

**Innovations in Monitoring Work Security:
A Case Study of Southeast Asian Refugees
in Lowell, Massachusetts**

By

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Contents

Acknowledgements	iii
1. Limitations of United States occupational health surveillance systems	1
1.1 Filters to medical care for work-related injuries and illnesses	3
1.2 Filters to recognition of work-related injuries and illnesses	3
1.3 Filters to reporting work-related injuries and illnesses to supervisors	4
1.4 Filters to lost work time due to work-related illness and injuries	4
1.5 Filters to charging medical care to workers' compensation	5
1.6 Filters to recording incidents in OSHA logs	5
1.7 Filters to filing first reports of injury to state workers' compensation agencies	5
1.8 Filters to participation in physician reporting systems	6
1.9 Filters to capture of medical records data in hospital databases	6
2. Alternative surveillance methods	6
2.1 Background	7
2.2 Objectives	8
2.3 Methods	9
3. Quantitative results	10
3.1 Age	10
3.2 Industry	11
3.3 Occupational health problems	11
3.4 Employment conditions and health care	12
4. Discussion	13
4.1 Sensitivity of data sources	13
4.2 Completeness of data sources	14
4.3 Accuracy and depth of data	15
5. Conclusions	15
References	18
Other papers in this Series	23

List of tables

Table 1. Common health problems according to data source (% of total injuries/health problems)	12
Table 2. Strengths of data collection systems	17

List of figures

Figure 1. Simplified flowchart of events necessary to the capture of work-related injuries and illnesses by current surveillance systems (filters represented as dotted lines)	2
Figure 2. Model for data collection on Cambodian and Lao occupational health in Lowell (not proportional to scale)	9

1. Limitations of United States occupational health surveillance systems

Comprehensive national surveillance systems are crucial to the recognition, treatment and prevention of occupational injuries and disease. Identification and reporting of work-related cases can lead to the targeting of resources and of interventions to the appropriate worksites, industrial processes, or populations. These targeted efforts can in turn benefit the individuals concerned, their immediate co-workers, other workers in the same industry, and people exposed to similar causal factors in other settings (Levy, 1996; Baker et al., 1989; Morse et al., 1998). The purpose of this paper is to draw attention to the shortcomings of existing official information, and to indicate an innovative approach to improving the situation.

Occupational health surveillance systems in the United States have long been recognized as inadequate to the documentation of occupational health problems, especially work-related disease (Sorock et al., 1997; Pransky et al., 1999; McCaig et al., 1998; Rosenman et al., 2000; Herbert et al., 1999; Morse et al., 1998; Pollack and Keimig, 1987; Park et al., 1992; Silverstein et al., 1997; Landrigan and Markowitz, 1989). These systems have been further weakened in recent years with the growth of contingent employment arrangements, decreasing unionization, and other labour market factors, which reduce job security, and, as a corollary, decrease effective capture of work-related cases.

Clearly, the occurrence of a work-related injury or illness does not automatically lead to the event's registration in a database. Several steps have to take place between the injury and its recording. Webb et al. (1989) summarized this process in Australia, proposing a "filter model" for the documentation of work-related health problems.

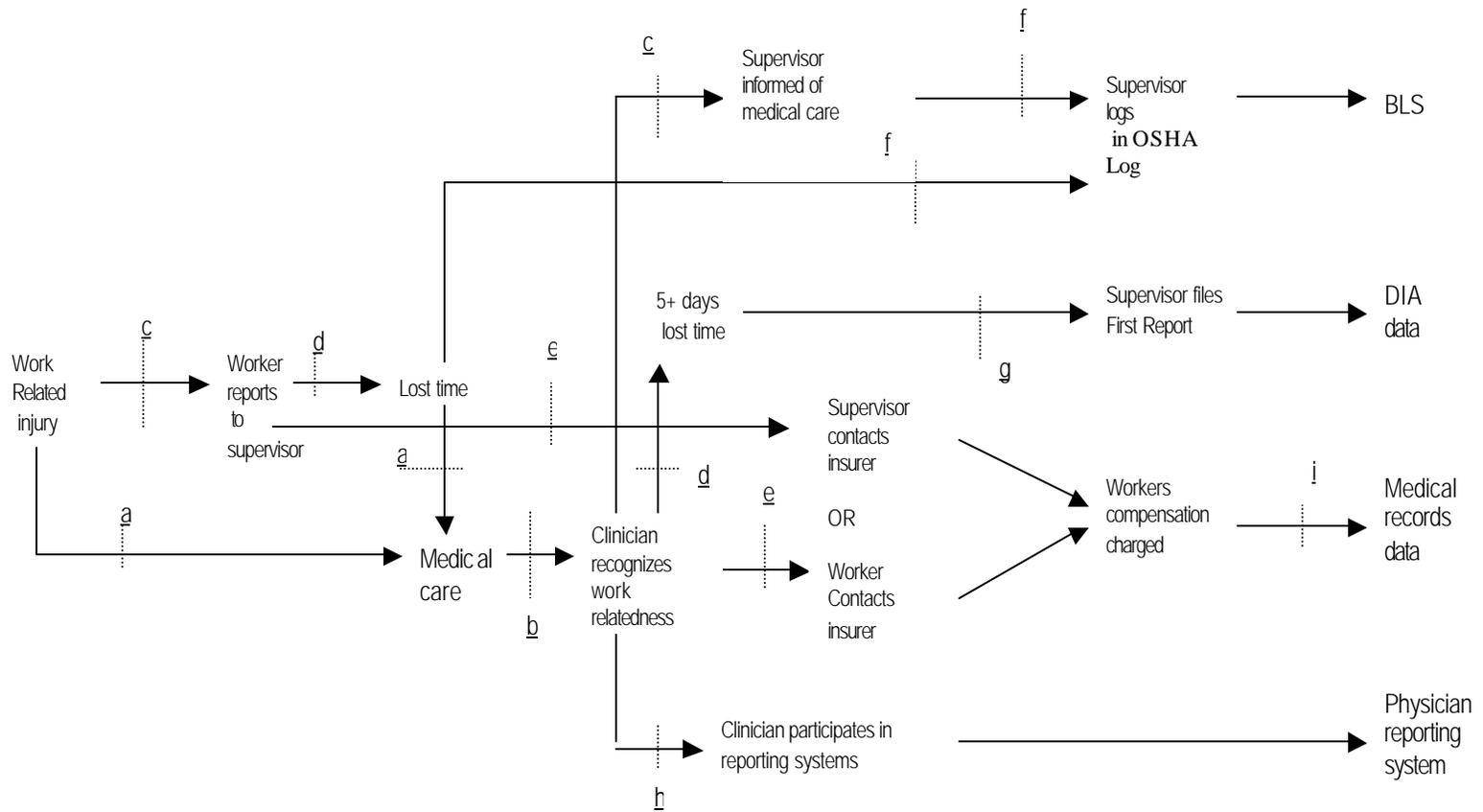
In the U.S., a filter model for capture of an occupational injury or illness by the Bureau of Labour Statistics (BLS) might include these steps:

- "Employees" are documented employees paid according to legal processes.
- Event occurs on the shop floor.
- Worker perceives that he or she is injured or sick.
- Worker perceives work-relatedness of illness or injury.
- Worker reports injury or illness to the supervisor.
- Supervisor allows the worker to take time off work OR worker seeks medical treatment, and informs the supervisor.
- Supervisor logs the injury according to Occupational, Safety and Health Administration (OSHA) record keeping requirements.

Similar steps should be included in state workers' compensation data (collected in Massachusetts by the Department of Industrial Accidents, DIA) and data extracted from medical records.

Figure 1 illustrates the filter model. Each filter is labelled with a letter and described in further detail below.

Figure 1. Simplified flowchart of events necessary to the capture of work-related injuries and illnesses by current surveillance systems (filters represented as dotted lines)



1.1 Filters to medical care for work-related injuries and illnesses

Workers who develop diseases without easily recognized symptoms or with long latency periods are not likely to recognize that they are sick, and, hence, are not likely to seek medical care. Alternatively, they may recognize their health problem but not believe it requires care.

Some employers employ medical professionals or trained non-clinicians to provide first aid to injured employees. For the purposes of OSHA record keeping requirements, first aid is not considered medical treatment and does not have to be logged.

Workers who do realize they are sick or hurt and require medical care may not expect their health costs to be covered by workers' compensation. They may be unaware of the work-relatedness of their condition; anticipate difficulty in demonstrating its work-relatedness; assume incorrectly that having a non-benefited job excludes them from the compensation system; or assume correctly that their job in the informal economy complicates this coverage. Others may be entirely unfamiliar with workers' compensation.

Workers who do not expect their condition to be covered by workers' compensation may forego medical care due to lack of access to or familiarity with alternative methods of payment. Approximately 44 million residents of the United States do not have health insurance of any kind. Of those, many do not enjoy ready access to indigent care such as Free Care or are not aware of such services (Weiner and Malakar, 1999; Saver, 1997). Obstacles such as lack of transportation to clinical services or inflexible work and childcare schedules may also preclude low-income people from seeking medical care (Bauer et al., 2000; Jacobs et al., 1999; Wagner and Guendelman, 2000).

These obstacles have particularly affected immigrants, who are frequently unaware of their entitlement to benefits and less likely than U.S. workers to have jobs providing for sick time or medical insurance (Drachman, 1995). Most immigrants in the United States are excluded from Medicaid eligibility for their first five years of residence and may be unable to obtain other types of health coverage.

Some immigrant workers are required to work long hours and up to 365 days a year, further complicating the possibility of medical consultation. Those who do succeed in obtaining treatment may find that the language barrier and hence misdiagnosis prevent them from receiving appropriate treatment and compensation (Stephenson, 1995; Mort, 1996; Burciaga-Valdez et al., 1993; Fingar et al., 1992).

Undocumented immigrants may choose to avoid medical services for all these reasons as well as fear of hospitals reporting their presence to the Government and of resulting deportation (Bauer et al., 2000). These workers have still fewer possibilities of finding new work or obtaining government aid if they are fired.

1.2 Filters to recognition of work-related injuries and illnesses

When workers realize that they are sick or injured, they may or may not make the connection between their health problem and their job (Park et al., 1992). Lack of hazard communication and health and safety training can contribute to this issue. Failure to recognize work-relatedness is likely to be exacerbated in the case of symptoms common to non-occupational illnesses and injuries.

Physicians and other clinicians may also fail to recognize the work-relatedness of their patients' health problems. Most physicians in the United States receive little or no training in the recognition and diagnosis of occupational illness. Lack of recognition is especially likely in cases in which symptoms are common to non-occupational disorders, such as non-pneumoconiotic chronic respiratory illness (Morse and Storey, 1999; McCaig et al., 1998; Murphy et al., 1996; Ehrenberg, 1989; Jajsky et al., 1999; Armenia and DeHart, 1993; Kipen and Craner, 1992; Campos-Outcalt, 1994).

1.3 Filters to reporting work-related injuries and illnesses to supervisors

Conway and Svenson (1998) have stated simply that "anything in the work environment that makes an employee uncomfortable with reporting an injury or illness to the company... could be seen as a disincentive". Explicit employer policies include rewarding groups of workers who report low rates of injuries with prizes such as money, material goods, or recognition. Other examples include testing workers for drug-taking or disciplinary action directed against those who report work-related health problems (Tyson, 1996; Bradford and Ryan, 1996; Smith, 1997; Himmelstein and Rest, 1996). Implicit employer practices can include the denial of overtime or promotion opportunities to employees who report occupational injuries or illnesses. During times of insecure employment, workers who report health problems may be the first to be laid off.

This filter is likely to affect different groups of employees differently: Workers in contingent employment arrangements, such as temporary employees and construction workers, may be denied further work opportunities. Particularly vulnerable groups of workers, such as those with at-risk immigration status or lack of marketable job skills, may be largely filtered out of the reporting process at this stage. Workers with union representation that provides some protection from adverse consequences of reporting might be affected less.

Many immigrants have low levels of education, low social status, and little long-term, stable experience in the formal economy, conditions that limit their options for finding new work. Few have savings or benefits to fall back on in case of job loss. Some employers take advantage of this vulnerability by hiring immigrants for dangerous work and saving money on training, engineering controls, and protective equipment. In many workplaces, complaints are routinely met with threats of firing. Legal protection against retaliation is rarely enforced. In some instances, decades of complaints to government agencies regarding egregious health and safety violations affecting immigrant workers have resulted only in job loss for the informant (Mort, 1996; Seshenson, 1995; Parker and Solomon, 1995; Kilborn, 1992; Griffith, 1990).

1.4 Filters to lost work time due to work-related illness and injuries

Workers may choose not to lose work time for work-related health problems for some of the same reasons they may choose not to report them: staying out of work might put them at increased risk of lay-off and decreased opportunities for overtime and promotion.

Workers with access to paid sick leave provided by their employer may choose to use that benefit rather than seek leave covered by workers' compensation. They are not eligible for workers' compensation partial wage replacement until they lose a minimum number of workdays. The compensation pays for only a portion of lost wages, often does not cover the first several days lost, and may take several weeks to arrive (Massachusetts, 2000; Ellenberger, 2000; Lax, 1996; Kisner and Fosbroke, 1994).

On the other hand, employment arrangements with no paid sick days, including temporary and contingent work, provide stronger incentives to avoid losing time. Indeed, certain illnesses do not prevent workers continuing with the job that nevertheless exacerbates their condition (Sorock et al., 1997).

1.5 Filters to charging medical care to workers' compensation

Employers may avoid reporting their employees' work-related injuries and illnesses to workers' compensation carriers because increased numbers of claims raise their experience modification ratings and thus their insurance premiums. Charging ordinary health insurance coverage for equivalent care, on the other hand, usually does not raise an employer's insurance rates, since these are calculated according to the insurance use patterns of many companies of a similar size (Glazner et al., 1998; Morse et al., 1998; Kisner and Fosbroke, 1994). This cost shifting is likely to be enhanced in the construction industry, where contractors' records of compensation claims also affect their competitiveness in contract bids (Glazner et al., 1998).

Other reasons for failure to charge treatment to workers' compensation, even when the treated condition is recognized as work-related, include employer, worker, or clinician unfamiliarity with the compensation system (Glazner et al., 1998). Some clinicians are familiar with workers' compensation but prefer to avoid the additional paperwork, delays in reimbursement, or fee schedule applied in this system (Ellenberger, 2000; Lax, 1996; Himmelstein and Rest, 1996; Park et al., 1992).

1.6 Filters to recording incidents in OSHA logs

Conway and Svenson (1998) listed potential obstacles to proper record keeping as sheer neglect for the records, no training for the record-keeper, no emphasis on maintaining records properly, downgrading record keeping to clerical or support staff, the record-keeper kept uninformed of injuries and illnesses even when employees reported them and management bonuses and opportunities for promotion tied negatively to injury and illness rates.

Silverstein et al. (1997) added that differences in management policy and personnel training may lead to large variations in record keeping practices among firms. They explained that employers may record occupational injuries and illnesses in ways that protect the business from liability. Additional incentives to incomplete record keeping include eligibility for OSHA voluntary compliance programs based on low rates of recorded injuries and OSHA enforcement efforts targeting employers with high rates of recorded injuries (Tyson, 1996).

1.7 Filters to filing first reports of injury to state workers' compensation agencies

Korrick et al. (1994) explain that compliance with workers' compensation requirements by employers and third parties is not formally monitored. Therefore, state workers' compensation agencies such as the Massachusetts DIA have no mechanism for ensuring that claims filed with insurers are reported to the State.

Workers who lose the required number of workdays due to work-related health problems are permitted to file First Reports of Injury themselves if their employer neglects to do so (Massachusetts, 2000). However, they may not be aware of this possibility.

Additionally, workers may have little incentive to file for lost wage compensation because such compensation pays only a portion of their loss and does not cover other expenses caused by the injury. Obtaining wage replacement for work lost due to occupational illnesses such as cumulative trauma disorders can be costly, time-consuming, or even impossible because insurers can dispute the work-relatedness of the condition (Morse et al., 1998; Ellenberger, 2000; Lax, 1996; Webster and Snook, 1994).

Other reasons for reluctance to file for workers' compensation include the difficulties of navigating the system, a desire to appear strong, the attitude that certain dangers or health problems are a normal part of a job, worker perception of lack of management commitment to a safe workplace, and socio-economic vulnerability of the worker (Goldenhar et al., 1998; Messing et al., 1997; Jefferson and McGrath, 1996; Park et al., 1992).

1.8 Filters to participation in physician reporting systems

Rosenman et al. (1997) estimated that only 0.7 per cent of the approximately 30,000 Michigan physicians required by law to submit reports of occupational asthma between 1988 and 1994 in fact complied. They also found that most of Michigan physicians had never heard of or submitted occupational disease forms despite the fact that reporting all occupational disease had been required since 1978. They concluded

We attribute the lack of complete reporting to many factors, including: (1) physician lack of awareness of the reporting law, (2) physician lack of awareness that aggravation of asthma from work exposures is a reportable condition, (3) physician antipathy and fear of programs that are perceived to involve governmental or legal hassles, (4) physician lack of familiarity and difficulty with diagnosing occupational diseases in general and work-related asthma specifically, and, (5) physician workload and demands on time for completing multiple record requirements.

1.9 Filters to capture of medical records data in hospital databases

As described above, many cases of occupational injury and illness are not recognized as work-related or are not charged to workers' compensation for other reasons. For instance, work-related cases that are treated in hospital may be compensated by other means. More sensitive capture of work-related conditions can require case-by-case review of clinical notes (Hunting et al., 1994).

2. Alternative surveillance methods

Given the limitations of existing occupational health surveillance systems, several authors have proposed alternative methods of gathering data. For example, direct surveys are particularly helpful for obtaining data on conditions where mortality is low (Ehrenberg, 1989). Surveys can be more sensitive than other data-gathering approaches (Silverstein et al., 1997; Messing et al., 1997; Lulich and Sestito, 1997) and survey results can be valid and reliable (Frederiksson et al., 1998; Eachus et al., 1996).

Surveys have been shown to be an effective means of gathering occupational health data from low-wage workers who are not captured by official databases and whose workplaces are not open to researchers. Developing surveys in cooperation with trusted, local non-governmental organizations and executing them in a culturally appropriate manner enhance effectiveness (Moure-Eraso et al., 1997).

This study uses a survey in combination with conventional data sources to investigate the occupational health status of one population of immigrant workers, Southeast Asian refugees in Lowell, Massachusetts.

2.1 Background

Southeast Asians in Lowell

People fleeing war, genocide, and economic collapse in Cambodia, Laos and Vietnam constitute the largest group of refugees ever to settle in the United States. A total of 1,342,532 Southeast Asian refugees immigrated between 1975 and 1998. This group now comprises one sixth of the Asian Pacific-American population, itself the fastest-growing racial group in the country (US Executive Branch, 2000). The vast majority of Cambodians arrived between 1979 and 1986, with immigration peaking in 1981-82 (Bunte and Joseph, 1992).

More Cambodians live in Lowell than any other city in the United States except Long Beach, California. Estimates of the number of Cambodians residing in Lowell range from 20,000 to 33,000 (McNeilly, 1998; Rodríguez, 1999; Cox, 2000). Other Southeast Asian groups include approximately 5,000 Lao, 1,500 Vietnamese (Meehan, 1999) and smaller numbers of Thai. In all, Cambodians and Lao comprise an estimated 30 per cent of the population of Lowell.

Healthy People 2000 (USDHHS, 1991) identified Southeast Asian refugees as a high-risk group due to poverty and occupational vulnerability. Several factors also put these groups at high risk for occupational health problems. Cambodians and Lao have the highest poverty rates of any Asian-American groups except Hmong. Data from the early 1990's showed 42 per cent of Cambodians living below the poverty level, with this figure rising to 55 per cent among Cambodian households in Lowell (US Executive Branch, 2000; USDEOM, 1993; Silka and Tip, 1994; Cox, 2000).

In the early 1990's 56 per cent of Cambodian households included no fluent English speaker, and a 1998 assessment by the Massachusetts Department of Public Health found that only 5.3 per cent of Cambodian immigrants to Massachusetts spoke English "very well". The Hmong, Lao and Cambodians also have the lowest average levels of formal education. In the early 1980's, 44 per cent of Cambodian and 53 per cent of Lao refugees had had no formal education. Only about 20 per cent of Lao refugees can read their own language. In 1990, a mere 6 per cent of Cambodians and 7 per cent of Lao over 25 had a bachelor's degree (US Executive Branch, 2000; Morrow, 1991; Silka and Tip, 1994; Cox, 2000).

Finally, discrimination and overt racism by judges, police, school officials, and others have targeted Southeast Asians in Lowell and elsewhere since their arrival in this country (Silka and Tip, 1994).

All these factors have contributed to overrepresentation of these groups in traditionally hazardous blue-collar industries. For example, just 5 per cent of Lao workers in the United States have found employment in technical, sales, or administrative support (Morrow, 1991; USDEOM, 1993; Silka and Tip, 1994; Cox, 2000).

At the same time, other factors make Cambodians and Lao less vulnerable to the worst working conditions than many workers from other countries. Most Southeast Asians have legally recognized refugee status with permission to live and work in this country. Many have benefited from educational programmes and other support resulting from the Migration and Refugee Assistance Act of 1975. This Act, which established a programme of resettlement for refugees from Cambodia and Vietnam, was extended to Lao by the

Immigration Act of 1976 (USDEOM, 1993). As a result, the majority of these refugees are not forced by lack of work permits or fear of deportation to accept substandard working conditions or avoid medical care.

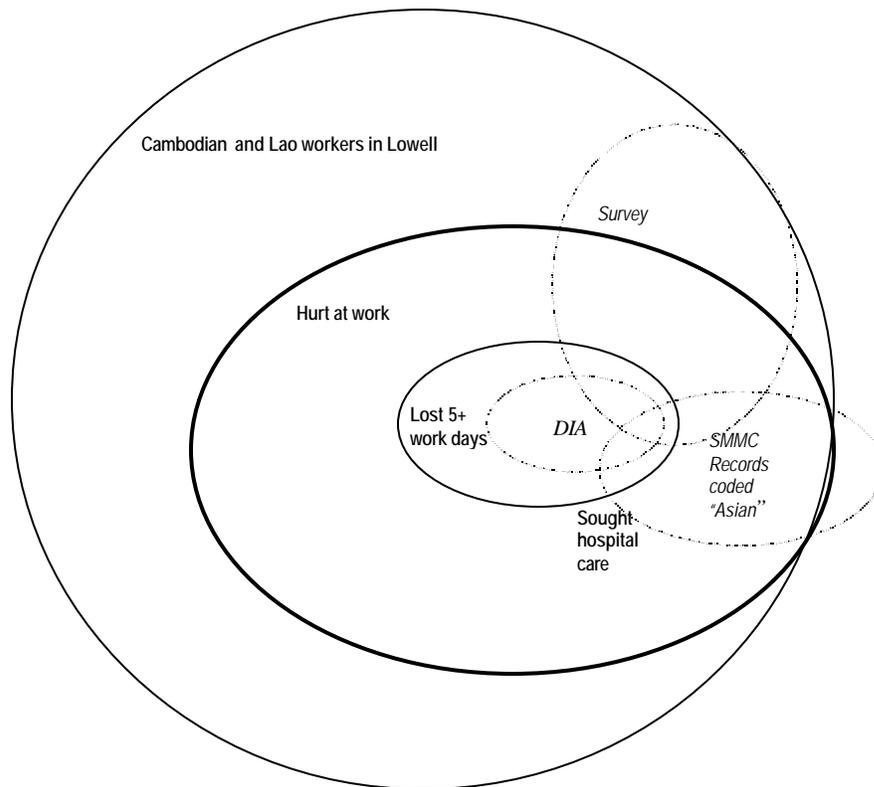
Gathering occupational health data from Cambodians and Lao also presents challenges. The low rates of English fluency and literacy noted above preclude widespread use of mail-in surveys or other written questionnaires. Perhaps more importantly, refugees' experience with their own governments and official information gathering has made many hesitate to participate in studies. Many Cambodians remember that the Khmer Rouge Government conducted a census in preparation for killing half a million people based on the occupations they reported to census takers (Rodriguez, 1999). General anxiety and concern about street crime in their neighbourhoods and swindles described as public interest activities contribute to Southeast Asians' reluctance to speak with interviewers they do not know (Bunte and Joseph, 1992; Chung and Kagawa-Singer, 1993)

Refugees' refusals to open the door to enumerators was one factor leading to an estimated 50 per cent undercount of Lowell Southeast Asians in the 1990 census (Rodriguez, 1999). Following that census, an Alternative Enumeration conducted in Long Beach, California, found that knocking on doors often failed to achieve entrance to Cambodian homes even when residents were clearly visible inside. Interviewers often needed introductions by friends or family, or conversations struck up in the yard, before having the opportunity to conduct their interviews (Bunte and Joseph, 1992). For surveys to be effective, it seems necessary to have Southeast Asian interviewers well known in their communities. In Lowell, connection with the University of Massachusetts carries some additional legitimacy due to a series of successful programmes with Asians in that city (Silka and Tip, 1994).

2.2 Objectives

The object of the study was two-fold: to describe the occupational health status of Southeast Asian workers who worked for wages between 1997 and 1999 in Lowell, and to evaluate the utility of data sets from three different sources: workers compensation data from the Massachusetts Department of Industrial Accidents (DIA), hospital data from the Saints Memorial Medical Center (SMMC) and data from a survey of Cambodian and Lao individuals carried out by the University of Massachusetts. The coverage of data from these sources is shown in figure 2.

Figure 2. Model for data collection on Cambodian and Lao occupational health in Lowell (not proportional to scale)



2.3 Methods

Workers' compensation data

Employers are required to submit First Reports of Injury to the DIA when employees miss more than five days of work due to a work-related illness or injury. Employees may also file if their employer fails to do so (Massachusetts, 1999). The DIA supplied names of cases involving Lowell residents filed with the Department from July 1, 1997 through August 9, 1999. Lao and Cambodian consultants identified names belonging to these ethnic groups. The DIA supplied copies of complete records for these cases, with personal identifiers removed.

DIA cases belonging to Lowell residents and corresponding to the dates specified totalled 1,884. Of these, 80 (4 per cent) were identified as pertaining to the ethnic groups under study. Complete records were supplied for these 80 cases. Of the 80 records, 69 (86 per cent) included the employers' required First Report of Injury. Of the 69 First Reports, 44 (55 per cent of records) contained injury and body part codes consistent with other information in the documents. The majority either lacked codes for industry or contained codes that were not consistent with other information in the record.

Hospital data

Saints Memorial Medical Center (SMMC) is the largest provider of medical care in the Lowell area. Data from SMMC Medical Information Services (MIS) were selected in two queries: treatment dates January 1, 1996 - May 31, 1999, patient ages 12-99, race

Asian, and financial class workers' compensation; and treatment dates January 1, 1996 - May 31, 1999, patient ages 12-99, race Asian, any financial class.

Of all visits to SMMC by Asians aged 12-99 during the period under study, 187, or 9 per cent, were charged to workers' compensation. Of all visits for all patients charged by the hospital to workers' compensation, 1.1 per cent corresponded to Asians.

Survey

Households were selected from the 1990 Lowell census tracts with the greatest proportions of Cambodians (285 households in two tracts) and of Laos (120 households three tracts) according to the 1990 census. Since the population of these two groups has grown since 1990, the households surveyed represented a maximum of 20 per cent of Cambodian households and of 46 per cent of Lao.

Households were located through telephone listings with Khmer or Lao surnames as identified by the respective consultants, and with street addresses corresponding approximately to the selected census tracts. All listed Lao households were approached. Cambodian households were selected through a combination of systematic representative sampling (names selected at regular arithmetic intervals from alphabetic listing), and convenience (people visibly at home during researcher presence in a neighbourhood).

Approximately 11 per cent of Cambodian households approached declined participation, and in those participating, at least 39 people, or one quarter of those sought, refused or were unavailable. Approximately 24 per cent of Lao households were repeatedly unavailable, or, in the case of three, declined participation and five Lao individuals in participating households were unavailable.

Thus, survey data were gathered from only 160 of an estimated 25,000 Cambodian and Lao workers living in Lowell. Therefore, the potential for random sample variation is large.

English-speaking researchers designed the survey questionnaire with input from the project's Advisory Board of health professionals and community agency staff, and Cambodian and Lao consultants. These consultants were chosen due to their leadership and trusted roles in their respective communities and their activities with community-based organizations. The questionnaire included open-ended questions about work experience, working conditions, health care and health in order to aid in-depth understanding of the factors affecting occupational health status. It also included closed-ended questions about common work-related symptoms. The consultants translated the questionnaire into the appropriate languages, and was administered orally in the language chosen by the person interviewed and revised after a field-test in approximately 10 households.

An informed consent form was designed in accordance with national and University policies for the protection of human subjects and also translated.

3. Quantitative results

3.1 Age

Respondents were distributed among five-year age brackets between 26 and 50 years of age, with at least five respondents from each ethnic group in each age bracket. Respondents were almost evenly divided by gender. Among Lao respondents, teenagers

and young adults were disproportionately unavailable during the survey and therefore under-represented.

DIA and SMMC cases are distributed differently among age groups. People born between 1946 and 1960 account for two to three times the proportions of DIA cases as SMMC cases. People born between 1961 and 1970 account for twice the proportion of SMMC cases as DIA cases. Survey data corrected for selection bias by age show more than twice the proportion of cases corresponding to people born 1971-1975 than in either the DIA or SMMC data, a statistically significant difference.

3.2 Industry

Electronics manufacture employed an average 5 per cent of all Lowell workers in 1998, but 24 per cent of survey respondents. Health services employed 11 per cent of Lowell workers but no survey respondents.

Of work-related injuries or illnesses reported in the survey, 40 per cent (at a 95 per cent confidence interval) took place in the sector Electronic and Other Electrical Equipment and Components, Except Computer Equipment. This industry accounts for 13 per cent of DIA cases. Rubber and Miscellaneous Plastics Products; Food and Kindred Products; Measuring, Analyzing and Controlling Instruments; Industrial and Commercial Machinery and Computer Equipment; Paper and Allied Products; Business Services; and Health Services corresponded to more than 5 per cent of DIA cases but no survey cases. Eating and Drinking Places and Stone, Clay, Glass and Concrete Products accounted for more than 5 per cent of survey cases but no DIA cases. All these differences were statistically significant

Temporary employment may account for some of these differences. DIA data may code cases of employees contracted through temporary agencies according to the industry worksite or as Business Services depending on workers' compensation arrangements and other factors.

3.3 Occupational health problems

Prevalent workplace hazards reported in the survey included exposure to a variety of chemicals, especially soldering fumes; inadequate ventilation; prolonged sitting or standing; prolonged awkward postures; unguarded machinery; and shift work with associated long hours and pressure to produce quickly. These and other conditions led to common symptoms including headaches (31 per cent of respondents), backache (26 per cent), dizziness (18 per cent), cuts (16 per cent), illness (14 per cent), contusions (11 per cent), skin rashes (9 per cent), bumps (7 per cent), eye or head injuries (7 per cent) and sprains or strains (6 per cent).

Of 25 lost workday incidents described in the survey, six (24 per cent) were reportedly due to dizziness, five (20 per cent) to backache; and five to feelings of illness including nausea, fatigue, and flu-like symptoms. One such incident was described as dizziness, headache, and a breathing problem.

Allowing for more than one work-related injury or illness per incident, DIA data contained a total of 97 injuries/health problems, hospital data 157 such problems, and survey data 219 problems. Medical care was sought for 34 health problems in the survey data. Some of the most common health problems from all three data sources are shown in table 1. The relatively high proportion of DIA injuries coded as sprains and strains, high proportion of hospital injuries coded as cuts and punctures, and low proportion of survey injuries coded as fractures are all consistent with intentional differences in data collection:

sprains and strains are expected to account for extended periods of lost work time; cuts and lacerations require treatment in hospitals more than most other types of injury; fractures are expected to be a common reason for hospital visits and lost work time but not as common in the general population. Levels of severity requiring medical care do not explain differences between survey and hospital data since symptoms and ill-defined conditions accounted for 18 per cent of survey injuries associated with medical care and dermatitis accounted for 6 per cent.

Table 1. Common health problems according to data source (% of total injuries/health problems)

	DIA N=97	SMMC N=157	Survey N=219
Sprains and strains	37	27	22
Cuts or punctures	9	23	11
Bruising or crushing	20	15	9
Fractures	9	8	3
Symptoms and ill-defined conditions	0	1	28
Dermatitis	0	0	7

3.4 Employment conditions and health care

Of 155 survey respondents currently employed, 39 (25 per cent) reported holding a temporary job, typically through a temporary employment agency. This proportion rose to 36 per cent among Cambodians, and 77 per cent among Cambodian women.

Of 147 adults (ages 18 and above) currently employed, 41 (28 per cent) reported regularly working between 41 and 75 hours per week, and working at least 40 hours every week. An additional seven (5 per cent) reported sometimes working under 40 and sometimes over 40 hours per week.

Of 160 respondents, 108 (68 per cent) reported that their current or most recent employer offered health insurance. Among Cambodians, this prevalence was 55 per cent. The questionnaire did not inquire about the affordability or adequacy of these plans.

Thirty-five respondents, or 23 per cent of those currently employed and not self-employed, were not aware of having received health or safety training at their work. Of temporary workers, 28 per cent reported this lack of training. Most people who had received such training had learned about personal protective equipment, but not about controlling hazardous exposures at their source. Twenty-two, or 14 per cent of respondents, identified sources of help or information about workplace hazards apart from their supervisors; others identified supervisors or no one.

Respondents named a total of 171 locations where they and family members normally seek medical care. Of these, 19 (11 per cent) were the SMMC or a paediatric clinic affiliated with SMMC. Thirty-eight (22 per cent) were a Vietnamese or other Asian doctor, and 59 (35 per cent) an unspecified personal doctor. Ten respondents reported no usual source of medical care or “don’t know”. Others listed specific hospitals or clinics. Of responses given by people whose employers do not offer health insurance, 31 per cent specified an Asian doctor and 15 per cent reported no usual source of medical care or “don’t know”.

Asked how they would pay for medical treatment for injuries or illnesses caused by their work, respondents mentioned health insurance (39 per cent), the company or

employer (28 per cent), and “don’t know” (22 per cent). Seven respondents, or 4 per cent, provided an answer describing workers’ compensation. A total of 32 per cent therefore provided some indication that the company would be responsible for ensuring coverage of their medical treatment.

This finding is consistent with the 31 per cent positive responses to this question: “A state program called workers’ compensation is supposed to pay for medical expenses for sicknesses or injuries that you get because of your job. Workers’ compensation is also supposed to pay for part of your lost wages if you miss more than five days of work because of a sickness or injury you got because of your job. Have you heard of workers’ compensation?” Fifty participants responded, “yes” to this question; 110 responded “No” or “don’t know”.

Twenty-three individuals (14 per cent) reported seeking medical care for 29 work-related incidents from 1997 to the survey date. Allowing more than one treatment site for each episode, 48 per cent of the treatment sites reported were hospitals and major clinics in and near Lowell, including six (21 per cent) at the SMMC. A further 21 per cent were attended by an unspecified private doctor and six more by a doctor specified as Asian. Four (14 per cent) received care at a company clinic.

Payment information was available for 27 episodes of treatment obtained for work-related health problems. Respondents reported that six (22 per cent) were paid for by the company or company insurance, suggesting coverage by workers’ compensation or direct company coverage in a company clinic. They described 48 per cent as being covered by their or their family’s regular health insurance. Respondents could not recall the source of payment for medical treatment for four episodes (15 per cent) of work-related health problems, which therefore may or may not have been covered by workers’ compensation. Three (11 per cent) paid for all or some of the expenses out of pocket. One case was covered by the Massachusetts free care system for the uninsured.

Seven survey respondents reported receiving treatment at SMMC for work-related health problems after 1997. Of the four who were able to provide approximate months of treatment, three patients with matching demographic and injury data were found in the SMMC data set within one year of the self-reported date. The fourth was not in the SMMC data set of work-related injuries, but matched part of the description of a case treated at SMMC but not coded as work-related. Three respondents who were not able to recall a date of treatment were not found in the data set.

The respondents missing from the SMMC database may have reported injuries occurring before the 1996 cut-off date of the SMMC data as well as the 1997 cut-off in the survey data. However, all involved injuries that were severe and traumatic, so it is worth noting that all three must have misidentified the time of accident by more than one year.

4. Discussion

4.1 Sensitivity of data sources

Given other findings about immigrant workers, the population of Cambodians and Lao would typically be expected to face more hazardous workplace conditions than the general population. However, existing data sources demonstrated weaknesses in the documentation of their work-related health problems.

Although Cambodians and Lao comprise an estimated 30 per cent of the population of Lowell, only four percent of workers’ compensation cases for Lowell residents filed

with the DIA during the period under study were identified as corresponding to these ethnic groups, nearly one eighth the proportion of this group in the Lowell population. Of six survey respondents reporting lost work time of five days or more due to work-related health problems, only one was found in the DIA data. This person had suffered severe traumatic injuries.

DIA data also suggest the possibility of inconsistent reporting practices among area businesses. The Massachusetts Department of Education and Training lists 75 establishments coded as Electronic and Other Electrical Equipment and Components, Except Computer Equipment in the Lowell Labour Market Area, and almost 24 per cent of survey respondents described work corresponding to this code. However, just eight such establishments reported the 10 cases with this code in the DIA data, and three reported all sprain and strain injuries found in this source. The Lowell telephone directory yellow pages lists over 60 temporary employment agencies, yet the five cases reported by temporary agencies to the DIA were all reported by three agencies, and sprain and strain injuries were reported by just one.

Only one percent of hospital visits charged to workers' compensation during the study period corresponded to patients coded as Asian. This low number is consistent with survey results indicating that most of the study population seeks medical care in private doctors' offices, particularly those staffed by physicians from Vietnam or other Asian countries. However, three of the four survey participants who remembered approximate dates of hospital visit for work-related health problems were in fact found in the hospital data and their payment class was coded as workers' compensation.

As an active rather than passive system, the household survey more sensitively captured occupational health problems. Face-to-face interviews by highly respected members of the ethnic groups under study enabled investigators to gather information from populations with limited English skills, limited literacy, and deeply embedded distrust of censuses and surveys. Conducting these interviews in private in people's homes facilitated the sharing of information by people whose traditional cultures and experiences have discouraged them from speaking in public or settings such as focus groups. Despite previous reports of Lao women's reluctance to speak with outside interviewers (Bunte and Joseph, 1992), people of both ethnic groups and genders appeared to participate freely.

4.2 Completeness of data sources

Both the Massachusetts Department of Industrial Accidents and Medical Information Services at Saints Memorial Medical Center generously and efficiently shared all relevant data with investigators. Thus, this study examined nearly complete data sets matching eligibility criteria of time period, Lowell residency, and ethnicity. However, of DIA case records, 14 per cent lacked First Reports of Injury, the documents containing the data categories examined in this study.

Selection of Cambodian participants was partly based on convenience, or the visible presence of household members. This was likely to bias the selection against people who work multiple shifts, or on weekends or early evenings when the survey was performed. Participation was low, with only 160 individuals interviewed, and refusals or unavailability among members of both ethnic groups may be expected to have excluded people working in the informal economy or especially insecure employment who may be frightened to speak to strangers about their jobs. Thus, some of the most dangerous jobs, including day labour and other casual work in construction, fishing, and manufacturing, were likely underrepresented in this sample (discussions with project Advisory Board). Survey results are therefore likely to underestimate both the frequency and severity of workplace hazards and associated health problems in the population of interest.

4.3 Accuracy and depth of data

SMMC data are coded by trained professionals and are expected to demonstrate a high level of accuracy. These data include injury, illness, body part, and external cause codes as well as demographic information, but no in-depth narrative data.

Most company personnel responsible for completing First Reports of Injury and other DIA documents have no training in occupational health. Of the records studied, only 43 per cent provided industrial codes matching other information in the case records to the level of industrial major group. Just 55 per cent listed injury, illness, and body part codes consistent with other documentation in the case records. Records provided varying amounts of descriptive information about the cause and type of health problems, surrounding circumstances, and interactions with the health care and compensation systems.

In order to elicit trust and cooperation, the survey did not solicit specific information about employers. Thus, some industrial information may have been coded inaccurately. In general, survey results are not entirely accurate because people do not necessarily have the knowledge to diagnose their own health problems or correctly identify the sources of those problems. Surveys do not usually provide the means of confirming or validating either health conditions themselves or the reported sources of those conditions. Symptoms not resulting in lost work time may be forgotten and underreported, and recall periods of more than a few weeks can reduce reliability (Silverstein et al., 1997; Lulich and Sestito, 1997). As a result, both reported conditions and their relationship to work could be underreported or over reported (Behrens et al, 1994).

By including open and closed questions about a variety of related employment and health issues, the survey also provided in-depth information about factors causing work-related health problems and preventing their capture by surveillance systems. Supplementary discussions with the project's Advisory Board and local health care providers improved understanding of the complex phenomena under investigation. The limited number of interviewers, and principal investigator participation in almost all interviews, reduced inter-investigator variability.

5. Conclusions

The survey data reveal prevalent occupational illnesses as well as injuries among Southeast Asians in Lowell, Massachusetts. Commonly reported injuries include sprains and strains, and generalized fatigue and ill health among these workers.

Proximate causes of these and other health problems among the study population include long hours of work, awkward and static postures, and exposure to dust, fumes, and solvents. However, almost no survey respondents report training on recognizing and controlling hazards at the source.

A large proportion of the survey respondents worked in electronics assembly and described hazards related to that industry. This is significant since this industry employs more workers than any other type of manufacturing in the United States and has grown more rapidly than any other industry. It is also a large employer in several other countries (USEPA, 1995). Electronics assembly involves a number of documented and putative health risks from exposure to hundreds of chemicals as well as awkward and static postures (USEPA, 2000; LaDou and Rohm, 1998). Therefore, the experiences described in the survey results may pertain to increasing proportions of the United States and international workforce employed in this sector.

The survey failed to inquire about union membership. Most respondents worked in electronics assembly plants and other local industries where unionization is virtually unknown. Almost no respondents described resources apart from their supervisors for obtaining help or information about health and safety on the job.

Although temporary workers were probably under sampled in this study, one quarter of respondents reported holding temporary jobs. Hazards and health problems associated with this form of employment emerged strongly. Lack of experience in a given work environment has been shown in previous studies to be associated with accidents and injuries. The insecurity and irregular schedules, low wages and therefore long hours of temporary work in this area clearly contribute to the prevalence of fatigue, headaches, light headedness, and general lack of well-being in the population studied.

Less than one third of survey respondents expressed any familiarity with the workers' compensation system. Some of the clinics used by the respondents do not accept workers' compensation. Most respondents expected to charge medical care to other payment sources, and in fact did so when hurt on the job.

More than half of survey respondents cited small private clinics as the normal source of medical care for themselves and their families, and almost one third of incidents of medical care for work-related illnesses and injuries were reported to take place at such clinics. This seems consistent with the findings of McCaig et al. (1998), who reviewed data from the National Ambulatory Medical Care Survey, which examined visits to office-based physicians and found that 21 per cent of injury visits were work-related.

Given these patterns of employment and health care utilization, it is to be expected that existing data sources would fail to capture the majority of work-related injuries and illnesses in this population. The survey findings support this supposition. The workers' compensation and hospital data studied contain very small numbers of cases corresponding to the study population relative to their presence in the overall local population. These sources tend to record traumatic injuries and some sprains and strains, but much lower levels of illness, chemical exposure and awkward/static postures than those reflected in the survey.

It is important to note that Southeast Asians in Lowell represent in many ways a best-case scenario for working conditions compared with other groups of refugees and immigrants who arrive in the United States with low levels of formal education. Unlike most of the large numbers of refugees fleeing violence and hunger in Latin America, Asia, Africa and the Caribbean, Cambodians and Lao in the United States are overwhelmingly legal residents with permission to work. Many have been granted refugee status with associated benefits. Thus, fear or deportation or prosecution to work in the underground economy and remain silent in the face of dangerous working conditions forces few.

Jobs in electronics assembly tend to pay well over minimum wages and many are benefited. Indeed, two thirds of people surveyed reported that health insurance was offered by their employer (although the survey failed to inquire about the affordability, adequacy, and accessibility of the insurance). Such jobs are not secure and very few are unionized, but employers in this industry value experienced workers, adding an element of security to such positions. Additionally, recent years have seen some of the lowest levels of unemployment in this region since the Massachusetts Miracle of the 1980's. It would be expected that working conditions would therefore be significantly safer now than during normal economic periods.

In summary, Southeast Asian workers in Lowell, although a relatively privileged population of immigrant workers, appear to suffer a significant burden of occupational illness and injury. This group reports little access to preventive or curative resources for

addressing workplace hazards, and is largely unfamiliar with mechanisms for compensation.

Prevalence of temporary employment, lack of occupational health training, low levels of unionization, and utilization of small clinics for health care may all contribute to the significant under representation of this population in existing occupational health surveillance systems. Thus, this study found that according to DIA data, work-related health problems are much less frequent. Most problems they do record involve traumatic injuries. Only three electronics assembly companies reported injuries due to repetitive, awkward, or static motion, and just one such case corresponded to the typical description of strain and sprain injuries in electronics assembly described in survey. This data source suggests that fumes and solvent exposure are not a significant hazard affecting the target population. Temporary employment does not emerge as an issue, since just five cases were reported by three temporary agencies, and only an agency specializing in asbestos remediation reported a sprain or strain injury.

SMMC data also suggest that most work-related injuries among the study population are traumatic and rarely involve chemical exposures or ergonomic problems. Women in this population demonstrated relatively high proportions of external causes given as hypodermic needles or unclassified. Comparing the SMMC data to national findings results suggests that work-related back pain and dermatitis may be more prevalent in the population under study than in the overall U.S. working population, while hand discomfort appears to be less prevalent (Behrens et al., 1994).

Table 2 shows the relative strengths of the three sets of data. The survey method of data collection fills important gaps and actually shows a picture of the problems of these immigrants not revealed by the official data sources. There is plainly a need to develop innovative data collection methods, especially in countries where official occupational health surveillance excludes large numbers of people, important sectors of the economy, or underrepresented groups, or where surveillance does not exist at all.

Table 2. Strengths of data collection systems

Data source characteristics	DIA	Hospital	Survey
Complete coverage of defined group	yes	yes	no
Data specific to defined ethnic groups?	yes	no	yes
Information on industry	yes	no	yes
Information on employer	yes	no	no
Information on cause of injury	yes	limited	yes
Clinical validation of injury	yes	yes	no
Active cases	no	no	yes
Largely independent of employer practice	no	yes	yes
Information on work hours and conditions	no	no	yes
Information on subjects' knowledge	no	no	yes
Coded by trained professionals	no	yes	no

Perhaps, then, the most important aspect of this research is that it has demonstrated that techniques which have been effective in developing economies in the investigation of rural villages and the informal sector are also effective in an industrialized setting. Indeed, the application of an effective public health model of research with extensive participant involvement is a tool essential to reaching populations traditionally excluded from surveillance of occupational injury and disease in an industrialized urban setting.

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