WORKING AND LIVING CONDITIONS OF CONSTRUCTION WORKERS: COMPARISON BETWEEN LARGE AND SMALL CONSTRUCTION SITES IN NORTHEASTERN THAILAND

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Abstract. This study examined differences in working and living conditions of construction workers in large and small construction sites in Northeastern Thailand. Data were collected by questionnaires, through observation and interviewing. A total of 812 construction workers from 20 large sites and 24 small sites were studied. Working and living conditions among the construction workers were generally poor. However, they were better at the large sites than the small ones. The data suggest an urgent need to improve sanitation and safety conditions on the construction sites and camp sites, including personal protective devices and improved welfare for the workers and their families.

INTRODUCTION

Construction is a high-risk industry with higher mortality rates than to other industries (Rossignol and Pineault, 1993; Feldman and Gerber, 1990; Stone 1993; Kisner and Fosbroke, 1994; Guiddotti, 1995; Burkhart *et al*, 1993; Howell *et al*, 1990; Bell *et al*, 1990). Sorock *et al* (1993) showed that work in the construction industry in the United States involves about a threefold increased risk of fatal injury compared with all industries combined. Data from the Ministry of Interior of Thailand reveal that, in 1991, in the construction industry the death rate from injuries was 14 times and the disability rate was 3.4 times the average for workers in manufacturing industries (Division of Techniques and Planning, 1991).

In Thailand, the number of construction workers is believed to be increasing by more than 10% per year and it was estimated that there were about one million construction workers in 1989 (Phandhuratana and Thongpasook, 1989). Thus rates of injuries and other health problems in the construction industry in Thailand are expected to be growing. Information about the living and working conditions of the workers could lead to the formulation of appropriate measures to prevent or reduce such problems. However, there have been few studies describing the nature of construction work and the living and working conditions of the workers, in Thailand or other similar developing countries.

Construction workers move from job to job. The duration of working in a particular place varies according to the size of project. A large construction project may need a year or more to complete while a smaller one may need only a few months. The workers may have to change their accommodation and live on or near the construction site.

In Thailand, there are two types of construction workers - local residents and migrant workers. Local workers stay in their own houses while working on the construction site. Migrant workers from other areas usually stay in a camp provided by the employer in or close to the construction site or find a place where they can live together, often in a slum in a big city.

There have been no published studies conducted in the northeastern region of Thailand on the conditions of construction workers. The situation could be different from a city, such as Bangkok, where there is an inadequate local work force. Also the size of the construction projects could be important. Large sites have more workers and this may lead to more social and health problems than at small sites. This study, therefore, examined the differences in living and working conditions of construction workers between large and small construction sites.

METHODS

A cross-sectional study was conducted between July 18 and 21, and August 24 and 25, 1994 in Khon Kaen and Nong Khai in the Northeastern Thailand. Khon Kaen is a major province in the center of the northeastern region, about 450 km northeast of Bangkok. Nong Khai is a province near the Thai-Lao border, about 180 km north of Khon Kaen or 630 km from Bangkok. The two provinces were selected because of their rapid economic growth. Two stage sampling was employed. A list of all construction sites was obtained by driving along all roads within the municipal area using an up-to-date map. The location of each site was marked on the map. All sites in the stages of basement preparation, installation of pile foundations, foundation construction, wood and concrete work were eligible. The largest sites, based on their usable area after completion, were selected from each province. From the remaining (smaller) sites, 12 from each province were selected using systematic random sampling. A list of all workers on the site on the day of the survey was used to obtain a random selection of 20 workers at each selected site.

Information was gathered using trained interviewers and data collection forms developed from a pilot study. General characteristics of the building and camp sites were obtained by observing the sites and interviewing the owner or the foreman. Data on the living conditions of the workers were obtained by interviewing the workers.

The incidence density of injuries during the previous month was estimated using as the denominator the number of worker days obtained by multiplying the average number of workers per day for each site by 30, then summing over all sites. To estimate the mortality rate, the number of worker days obtained by multiplying the average number of workers per day for each site by the number of days from the start of construction work to the survey date and then summing over all sites.

For continuous variables *t*-test were used to compare means between large and small sites where the data were aproximately normally distributed, otherwise Mann-Whitney U tests were used. Chi-square tests were used for comparing proportions. Fisher's exact test was used for categorical data if the frequencies in some groups were small.

RESULTS

From the total of 233 construction sites (164 sites in Khon Kaen and 69 sites in Nong Khai) 44 sites were selected for the study. From each of these sites, 20 workers were randomly selected, except that at those with 20 or fewer workers where all were selected. Thus a total of 812 workers were studied. The findings are presented in two parts - environmental conditions (based on the total of 44 study construction sites and 33 camp sites) and living conditions (based on data from the 812 workers).

Construction sites

Environmental conditions of the sites: The main source of water for drinking, washing or cleaning was piped water for most of the sites. None of the sites provided eating areas, tables and chairs or a room for the workers. At 8 of the 20 large sites food was sold nearby. For the 24 small sites, 4 had food shops and 4 had hawkers nearby. None of the sites had any garbage containers. Garbage was lying around at 17 of the 20 large sites and 17 of the 24 small sites. Thirteen of the 20 large sites and 15 of the 24 small sites had wet ground. There was an average of 28.3 workers per toilet for the large sites and 22 at the small sites. Overall, the environmental conditions were similar for the large and small sites.

Safety conditions: The foremen were trained about safety at 9 of 20 large sites and 4 of the 24 small sites (p-value = 0.05). At fewer sites were the workers trained about the safety - 8 and 6 for the large and small sites, respectively (p-value = 0.25). Fencing was present on more of the large sites, 7 out of 20, compared to only 2 of the 24 small sites. There were 3 large sites with a crane whereas none for the small sites had this equipment. From the total of 17 large sites and 23 small sites having more than one story, guard netting was present at 3 large sites and none of the small sites. Strong metal scaffolding was found at 7 and 2 of the large and small sites, respectively (p-value = 0.02). Warning signs were present at 2 of the large sites only. First aid equipment was available at 15 of the 20 large sites and 5 of the 24 small sites (p-value < 0.01). Generally, there were few safety precautions and many unsafe conditions in both large and small sites. Additionally, the small sites had consider-

ably fewer safety conditions and precautions than the large sites.

For personal protective devices, there were few statistically significant differences between the large and small sites except for the provision of helmets (p-value < 0.01), shoes (p-value = 0.01) and safety belts (p-value = 0.02); all of these were more common at large sites. At 12 out of 20 large sites and 20 out of 24 small sites no workers was observed to be wearing a helmet. Only one large site was found where all workers were wearing helmets. At 65% and 62% of the large and small sites respectively, fewer than half of the workers were wearing shoes.

Inspection by government officers: The large sites were inspected mainly by officers from the Civil Department, 11 compared to 5 of the small sites (p-value = 0.03). The small sites were mainly inspected by Municipal officers, 8 compared to 3 of the large sites. Officers from the Labour Force Department inspected mostly the large sites, 6 out of 20, but very rarely the small sites, 1 out of 24 (p-value = 0.04). These differences were due to the different areas of responsibility of the two authorities. The Municipal Office is responsible for all sites within the municipality which were mostly small sites. Most of the large sites were not within the municipality and were the Civil Department's responsibility. The Labor Force Department is mainly concerned with sites with large numbers of workers. The one small site inspected by the Labor Force Department was a housing estate where the number of workers was quite high. Officers from Health Departments rarely inspected either the large or small sites.

Environmental sanitation at the camp sites: Camp sites for housing the workers were available for 17 of the large construction sites and 16 of the small sites. On average there were two workers per room in the camps for both types of the construction sites. The rooms at most of the camps, 15 of the 17 large sites and 13 of the 16 small sites, were without windows and very dark. The rooms at 15 of the large sites and 13 of the small sites were dirty. There was garbage around the camp for 14 large sites and 14 small sites. Waste water had accumulated at 11 of the large sites and 9 of the small sites and there were 15 camps for each type of site lacking of waste water drainage. From the total of 9 food selling places at the large sites, 6 were dirty, and all the 3 places for the small sites were dirty.

The number of toilets per camp ranged from 1 to 32 (median = 4) for the large sites and from 1 to 5 (median = 1) for the small sites. There were only 3 unusable toilets, 2 at camps for large sites and 1 at a camp for a small site. Everywhere, there was at least one usable toilet per site. The number of workers per usable toilet was higher in the small sites (10) than in the large sites (7.5). Sixteen of the 17 large sites and 13 of the 16 small sites had piped water.

In summary, the camps for both large and small sites were not very crowded but they were unhygienic. There were no statistically significant differences between the large and small sites.

Workers

Demographic characteristics: A total of 400 workers from the large sites and 412 workers from the small sites were sampled. Both the large and small sites had more male than female workers (male : female = 2.5 : 1 and 2.1 : 1 respectively), with a similar sex distribution at both type of sites (p-value = 0.28). The age distributions at both the large and small sites were also similar (p-value = 0.11) ranging from 14 to 60 years. The median ages were 28 and 30 years for the large and small sites, respectively, and more than 85% of the workers were aged 40 years or younger. At both types of sites, most of the workers were married and living together and more than 90% had primary school education. The majority of the workers were born in the northeastern region (including Khon Kaen and Nong Khai) and reported their place of residence there too. There were more migrant workers at the large sites than the small ones (p-value < 0.01).

General living conditions: More of the workers at the large sites, 38%, lived in the camp sites than those at the small sites, 21% (p-value < 0.01). For the workers at the large sites, the main means of travelling from where they lived to the construction sites was walking (37%), whilst those two worked at the small sites mainly used public transport (38%) or their own cars or motorcycles (32%). This was because workers at the large sites were more likely to be living at the camp sites. Most workers were paid every two weeks - 93% at large sites and 87% at small sites. More than half the workers had construction work as their only source of income.

The monthly income from construction work was similar at the large (median = 3,063 baht) and small sites (median = 3,000 baht). Slightly more than half of the workers reported that they were in debt. However about three quarters of them had television sets and one fifth possessed refrigerators. There were no statistically significant differences between large and small sites for any of these characteristics and overall about 60% said they could balance their budgets.

Health of the workers: Data on deaths were obtained from the foremen. There had been a total of 2 workers who died since the beginning of construction at the study sites. The deaths had occurred at two different large sites. Both workers were males and died accidently, one from falling from the building and another one from electrical shock. Ten of the 20 large sites and 7 of the 24 small sites reported they had had at least one worker injured during the last month. For the large sites, there was a total of 22 injuries, all among males. The number of injuries per site for the large sites ranged from 0 to 5. At the small sites there was a total of 9 injuries, 6 among males and 3 among females; the number per site ranged from 0 to 2. The major cause of injuries, both for the large and small sites, was the unsafe working environment leading to nail puncture, falling objects or falling from the scaffolding. In fact, 20 of the 22 injuries at the large sites and 7 of the 9 injuries at the small sites were caused by such environmental hazards. There were only 2 injuries for each of the large and small sites caused by carelessness or lack of skill of the workers, such as hitting a finger with a hammer or cutting feet with a shovel.

From these data it is possible to estimate the incidence density of injuries. The injuries were severe ones which required the worker to stop working. At the large sites the rate was 2.6 (22/84,360) per 10,000 worker days (95% CI : 1.6 - 3.9) and at the small sites it was 3 (9/29,970) per 10,000 worker days (95% CI : 1.4 - 5.7). The estimated rate of deaths at the large sites was 0.025 (2/815,795) per 10,000 worker days (95% CI : 0.003 - 0.09). There were no deaths at the small sites.

Data on illness were obtained from the workers. During the last year 20% of the workers from the large sites and 29% from the small sites reported they had at least one illness of sufficient severity that they had to stop working (p-value = 0.02). Accidents were the causes of these illnesses for 11% of those from the large sites and 16% of those from the small sites. After accidents, the most common illness was influenza followed by headache and stomachache.

The patterns of seeking treatment, including hospitalization, for the most recent illnesses were similar for both type of sites. For workers who stopped working due to illness the median time off work was 5 days at the large sites and 4 days at the small sites. Almost 90% of workers were not paid if they stopped work due to illness and about 70% had to pay the full cost of treatment themselves (the same for both type of sites).

Employment and working patterns: The majority of the workers were temporary and paid according to the number of days they worked. There was a significantly higher proportion of permanent workers (8% versus 3%) and fewer temporary workers (91% versus 96%) in the large than in the small sites, respectively (p-value < 0.01).

Before the current construction work, 68% of those from the small sites and 57% of those from the large sites had been farmers (p-value = 0.02). About half of those at both types of sites had previously been construction workers. Median duration of working as construction workers was 3 years for large sites and 2 years for small sites (p-value = 0.48). The median number of construction companies worked with, including the current one, was 2 which was similar for the workers at both large and small sites (p-value = 0.34). The workers at the small sites had to undertake a greater variety of activities and these could change quickly because the sites were small. In contrast for the large sites, each type of work took more time to complete which resulted in longer assignment to particular jobs.

Provision and use of personal protective devices (PPDs): More than 90% of the workers always wore some type of footwear while working (Table 1). The most common types were cut-shoes or slippers which were worn by about half the workers. More shoes (p-value < 0.01) and helmets (p-value < 0.01) were worn at the large sites. Boots were worn by fewer than 20% of the workers and most of the workers did not wear gloves. Most of the workers never used helmets, especially at small sites.

When asked about the provision of the PPDs, fewer than 10% of the workers reported that shoes,

Table 1

Provision and use of personal protective devices at construction sites in the Northeastern Thailand in 1994.

Characteristics	Large sites (n = 400)	Small sites (n = 412)	p-value
1. Footwear worn while working			
- Never	1%	1%	0.63
- Sometimes	5%	7%	
- Always	94%	93%	
2. Type of footwear worn			
- Cut shoes/slipper	44%	53%	< 0.01
- Shoes	37%	25%	
- Boots	18%	20%	
- Others	1%	2%	
3. Gloves worn			
- Never	61%	58%	0.07
- Sometimes	22%	28%	
- Always	18%	14%	
4. Helmets worn			
- Never	78%	93%	< 0.01
- Sometimes	10%	4%	
- Always	13%	3%	
5. Provision of PPDs by the companies			
- Shoes	7%	3%	0.02
- Gloves	10%	3%	< 0.01
- Helmets	12%	3%	< 0.01
- Safety belts	1%	1%	0.72

gloves, safety belts and helmets were provided by the companies. However, all of the PPDs, except safety belts, were significantly more likely to be provided at the large sites than at the small sites (p-value < 0.01).

Working conditions, wages and welfare: Few workers had employment contracts either officially or unofficially (Table 2). Seven percent reported that the companies provided bonuses. More workers from the large sites, 66%, than from the small sites, 45%, said that payments were made for over time work (p-value = 0.01). Also provision of lodging and travelling expenses or transport were reported more frequently by workers from the large sites than the small sites (p-value = 0.01). Only a few workers reported that meals and uniforms were provided. About half of those from the large sites and one third of those from the small sites reported that medical costs were provided by the company (p-value < 0.01). All of these benefits were more commonly provided by the companies at large sites than at the small sites.

Most of the workers had no holidays. More workers from the large sites (38%) than from the small sites (29%) had at least one day per month for holidays (p-value = 0.03). For some or all public holidays, about 92% of the workers were allowed to stop working. However most of them were not paid for those days especially at the large sites (p-value < 0.01). For the days when the workers had to stop working because they were sick, partial payments were significantly more common in the small than in the large sites (p-value = 0.01).

Most of the workers had no opportunities for job training. However, 16% of those from the large sites and 13% from the small sites reported some job training (p-value = 0.29). Promotion was rare, but significantly more common at large sites (14%) than small sites (8%) (p-value = 0.01). More than 80% of the workers at both types of sites said they were satisfied with their jobs. However more than half of them did not want their children to work as they did. Those who wanted their children to work as they did were more common in the large than in

Table 2

Working conditions, wages and welfare for workers at construction sites in the Northeastern Thailand in 1994.

Characteristics	Large sites (n = 400)	Small sites (n = 412)	p-value
1. Having official employment contracts	5%	2%	0.06
2. Having unofficial employment contract (verbal only)	41%	42%	0.80
3. Bonus provided	7%	7%	0.66
4. Overtime payment	69%	49%	< 0.01
5. Lodging provided/reimbursed	81%	49%	< 0.01
6. Travelling expenses reimbursed	33%	18%	< 0.01
7. Meals provided	3%	5%	0.22
8. Uniforms provided	0%	1%	0.58
9. Health care cost reimbursed	70%	44%	< 0.01
10. Number of holidays per month			
- None	62%	71%	0.03
- 1 - 4	33%	25%	
- 5 or more	5%	4%	
11. Stop for public holidays			
- Yes, but not all	75%	74%	0.79
- Yes, all holidays	17%	18%	
- No, not at all	8%	8%	
12. Paid for public holidays			
- Yes	1%	3%	< 0.01
- No	99%	97%	
13. Paid when stopping work due to illness			
- Yes, fully paid	13%	7%	< 0.01
- Yes, partly paid	82%	91%	
- No, not at all	5%	2%	
14. Job promotion and satisfaction			
14.1 Having job training	16%	13%	0.29
14.2 Having chance to be promoted	15%	9%	0.01
14.3 Feel satisfied with the job	83%	83%	0.98
14.4 Want their children to work they did	42%	35%	0.05
15. Issues related to the Labor Law			
15.1 Knowing about rights according to the Labor Law	18%	12%	0.01
15.2 Knowing about Health Insurance	15%	11%	0.158
15.3 Knowing about minimum wages according to the Labor Law	39%	32%	0.03
15.4 Belief that the employer followed the Labor Law	72%	69%	0.42

the small sites (p-value = 0.05).

Workers who knew about their rights under the Labor Law were significantly more common in the large, 18%, than in the small sites, 12% (p-value = 0.01). For health insurance, 15% of those from the large sites and 11% of those from the small sites knew they had this right (p-value = 0.16). For minimum wages, 39% of those from the large sites and 32% of those from the small sites knew that minimum wages were covered in the Labour Law (p-value = 0.03). About 70% of them reported that

the employers followed the law - the same in both large and small sites (p-value = 0.42).

DISCUSSION

Most of the workers at both the large and small sites were local people from the Northeast. They took up construction work as an occupation aside from farm work mainly to earn more income. Additionally construction work was quite dependable while farm work relies more on uncontrollable factors such as the weather. So they tolerated and accepted the poor living and working conditions and lack of welfare.

Since the workers were mainly people from the region temporary employed as construction workers, most of their characteristics were similar to the general population. Workers at the large sites were younger, and there were proportionately more males and more migrant workers than those at the small sites. The young people were likely to seek jobs further away from their hometown. At the small sites most workers were local residents who left their homes in the early morning and returned at the end of the day. Most of the local women and the older adults who were normally jobless during the dry season, seek jobs in the city near their home. Jobs which are temporary and require no qualifications are available as unskilled construction workers, especially at small construction sites.

As most of the workers were local residents, many were from the same villages as one another; they knew each other quite well or were even related. This led to fewer social problems than found in other surveys mostly among workers in Bangkok (Chaisut, 1989; Kittithornsap, 1982). Their way of life as construction workers was not very different from their normal way of life. Although some of them stayed in the camp sites, more than two thirds of them lived with their husbands or wives. This also reduced the use of prostitutes (data collected but not shown here) which could lead to social and health problems.

Fewer workers stayed in camp sites and the camp sites were not as crowded as found in other surveys (Chaisut, 1989; Kittithornsap, 1982; Otrakul *et al*, 1987). Problems about caring for children and their education were not major issues for these workers in contrast with the migrant workers in Bangkok (Chaisut, 1989; Kittithornsap, 1982).

Public transport was the usual means of travelling to work, more so for the small sites than the large ones. Public transport here refers to all kinds of vehicles for which the workers had to pay a fare. Mostly they were small trucks owned by one of the workers taking other workers from the same village to work in the city. The truck was not designed for passengers, with no roof and no seats. The workers have to stand up so that the truck can take as many as possible to lower the fare per head. This can result in mass casualties if there is a road accident.

Almost all workers were temporary, paid on a daily basis. This allows the contractors great flexibility due to the ready availability of workers, stages of construction lasting for a short time and requiring no specific skill of the workers. The workers are willing to work under these conditions since it enables them start or stop working whenever they want. This is necessary because they have to work in the farms or the rice fields whenever the crops are ready to be harvested or the fields are ready to grow crops due to the recent rain. The flexibility provided by construction work and the fact that they can work near where they live may be the main reason why more than half of the workers said they were satisfied with their current jobs. They were willing to work at construction sites even though a number of them were paid less than the minimum wages stated in the law.

The unskilled nature and the greater variety of the work at the small sites as well as the lower safety levels could be the reasons for the higher prevalence of injuries than at the large sites. The more experienced workers at the large sites had fewer injuries. The use of PPDs did not reduce the incidence of injuries. This can be explained by that the type protective devices used. For example, shoes were mostly cut shoes or slippers which are not adequate to protect against accidents such as nail puncture or other harm to the feet. The inadequate use of the helmits was also found.

Low use of PPDs appeared to be related to the climate rather than law enforcement. The workers complained about the hot weather with temperatures which sometimes were up to 40 degree Celsius. It was too hot for them to wear boots or helmets which were not designed to protect against the heat. For example, most of the workers were willing to wear hats to protect themselves from the sun rather than helmets. Thus the appropriate design of PPDs for use in hot weather could increase

occupational safety in tropical countries.

Health and safety conditions in the work place and the camp sites were often poor and did not follow the law. For example, there were unsanitary camp sites, lacking drainage and proper garbage disposal. The work sites had unsafe scaffolds. Although there are laws relating to these matters, the fines for those who do not obey the laws are very small. The owner of a site can pay the fines for the whole duration of construction for a smaller amount of money than the cost of providing the health and safety items required by law. This resulted in the very low levels of inspection by the government officers because nothing would be changed by inspection. Another reason why the owners are not concerned about the safety of the workers is that most of the workers are temporary and the construction has relatively short duration. Therefore there appear to serious barriers to resolving problems of safety and sanitation. Revising the law followed by full enforcement could work in theory but in practice would be difficult. Other options should also be considered.

Approximately two thirds of all of injuries caused by accidents were due to the unsafe working conditions at the sites. The remainder were due to lack of skill of the workers. For both of these causes, the foremen can play an important role in solving the problem. They themselves agreed that accidents could be prevented by paying attention to safety issues and prevention of accidents, for example, providing guard netting to protect against falling objects. The workers have to obey the foremen otherwise they will not be paid or may be dismissed. Thus if the foremen became more concerned about safety issues and working conditions, the prevalence of accidents could be decreased dramatically.

Fewer than half of the sites had first aids kits. Mostly these were the large sites. However these kits were not fully equipped, usually containing one or two kinds of wound cleaning solutions, cotton and anti-septic although some sites also had analgesics. No person at any of the sites had been trained in first aid. This is one area where the government health agencies could have a role. At least one of the workers, preferably the foreman, at each site should be trained to perform first aid properly. This could reduce the need for hospitalization for workers who have accidents.

There was little provision for welfare. Only a few sites provided payments for lodging or for overtime work. There were no holidays for the workers. But most of the workers stopped working two days a month, usually the days after the pay days. The workers took the money to their families, paid debts, or spent their money on these days. This resulted in automatic closure of some sites on these days.

Most of the workers knew little about their rights under the Labor Law, but still most of them believed that the employers followed the law. It could be that they were familiar with other issues where the law had little effect on the real circumstances. It was not so much a feeling of hopelessness but rather that the conditions were unavoidable. Thus, being employed and earning money were good enough for them.

In summary, working and living conditions among the construction workers in the Northeastern Thailand were poor. However, they were better at the large than small sites. The findings suggest an urgent need to improve sanitation and safety conditions in the construction and camp sites, provision and use of personal protective devices and improved welfare conditions. Special attention is needed for the workers at small sites. Empowering the workers and educating them to know their rights, full enforcement of the law, and promoting obligations of the employers not to take such advantages of the workers would alleviate the problems.

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