 ‰ PWE was estimated. This is the only study on the prevalence of epilepsy in Lao PDR (and only a few population based studies have been conducted in the Subregion). The prevalence corresponds well with the prevalence rates known from the neighbouring countries. Based on this information an estimated number of 50,000 PWE are currently living in Lao PDR. Observation showed that only a small portion of them are currently under treatment. Therefore, the treatment gap is tremendous (around 90%). Based on these information number of PWE were estimated in the largest provinces of the country (Table 1).

**Table 1:** Estimation of number of Epileptic Patients in four main regions of Laos

	Population (2005)	Epileptic patient 7.7‰	Minimum 5,3‰	Maximum 10,7‰
Savannakhet	820 000	6314	4346	8774
Vientiane Capital	700000	5390	3710	7490
Champassack	605000	4658,5	3206,5	6473,5
Luang Pra Bang	410000	3157	2173	4387
Total	2 535 000	19 520	13 436	27 125

In the prevalence study 33 PWE only one person was under regular treatment. Despite figuring on the national essential drugs list, phenobarbitones are available only in relatively small numbers of pharmacies. Only 53% of urban pharmacies can provide it, and diazepam short courses are the most used regimen to treat seizures. Misconceptions and stigma on epilepsy of patients, close relatives and the general population are common.

Currently, there are no national guidelines for the treatment of epilepsy and there is no national control program for PWE.

There is currently only one trained neurologist in Laos based in Vientiane. General practitioners are generally not trained to manage epileptic patients. On the contrary, some doctors reported to be afraid of the condition. Only few PWE are seen in outpatient departments of health facilities.

An small-scale intervention study has been carried out from 2004 to 2006 in rural areas (Hinheub district, Vientiane province) in the North of Vientiane involving 53 PWE. Phenobarbital was provided free of charge by the district hospital after an initial consultation by neurologist from France. Compliance with treatment was low. A high mortality of PWE was observed, particularly in the non-compliant group.

Following this experience, a further small community based project was started by Handicap International (NGO) in 2006 in Savannakhet province (Central Laos). Up to date 14 patients have been included and are followed-up. Based on these experiences essential know-how has been acquired for starting an implementation of a national intervention in Laos.

The number of years lost because of premature mortality and the disability burden of epilepsy affecting around 50 000 PWE in Laos must be high as shown in rural China (2 per thousand in rural China)(3).

### ***1.3 Why should we implement a project for PWE in Lao PDR?***

Experience from china demonstrate the impact of Primary care treatment of epilepsy with phenobarbitone in rural China(4;5)

Generally, there is a few infrastructure with regard to neurology, low numbers of skilled staff, lack of financial resources in the health services, high illiteracy rate in the population and low accessibility to health centres will be some of the main issues the project will address. Below is a description of the general characteristic of the health system in Lao PDR

#### **General characteristics of the health system in Lao PDR**

The public health system is predominant, although private services are growing in number. There are no private hospitals in Lao PDR, but around 1865 private pharmacies and 254 private clinics, mainly in urban areas. The states' curative health services are tremendously under-utilised, especially in the peripheral areas. In an effort to increase access through village volunteers and village revolving drug funds, the Government has managed to reach 5226 villages.

The main network for health care service provision remains the public system. Its health facilities consisted of four central teaching and referral hospitals; five regional

hospitals, including one teaching hospital; 13 provincial hospitals; 127 district hospitals, and about 746 health centres (in 2005). District hospitals are further classified into categories A and B; category A meaning facilities that have surgical capacity; in category B hospitals surgical facility is absent. The total number of hospital beds was 5081 in 2005, which are 0.9 beds per 1000 inhabitants.

### **Human resources**

The country faces a general shortage of qualified health workers. The total health workforce in 2005 was 18,017 persons corresponding to a ratio of 3.21 health workers per 1000 inhabitants.

High- and mid-level medical staff under the Ministry of Health, defined as physicians, nursing staff and midwives with more than two years of formal training, account only for 23% of all the workforce in the health sector (4123, i.e. 0.74 workers per 1000 inhabitants).

Less than 50% of all health workers are in public health facilities managed by the Ministry of Health. The 8942 regular health workers under the MoH work in hospitals, health centres and district health offices/hospitals. District-level facilities account for the majority of health workers. However, the bulk of the staff at district level are mid- and low-level (88%), with physicians representing only 6% of district-level staff. Health centres are almost totally served by low- (81%) and mid-level (18%) staff. Nationwide, there are only eight doctors working in health centres.

**Comment [o1]:** Where are the other 50%. I am sure to understand here ...

There are only 2992 regular high- and mid-level medical staff at health facility level, corresponding to 0.53 workers per 1000 inhabitants, which is far below the recommended WHO target of 2.5. These workers tend to be concentrated in regions that are socio-economically better-off to cope with the limitations of their salaries and wages. Rural areas, where living conditions are difficult, are not attractive to newly trained competent workers. (WHO Lao Country Health Profile, 2007, www.wpro.who.int)

### **Access to and usage of health services**

Only one in seven sick people receives modern health care treatment, most people rely on self-medication and/or reliance on self-healing.

Many ethnic groups still consider health and well-being as a consequence of spiritual balance rather than as a result of a sufficient food intake, health and care practices<sup>1</sup>. At the same time, the health system of the Lao PDR, especially at district level is badly resourced, maintained and villagers abstain from often high costs for medicine. In many cases, villages experienced to be overcharged for medicine. Also, in many other cases belief systems prevent villagers from leaving the village in times of illness. In addition, in the remote uplands, health services are often difficult to access. As such, the distance to health centres increased from 10.7 km in 1992/3 to 11.7 km in 2002/3 for the poor, while it fell from 7.4 km to 6.5 km for the non-poor<sup>2</sup>.

## ***2. Project description***

### ***2.1 Aim***

The aim of this project is to initiate access to treatment for PWE in Lao PDR. A step-wise approach for the development and the introduction of a national program for PWE will be carried out. All aspects of access to treatment will be improved: (i) awareness of patient, families, general population, and health personnel, (ii) availability of drugs, (iii) accessibility of drugs in urban and rural pharmacies, (iv) price of treatment (affordability) will be addressed, (v) adequacy of patient – provider interrelation and (vi) acceptability of treatment by patient and (vii) health personnel knowledge and ability will be addressed.

### ***2.2 Location (target population)***

The project will be carried out in two main regions of Laos Vientiane Capital and Luang Pra Bang which account for 20% of the total population. The choice of a Northern site (LPB) is justified by poorer access to health services in northern Lao PDR than in the southern region. A total target population of 8000 patients (range 6000-12,000) is expected to be included in the project. The total (min-max) of expected patient was provided Table 1.

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<sup>1</sup> Wendy Holmes, Damian Hoy, Anonh Xeuatvongsa, 2003: LADHCP Report on Health Study Findings.

<sup>2</sup> World Bank (2006a)

The total of patients expected will be 19,500 (range 13,400-27,200). Table 2 and 3 provide the health profile of the different regions.

Table 2: Population and health facilities

	Population (2005)	PH	DH	HC	Med staff (2001)
Savannakhet	820 000	1	14	85	2002
Vientiane Capital	700000	1	10	27	1499
Champassack	605000	1	9	58	1546
Luang Pra Bang	410000	1	11	44	1197
Total	2 535 000	4	44	214	6244

PH=provincial hospital, DH = District Hospital, HC=Health Center, Medical staff: include doctors and nurse

### ***Human resources in Lao PDR regarding neurology***

The whole country only has 2 psychiatrists, one neurologist, and 8 general practitioners, 5 medical assistants and 12 nurses who have been specifically additionally trained for managing patients with neurological and mental disorders.

There is currently 1 neurologist and 1 neurosurgeon in Vientiane capital. One additional doctor is expected to finish his training in Neurology in April 2008 and will be working in the neurological Unit in Mitthapap Hospital, Vientiane, one of four main hospitals of Vientiane. Two young doctors have been offered a grant to enroll in a two years-program in Khon Kaen University (Thailand). They will start their training next semester.

### **Equipment**

There are 5 CT Scans in Laos: three of which in Vientiane (Mitthapap, Mahosot and Sethathirat hospital), One CT Scan is in Savannakhet, and one in Pakse.

Electroencephalogram material is only available in Mitthapap hospital where the staff has been trained to its use 2 years ago.

Additional, short term training on neurological topics offered one or twice a year during one or two weeks by incoming overseas team.

### ***2.3 Main activities of the project***

The project will include the following components

1. Establish and animate a network of partners of Lao curative and preventive health services, training institutions (University, other institutions such as IFMT, external trainers) and NGOs involved in the management of PWE. The coordination unit of the project will be located in the NIOPH, Vientiane. All activities listed below (2 to 15) will be coordinated and monitored by this unit.
2. Census of patients with Epilepsy symptoms
  - a. Active detection by peripheral preventive health services
  - b. Passive by snow ball through mouth-to-mouth effect of treated patient
3. Diagnosis confirmation by trained MG and neurologist for suspicious cases
4. Establish follow up of PWE through a one outpatients consultation/trimester following the diagnosis and treatment
5. Population awareness and education on epilepsy disease and treatment
  - a. Education Campaign through mass media: radio and TV spots
6. Health staff training on public health ability: public health education, community screening and management skill.
7. Health staff training on how to diagnose, care and follow up PWE
  - a. In main hospitals (regional and districts)
  - b. In all Health centres
  - c. A special training of health volunteers will be done for patients living in remote village with poor access to Health Centre using the already village health workers (VHV, “ossobo”)
  - d. Special courses at the Laos Faculty of Medicine
8. Guidelines for the different level of care
9. Support accessibility and availability of phenobarbitone to all places according to the number of cases, including work on the policy level

10. Introduction to the management of epileptics patients not responding to phenobarbitone : availability of carbamazepine and Sodium valproate in referral center
11. National advocacy campaign for epileptic patients among policy makers
12. Establishing referral centres
  - a. Special courses
  - b. Training in EEG
13. Scholarship for 4 Masters in neurology and neuroscience
  - a. 2 in Asia
  - b. 2 in Europe
14. Scholarship for 4 residency specialization in neurology
15. Mid term evaluation of the program
16. Final evaluation of the program

#### ***2.4 Mode of implementation***

The following choices for the implementation are made:

1. The project will start small and will develop over time: primary target populations will be the population of Vientiane Municipality and the Luang-Prabang province.
2. Initial training support to curative and preventive health services will increase quality of service for management of neurological disease in general and epilepsy in particular.
3. Awareness creation in population will provoke PWE to seek care. Support from the coordination unit to those patients will be provided. Therefore, the coordination unit has also the role of “door opener” (facilitating treatment access).
4. Snow-ball effect: in area where PWE use service more support (resources) will be provided in order to increase utilization of the services.
5. Compliant PWE will be asked to help identify and “coach” new PWE which increases the self-reliance of PWE and snow-ball effect of the project implementation.
6. The project follows the logic of action-research. Epilepsy is regarded as an example of a chronic disease. The project will – besides of providing treatment to the PWE – provide important insight how access to health services may be increased in Laos for chronic diseases. These results are likely to be valid in similar settings.

### ***2.5 NIOPH, and envisaged partners in the network***

The project will include the main organizations (Institutional and NGO) already involved in training medical staff in Laos which will back the project.

#### **MOH, NIOPH (National Institute of Public Health)**

The Ministry of health and the National Institute of Public health will be in charge of housing the project and to facilitate integration with the current tasks of the MoH. Their full support will be needed for sustainable care for the PWE integrating the care of PWE into the routine task of Health Centre and hospitals.

Below is a description of the non governmental organization (NGO) which have already activities in the field of chronic disease treatment and are interested to be part of a network with the care of PWE. Their collaboration will extend the effectiveness of the activities as they will be able to contribute with additional resources e.g. with their staff for training, local knowledge on patients or local barriers to access to treatment etc. Furthermore, a net of more than 40 pediatricians have been trained by Health Frontiers and are now working all over Laos. These trained doctors are also under the responsibility of the MoH. Some of the NGOs have already showed interest to participate in the project and could participate in the implementation the initiative.

#### **Non-governmental organizations (NGOs)**

**Handicap International (HI):** involve in supporting people with disabilities in Lao PDR including a pilot project in Savannakhet with PWE.

[www.handicap-international.org.uk/page\\_188.php](http://www.handicap-international.org.uk/page_188.php).

**BasicsNeeds (BN):** Care of people with mental disorder involving PWE

([www.basicneeds.org/](http://www.basicneeds.org/)). BBN works to bring about a lasting change in the lives of mentally ill people around the world. Mental illness is a problem that is often ignored and this is especially the case in the poorest countries in the world. With an often complete lack of locally available, free mental health care, desperately poor mentally ill people stand little hope of recovery. Working with mentally ill people, rather than

just for them, BN have built an innovative approach to the problem that tackles mentally ill peoples' poverty, as well as their illness.

**Health Frontiers:** in charge of training of the Lao paediatrician. The paediatrician net all over the country will be an important to improve the care of PWE.

([www.healthfrontiers.org](http://www.healthfrontiers.org)). Up to now 27 Lao pediatric residents are working all over Laos. They have clinical responsibilities in major hospitals in the country. They, 14/27 are working in the four major teaching hospitals in Vientiane: Setthathirat, Mahosot, Mittaphab and Maternal Child Hospitals. There are pediatric graduates, 13/27, working in eight provincial hospitals, Vientiane Province, Luang Phabang, Savannkhet, Champasack, Bolikhamsy, Sayaboury, Luang Namtha and Saravan. In provincial hospitals, Lao pediatric graduates are the Chief of Pediatrics in six provinces: Vientiane, Chamapasack, Savannekhet, Bolikhamsy, Luang Phabang and Luang Namtha.

**Family Medicine Speciality Program** has now trained about 60 new family doctors over the past 3 years who are now working in rural districts. This is a partnership program involving the University of Calgary, the Lao University of health Sciences, and the Ministry of Health.

**INGO group** (association of all NGO working on health in Laos)

This group of Health association has regular meeting and would be involve in the project since some of theses associations are based in the province and can provide helpful support

IFMT has trained around 90 Lao doctors and provide a Master in Tropical Health. A majority of them returned to district and provincial hospital and could be a good relay for the project.

### **Scientific collaboration**

NIOPH will be supported by IFMT Vientiane ([www.auf.ifmt.org](http://www.auf.ifmt.org)) who has accumulated substantial local knowledge on the syndrome. IFMT has been conducted

most of the studies on epilepsy in Lao PDR and provide research and training for Master Student in Tropical Health.

The project will be supported by Malaysia, Pr CT Chan and International League against Epilepsy.

The implementation of the project will be further supported by IENT Limoges ([www-ient.unilim.fr](http://www-ient.unilim.fr)) and the Swiss Tropical Institute ([www.sti.ch](http://www.sti.ch)) which participated in studies on epilepsy and PWE in Lao PDR.

Additional input will be provided by Prof. Robert Lee from the University of Calgary, Canada, a retired neurologist and former president of the Canadian Neurological Society. He is presently involved in a Lao –Calgary partnership project to train family doctors to work in rural areas of Laos. Prof Lee will also provide a link with experts in the Epilepsy Program at the University of Calgary.

Additional technical support will be provided on the economical aspect by Dr F.Haegeman and J.M Somé.

### ***3. Sustainability***

Sustainability is a main challenge for the project and this has to be closely thought over.

High-Awareness of the MoH and involving Lao doctors and authorities will be some of the priorities starting the project. We have already carried-out a workshop to exchange with MoH on the results of the 5 years researches. Discussion on potential avenues were fruitful.

Housing the project within the MoH is of main importance. As a next we shall discuss to enrol a young skilled Lao doctor who will be in charge of the preparation of the project: building links within MoH and provincial and district health authorities, analysis the partnership collaboration and the level of human resources, meeting and

discussing with people to identify the priorities and the best strategies etc.. Seed money (initial funding) for these activities could be provided by IFMT until the end of 2008 (Corus Research project).

Sustainability will also be based on integration of the activities in the current health system. There are two aspects: (i) increase the net of local skilled doctors for epilepsy, and (ii) increase the awareness about epilepsy in the population and in mid level health staff. A step by step approach will avoid the consequences of the end of the project.

Financial sustainability is a main issue. It will require discussions further with Health socio economist with a wide- experience in Laos (JM Tomé, F Haegeman). As a preliminary idea we think to provide free treatment for 6 months for all consented patients enrolled in the project. If accessibility is secured patients and their families will be asked to cover their drug costs. This will free financial support to include a next patient. Drugs at real costs will be made available through the public health system with a maximum. Detailed mode of implementation needs to be established.

### ***3.1 Lao doctors involvement***

We plan to involve as far as possible all skilled doctors in Laos. We are now conducting investigation among the already trained doctors to know (i) how many potential human resource we have, (ii) if they are interested to become involve, (iii) estimate the number of current patients already follow up, and (iv) the estimated gap for long term treatment.

For all interested doctors we will objectives for the next 3 years in terms of i) number of new patients follow up on long term ii) number of health staff trained in epilepsy patients care management.

From this baseline evaluation a step by step procedure will be discussed and planned in agreement with the project's partners.

#### **4. Evaluation**

The project will be managed with a continuous evaluation based on the achievement of step by step objectives with an qualitative component and regular back up. This will help to measure the integration of the main aims of the project among their main targets (health staff, population epileptic, pharmacist, drug seller..) of the project to its aim. A go-no go approach will be carried out.

#### **4. Funding**

The project will be presented for funding to a few sources including national society against epilepsy, external development program, International League against Epilepsy etc...

We suggest that some institution or Ngo assume directly part of the program

And a preliminary meeting will be hold out in May 2008 to involve the NGO workings in Laos, then funding proposal will be made at the institutional and international level. Collaboration with the International League against Epilepsy and the National Societies of Neurology are one of the main potential support.

We present a 100 000 US \$ proposal for funding. The main implication of ILAE will be to support training, awareness of the population, research, and a financial participation in the management of the project. We are really open to any suggestion to take in charge other part of the funding program or switches to more accurate budget lines.

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**Budget: Detail for a 100 000 US \$ funding**

Budget	For 3 year program			Total	<i>ILAE</i>	Potential support
	number	cost	Number of unit		<i>To be funded</i> US \$	
Census of patients	1 000	4		4000	<b>500</b>	IFMT/NGO
Neurologist support for diagnosis	1	4000		4000		Partners
<b>Subtotal</b>				<b>8000</b>	<b>500</b>	ILAE
<b>Awareness campaign</b>						
Through mass media				500	<b>500</b>	
Guidelines				500	<b>500</b>	Local working group
<b>Subtotal</b>				<b>1000</b>	<b>1000</b>	ILAE
<b>Drug availability</b>						
Phenobarbitone twoyear	1000	6		6000	<b>6000</b>	
Others drugs	80	100		8000		Lab Sanofi
<b>Subtotal</b>				<b>14000</b>	<b>6000</b>	ILAE
<b>Training</b>						
Health volunteers	500	20		10000	<b>10000</b>	Local partners
Nurses and doctors	300	20		6000	<b>2000</b>	Local partners
Experts for training 2 x5 months (1500 \$/month)	10	1500		15000	<b>3000</b>	Local partners
Provincial responsible of program (250\$/month)	1	250	36	9000		
Chief of program (2000 \$ /month)	1	2000	36	72000	<b>26000</b>	ILAE
Assistant project	2	200	36	14400		MoH
<b>Subtotal</b>				<b>126400</b>	<b>41000</b>	ILAE
<b>Specialized training</b>						
2 masters neuroscience 1 years (1200\$/month)	2	14400		28800	<b>28800</b>	International cooperation
2 neurologist (2 years)	4	14400		57600		International cooperation
<b>Subtotal</b>				<b>86400</b>	<b>28800</b>	International cooperation
<b>Material and equipment</b>						
Support for Provincial hospital	1	20000		20000		
Support for Vientiane Hospital	1	20000		20000		

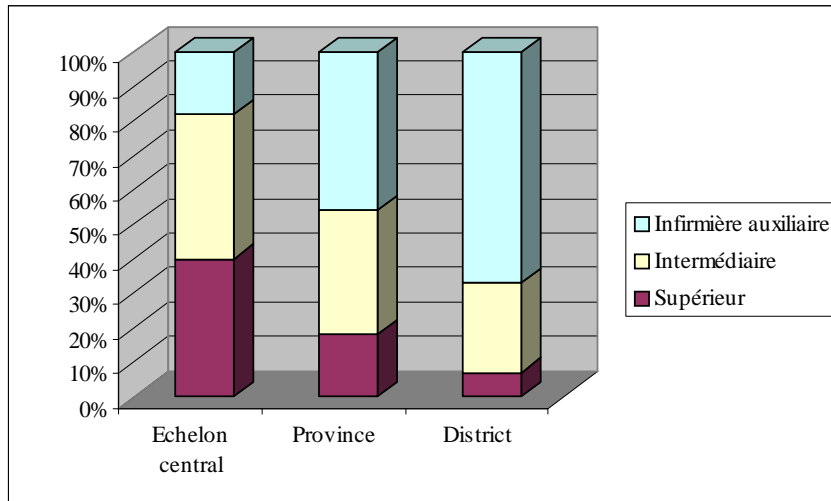
<b>Subtotal</b>			40000	0	International cooperation
<b>Transportation facilities</b>					
Motorbikes	10	1500	15000	4500	
Essence	250	3	20	15000	2000
2 wheels cars	2	22000	44000		
Insurance/maintenance	2	3000	6000	1200	
<b>Subtotal</b>			80000	<b>7700</b>	ILAE
<b>Support to MoH office</b>					
Office rental	36	150	5400		
Office equipment			2000		
Sub total			7400	0	MoH
<b>Bureautic</b>					
Computer	4	800	3200	1000	1 Computer Corus
Copier	1	1000	1000		
Phones/electricity/internet	36	150	5400	3000	
Administrative cost	36	150	5400	4000	
<b>Subtotal</b>			14800	<b>8000</b>	ILAE
<b>Research and publication</b>					
Support 2 research/per year	6	3000	18000	5000	ILAE
Publication support 2/year	6	1500	9000	2000	
<b>Subtotal</b>			27000	<b>7000</b>	International cooperation
<b>Evaluation mi term</b>					
2 experts 7 days	14	400	5600		
Evaluation end of program					
2 experts 15 days	30	400	12000		
<b>Subtotal</b>			12000		International cooperation
Subtotal			405000		
5% subtotal			20250		
<b>Total Cost</b>			<b>425250</b>	<b>100000 US\$</b>	

Annex

The next figure give information about the different region and about the skills and distribution of the health staff in Laos.

Sources •MOH/WHO Lao PDR, 2006 Human Resources for Health

Graphique 4.1. Répartition du personnel de santé par niveau de qualification



Source :Lao Health Master Planning Study , JICA/Ministère de la Santé, 2002, Vol 4, pp 10-9

Figure 10: Numbers and density of health workers by main types in all health sectors, under MoH, with regular civil servant position, at health public health facilities (only regular staff), of which medical regular staff and medical high and middle level staff.

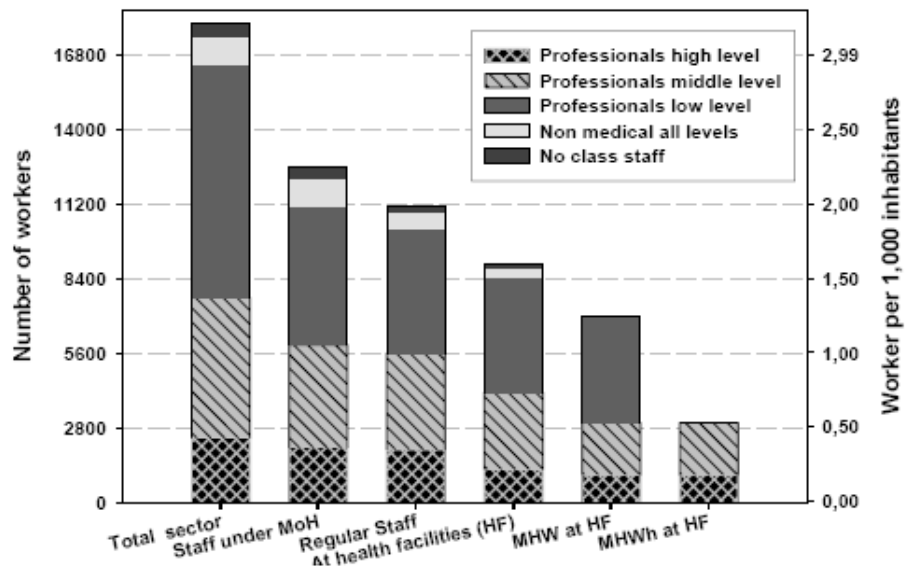


Table 2: Major health indicators in Lao PDR and neighboring countries in same year.

	<i>Human Development Index Rank of 177 (2003)</i>	<i>Life expectancy at birth (2005)</i>	<i>Infant mortality rate Deaths per 1,000 live births (2003)</i>	<i>Maternal mortality rate Deaths per 1,000 live births (2003)</i>
Lao PDR	133	61	82,2	530
Cambodia	130	56	97	440
Myanmar	129	60,1	76	230
Vietnam	108	70,4	19	44
China	85	71,5	30	80
Thailand	73	69,7	23	36

paper for Lao PDR and neighboring countries in same year, to support the study.

- (3) Ding D, Hong Z, Wang WZ, Wu JZ, De Boer HM, Prilipko L et al. Assessing

Table 27: Characteristics and productivity of 16 hospitals in Lao PDR.

	<i>Central Hospitals</i>	<i>Provincial or Regional Hospitals</i>	<i>District Hospitals</i>
( Number of inpatient bed	63 – 450	60 - 250	18 - 35
Number of health workers	83 – 616	88 - 288	11 - 40
Total unit of service per year	61,323 – 217,290	24,588 - 133,599	2,683 - 20,128
Total staff per bed	1.32 - 2.61	1.12 - 1.71	0.61 - 2.06
Unit of service per total staff	238 - 739	214 - 483	187 - 347
Unit of service per staff per All staff day	0.7 - 2.0	0.6 - 1.3	0.5 - 1.0
(			
	<i>High level</i>	2.8 - 5.6	3.1 - 6.1
	<i>Middle level</i>	1.6 - 4.2	2.1 - 3.2
Bed occupation rate	60% - 70%	52% - 74%	12% - 27%