

Original article

Perceived ill-health and health seeking behavior in two communities in the Nam Theun 2 hydroelectric project area in Lao People's Democratic Republic

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Abstract

Objective: To compare perceived ill-health and health seeking behavior between two communities affected by the large Nam Theun 2 hydroelectric project in central Lao People's Democratic Republic (PDR). **Methods:** Two different affected areas: Nakai plateau being remote, sparsely populated and mountainous, and Xe Bang Fai lowland plains, more densely populated and comparatively affluent were included. Data were obtained from two cross-sectional household-based health and socio-economic surveys. **Results:** We found pronounced differences in the frequency of self-reported fever, cough, headache and myalgia according to location. On the Nakai plateau, 45.1 % of the individuals with ill-health report (recall period: 2 weeks) went to a local health volunteer compared to only 7.2 % in the Xe Bang Fai area ($P < 0.001$). In Nakai, there were disproportionately more illiterates seeking help from local health volunteers when compared to those who attended at least primary schooling (49.2 % versus 17.5 %, $P < 0.01$). Self-medication with antimalarials was more common in Xe Bang Fai than on Nakai (32.3 % versus 7.0 %, $P < 0.001$). The mean amount of money spent per health consultation was US \$ 1.7 in Nakai and US \$ 7.2 in Xe Bang Fai. **Conclusion:** The observed differences in self-reported ill-health and health seeking behavior among these two Lao communities need to be considered when implementing setting-specific mitigation measures as part of the public health action plan of the Nam Theun 2 hydroelectric project.

Keywords: Self-reported ill-health; Health seeking behavior; Lao PDR; Nam Theun 2 hydroelectric project

INTRODUCTION

According to the Human Development Report 2007/

2008, Lao People's Democratic Republic (PDR) ranks at position 130 among 177 referenced countries, and is currently considered a country with a medium human development index (HDI) ^[1]. Health indicators, such as under 5 mortality (83 per 1 000 in 2004), life expectancy at birth (59 years), maternal mortality (405 per 100 000 live births), and expenditure for health per person per year (US \$ 11 in 2003) are among the worst across

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Asia^[2]. In 2005, it was estimated that 79.4 % of Lao people still lived in rural areas^[3].

Lao PDR's public health system is constrained by a lack of human and financial resources, and there are considerable challenges to improve this situation, due to the interplay of ecological, political and socio-economic factors. The provision of health services is mainly concentrated in populated and more developed areas in the Mekong lowland, whilst remote and sparsely inhabited settings are often neglected^[4,5]. Although quite comprehensive health data of Lao PDR have been published by the Ministry of Health (MoH) in 2001, there is a paucity of information regarding perceived ill-health and health seeking behavior, and only little is known about differences according to age, gender, educational attainment and location (e.g., lowland versus highland dwellers)^[6]. Health systems may therefore be insufficiently prepared to local needs^[7,8]. Furthermore, access to health care and mitigation services must be seen and planned in a broader context. On one side are the health services embedded in the health system and the wider institutional network of the country, and on the other side are the livelihood assets of affected individuals^[9]. The latter is governed by the overall vulnerability of the population. Large infrastructure developments, such as the Nam Theun 2 hydroelectric project in central Lao PDR, can have a positive or negative effect on health and wellbeing^[10]. Knowledge on patient's perception on ill-health and health seeking behavior within a given vulnerability framework is of central importance to understand why, how and when a patient seeks access to health care^[11].

The purpose of this article was to examine differences in self-reported ill-health and patterns of health seeking behavior among two rural communities affected by the Nam Theun 2 hydroelectric project^[12]. The data stem from large-scale cross-sectional surveys that were designed to characterize the baseline health and socio-economic situation on the Nakai and in the Xe Bang Fai downstream areas before implementation of this water-resource development project.

MATERIALS AND METHODS

Study area and population

In a collaborative effort between the MoH, other Lao institutions, and the Nam Theun 2 Power Company (NTPC), two large cross-sectional household-based surveys were carried out on the Nakai plateau and in the Xe Bang Fai river plain in the provinces of Khammouane and Borikhamxay, central Lao PDR. In 2002, the public health system in Khammouane province (estimated population 258 000) in which most of the study area lies, comprised of one provincial hospital (150 beds), 8 district hospitals (146 beds) and 71 health centres. There were 71 village health volunteers responsible for a total of 806 villages and, on average, there were 4.1 health workers per 1 000 inhabitants^[12].

Details of the study area and population surveyed have been presented elsewhere^[10]. The Nakai survey took place between November 2001 and September 2002, enrolling more than 5 000 individuals in 864 households of 17 villages on the Nakai plateau where the reservoir will be created. The Xe Bang Fai survey, carried out between June and August 2001, enrolled over 10 000 individuals from 1 680 households in 112 villages.

Questionnaire survey

Data on perceived ill-health and health seeking behavior were obtained by interviewing the heads of households and family members using a standardized questionnaire. Here, we focus on demographic features, self-reported symptoms, health seeking behavior, antimalarial treatment, drugs administered in health facilities and health expenditures.

Data management and statistical analysis

Questionnaire data were entered into two separate Microsoft Access databases. Data quality was ascertained by a number of internal consistency checks with inaccuracies being removed after consulting the original questionnaires. The two databases were then converted to STATA version 8.2 (Stata Corp; College Station, USA), and merged to a single database. Standard deviations (SD) of means and significance of differences between frequencies were tested



using χ^2 -test in STATA.

Ethical considerations

The data presented in this report stems from field surveys carried out by the Khammouane Provincial Health, MoH and NTPC under the overall recommendations of the Ministry of Health for the Health Impact Assessment of the future hydroelectric project in Laos. The database used for the analysis was anonymised.

RESULTS

Demographic features

Table 1 summarizes the demographic data for the two communities surveyed. The percentage of children below the age of 6 years was 20.1 % in Nakai and 15.3 % in Xe Bang Fai ($\chi^2 = 7.4$, $P < 0.001$). At the national level the respective percentage of children younger than 6 years is 16.2 %. The percentage of individuals aged below 15 years was 45.8 % in Nakai and 42.0 % in Xe Bang Fai ($\chi^2 = 4.7$, $P < 0.001$).

Table 1 Population frequencies stratified by sex and age groups in the Nakai.

	Sex (%)		Age (years) (%) ^a				
	Females	Males	≤5	6-14	15-29	30-59	≥60
Nakai (n = 5 099)	51.2**	48.8	20.1*** (****)	25.7	23.9*	25.2*	5.1*
Xe Bang Fai (n = 10 032)	50.8*	49.2	15.3*	26.7	25.8	26.7	5.6
Nationally (n = 38 260)	50.6	49.4	16.2	26.7	25.0	26.1	6.0

^a In Xe Bang Fai, data on age was missing for 96 individuals (n = 9 936); Asterisk indicate significance differences between Nakai and XBF and asterisk in brackets between Nakai/XBF and nationally (*: $P < 0.05$; **: $P < 0.01$; ***: $P < 0.001$).

Gender differences in educational attainment were apparent on Nakai and Xe Bang Fai (Table 2). In Xe Bang Fai, the frequency of illiterate males and females was about half to one-third compared with Nakai (males: 13.2 % versus 35.1 %, $\chi^2 = 16.3$,

$P < 0.001$; females: 33.1 % versus 65.0 %, $\chi^2 = 20.3$, $P < 0.001$). The percentage of people who only attended primary school was 42.7 % in Nakai and 47.2 % in Xe Bang Fai ($\chi^2 = 3.9$, $P < 0.001$).

Table 2 Educational attainment of the Nakai and the Xe Bang Fai study populations (only persons > 14 years of age).

Educational attainment	Nakai (n = 2 760) (%)		Xe Bang Fai (n = 5 870) (%)	
	Males (n = 1 292)	Females (n = 1 468)	Males (n = 2 811)	Females (n = 3 059)
Illiterate ¹	35.1*** (****)	65.0(****)	13.2***	33.1
Primary school	55.3*** (**)	31.5(****)	50.7***	43.9
Lower secondary school ²	6.6*** (****)	2.5(****)	20.7***	12.6
Upper secondary school ²	1.9*** (****)	0.5(****)	8.7***	4.3
Higher education ³	0.8** (****)	0.1(****)	3.2**	2.0
Unknown	0.3(****)	0.3(****)	3.5	4.1

¹ Illiteracy nationally; 30.0 %; ² Lower secondary school: 3 years (grade 6 - 8); upper secondary school: 3 years (grade 9 - 11); ³ University, vocational and technical school; Asterisk indicate significance differences between males and females of either Nakai or XBF and asterisk in brackets between the same sex in Nakai and XBF, respectively (**: $P < 0.01$; ***: $P < 0.001$).

The majority of heads of household were male (Nakai: 83.2 % , Xe Bang Fai: 84.2 %) and married (Nakai: 76.2 % , Xe Bang Fai: 80.7 %). Their mean age was 46 years (SD: 14.0 years) in Nakai and 47 years (SD: 13.7 years) in Xe Bang Fai. Most of the household heads were farmers or fishermen; 82.9 % in Nakai and 81.7 % in Xe Bang Fai, respectively.

Self-reported symptoms

In Nakai, 8.0 % of the interviewees reported at least one symptom 2 weeks prior to the survey. In Xe Bang Fai, the frequency of reported symptoms was significantly lower (6.1 % ; $\chi^2 = 4.4$, $P < 0.001$). If symptoms can be taken as a proxy to illness, Nakai had the highest level of illness (80/1 000 population) compared to Xe Bang Fai (61/1 000) and the national estimate (25/1 000). Table 3 shows that the most frequent symptoms reported by the Nakai and Xe Bang Fai study population were fever

(Nakai: 70.4 % , Xe Bang Fai: 55.1 % ; $\chi^2 = 4.9$, $P < 0.001$), cough (Nakai: 51.3 % , Xe Bang Fai: 31.5 % ; $\chi^2 = 6.4$, $P < 0.001$), headache (Nakai: 42.5 % , Xe Bang Fai: 42.6 % ; $\chi^2 = 0.03$, $P > 0.05$), and myalgia (Nakai: 33.3 % , Xe Bang Fai: 26.7 % ; $\chi^2 = 2.4$, $P < 0.05$). These high frequencies imply that several symptoms were reported simultaneously. In Nakai, the occurrence of watery diarrhea was significantly less frequent than the national estimate (5.4% versus 10.5 % , $\chi^2 = 3.0$, $P = 0.003$). Fever was most frequent in young children under 5 years and in the elderly aged above 59 years. Fever was significantly less often reported in Nakai than in Xe Bang Fai (5.1% versus 6.0% , $\chi^2 = 2.3$, $P = 0.05$). However, when stratified after gender and age, significant differences were only found between the female population of Nakai and Xe Bang Fai, respectively. Nationally, the occurrence of fever was two-to three-fold lower ($P < 0.001$) as summarized in Table 4.

Table 3 Frequencies of self-reported symptoms of the Nakai and Xe Bang Fai survey population.

	Nakai <i>n</i> = 408	Xe Bang Fai <i>n</i> = 615	Nationally <i>n</i> = 959
Any symptom (proxy illness)	80/1000 pop.	61/1000 pop.	25/1000 pop.
Fever	70.4 % ^{****}	55.1 %	57.7 %
Cough	51.3 % ^{****}	31.5 %	27.2 %
Headache	42.5 % ^(****)	42.6 % ^(****)	22.2 %
Myalgia	33.3 % ^{****}	26.7 % ^(****)	13.6 %
Cough and runny nose	31.8 % ^{****}	13.7 %	n. k.
Sneeze and runny nose	25.9 % ^{****}	17.9 %	13.5 %
Chills	18.1 % ^{****}	10.1 %	n. k.
Vomiting	13.0 % ^{**}	7.3 %	n. k.
Sore throat	12.5 % ^{****}	3.9 %	n. k.
Chest pain	10.8 % ¹	10.9 %	n. k.
Abdominal pain	10.0 %	13.8 %	11.3 %
Watery diarrhea	5.4 % ^(**)	6.5 % ^(**)	10.5 %
Fatigue	5.4 % ^{****}	11.4 %	n. k.
Respiratory difficulties	4.7 %	6.8 %	n. k.

¹: Males were significantly more affected than females ($P < 0.05$); n. k. : not known; Asterisk indicate significance differences between Nakai and XBF; Asterisk in brackets indicate significance differences between Nakai / XBF and national figures (* : $P < 0.05$; ** : $P < 0.01$; *** : $P < 0.001$).

Table 4 Occurrence of fever in a period of 2 weeks prior to the survey in the Nakai and Xe Bang Fai population.

	Sex (%)		Age (years) (%) ^a					Total
	Females	Males	≤5	6 – 14	15 – 29	30 – 59	≥60	
Nakai (n = 5 062)	5.2*	5.0	7.7	3.5	3.0	5.5	9.7	5.1*(****)
Xe Bang Fai (n = 10 029)	6.5	5.6	9.3	4.5	4.1	6.7	9.6	6.0(****)
Nationally (n = 38 260)	2.1	2.0	2.9	1.7 ¹	1.1 ²	2.2 ³	2.2	1.9

Asterisk indicate significance differences between Nakai and XBF; Asterisk in brackets indicate significance differences between Nakai / XBF and national figures (* : $P < 0.05$; **** : $P < 0.001$); ¹ age group 6 – 14 years; ² mean of age groups 15 – 19, 20 – 24, and 25 – 29 years; ³ mean of age groups 30 – 34, 35 – 39, 40 – 44, 45 – 49, 50 – 54, and 55 – 59 years.

Health seeking behavior

Table 5 summarizes the patterns of health seeking behavior, stratified by location. In Nakai, 59.0 % of the illiterates and 60.6 % of the individuals with at least primary education who reported symptoms within the past 2 weeks sought health care. In Xe Bang Fai, the respective percentages were 67.3 % and 73.4 % ($P > 0.05$). In the Nakai study area,

the most frequent health seeking behavior was to visit a local health volunteer (45.1 %). Visiting pharmacies/private clinics was reported by 21.6%, whereas self-treatment was reported by 20.8% of the interviewees. Illiterates sought health care at local health volunteers more frequently than their more educated counterparts (49.2 % versus 17.5 %, $\chi^2 = 3.2$, $P = 0.001$).

Table 5 Kind of medical service utilised by people who sought health.

	Nakai (n = 255)		XBF (n = 433)		Nationally (n = 959)
	Kind of service utilised	Differences between illiterates (illit, n = 59) and educated (edu, n = 40) people ¹	Kind of service utilised	Differences between illiterates (illit, n = 148) and educated (edu, n = 396) people ¹	Kind of service utilised
Local health volunteer	45.1% **** (****)	ill > edu**	7.2% (****)	ill = edu	3.0%
Pharmacy/private clinic	21.6%	ill < edu*	25.9% (***)	ill = edu	18.7%
Self-treatment	20.8% (****)	ill = edu	21.9% (****)	ill = edu	52.9%
District hospital	3.9% ***	ill = edu	11.1% (*)	ill = edu	7.1%
House visit by doctor	1.6% *** (*)	ill = edu	10.4% (****)	ill = edu	5.2%
Health centre	1.2% *** (**)	ill = edu	18.1% (****)	ill < edu*	5.3%
Neighbours	0.8%	ill = edu	1.8%	ill = edu	n. k.
Provincial hospital	0.8% * (**)	ill = edu	3.5%	ill = edu	4.7%
Traditional healer	1.2% *	ill = edu	0% (*)	ill = edu	1.0%
Do not know	2.7%	–	0.2%	–	n. k.

¹ Educational attainment of an individual < 18 years was defined by the educational attainment of its mother; n. k. : not known; Asterisk indicate significance differences between Nakai and XBF; Asterisk in brackets indicate significance differences between Nakai/XBF and national figures or between illiterates and educated people (* : $P < 0.05$; ** : $P < 0.01$; **** : $P < 0.001$).

Malaria treatment

The percentage of people who reported to have taken antimalarial drugs (e.g., chloroquine or sulfadoxine-pyrimethamine (SP) are available in the area), or paracetamol, before and during the attendance of health facilities, is summarized in Table 6. In Nakai, 7.0 % of the individuals practiced self-treatment

with antimalarials before they visited health facilities. Self-treatment was more common in Xe Bang Fai. However, in health facilities antimalarials were received more frequently in Nakai compared to Xe Bang Fai and national estimates (44.0 %, 30.7 % and 7.6 %, respectively).

Table 6 Percent of patients who did self-treatment and who received medicines in health facilities.

	Self-treatment with chloroquine, SP, or paracetamol (%)			Chloroquine, SP, or paracetamol received in health facilities (%)		
	Anti-malarial medicine	Paracetamol	Other	Anti-malarial medicine	Paracetamol	Other
Nakai n = 100	7.0 ^{***(***)}	17.0 ^{***(***)}	1.0 ^(**)	44.0 ^{**(***)}	87.0 ^(****)	23.0 ^{***(***)}
XBF n = 232	32.3	90.6 ^(**)	3.1 ^(****)	30.7 ^(****)	82.4 ^(****)	9.0
Nationally n = 137	26.8	84.0	33.3	7.6	31.0	9.7

Asterisk indicate significant differences between Nakai and XBF. Asterisk in brackets indicate significant differences between Nakai/XBF and national figures: * : $P < 0.05$, ** : $P < 0.01$, *** : $P < 0.001$.

Expenditure for health

The mean amount of money spent when Nakai villagers visited a health facility, pharmacies or for self-medication, which includes transportation, admission fees and drugs, was 17 000 Laotian Kip (LAK) (approximately US \$ 1.7 in 2005). The 50 % and 90 % percentiles were 2 750 LAK (US \$ 0.3) and

27 000 LAK (US \$ 2.7), respectively. In Xe Bang Fai, expenditure for health, on average, was 72 000 LAK (US \$ 7.2), and the 50 % and 90 % percentiles were 20 000 LAK (US \$ 2) and 75 000 LAK (US \$ 7.5), respectively.

DISCUSSION

The results presented here stem from two large-scale cross-sectional surveys that investigated perceived ill-health and health seeking behavior among more (Nakai plateau) and less remote populations (Xe Bang Fai lowland plains) that are affected by the US \$ 1.45 billion water-resource development project on the Nam Theun River in central Lao PDR [10].

Our findings suggest that Nakai plateau dwellers are more affected by communicable and vector-borne diseases than people living in the Xe Bang Fai lowland plains. We found pronounced gender differences in health seeking behavior and highlanders were less integrated in the health system compared to communities in the Mekong lowlands. Our findings indicate that infectious diseases are the predominant causes of ill-health both in Nakai and Xe Bang Fai.

Reported symptoms such as myalgia, chills, fatigue, cough accompanied by sneeze and runny nose are most likely due to infectious diseases. Compared to Xe Bang Fai and national figures, fever was more frequently reported in Nakai. Vomiting and watery diarrhea can be attributed to intestinal infections or the consumption of contaminated food [13]. Studies on the etiological agents of patients visiting health facilities in the capital Vientiane found that *Shigella* spp., heat-stable enterotoxin producing *Escherichia coli*, and serogroup-based enteropathogenic *E. coli* were the main causes for diarrheal episodes [14].

Abdominal pain could be caused by helminth (e.g., *Ascaris lumbricoides*, hookworm, *Strongyloides stercoralis* and *Opisthorchis viverrini*) and protozoal infections (e.g., *Giardia duodenalis*). In Lao PDR intestinal parasitic infection are highly prevalent in all age groups [15]. A study carried out in Khamm-



ouane province close to our study sites found 82 % of the participants infected with intestinal helminthes^[16].

The high number of self-reported cough in Nakai represent a common health problem in resource poor settings (i. e. respiratory tract infection). In addition, it is likely to be associated with poor housing conditions. The absence of windows and ventilation, coupled with harmful exposures to smoke of solid fuels that are burnt indoor for cooking and heating, favor transmission of respiratory diseases. Particularly the susceptibility to pneumonia and tuberculosis is higher when people are excessively exposed to smoke^[17]. Improvement of housing holds promise to reduce the burden of respiratory diseases^[12,18].

Despite the success of insecticide-treated bed nets (ITN) and other control measures, malaria remains one of the major public health issues in Lao PDR^[19]. Early treatment of malaria infections prevent from severe disease and death. On the other hand, self-treatment can contribute to drug resistance, especially when drugs are underdosed or treatment schedules abridged^[19-21]. Assuring drug quality and compliance in drug consumption is essential for a sustainable and effective malaria control program in the two study areas.

Generally, access to health facilities and provision of primary health care in Lao PDR is limited by a lack of infrastructure, resources and by inaccessibility^[8]. Moreover, the people's perception on health, and their understanding of cure and perceived quality of available care are determinants of access to health care^[22]. Significant differences in health seeking behavior between the Nakai and Xe Bang Fai study areas suggest that health services need might adapted to local needs and preferences. On the Nakai plateau local health volunteers are the preferred contact persons. They provide health services directly in the villages. Travelling to the health centers and hospitals is impractical or impossible, especially during the rainy season when the few existing roads are hardly passable. Therefore, provision of resources and training to local health volunteers might increase access to health care. However, health seeking behavior is likely to change in the coming years. The interventions currently put in place in the context of the NTPCs Social Development Plan will

improve health centres, district and provincial hospitals, and hence, are likely to increase accessibility of remote populations. The need for focusing health service provision on delivery of primary health care is paramount.

The Nam Theun 2 hydroelectric project impacts on the people's assets, which in turn influences the recognition of ill-health and health care seeking. Human capital (local knowledge, education, and skills) is impacted by diverse project-related interventions such as the Social Development Plan. Social capital (social networks and affiliations) is significantly changed by resettlement activities, the influx of labour force and camp followers (e. g. small business holders). The natural capital (land, water, livestock) as well as the physical capital (infrastructure, equipment, and means of transport) is altered by loss of land, gain of water surface, building of roads and the access to electricity and communication infrastructure. Financial capital (cash and credit) is changing due to available labour, access to national markets, tourism and poverty reduction plans in the framework of the project^[9]. Despite the fact that changes can be both favorable and adverse, overall quantity to livelihood assets and therefore the access to health care is expected to improve during construction and operation of the project according to the operator^[12].

A further important finding of this study is, that in Nakai out-of-pocket expenditures for health were four-fold lower compared with Xe Bang Fai despite symptoms were more frequently reported on the Nakai plateau. Considering that those expenditures were made within a recall period of 2 weeks the question arises about the accuracy of the WHO's quoted amount of expenditure for health per person per year (US \$ 10 in 2002)^[23].

It is likely that access to quality health care improves in the NTPC affected area compared to non-affected areas. As over time, overall vulnerability of the local population may decrease and may liberate household assets for access to health care in a political environment where institutions and organisation may be granted support which may affect positively the health system. In this study we report the baseline situation regarding perceived ill-health and health seeking behavior in two Lao communities af-

ected by a large hydroelectric project. It will serve as a benchmark for monitoring changes over time.

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