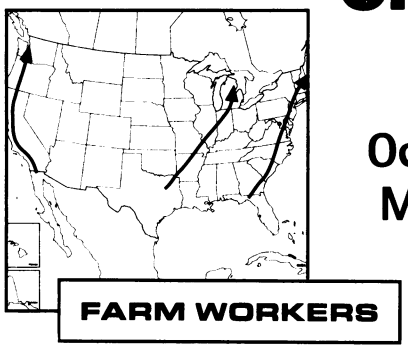
Cross-cultural Medicine
A Decade Later

- **The total population of migrant and seasonal farm workers in the US is estimated to be as large as 5 million**
- **In 1987, the all-cause work-related death rate (49 per 100,000 workers) for farm workers was the highest for all occupations (compared to 11 deaths per 100,000 workers for all jobs)**



Occupational Health Problems Among Migrant and Seasonal Farm Workers

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Migrant and seasonal farm workers are one of the most underserved and understudied populations in the United States. The total US population of such farm workers has been estimated at 5 million, of whom about 20% live or work in California. Farm workers perform strenuous tasks and are exposed to a wide variety of occupational risks and hazards. Low socioeconomic status and poor access to health care also contribute to existing health problems in this population. Potential farm work-related health problems include accidents, pesticide-related illnesses, musculoskeletal and soft-tissue disorders, dermatitis, noninfectious respiratory conditions, reproductive health problems, health problems of children of farm workers, climate-caused illnesses, communicable diseases, bladder and kidney disorders, and eye and ear problems. Few epidemiologic studies exist of these occupational health problems. No comprehensive epidemiologic studies have assessed the magnitude of occupational health problems among migrant and seasonal farm workers and their dependents. Although the migratory nature of this population makes long-term studies difficult, the development of standardized data collection instruments for health consequences and scientific assessment of farm work exposures and working conditions are vital to characterize and reduce the occupational health risks in farm workers.

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They come with the dust, and go with the wind.[1]

Agriculture is a major industrial sector in the United States and relies heavily on migrant and seasonal farm labor, especially in California where many of the labor-intensive crops, such as fruits and vegetables, are grown. Migrant and seasonal farm workers are one of the most underserved and understudied occupational populations in the US, even though they are working in one of the most, if not the most, hazardous occupations in this country.[2,3] In 1987 the three highest all-cause work-related death rates per 100,000 workers were 35 for construction workers, 38 for miners, and 49 for agricultural workers, compared with a rate of approximately 11 deaths per 100,000 workers for all occupations.[4]

The US agricultural work force was estimated in 1986 to number about 6.5 million, 5.4 million of whom lived on farms[5] and 1.1 million of whom were hired workers.[6] Migrant and seasonal farm workers are not counted separately from other farm workers by most agricultural surveys. Recent estimates indicate that as many as 5.0 million migrant and seasonal agricultural workers live and work in the US.[7] Statistics generally underestimate the dependence of agriculture on hired workers.

Among the migrant and seasonal farm-worker populations, basic health data—such as crude maternal and infant mortality, survival, and disability—are lacking, in part because of the absence of a precise denominator. This results from the transient nature of the population, their migration into and out of the US, undercounting of those workers who meet the legal definition of a migrant but who do not fit ethnic and demographic stereotypes or occupational classifications, and the desire of many immigrant workers to avoid contact with government agencies.[8] Language barriers, the seasonal nature of the work, and the large distances between camps or farms in rural, often remote, areas create further difficulties in obtaining reliable data on this population.

There is no uniform definition of migrant and seasonal farm workers among government agencies. The US Departments of Agriculture, Labor, Health and Human Services, and Education all use different standards for counting the farm-worker population, making data across agencies not strictly comparable. Currently the only national reporting system that tracks farm worker health data is the Migrant Student Record Transfer System maintained by the Office of Migrant Education of the US Department of Education. This computerized system contains the health and academic records of children of migrant farm workers in the US and Puerto Rico, but there exists no such collection of national health data on adult farm workers.[9]

Background

Agricultural labor in the United States began in the plantation days, when imported slaves worked the cotton, sugar cane, and tobacco fields of the southern states. With migra-

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tion to the West and the cultivation of vast agricultural lands in the second half of the 19th century, the need for farm help grew rapidly. First Chinese, then Japanese, East Indian, and Filipino laborers were imported to work the fields on the West Coast. During the late 1920s and until World War II, many "dust bowl migrants" from the Midwest replaced the traditional non-white farm laborers in California and other western states. With the beginning of World War II, many of those "dust bowl migrants" left the fields to take higher paying blue or white collar jobs in the defense industries. In response to the demand of American growers, *braceros*, temporary farm workers, were imported under government contract from Mexico. During this program, which continued for more than 20 years, Mexicans worked in more than 20 states but mainly in California. At the same time, laborers from Jamaica and the Bahamas were brought in under a variety of work agreements for agricultural work from New York to California. With the end of the *bracero* program in 1964, working conditions were no longer regulated by official governmental contracts between the US and Mexico. Workers were still needed, however, and this demand enormously increased illegal immigration from Mexico to the Southwest.[10]

At present three major North-South migrant "streams" exist in the continental United States. Migrants based in southern California make up the stream that heads north to northern California, Oregon, and Washington. Others, based in Texas and Arizona, travel up the Mississippi Valley to Ohio, Michigan, Indiana, and Illinois. Still others move from southern Florida through Georgia, the Carolinas, Maryland, Delaware, and New Jersey into New York and New England.[11] These streams are made up primarily of immigrants from Mexico, Puerto Rico, Haiti, Jamaica, and Central America, as well as of indigenous Native Americans and African Americans.

California is the biggest producer state in the US for vegetables and fruit and relies heavily on migrant and seasonal farm workers for these labor-intensive crops. California's migrant labor force is estimated to be between 600,000 and 1.1 million, including dependents.[12] A substantial proportion (28%) of the farm labor work force is made up of women.[13] Many migrant farm workers and their families live in established farm worker towns and maintain strong ties to Mexico. In a recent study of Chicano and Mexican rural enclaves in California, at least 60 communities were identified to be farm worker oriented, with a population that was at least 60% Hispanic.[14]

In a 1989 study of farm-worker households in four farm-worker communities in California, 65% of the persons relied on seasonal or temporary farm jobs.[14] The gross annual household income averaged $15,203, but, considering their size (average of 6.8 members per household and 2.6 workers per household), most households actually lived below officially defined poverty levels. According to 1990 US Census figures, Fresno and Tulare counties in California house possibly the poorest farm-worker communities in California, where frequently 30%or more of the inhabitants of the predominantly Hispanic farm-worker towns live below poverty levels.[15] Many farm workers and their families live in substandard and overcrowded conditions and often lack basic sanitary facilities. At peak harvest time, when migrant and seasonal farm workers travel from one harvest site to another, temporary and makeshift shelters next to the fields are common.

Intimately intertwined with the socioeconomic and general health status of this population are health problems directly due to the occupational hazards of farm work. Occupational health problems cover a wide range: accidents, pesticide-related illness, musculoskeletal and soft-tissue problems, dermatitis, noninfectious respiratory conditions, reproductive health problems, health problems of farm-worker children in the fields, climate-related illnesses, communicable diseases, urinary tract infections and kidney disorders, and eye and ear problems.[9] In addition, general health problems, such as malnutrition, poor dental health, obesity, cardiovascular disease, diabetes mellitus, anemia, and mental disorders might exacerbate the risk of work-related diseases among farm workers and their families.[8,11]

We review critically the occupational health problems of migrant and seasonal farm workers, a population defined by its occupation. Although this is only one component of the total health picture in this unique occupational group, it is an important aspect requiring urgent attention.

Accidents

Data on work injuries are not as readily available for farm workers as for workers in other industries for several reasons. First, there are no legal injury-reporting requirements for farms, other than for those farms with 11 or more employees, which must follow the regulations of the Occupational Safety and Health Administration. Workers' compensation data for agriculture are not consistent or even widely available owing to numerous exclusions, exemptions, and loopholes in state laws. Second, agriculture is physically dispersed so that collecting data about injuries requires substantial time and money. Third, as noted previously, migrant and seasonal farm labor is not treated as a separate occupational category; therefore, national agricultural accident statistics include both farmers and farm workers in the same category.

In 1989 the National Bureau of Labor Statistics estimated the annual incidence rate of all work-related injuries among agricultural workers to be 11.7%.[16] Even by these limited data, the rate of injuries in agricultural workers was higher than for workers in manufacturing industries, where the injury rate was 10.6% in 1988.[4]

Because of the wide range of tasks performed on many different crops, migrant and seasonal farm workers receive exposure to numerous factors that contribute to injury and death. Occupational accidents in agriculture include fractures or sprains due to falls from ladders or equipment; sprains or strains from prolonged stooping, heavy lifting, and carrying; amputations, lacerations, and crushed bones and joints from tractors, trucks, or other machinery; pesticide poisoning by direct spraying or mixing; electrical accidents; carbon monoxide poisoning from running equipment in enclosed areas; and drowning in irrigation ditches.[9,17]

The most comprehensive study of farm injury morbidity and mortality is the National Safety Council's 1988 survey of 127,169 farm family members, which included 57,301 full- and part-time employees on 37,293 farms in 31 states.[18] The data base covered more than 5,753 injuries, ranging from minor to crippling to fatal accidents. The survey grouped farmers and farm workers, however. The highest work-related injury rates were reported for the age group 5 to 24

years, with a combined overall rate of 25.8 work-related injuries per million work hours. Work-associated injury fatality was relatively high for those younger than 15 years (7.4%, when only 4.3% of the combined working hours by the whole farming population was contributed by this age group) and for those older than 64 years (11.1%, with 5.5% total work-hour contribution by this age group). Agricultural machinery was the single leading source of occupational injury (17.6%), followed by animal-related injuries (16.9%). Other surveillance studies of occupational injuries and mortality in farmers and their dependents have shown similar results,[19,20] but again no distinctions were made between farmers and farm workers.

Surveillance of occupational injury in migrant and seasonal farm workers poses even greater challenges than that of farmers and permanent farm help. There are difficulties in locating and identifying farm workers and gaining their cooperation in a study after a long workday. Underreporting might also be prominent if symptoms are mild, short-lived, or both. Symptoms might be ignored by a temporary farm worker, who is fearful of losing his or her job or of being reported to immigration authorities.

In 1981 a study was done of 467 families comprising 1,888 persons in Tulare County, California.[21] An aim of the survey was to gather data on the relationship between work and health. The most frequently reported work-related health problems were injuries, which accounted for 56% of all health problems reported. Falling stacks of crates, overturning gondolas, and other accidents associated with farm machinery—forklifts and tractors—were the most frequent causes of farm accidents for those who worked with field crops. Tree accidents, which included falling down from or through ladders with bags full of fruit, caused fractures, sprains, contusions, puncture wounds, and lacerations.

Of 287 migrant farm workers studied in North Carolina, 24 (8.4%) reported an occupational injury during the previous three years.[22] Broken bones, sprains, and cuts accounted for 80% of the injuries. Vehicles or machinery caused 21% of the injuries, which often resulted in time lost from work. The relatively small number of reported injuries limits the interpretation of the results. The incidence rate of injury (8.4% for a 3-year period) is, however, probably an underestimate. The use of recall rather than surveillance strategies and the exclusion of previously injured workers from the current work force could also contribute to the underascertainment.

More population-based research is necessary to characterize fully the nature, frequency, and consequences of occupational injuries in farm workers. Most of the occupational injury categories outlined by the National Safety Council have rarely been studied in migrant and seasonal farm workers. This scarcity of data limits our understanding of work-related injuries in this population.

Pesticide-Related Illness

Pesticides are a major source of public concern because of their known toxicity, their pervasiveness in the environment, and their possible association with delayed health effects, such as cancer and adverse reproductive consequences.[23,24] Pesticides, used extensively in US agriculture, include compounds such as insecticides, herbicides, defoliants, molluscicides, nematocides, algicides, and acaricides.[25] Agricultural workers can be exposed to pesticides in a variety of ways (Table 1).[9,25,26]

Labor-intensive crops, such as fruits and vegetables, are treated extensively with pesticides. Most (more than 50%) farm workers are hired for harvesting operations, during which they might be exposed to different chemical compounds when handling and touching the foliage.[26] Pesticides are absorbed into the human body through the skin, by inhalation, and by ingestion. Exposure can result in acute systemic poisoning—abdominal pain, ataxia, nausea, dizziness, vomiting, headache, and malaise—or skin or eye problems, such as rashes, inflammation, or corneal ulceration. Chronic health problems may include chronic dermatitis, fatigue, headaches, sleep disturbances, anxiety, memory problems, and different kinds of cancers, birth defects, sterility, blood disorders, and abnormalities in liver and kidney function.[9,17,26,27]

The number of workers in the United States affected by pesticides is unknown; California and Washington are the only states with mandatory reporting of pesticide-related illnesses. In the 1987 summary document of pesticide-related illnesses in California, 372 of 1,507 (25%) reported occupational cases of pesticide illness were in agricultural field workers.[28] Even in California, underreporting is likely to occur because many of the migrant and seasonal farm workers never see a physician or are never properly diagnosed.

Little is known about the extent or magnitude of chronic health problems related to occupational exposure to pesticides. Few population-based studies of such effects exist. Although several studies have addressed the association of cancer and pesticide exposure among farmers and permanent farm help,[29-34] few population-based studies have been published about the effect of pesticides in migrant and seasonal farm workers. In California, a case study of a childhood cancer cluster,[35] a hospital record-based study of birth defects,[36,37] and a health survey[21] examined some of the effects. These investigations suggest that increased chronic health problems occur. All of these studies have been limited in size and scope, however, and have not reached clear conclusions about the magnitude of pesticide-related health effects among migrant and seasonal farm workers.

Although difficult, it is important to carry out further studies on the adverse health effects associated with pesticides among farm workers. Although cohort studies of cancer or other chronic diseases would be exceedingly difficult and costly, studies of hazardous exposures, such as case-control studies of acute exposures to pesticides, are possible and appropriate. An important problem to consider is assessing exposure. Estimates of human exposure must be considered in conjunction with results of the dose-response determination to obtain quantitative estimates of risk. Appropriately designed studies could measure pesticide residues among farm workers and compare their exposure to that in other populations. Developmental toxicity and cancer from pesticides are other important areas for assessment. Pesticides have been associated with adverse acute and chronic health effects in farmers, but much additional work is necessary to characterize the nature and magnitude of this problem in migrant and seasonal farm workers.

Musculoskeletal and Soft-Tissue Problems

Heavy physical labor contributes to a variety of musculoskeletal problems, including traumatic injuries, soft-tissue

TABLE 1.—*Opportunities for Exposure to Pesticides*

Usually an avoidable exposure	Diluting and mixing; loading into applicators; applying to crop; flagging during cropdusting
Often an unavoidable exposure	Drift; contact with residues during harvesting, weeding, pruning
Frequently an unknown exposure	Eating or smoking in field; drinking, bathing, cooking with contaminated water

disorders, and degenerative joint disease of the hands, knees, and hips.[9] Few formal studies of the risk of musculoskeletal and soft-tissue conditions have dealt with agricultural populations; none have examined this in migrant and seasonal farm workers. Published articles, however, show that farm workers are exposed to many of the risk factors associated with musculoskeletal injury. For example, occupational factors that contribute to back strain include previous back injury, heavy lifting and carrying, difficult work positions, an excessively fast work pace, whole-body vibration, and work in cold or hot climates.[38]

Farm workers carry heavy bushels and buckets of produce, often lifting them above their heads to empty into trucks. Orchard workers wear canvas bags held with straps over their shoulders that they fill with as much as 30 to 35 kg of fruit as they climb up and down ladders. Mushroom workers stand on catwalks 1.5 m high that are stretched across beds so that the workers can pick mushrooms and load and unload the beds with dirt. Farm workers also spend long hours bent over low-lying crops such as cucumbers, beans, strawberries, and squash.[9]

Only a few studies of ergonomic stress and health problems in farm labor populations exist. One study in Japan examined posture patterns and musculoskeletal problems in strawberry and eggplant growers.[39] Another Japanese study compared the overhead working posture of pear and apple workers.[40] An increased number of physical symptoms such as fatigue and pain in the lower back and shoulders and tiredness, stiffness, and pain in the neck, shoulders, and arms was reported, respectively, for the two different studies. (Statistical analyses were not presented in either article.) Swedish investigators compared the frequency of hip joint operations in the Swedish population and found that more agricultural workers (36%) underwent this operation than the general population (23%).[41]

Although no formal studies of musculoskeletal problems have been carried out among migrant and seasonal farm workers, in two different health surveys of farm workers, musculoskeletal complaints ranked second and third, 21% and 27%, respectively, of all physical problems experienced.[21,42] Future epidemiologic studies on musculoskeletal problems in farm workers should focus on changes of working conditions and equipment design needed to reduce work-related musculoskeletal symptoms and disabilities among these workers.

Dermatitis

Agriculture has consistently been identified as the major industrial division with the highest risk of occupational skin disease.[43,44] In 1984 skin disorders made up more than two thirds of occupational illnesses reported to the Bureau of Labor Statistics among crop production workers.[45] Reported rates for occupational skin disease (in California) might underestimate the actual rate by 10-fold to 50-fold.[46] Table 2 shows the agents that may affect the occurrence of dermatitis in farm workers.[47,48]

The prevalence of dermatitis in general populations has been estimated in several large studies, including some in Western Europe,[49] the United States,[50] and the Netherlands.[51] Dermatitis has also been studied in Hispanics in the United States,[52] but few data exist concerning the prevalence of dermatitis in any agricultural populations, including predominantly Hispanic California farm workers. Several outbreak investigations—related primarily to pesticides—in California and Tennessee have been reported.[53-55] California grape, tomato, and citrus workers were investigated for risk factors contributing to dermatitis.[48,56,57] These surveys found that grape workers were more likely than citrus or tomato workers to report rashes and to have contact dermatitis and lichenified hand dermatitis, possibly because of crop-specific work patterns and exposures.

The future study of specific risk factors for occupational skin disease in agricultural workers could be addressed by case-control studies. The transient nature of some skin variations, however, raises issues of selection and recall bias in this type of study. To determine actual incidence, active surveillance and prospective cohort studies are necessary. The development of standardized data collection instruments is also necessary to improve the ability to compare results between populations.

TABLE 2.—*Agents Causing or Exacerbating Dermatitis*

Environmental
UV radiation
Soil
Climate—heat, cold, wind, moisture
Zoonoses
Other physical agents, such as materials for protective devices
Chemical
Pesticides, including residues on foliage
Fertilizers
Other chemicals, such as machinery lubricants
Crop-related
Specific crop type
Specific job activities, such as hoeing
Plant materials
Personal
Hygiene
Personal allergy history
Use of protective devices

Noninfectious Respiratory Illness

Respiratory illness from agricultural exposures has been well documented.[58-60] Studies have shown increased mortality from nonmalignant lung disease[61-63] and an increased number of respiratory symptoms in agricultural workers compared with nonagricultural controls.[64-69] In one study, the relative risk for pulmonary problems among farmers was found to be 1.92 compared with nonfarming controls.[68] The distinction between nonoccupational and occupational respi-

ratory exposure, however, is most difficult to draw on farms. For example, fungi that colonize growing crops predominate in the air, both by day and by night, are dispersed during haymaking, harvesting, and other agricultural operations, and affect farm workers and other rural dwellers alike.[58]

Respiratory health problems have a complex profile: One or more specific respiratory tract problems can develop at the same time. Obstructive airway disease (such as bronchitis) caused by biologic and physical agents and occupational asthma, caused generally by organic antigens contained in dusts from plant and animal sources, are major occupational health problems for farmers and farm workers. Restrictive lung disease is a less recognized result. Although continually inhaling organic dust represents a known risk for restrictive lung disease, recent studies suggest that inorganic dusts in the agricultural workplace may be hazardous as well.[70-75] "Farmer's lung" (hypersensitivity pneumonitis), probably the best known respiratory disease of farmers, is generally associated with exposure to fungal spores in moldy hay. "Organic dust toxic syndrome" resembles farmer's lung disease but is distinguished primarily by the lack of reactivity to farmer's lung antigens and by bronchoalveolar lavage findings. Often the only significant objective findings are fever and an elevated leukocyte count.[59]

Agricultural workers also may have exposure to a multitude of potential respiratory toxins, including hydrogen sulfide, fumigants such as phosphide and phosgene, ammonia, oxides of nitrogen from decomposing silage, herbicides, and pesticides.[60]

Pulmonary function has been analyzed with prediction equations developed for several populations in the United States, and ethnicity may be an important predictor of lung function.[76-78] Despite the fact that Hispanics are one of the largest and most rapidly growing ethnic groups in the US, few studies have been done of their pulmonary function. Specifically, only one comprehensive study of respiratory health in migrant and seasonal farm workers in California has been undertaken so far.[79,80] This survey found that Hispanic farm workers in California had similar prevalences of smoking to other Hispanic populations. Grape workers in this study had reduced forced vital capacities, consistent with crop-specific agricultural exposures such as inorganic dusts, organic agents, and pesticides. Furthermore, the effect of agricultural work on respiratory disorders in this population was equal in magnitude to that of cigarette smoking.

Further epidemiologic investigations on farm workers should specifically attempt to identify activities or processes associated with increased respiratory tract symptoms. Physicians caring for agricultural workers should be alert for respiratory tract symptoms and attempt to familiarize themselves with the work in which their patients are involved. Work-site evaluations by industrial hygienists, although time consuming, may help clinicians assess exposures and provide insight for recommendations regarding treatment or preventive interventions. Longitudinal assessment of lung function in populations of exposed workers will be important to determine the persistence of changes in lung function, if any, and their clinical significance.

Reproductive Health Problems

Reproductive health problems have not been well studied in either men or women working in agriculture. Case reports of sterility or low sperm counts in men who worked in manufacturing the agricultural fumigant dibromochloropropane (DBCP) have been reported from California and from six southern states.[81,82] In general, there are little or no data on reproductive problems in male farm workers.

Female farm workers also are exposed to reproductive hazards, such as prolonged standing and bending when working at conveyor belts, hoeing, thinning, or harvesting, as well as to overexertion and fatigue, pesticides and other agricultural chemicals, and insufficient sanitary facilities in the fields. These exposures might have adverse effects on reproductive health, possibly resulting in menstrual cycle disorders, infertility, spontaneous abortion, premature birth, pregnancy complications, fetal malformation or growth retardation, cancer among offspring, or abnormal postnatal development of infants from exposure to chemicals transmitted in breast milk.[9]

Some studies have analyzed the association of occupational exposures and reproductive outcomes of women employed in different occupations, including agriculture,[83-85] although none of these large studies have been designed specifically to include migrant farm workers. In a Quebec study of spontaneous abortions, statistically significant excesses of stillbirth were noted in agricultural and horticultural workers compared with other women employed in different occupations (odds ratio 5.65, $P < .01$).[84] Prematurity and occupational activity of women were investigated in two separate studies.[86,87] The rate of premature births was higher among women with jobs requiring prolonged standing (7.7%) than those with sedentary (4.2%) or active jobs (2.8%).[86] Few population-based surveys have studied infant mortality rates in this population.[88-90] In a recent study conducted in migrant clinics in California, maternal occupation in agriculture was not significantly associated with the birth weight of infants born to Hispanic mothers.[91] In other California studies,[36,37] the relative risk (RR) of giving birth to a child with limb reduction defects was significantly elevated among women who resided in a county of high agricultural productivity compared with the general population in California (RR = 1.7, 95% confidence interval 1.1 to 2.7).[37]

Many questions remain unanswered regarding possible reproductive health problems among farm workers. Future investigations might be directed at risks for fetal loss, pregnancy complications, reduced fertility, and menstrual cycle dysfunction in this population and the degree to which these risks are modified by such factors as nutritional status and access to medical care.

Health Problems of Children of Farm Workers

Children of farm workers are exposed to hazards in various ways: by doing field work (children are legally allowed to work on farms with parental consent at the age of 12, and exemptions may be granted by the US Department of Labor for 10- and 11-year-olds to harvest potatoes and strawberries), by accompanying their parents to the fields and playing in or near the fields, by living adjacent to the fields where they work, and by having contact with family members wearing contaminated clothing.[9] Indirectly, the socioeconomic and migratory or seasonal status of the parents intensifies the health problems of these children.

The lack of sanitary facilities and the unsanitary, substandard housing contribute to the spread of communicable diseases. A lack of basic health care frequently results in these children not receiving the usual childhood vaccina-

tions. Furthermore, because family income levels are often below the poverty line, many farm-worker children suffer from malnutrition.[88] In 1989 a general health screening project was carried out on 1,717 children aged 1 through 12 years in McFarland, California, following the observation of a cancer cluster among children there.[92] Of the children screened, most (71%) were referred for at least one health problem, most commonly for vision problems (40% of referrals), followed closely by dental problems (37%) and anemia (24%).

Few studies have assessed the causes and rates of injury and fatal accidents in farm children.[20,93-95] In two studies an association was noted of childhood brain tumors and leukemia with pesticide exposure, although not necessarily among children of farm workers.[85,96]

Information on the children of farm workers and their health is limited. To make any concrete assessments and recommendations, it is essential to continue studying the health problems of these children, including the health effects of short- and long-term exposure to pesticides.

Other Important Occupational Health Problems

Migrant and seasonal farm workers have exposure to other hazards that may increase their risk of health problems: climate-dependent problems, such as heat stroke or cold shock,[97] and occupationally caused infections such as anthrax, ascariasis, encephalitis, leptospirosis, rabies, salmonellosis, tetanus, and coccidioidomycosis.[98] Sensory problems are common: eye problems, caused by irritation, infection, or injury from the wind, sun, dust or soil, agricultural chemicals, debris ejected from farm machinery, and allergic reactions to plants,[99] and hearing problems due to noise from farm machinery and cannery work.[100] A lack of proper sanitary facilities in the field and crowded and unsanitary living conditions are responsible for spreading many infectious diseases such as tuberculosis and other communicable diseases.[101] Urinary tract infections and kidney disorders also occur frequently, especially in women.[9]

Despite these risks, few population-based studies have been done to assess the frequency of occupational health problems in these workers.

Conclusion

Although a number of occupational health risks have been identified through studies of agricultural workers, many gaps remain in our knowledge of the level of exposures and magnitude of specific health risks. An investigation of occupational health risks in agricultural workers must also include a consideration of general health status and access to medical care of migrant and seasonal workers. Some of the usual approaches in occupational health investigations may not be possible in this population owing to the demographic, economic, cultural, and life-style realities of the study population. The migratory nature of this population precludes serious consideration of long-term cohort studies without enormous resources, but case-control and cross-sectional studies should be considered for some health effects.

The development of standardized data collection instruments for assessing health consequences and exposures will improve the ability to compare results between populations. The application of these instruments to agricultural workers must also distinguish between the usual "farmer" category and the large population of migrant and seasonal farm workers for the results to be informative.[23]

Farm workers, their employers, and their community leaders must be approached directly to address health issues in this population. In addition, rigorous survey sampling methods involving a complete enumeration of all types of households and living quarters of migrant and seasonal farm workers in different agricultural areas during the peak agricultural work seasons must be implemented in future studies of participants who accurately represent the larger population of farm workers. Furthermore, the different languages and cultural and demographic factors inherent in these workers must also be carefully addressed in any scientific investigation.

These approaches are necessary to obtain the cooperation of farm workers and their employers so that occupational exposures and protection as well as health consequences are accurately and completely ascertained. In addition, information about health effects should be obtained in a way that is not only culturally sensitive but also meaningful to study participants and yet comparable to that obtained through standardized instruments. Undertaking studies of occupational health risks in this population with these considerations will not only contribute to the understanding of such risks but can also further preventive efforts and lead to better health in this high-risk population. Effective prevention can reduce suffering and death and contribute to enhanced productivity in the workplace. In this way, both the employers and the employees gain.

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