Thailand and four MDR cases in the United States in the same refugee population within 16 months is cause for concern. Why the reported number of TB cases among resettled refugees was higher in California and why MDR TB cases among resettled refugees were found only in California remains unknown.

Because of the high prevalence of TB disease among the refugees described in this report, all are at risk for recent exposure to *Mycobacterium tuberculosis*. Recent infection is a major risk factor for progression to TB disease (*6*), but latent TB infection (LTBI) is not routinely treated in Thailand. Therefore, to prevent *M. tuberculosis* transmission and progression to TB disease in the United States, the domestic refugee health and TB programs affected by this resettlement should ensure postmigration monitoring and services for refugees, including treatment of LTBI.

These investigations and responses have required and will continue to demand considerable public health resources. Per person, the estimated costs of detecting disease and treating patients with LTBI range from $208 to $11,125, and the direct medical costs associated with TB and MDR TB disease range from $3,800 to $137,000, depending on case complexity.[§] These projections underestimate the costs for treating Hmong refugees because they exclude the additional expenses of providing culturally appropriate outreach, interpretation, and transportation services.

The annual number of immigrants to the United States continues to increase (*1*), and TB is the medical condition most frequently diagnosed among applicants for permanent residence (CDC, unpublished data, 2005). The number of imported TB cases described in this report would have been substantially greater if overseas screening had not been enhanced. For Hmong refugees resettling from Thailand, mycobacterial cultures and drug-susceptibility testing helped ensure appropriate treatment of patients with TB disease. These and other enhancements to standard premigration screening guidelines are under consideration for future U.S.-bound refugees and immigrants from other countries with a high TB burden.

[§] Estimated costs are derived from several studies (*7*–*10*). Direct medical costs of TB screening and treatment of LTBI caused by presumed isoniazid-susceptible strains are approximately $208–$311 per person without DOT. For each infected contact of a patient with MDR TB, California estimates follow-up and treatment costs to be $11,125 (T. Porco, California Department of Health Services TB Control Program, personal communication, 2005). If drug-susceptible TB disease is diagnosed, treatment costs are approximately $3,800 under daily DOT. Costs increase an additional $19,000 when patients require hospitalization, as do approximately 50%. Direct medical costs associated with MDR TB hospitalization average $53,000 and range from $15,000 to $137,000 per case. For each study, costs were updated to 2004 U.S. dollars by taking the costs determined by that study and multiplying them by the ratio of the medical-care component of the consumer price index for 2004, divided by the index for the year of the study, or, for costs dominated by personnel, a similar ratio of wages.

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Fatal Injuries Among Volunteer Workers — United States, 1993–2002

In the United States, an estimated 59 million persons spend a median of 52 hours each year volunteering, most often in religious, educational, youth, or community service organizations; volunteers commonly perform activities such as coaching, campaigning, fundraising, delivering goods, and serving on boards or neighborhood associations (*1*). Few studies have analyzed fatal injuries to volunteers, and studies have typically focused on a specific volunteer group (e.g., Peace Corps). To characterize fatal injuries among volunteers in the United States, CDC analyzed data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI)* for 1993–2002. This report describes the results of that analysis, which indicated that a total of 501 persons died from injuries sustained while volunteering during this period; most often these persons were firefighters and other volunteers who were operating motor vehicles at the time of death. To reduce these fatalities, organizations that rely on volunteers need to

* By using death certificates, worker's compensation reports, state and federal agency records, and other supporting documents, CFOI collects data on all traumatic occupational fatalities in the 50 states and District of Columbia to determine worker demographics and the circumstances and causes of the fatality. CFOI data files provided to CDC do not include New York City.

provide adequate training (e.g., defensive driving and recognition of evacuation signals) on the basis of well-communicated and enforced safety and health policies.

CFOI classifies employee status into one of seven categories: 1) active-duty armed forces, 2) self-employed, 3) work in family business, 4) work for pay or compensation, 5) volunteer, 6) off-duty police, or 7) not reported. CFOI includes fatalities to volunteer workers if they were performing the same duties or functions as paid employees and they met the CFOI work-relationship definition.[†] For this study, deaths were included if the decedent's employment status category was marked "volunteer." Excluded were deaths resulting from the terrorist attacks of September 11, 2001. After numbers of deaths were obtained from CFOI, rates of death among volunteers were calculated by using estimates of median annual volunteer hours worked from the September 2002 Current Population Survey (CPS) volunteer supplemental survey[§] (*2*) and converting those hours to full-time equivalents (FTEs) (i.e., 2,000 hours worked per person per year). CPS defines a volunteer as a person who performed unpaid activities for an organization (*3*).

During 1993–2002, three occupations accounted for approximately half of the 501 fatal injuries to volunteers: firefighters, 185 deaths (37%); nonconstruction laborers, 35 (7%); and pilots/navigators, 24 (5%). The remaining fatalities (all ≤4%) were distributed across 13 occupations (Table 1). The single most common volunteer activity at the time of death was firefighting, for which 76 deaths (15%) were recorded. Driving a motor vehicle (e.g. automobile, truck, or farm vehicle) was recorded in 100 (21%) of the fatalities (Table 1). Under the system used by BLS to classify industry sectors, 240 (48%) deaths related to volunteer work occurred in public administration (including firefighting), 154 (31%) in services, and 23 (5%) in agricultural forestry and fishing. Median age of victims at the time of death was 41 years; 436 (87%) of the decedents were male.

The overall rate of death among volunteers was 3.2 per 100,000 FTE population (Table 2). Among 189 volunteer workers aged ≤34 years, 103 (54%) were volunteer firefighters or firefighting supervisors. The fatal injury rates for volunteer workers aged ≥35 years were lower when compared with the overall volunteer death rate. The rates among volunteers aged 20–24 and 25–34 years were 7.4 and 6.5 per 100,000 FTE population, respectively, more than twice the overall volunteer death rate and higher than the 1993–2002 average annual fatality rate for all workers aged 20–24 and 25–34 years of 3.5 and 3.9 per 100,000 employed, respectively (*2*).

TABLE 1. Number* and percentage of deaths among volunteer workers, by occupation and activity at time of death — Census of Fatal Occupational Injuries (CFOI),† United States, 1993–2002

Occupation/Activity	No.	%§
Occupation		
Firefighter	185	37
Nonconstruction laborer	35	7
Pilot/Navigator	24	5
Religious worker	19	4
Construction laborer	16	3
Truck driver	15	3
Farm worker	12	2
Groundskeeper	12	2
Protective services	8	2
Health technician	7	1
Personnel services	7	1
Athlete	6	1
Manager/Administrator	6	1
Firefighting supervisor	5	1
Sales supervisor	5	1
Nonclassifiable	7	1
Activity		
Driving	100	21
Truck	*49*	*10*
Automobile	*33*	*7*
Farm vehicle	*9*	*2*
Driving not elsewhere classified (NEC)	*9*	*2*
Fighting a fire	76	15
Riding (automobile or truck)	37	7
Operating (airplane)	22	4
Riding (airplane)	20	4
Walking in or near roadway	15	3
Rescuing or evacuating	15	3
Directing, flagging traffic	14	3
Installing	12	2
Walking	10	2
Repairing	7	1
Protective service activities	7	1
Standing	7	1
Tending an establishment, waiting on customers	7	1
Constructing, assembling	6	1
Driving, operating bicycle or motorcycle	5	1
Walking behind vehicle	5	1
Other (miscellaneous, not reported, NEC)	136	27

* N = 501. Occupations with <5 volunteer workers (n = 132) are not reported.
† By using death certificates, worker's compensation reports, state and federal agency records, and other supporting documents, CFOI collects data on all traumatic occupational fatalities in the 50 states and the District of Columbia to determine worker demographics and the circumstances and causes of the fatality. CFOI data files provided to CDC do not include New York City.
§ Percentages do not total to 100% because of rounding.

† Available at http://www.bls.gov/iif/oshcfdef.htm.

§ Current Population Survey (CPS), sponsored by the U.S. Census Bureau and BLS, is a multistage, stratified sample of approximately 60,000 households that provides current information on the labor force and demographic characteristics of the U.S. population. CPS includes the civilian, noninstitutionalized population aged ≥16 years. Response rate for the 2002 CPS survey was 92% (CPS, unpublished data, 2005). Volunteer supplemental surveys were conducted in 1989 and 2002–2004. This analysis used the 2002 volunteer survey to calculate rates. Response rate for the volunteer supplemental survey 2002 was 88% (CPS, unpublished data, 2005). Additional information is available at http://www.census.gov/prod/2002pubs/tp63rv.pdf.

TABLE 2. Fatal injuries to volunteer workers,* by age group and selected characteristics — Census of Fatal Occupational Injuries (CFOI),† United States, 1993–2002

Age group (yrs)	Volunteer deaths		Volunteers (in thousands)		Median annual hrs	Full-time equivalent (FTE) volunteers in 2002§	Rate per 100,000 FTE volunteers¶
	No.	(%)	No.	(%)			
≤15	12	(2)	—**	—	—	—	
16–19	27	(5)	4,346	(7)	40	86,920	3.1
20–24	47	(9)	3,515	(6)	36	63,270	7.4
25–34	103	(21)	9,279	(16)	34	157,743	6.5
35–44	86	(17)	15,089	(25)	52	392,314	2.2
45–54	81	(16)	12,296	(21)	53	325,844	2.5
55–64	54	(11)	7,146	(12)	60	214,380	2.5
≥65	85	(17)	7,492	(13)	96	359,616	2.4
Total	**495††**	**(99)**	**59,163**	**(100)**	**52**	**1,538,238**	**3.2**

* N = 501.
† By using death certificates, worker's compensation reports, state and federal agency records, and other supporting documents, CFOI collects data on all traumatic occupational fatalities in the 50 states and the District of Columbia to determine worker demographics and the circumstances and causes of the fatality. CFOI data files provided to CDC do not include New York City.
§ FTE = full time equivalent. (Median hours divided by 2000) multiplied by number of volunteers in 2002.
¶ ([Number of volunteer deaths during 1993–2002 multiplied by 100,000] divided by 10 years) divided by number of FTE volunteers.
** Not available.
††Age data for six cases were not available.

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Editorial Note: Certain volunteer work, such as firefighting, performing structural repairs, or collecting roadside litter can involve inherently hazardous duties or environments that increase the risk for injury or death. Volunteers engaged in this work might not be sufficiently aware of the dangers involved or any health and safety regulations associated with the work. In addition, supervisors of volunteers might not have the same authority as employers of paid persons to make certain that health and safety regulations are followed. The findings in this report indicate that 28% of all work-related volunteer fatalities occurred while driving or riding in a motor vehicle and that the decedents were most commonly firefighters. To reduce the risk for fatalities, driver training should be provided to volunteer firefighters as described in National Fire Protection Association standard 1451 (*4*). Other organizations using volunteer drivers should consider adopting policies and providing education that emphasizes safe driving at work (*5*) and in the community (*6*).

The findings in this report are subject to at least four limitations. First, CFOI might not capture all volunteer fatalities (i.e., deaths to volunteers in NYC or to persons involved in a motor-vehicle crash that might not have been identified as including a volunteer). Second, although the median number of hours worked by volunteers does not change substantially from year to year (*7*), calculation of death rates is based on the median hours of volunteer work reported from a single CPS volunteer supplemental survey (September 2002), which uses a sample of the U.S. population. Third, volunteer firefighters, although not typically paid for their work, might receive compensation such as reimbursement for annual medical exams or worker's compensation and retirement benefits. A state-by-state comparison of benefits is available at http://www.nvfc.org. Finally, occupation-specific fatality rates could not be calculated because volunteer occupations in the CPS survey are not categorized by using the same occupation definitions as CFOI.

Organizations that use volunteers should create or maintain policies that incorporate safety education and training into structured volunteer training and orientation. Organizations should designate persons with authority to identify and correct potential hazards and should monitor the activities of volunteers for adherence to their policies. All organizations, whether using volunteers or paid staff, should 1) identify risks and establish safety plans that include administrative measures for enforcement, 2) implement any necessary engineering controls, and 3) provide workers with any needed personal protective equipment (*8*). To identify risks to firefighters, CDC's National Institute for Occupational Safety and Health operates an ongoing Fire Fighter Fatality Investigation and Prevention Program that investigates deaths among firefighters, including volunteer firefighters.

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Interim Guidance for Minimizing Risk for Human Lymphocytic Choriomeningitis Virus Infection Associated with Rodents

On July 29, this report was posted as an MMWR Dispatch *on the* MMWR *website* (http://www.cdc.gov/mmwr).

In May 2005, CDC received reports of four organ-transplant recipients with unknown illness. All were discovered to have been infected with lymphocytic choriomeningitis virus (LCMV) via a common organ donor (*1*). Epidemiologic investigation traced the source of the virus to a pet hamster purchased by the donor from a local pet store. LCMV testing of other rodents at the pet store revealed three other LCMV-infected rodents (two hamsters and a guinea pig), supplied by a single distributor (distributor A). Preliminary laboratory testing of hamsters from distributor A has identified an infection rate of approximately 3% among the animals sampled. The facility of distributor A is under quarantine until it can be documented as free of LCMV infection. This report provides background information on LCMV and interim guidance* for the public on reducing risk for LCMV infection from pet rodents.

Background Information

LCMV is a rodent-borne arenavirus endemic in house mouse (*Mus musculus*) populations worldwide (*3–5*). Pet rodents (e.g., hamsters and guinea pigs) can become infected with LCMV after contact with wild rodents at a breeding facility, pet store, or home. The prevalence of LCMV in pet rodents is not known. Although other animals could possibly become infected with the virus, documented infections in humans have occurred only after exposure to infected mice, guinea pigs, and hamsters (*6,7*).

LCMV infection in humans with normal immune systems usually causes either asymptomatic or mild, self-limited illness, characterized by any or all of the following symptoms: fever, malaise, lack of appetite, muscle aches, headache, nausea, and vomiting. Aseptic meningitis also can occur in some patients, but the infection is rarely fatal (*6*). LCMV infection during the first or second trimester of pregnancy can cause severe illness or developmental defects in the fetus, including hydrocephalus, psychomotor retardation, and blindness (*8*); the proportion of developmental defects caused by LCMV is not known. Serologic studies of previous infection in humans in urban areas of the United States have demonstrated a prevalence of previous LCMV in those populations of approximately 5% (*3*).

Person-to-person transmission has not been associated with LCMV, except for transmission from mother to fetus or through organ transplantation (*1*). Human infection occurs most commonly through exposure (by direct contact or aerosol) to secretions or excretions of infected animals (*9*). LCMV infection is a well-known occupational risk for laboratory workers who work with LCMV-infected laboratory rodents (*9*).

An outbreak associated with pet hamsters sold by a single distributor was reported in 1974, when 181 symptomatic cases in persons with hamster contact were identified in 12 states; no deaths occurred (*10*). The outbreak was brought under control by voluntary cessation of sale and destruction of the infected breeding stock.

Control of Wild Rodents

Environmental modifications and hygiene practices that deter rodents from colonizing the home and work environment are the best means of reducing risk for exposure to infectious rodents. In addition, if rodents are found in work or living areas, safe practices for cleaning rodent waste and nesting materials are recommended. Preventing wild rodent entry also reduces opportunity for infection of pet rodents.

Detailed instructions on rodent-proofing, safe cleaning practices, and trapping wild rodents are available at http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/lcmv.htm.

*These recommendations were assembled by a CDC working group to provide interim guidelines for protection of public health. Guidelines for care of laboratory animals have been published previously (*2*). In addition, the National Association of State Public Health Veterinarians, in conjunction with partners, is developing a set of comprehensive veterinary infection-control guidelines.

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Multidrug-Resistant Tuberculosis in Hmong Refugees Resettling from Thailand into the United States, 2004–2005

In December 2003, the U.S. Department of State initiated a resettlement program for 15,707 Hmong refugees who had been displaced from Laos and were living on the grounds of Wat Tham Krabok, a Buddhist temple in Thailand. In January 2005, reports of tuberculosis (TB) cases among refugees still in Thailand and refugees who had arrived in the United States, including some cases caused by multidrug-resistant* (MDR) strains, prompted a 1-month travel suspension. After enhanced screening in Thailand and intensified TB-control measures in the United States, resettlement resumed on February 16. A majority of the Hmong refugees in Thailand and the United States with TB diagnosed were started on treatment and monitored. As of July 15, no additional TB cases had been diagnosed among newly resettled Hmong refugees. U.S. health departments should continue to ensure careful monitoring for TB among this refugee group.

Approximately 50,000–70,000 refugees resettle in the United States each year (*1*). Before resettlement, all refugees undergo medical screening to prevent importation of diseases that pose an immediate public health risk. The standard TB-screening algorithm, used in early 2004 to evaluate Hmong refugees in Thailand, includes a medical history and physical examination for all applicants and a chest radiograph for persons aged ≥15 years. Applicants with clinical or radiologic findings suggestive of TB disease submit three sputum specimens for acid-fast bacilli (AFB) smear microscopy. Those with positive results must begin anti-TB treatment and have follow-up specimens with consistently smear-negative results before travel to the United States is allowed.† The standard premigration algorithm was revised in May 2004 to add requirements for mycobacterial culture and drug-susceptibility testing.

During June 2004–January 2005, the United States resettled 9,459 Hmong refugees in 20 states (Table and Figure). As the newly arrived refugees underwent health assessments at local health departments and in private health-care facilities, 37 TB cases, including four MDR cases, were reported. This finding coincided with assessments in Thailand, where 17 (33%) of 52 culture-confirmed cases among refugees were determined to be MDR. In contrast, among all new TB cases reported in the United States during 2004 with drug-susceptibility results, 1% were MDR TB (*2*). Hmong refugee travel to the United States was suspended to allow for epidemiologic investigation and to prevent further importation of TB cases.

In January 2005, coordinated investigations were conducted in Thailand and the United States by the International Organization for Migration, CDC, the Thailand Ministry of Public Health, the U.S. Department of State, the U.S. Department of Health and Human Services Office of Global Health Affairs, and state and local health departments to describe the epidemiology of TB disease and to direct TB-control measures among the refugees. The case definition for TB disease required either 1) bacteriologic evidence (i.e., sputum-smear microscopy or culture) or 2) a decision to

*Defined as resistant to at least isoniazid and rifampin.
† *Medical Examination of Aliens*, 42 C.F.R. § 42; 2004.

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