Annu. Rev. Public Health 2003. 24:175–93
doi: 10.1146/annurev.publhealth.24.100901.140901

First published online as a Review in Advance on September 25, 2002

THE HEALTH OF U.S. HIRED FARM WORKERS

Don Villarejo
P.O. Box 381, Davis, California 95617; email: donfarm@pacbell.net

Key Words farm worker, migrant labor, occupational health and safety, Hispanic health, minority health

Abstract Despite a recent surge in knowledge about U.S. hired farm workers, little is known about the health of this population. No national data are available on the size of the population, mortality or morbidity data, or on chronic health indicators. Demographic data show that these workers are mostly Mexican immigrant or migrant males, and nearly two thirds live in poverty. At least half of all current hired farm workers are undocumented. Fewer than one in five have health insurance, either through their employer or through government programs. However, programs targeting women farm workers, such as WIC or, in California, emergency MediCal, are more effective in helping them obtain needed services. The federal Migrant Health Program serves about 13% of the total of workers plus dependent family members. This paper reviews what is known in the following topical areas: (*a*) mortality and morbidity; (*b*) access to health care services; (*c*) control of infectious diseases; (*d*) maternal and child care; (*e*) occupational health; (*f*) violence; and (*g*) chronic health indicators. It is suggested that future research incorporate a minimal physical examination of all patients or subjects in order to establish baseline information for the population. Such information will be helpful in targeting interventions and measuring their effectiveness.

INTRODUCTION

This paper is concerned with the health of hired farm workers: the health status of persons who are employed on a farm to perform tasks that directly result in the production of an agricultural commodity for sale. The broader term farm worker comprises three major subgroups who perform such tasks: farm operators (usually self-employed persons; often termed farmers), unpaid family members of farm operators, and hired farm workers.

For many decades, it has been widely recognized that hired farm workers are a population requiring special attention from the health community. This designation as a "special population" is associated with the unusual combination of higher than average occupational risk exposures as well as poorer than average health status. Indeed, the federal Migrant Health Program, initiated in 1962, sought to address some of the problems faced by workers whose primary source of income involved migrating to obtain farm employment. By 1970, the federal program had expanded its eligibility criteria to include persons whose primary source of

0163-7525/03/0505-0175$14.00

income involved seasonal farm employment, whether or not they migrated to obtain such jobs.

THE HIRED FARM WORKER POPULATION: DEMOGRAPHICS

Despite four decades of federal funding intended to assist hired farm workers, relatively little is known about this population. For example, its size, essential for quantitative epidemiology, is not known with any degree of precision. The most authoritative estimate of the number of persons employed as hired workers on U.S. farms puts the total at 2.5 million persons in 1990 (8).

The only national cross-sectional survey of hired farm workers is the National Agricultural Workers Survey (NAWS), conducted three times a year since 1988 by the U.S. Department of Labor. The NAWS is limited to workers who perform seasonal agricultural services in perishable crop agriculture: No livestock workers are included. Starting in 1999, the NAWS added an occupational health supplement. The most recently published NAWS findings are based on a large sample (N = 4199) of interviews obtained during the federal fiscal years 1997 and 1998 (45).

What is known from the NAWS is that roughly three quarters (79%) were born in Mexico or Central America and nearly two thirds (61%) live in poverty. Half earned less than $7500 per year, and one half of all farm worker families earned less than $10,000 per year. The available evidence also indicates that both wage rates and real income declined for this population during the 1990s.

Nearly nine out of ten (88%) are Hispanic. Only 1% are black or African American. Increasing in number are indigenous migrants from southern Mexico and Central America. The California Agricultural Worker Health Survey (CAWHS) found that about 8% of that state's hired farm workers were indigenous migrants (72).

Among persons who have migrated to the United States and who perform seasonal agricultural services, the NAWS estimates that at least half (52%) are working without recognition by the immigration authorities, i.e., are undocumented workers (sometimes referred to as "illegal immigrants"). Partly because such a large share lack legal immigration status, relatively few hired farm workers (17%) utilize any government-provided, needs-based services such as food stamps (10%), WIC (10%), and Medicaid (13%).

Turnover is very high among these workers. Roughly one third (32%) of the foreign-born workers had been in the United States for two years or less. In other words, fully one quarter (26%) of the labor force had been replaced in just two years. Only half (54%) of the sample said they intended to remain in farm work for at least five years or for as long as they were physically able to work.

Half are under the age of 29, and eight out of ten are male. Half (52%) are married, but nearly half of those who are married and have children (45%) were not accompanied by their family members. Median educational attainment is just

six years, most often obtained in Mexico. Only one worker in ten claims the ability to either read or speak English fluently.

The age distribution of hired farm workers shows that four fifths (79%) are between 18 and 44. No data are presently available on a national basis regarding the age distribution of family members who reside with hired farm workers in the United States. However, the CAWHS data show that in California, more than half (52%) of the combined worker and accompanying family members are under the age of 25, and more than two thirds (70%) are younger than 35.

Thus, resident hired farm worker families have a significantly larger share of children and of women of childbearing age than are found in the general population. This implies that maternal and child health care is of proportionately greater importance for U.S. hired farm workers.

Only 5% of hired workers who perform seasonal agricultural services reported having personal health insurance through their place of employment (83% said they did not have such insurance and 12% said they did not know if they were insured). About one fourth (28%) of such workers say they have workers compensation insurance coverage at their job, whereas more than half (56%) said they did not have this benefit (17% did not know of this insurance).

Estimates of migration status are difficult to make. Eligibility criteria for services by various federal programs intended to serve migrant workers are inconsistent (39), and the concept of cross-border migration, as distinct from immigration, is itself somewhat ambiguous. Nevertheless, it is estimated that about one sixth (17%) of workers performing seasonal agricultural services literally "follow-the-crop," and an additional 39% "shuttle" back and forth between a home base, most often in Mexico, and a single, specific U.S. location where they find employment.

In summary, this is a population that is characterized by low socioeconomic status, and fully half work on U.S. farms despite immigration law restrictions intended to prevent them from being hired. Clearly, barriers to accessing health care services, such as poverty, literacy, language, and culture, are substantial, both for providers and for the workers themselves. On the other hand, the fact that the population is young suggests that adverse chronic health conditions afflicting older workers are likely to be less prevalent. Moreover, the most physically able workers in a Mexican village are probably the ones who are most likely to be willing to endure the hardship associated with clandestinely crossing the most highly protected international border in the Western Hemisphere.

THE MIGRANT HEALTH PROGRAM

The federal Migrant Health Program (MHP) began in 1962 as "grants for family health clinics for domestic agricultural migratory workers" (52). The original concept of the program was based on the perception that the most vulnerable farm worker families were those who follow-the-crop seeking employment. Reports of poor health conditions among migrant workers and of the potential danger to the health of the public at large had gained attention in the previous decade. For

example, the prestigious Presidential Commission on Migratory Labor wrote, "To permit migratory workers to live under conditions now prevailing is to endanger not only the health of the migrants, but the health of the community as well" (51).

Nevertheless, there was discomfort over the fact that Mexican nationals constituted a major portion of the migratory labor force, both contract laborers and unauthorized immigrants (usually referred to as "wetbacks" at that time). At that time, in 1962, hundreds of thousands of Mexican nationals were employed on U.S. farms as foreign contract workers, and required to return to their homeland once their job had concluded. Thus, the MHP emphasized "family health clinics" to serve "domestic agricultural migratory workers," not services for Mexican contract laborers. The famous one-hour CBS News documentary "Harvest of Shame," shown on national network television on Thanksgiving Day 1960, repeatedly stressed that the workers and family members portrayed were American citizens, implying that viewers should be offended that the mistreatment of workers shown in such a dramatic and compelling fashion was affecting Americans as opposed to foreigners. Of the hour-length program, only a few seconds were of images of Mexican contract laborers.

The central notions of the MHP were that migratory families should be able to access health services that are usually available to other families in American society, and that preventive services, such as immunization and health education, would serve to remedy some of the most egregious conditions. The term migrant farm worker was used to represent both the workers themselves as well as their dependents traveling with them. Initially, little attention was given to the possibility that large numbers of migrant workers would be foreign-born and unable to read or speak English.

At the time the MHP program began, it was believed that there were three main migrant streams. An Eastern Stream, originating in Florida, brought workers successively north along the eastern seaboard states as the harvest seasons progressed, and ended in New York for the apple harvest. A Midwestern Stream brought workers from south Texas to a wide range of Great Lakes and middle-western states, such as Ohio, Michigan, Wisconsin, and Minnesota. A Western Stream brought workers from south Texas, New Mexico, and Arizona to California's San Joaquin Valley, as well as to Oregon and Washington.

By 1970, it was realized that migrant workers were not the only group of hired farm workers needing special health program services. It was argued that all seasonally employed farm workers experienced similar employment and living conditions. The MHP program was expanded to provide services to "seasonal farm workers" as well as "migrant farm workers."

In 1975, the entire program was rewritten and statutory definitions of "migratory agricultural worker" and "seasonal agricultural worker" were made explicit (52). The former refers to "an individual whose principal employment is in agriculture on a seasonal basis, who has been so employed within the last 24 months, and who establishes for the purpose of such employment a temporary place of abode," and the second type refers to "an individual whose principal employment in agriculture on a seasonal basis and who is not a migratory agricultural worker." The new statute made no reference to "domestic" farm workers.

At the same time, and independently, a new Community Health Center (CHC) program was created with the explicit goal of providing health services in "medically underserved" areas. The notion was that local service providers would take on the burden of providing services, with federal funding, that would otherwise not be available. The MHP was the model upon which the much more ambitious CHC program was to be based. The CHC was founded with the intention of capitalizing on the legitimacy and success of the MHP.

Funding for the MHP was through grants to locally based, nonprofit organizations that operated clinics and other facilities. In 1970, some $14 million was appropriated for this purpose. By 1990, funding had reached $48.5 million and about 102 grantees received MHP financial support. In 2001, 124 MHP grantees received $91 million (G. Ersek, personal communication). Although in nominal terms there has been substantial growth in funding levels, taking account of the Consumer Price Index for medical services leads to the opposite conclusion. For example, $14 million in 1970 dollars is equivalent to $112 million in 2001 dollars. From this perspective, the current level of MHP funding represents a 19% decrease in the level of services supported as compared with the 1970 level.

More problematic than the decline in funding in constant dollars was a fundamental change introduced in the 1996 reauthorization of the MHP program. The MHP program was absorbed within the very much larger CHC program and is no longer a separate line item in the federal budget. Since most MHP grantees were also CHC grantees, the administrative simplicity of this move was already attractive.

Although the MHP program still exists, and grantees receive support in the same manner as before, the unique status that the health of hired farm workers once enjoyed as a separate line item in the federal budget is now gone. Even the budget of the MHP cannot be determined today with the same degree of accuracy that was possible in the past.

The most authoritative history of the MHP program presented a strong case that the special status of hired farm worker health in federal policy would be jeopardized if the MHP were absorbed within other federal health programs (32). According to this source, Congress had always resisted such a move, and among relevant congressional committee members, there was "unanimous agreement that the (federal migrant health) program had been successful, and this success could be attributed to the program's separate identity that could be jeopardized by a merger with other programs."

MEASURING THE HEALTH STATUS OF U.S. HIRED FARM WORKERS

A review of the literature on the health status of U.S. hired farm workers demonstrates a very substantial increase in the volume of research on this topic within the past decade as compared with pre-1990 levels. In 1990, a review of the literature found that during the period 1966 through October 1989, Medline had 152

references explicitly related to migrant families and another 51 to the health of agricultural workers or farmers (58). The current review finds 423 Medline listings for the period 1990 through June 2002 that refer to the health of hired farm workers, irrespective of migrant status. Since 1997, there are 198 Medline listings, nearly as many as the entire 1966–October 1989 search yielded. Other sources, including a second literature review (65), the Melvyl catalog of the University of California library system, and the libraries of the California Institute for Rural Studies and the National Center for Farmworker Health, provided additional citations explicitly addressing hired farm worker health issues. It is useful to organize the present review according to the following major topics: (*a*) mortality and morbidity; (*b*) access to health care services; (*c*) control of infectious diseases; (*d*) maternal and child health; (*e*) occupational health; (*f*) violence; and (*g*) health indicators. These topical categories, modified somewhat, follow the discussions of the health status of migrant workers throughout the world (62).

However, there is no report anywhere in the literature, at any time, of a national, cross-sectional assessment of the health status of U.S. hired farm workers. By this we mean assessments that include a reasonably comprehensive physical examination as well as self-reported data. The reasons most often cited for the lack of such a health assessment are the difficulty of accessing this population as well as the transient nature of both jobs and workers. Clearly, epidemiological research is severely hampered by the absence of both reliable denominator data as well as cross-sectional assessments of health status.

There has, however, been some significant progress in cross-sectional health status studies that include a physical examination at the level of individual states. The most comprehensive was the CAWHS undertaken in California.

MORTALITY AND MORBIDITY

There are no reports in the literature of mortality and morbidity for the population of U.S. hired farm workers. However, one report summarizes proportionate mortality findings obtained by reviewing death certificates of 24 states for the period 1984–1993 that identified the occupation of the deceased as farm worker or farmer (20). For those cases identified as farm worker, there was significantly elevated proportionate mortality from injuries, tuberculosis, mental disorders, cerebrovascular disease, respiratory diseases, ulcers, hypertension, and cirrhosis. In contrast, there was significantly reduced mortality from infectious diseases (other than tuberculosis), endocrine disorders, nervous system diseases, pneumoconioses, arteriosclerotic heart disease, and all cancers combined.

A major problem in developing reliable mortality and morbidity data for this population is that an unknown, but presumably large, share of Mexican-born hired farm workers return to their homeland at the conclusion of their working life in the United States. Also, many workers seek health care services in Mexico and even their public health reportable conditions may not be detected and reported in

the United States. An important binational health survey (BHS), based in a series of villages in the Mexican state of Zacatecas, provides, for the first time, some insight into the life of "returnees" and their health (47).

ACCESS TO HEALTH CARE SERVICES

The available evidence, limited as it is, convincingly demonstrates that only a very small portion of hired farm workers, in the range of 5% to 11% of the total, have health insurance provided through their employer. Equally disturbing is evidence that only a few, between 7% to 11%, have been able to obtain Medicaid or other government-provided, needs-based, health insurance coverage, despite the fact that their poverty status would otherwise qualify them. An obvious barrier to accessing the latter type of health insurance is the fact that so many are undocumented immigrants.

Most farm workers appear to access health care services only when absolutely necessary. The CAWHS found that nearly one third (31%) of male workers interviewed had never visited a medical clinic or doctor. And only half (48%) had been to medical clinic or doctor within the previous two years.

Utilization of dental services and vision care services is much lower. Studies throughout the nation uniformly report poor dentition among hired farm workers. The CAWHS found that half of the men (50%) and two fifths of the women (44%) interviewed had never been to a dentist. The dental screening performed on these persons confirmed that two thirds had one or more adverse dental conditions: untreated caries, missing or broken teeth, or periodontal disease.

Vision care is even less frequent. The CAWHS found that more than two thirds of all subjects had never had an eye care visit. The important and recently formed Farmworker Eye Network seeks to address both occupational eye injuries and illnesses as well as the lack of eye care in this population.

Many hired farm workers only seek care when it is absolutely essential, visiting hospital emergency rooms or community clinics. The most common form of payment for health care visits, hired farm workers say, is out-of-pocket. Lack of health insurance protection discourages many workers from utilizing the U.S. health care system. A study of occupational injuries among randomly selected hired farm workers in North Carolina found that among the more seriously hurt, many did not receive prompt care or never received care (14).

The great importance of cost, even for minor examinations, may not be fully appreciated by the wider community. A pilot mammography screening program in the state of Washington suggested that the main barrier to the use of this service by hired farm worker women was simply cost (64). This hypothesis was tested by offering the women a voucher covering the full cost. The important result was that 88% of women with vouchers obtained a screening within 30 days, but only 17% of those without vouchers did so.

The CAWHS found that one fifth (18%) of those who sought medical care went to Mexico to obtain those services. Both employer and labor unions now provide

support for U.S. farm workers who choose to utilize the Mexican health care system. In the case of the Western Growers Association, the largest agricultural employer organization providing health insurance services for farm workers, no copayment is charged if the worker goes to Mexico to obtain care, providing an additional financial incentive.

When asked why they sought health care services in Mexico, most responded that the absence of language and cultural barriers was decisive. Few U.S. providers are fully fluent in the Latin American vernacular of Spanish, let alone knowledgeable about Mexican cultural views of health, and many must rely upon interpreters to assist in treating hired farm worker patients.

One factor relating to health among Mexican immigrants that deserves special attention is the widespread belief that injections of vitamins and antibiotics, often performed at low cost by lay persons, is conducive to good health and superior to what is available in conventional medical care in the United States (44). Some workers deliberately seek care in Mexico because they can obtain injections that they believe they need. As McVea points out, in the age of AIDS, this may be a risky behavior, and some workers have modified their use of injections as a result of HIV/AIDS health education.

Accurate data on the proportion of eligible hired farm workers and dependents served by the MHP are not available. CDC estimated that 13% are served by or have access to care from federally funded migrant clinics (10). The Migrant Clinician Network frankly states, "The 136 migrant health centers currently serve only 12 to 15 percent of the total migrant farmworker population .... The majority of farmworkers receive care on an emergency basis only, from health departments, from local providers, or not at all" (http://www.migrantclinician.org).

Physician retention is a serious on-going problem for CHC-MHP health centers. Inasmuch as the centers are operated by nonprofit organizations that seek to provide services for poor people, staffing often relies upon physicians from the National Health Service Corps. One study of primary physician tenure at CHC-MHP health centers found that the median tenure was just three years (63). Obviously, if physician recruitment and retention is a serious problem, the imposition of language or cultural familiarity requirements during recruitment are out of the question.

MHP and CHC clinics play a vital role in rural communities where hired farm workers comprise a plurality of the labor force. Nevertheless, one study of such communities in California found that one fifth of them did not have a single primary care physician, and they had more than 3000 persons per primary care physicians (70). In contrast, the corresponding figure for all urban areas of the state was 1000 persons per primary care physician. The same study found that the Index of Medically Underserved (IMU), a federally defined index used to determine possible eligibility for health service funds, averaged 61.1 in the hired farm worker communities versus 83.4 in all urban areas of the state. An IMU figure below 62 is the trigger for eligibility for possible official designation as "medically underserved." A study of the methodology used by federal agencies points out that changes being discussed in regulations for designating Medically Underserved Population would especially adversely affect rural communities (29).

In summary, the literature demonstrates that hired farm workers remain an underserved population. Lacking health insurance, and in some cases residing in communities lacking health care providers, many hired farm workers find that the CHC-MHP health agencies are often the only link to needed medical care. Of the five hired farm worker communities that the CAWHS randomly selected throughout the state, only one (Vista) had a CHC-MHP clinic. The desert community of Mecca was purposefully selected for inclusion in the CAWHS in order that at least one MHP clinic be represented among the seven communities where the study was conducted.

Several papers describe model programs to bring services directly to labor camps and other isolated, rural communities lacking services. One report identified ten types of unmet needs and proposed a mobile program to reach workers (23). Another describes the success of using a mobile clinic, staffed with family nurse practitioners, registered nurses, and other health care workers (68).

Another innovation is the development of bi-national (Mexico-United States) patient tracking (69). Since so many migrant workers seek medical care in Mexico, even while working in the United States, and many others return to their home villages each year, bi-national tracking has become essential.

THE CONTROL OF INFECTIOUS DISEASES

Dozens of reports in the literature confirm a higher than average prevalence of several infectious diseases among hired farm workers. In what follows, only health screenings that included a physical examination for at least 100 subjects, or confirmed case reports for a cluster of at least 10 cases are discussed.

Two studies report a high prevalence of parasitic infections, both in southeastern states. In Georgia, a prevalence of 11% of intestinal parasites was found among hired farm workers (3). In North Carolina, 9.5% of randomly selected residents of farm labor camps had parasitic infections (17). A companion study of drinking water in North Carolina labor camps found total and fecal coliform levels of 44% and 28%, respectively, but none had detectable levels in advance of occupancy (16). The authors suggest that water testing be conducted regularly during peak occupancy rather than just prior to the arrival of worker residents.

Importantly, tuberculosis is reported among hired farm workers at a rate six times higher than in the general working-age population, and federal health authorities issued a series of recommended actions by public health officials (11). The Center for Disease Control also reported a substantial screening program for tuberculosis conducted in Florida farm labor camps (10).

A national review of reported cases of active tuberculosis during the period 1993–1997 found that migrant farm workers were a high-risk group for contracting this disease, but that most cases were in California, Florida, and Texas (61). In stressing the need for improved epidemiological intelligence in light of "... an unprecedented upturn in tuberculosis morbidity and outbreaks of difficult-to-treat and highly lethal multi-drug-resistant tuberculosis ...," public health officials have

agreed to include information about the migrant farm worker status of individuals who are diagnosed with active tuberculosis (6). As previously discussed, in a proportionate study of mortality, farm workers had an elevated share of deaths from tuberculosis.

Several reports of local, community-based surveys show that positive PPD test results are quite common among hired farm workers who have been tested, in the range of one third or greater in North Carolina and Georgia (4, 15), one fourth (28%) in Indiana (28), to one sixth (17%) in California (43). Follow-up work in the North Carolina study for the 46 persons who initially exhibited negative PPD results showed that 2 had contracted active tuberculosis and 14 were PPD positive (19). High levels of positive PPD cases have been found in other studies as well: 44% in a sample in which 5% were also HIV-positive (74), suggesting that reduced immunity is an important factor in the increased prevalence of tuberculosis; and 30% in a sample of migrant farm workers who were recruited to participate in a health education program (53).

HIV infection and AIDS are another health concern in this population because a substantial share of hired farm workers may engage in some high-risk behaviors (1, 7, 77). By 1993, it was clear that migrant and seasonal farm workers in some southeastern states constituted a group at higher than average risk of acquiring HIV (5). An important review paper cautions that information on HIV prevalence is exceedingly difficult to obtain in this population, but it does present a summary of the limited number of screening studies (49). According to this source, the reported prevalence of HIV ranged from 13% in a small sample of black migrant workers in South Carolina to 5% among black and Latino farm workers in Belle Glade, Florida, at peak season. Belle Glade, Florida, was discovered to be an epicenter for the HIV epidemic among black migrant farm workers.

By contrast, the same article cites two reports of small groups of self-selected male, Mexican farm worker subjects in California in which 0% prevalence was found. A very recent communication indicates that HIV prevalence is no different among hired farm workers than in the general population (E. Hendrikson, personal communication). Wives of U.S. hired farm workers who remain in Mexico have become informed about HIV and are cognizant of risk behaviors associated with transmission (59).

The prevalence of other sexually transmitted diseases in this population is also not known. For example, there are only a few studies of the prevalence of syphilis, again only based on local or statewide samples. In a two-county area in South Carolina, a prevalence of 16% was reported (33). The CDC reported on screening for syphilis in Immokalee, Florida (10). Finally, the CAWHS sample in California found a prevalence of 0.9% (D. Villarejo, unpublished data). The CAWHS screened for chlamydia (CT) and gonorrhea (GC), finding 1.7% CT positive and 0% GC positive among male workers (7). Among female workers, CAWHS finds 0% positives for both CT and GC.

Other reported instances of infectious diseases involving hired farm workers are scattered through the literature. A rubella outbreak in North Carolina among adult

migrant workers from Mexico was mostly concentrated among persons working in industrial settings (54). A single report of screening for cysticercosis found a prevalence of 10% in migrant farm workers, again in rural North Carolina (18). Several reports of malaria cases in the hired farm worker population should be noted inasmuch as this disease was thought to have been eradicated in the United States. One outbreak was reported in San Diego County, California (9, 38). In North Carolina, 4% of a random sample of hired farm workers had evidence of plasmodia species, and one case of malaria was confirmed (18).

MATERNAL AND CHILD HEALTH

Provision of health care for pregnant women and young children is an integral part of the CHC-MHP programs as well as of state and federal agencies. Despite controversies about serving undocumented workers, the California version of Medicaid, known as MediCal, enrolls pregnant women of undocumented status and pays for needed services through the fourth month following delivery. The effectiveness of this program was confirmed in the CAWHS: No difference was found between citizen, legal resident, and undocumented immigrant women in the fraction reporting a recent visit to a physician or medical clinic. About two thirds in each category said they had such a visit within the previous two years (73).

A review of maternal health care services to migrant farm worker women, supported by WIC and the Pregnancy Nutrition Surveillance System, examined prenatal care, weight gain during pregnancy, and birth outcomes (12). National goals for the year 2000 were not being met.

Proposals for improvements in serving the maternal health care needs among migrant farm workers stress the need to increase the use of cultural brokers for overcoming cultural and linguistic barriers (36). Additionally, nurses in North Carolina felt isolated from their Spanish-speaking patients and suggested that their agencies sponsor in-service instruction in the Spanish language to help address this problem (50).

A review paper on the children of migrant farm workers points out that many children are employed along with their parents (78). Thus, these children face both occupational health risks as well as challenges to obtaining routine child health care services.

Some Mexican immigrant women of indigenous origin find nearly insuperable barriers to accessing health care while in the United States (2). Not only is language a problem since many of these women speak an indigenous dialect, not Spanish, but cultural understandings of health and proper health behaviors are vastly different as well. As the numbers of indigenous migrants increases, and as they find jobs across the United States, this will present a new and quite difficult challenge to a health care system that has already been jarred in trying to accommodate patients who do not speak English: Many Mexican indigenous cultures do not have a written language.

A comprehensive health screening among nearly all (92%+) of the children of the city of McFarland, a predominately farm worker community in California's San Joaquin Valley, found that over two thirds of the children (70%) required a medical referral (25). In a follow-up paper, a multivariate analysis demonstrated that the lack of attention to the children's health was positively associated with poverty status, with lack of health insurance, and with lack of a regular physician (66).

Innovative efforts to provide needed services for children, such as employing outreach workers or bringing services directly to their homes, have been described in the literature (30, 75). Nevertheless, the highly touted programs to provide health insurance to all uninsured children have provided relatively little benefit to the families of hired farm workers (22).

Studies of the health status of the children of hired farm workers include findings of late immunization in South Carolina (37), a substantial fraction in Florida who were positive for anti-Hepatitis A virus (24), a large segment of children with psychiatric disorders (34, 41), significant evidence of child abuse and neglect (35), iron deficiency (55), and large numbers of children with untreated dental caries (48).

Recently, possible exposure of the children of hired farm workers to pesticide residues in the home has been carefully examined. Results demonstrate the presence in the homes of hired farm workers and of farmers of detectable levels of the restricted materials chlorpyrifos and parathion in the state of Washington (27), and of azinphos-methyl in the Oregon (42). It is not known whether long-term exposures of children to these materials in their residences will lead to adverse health outcomes.

In summary, these findings suggest that although substantial programs have been initiated to enroll hired farm worker families in needs-based services, poverty-related factors, most simply cost, is still a significant barrier to obtaining needed services.

OCCUPATIONAL HEALTH

Villarejo & Baron reviewed the occupational health of U.S. hired farm workers (71). This article also summarizes the report of an ad hoc task force, convened by the National Institute for Occupational Safety and Health to address this subject. The task force recommended priorities for substantial new research into the disorders endemic in this population: musculoskeletal disorders, pesticide-related conditions, traumatic injuries, respiratory conditions, dermatitis, infectious diseases, cancer, eye conditions, and mental health.

Recently, a special issue of the *American Journal of Industrial Medicine* was devoted exclusively to reports on cancer research in this population (79). One paper discussed the findings of an attempt to match persons listed in the California Cancer Registry against the 140,000 persons who are or were members of the United Farm Workers of America, AFL-CIO (46). This paper sought to find a link between workplace exposures in farm jobs and the prevalence of various types of cancers. A higher prevalence was found for some types of cancers, but lower

prevalence was found for other types. However, lack of quantitative exposure data hampered the analysis.

Mass poisoning of hired farm workers continues to occur. One of the most serious incidents over the past decade was described by the Centers for Disease Control and Prevention (13). In that accident, 34 workers had a lengthy exposure in a field that had recently been treated with carbofuran, a cholinesterase-inhibiting carbamate pesticide. The field had not been posted with warning signs; posting is required by California law.

A review article examining pesticide illnesses and injuries among California's hired farm workers found that skin disorders dominate the illnesses, although eye and systemic effects are also common (21). These authors find that the MHP system is underutilized, suggesting that significant barriers to health care access still exist.

Mexican farm workers who had returned to their home villages after ending their work experience in U.S. agriculture report a wide range of symptoms that they attribute to their workplace exposures: musculoskeletal pain afflicted 42% (47). Dermatitis and respiratory illnesses ranked among the most frequently reported. Chronic diseases, such as diabetes, were also found in significant prevalence. Half of those workers, despite their long presence working in the United States, preferred the Mexican health care system to the U.S. system. This report is the only one in the literature to recognize that large numbers of former U.S. farm workers, including those too ill to continue working, return to their home villages where their families provide care.

Lung disease in farm workers has now been linked to the industrialization of farming, animal raising, and forestry (26). Exposure to hazardous agents is virtually universal: organic dust, allergens, chemicals, particulate matter, and toxic gases.

VIOLENCE

Domestic violence is a health problem for this population. Barriers of language, culture, and poverty make it difficult for many health care professionals to recognize abuse and provide care for battered farm worker women (56). Nevertheless, it is increasingly clear that there is a serious problem in the farm worker community that needs additional attention: family violence.

An important factor in bringing this problem out of the shadows has been the emergence of women farm worker leaders, sometimes spouses of abusive men, who have decided to directly confront the issue. The relatively new organization *Lideras Campesinas* has been at the forefront in California, raising serious questions about how to address the problem (67). Battered farm worker women have found strength in collective support as they seek to remedy the violence they face in their homes (57). Another report in the literature examined abuse of children (35).

The effect on children of family and nonfamily violence has also been studied (40). A positive association was found between exposure to violence and various emotional and behavioral problems, including weapon carrying.

CHRONIC HEALTH CONDITIONS

In striking contrast to the relatively large number of reports on infectious diseases or maternal and child health care, there are only a very few reports on the chronic health indicators in this population. No national reports on obesity, hypertension, cholesterol, or related health conditions among hired farm workers could be found. However, diabetes is identified by the Migrant Clinicians Network as "... a leading chronic health condition among patients served by migrant/community health centers" (http://www.migrantclinician.org).

The CAWHS appears to have been the first statewide, population-based health needs assessment to report on chronic health conditions among hired farm workers. In California, obesity was found, in all age cohorts, to be in higher prevalence among hired farm workers than among Mexican Americans, the general population, or Mexicans residing in their own country. High serum cholesterol was also found, in all age cohorts, in higher prevalence among hired farm workers than among the first two comparison groups. The CAWHS also found that an elevated prevalence of obesity and high serum cholesterol did not occur, in all age cohorts, among recently arrived immigrants from Mexico (73), possibly owing to a healthy migrant effect.

There is some evidence that the diet of Mexican migrant farm workers deteriorates in the first several years after coming to the United States to work, possibly a factor in the observation of the deterioration of chronic health indicators. In a cohort study in California, nutritional content was found to decline markedly among the diet of these immigrants during their first year in the United States (31).

A study in Indiana of respiratory disease found elevated levels of chronic respiratory symptoms (coughs, wheezing, sputum production) in hired farm workers (28). Studies of occupational health among hired farm workers indicate that respiratory disease is associated with workplace exposures (60).

The fact that cirrhosis is a leading cause of death among a large sample of hired farm workers indicates that substance abuse, notably alcohol consumption, is also a serious problem in this population. A recent review demonstrates that substantial new initiatives are needed in this area as well (76).

CONCLUSIONS

Substantial research in recent years has yielded important findings about hired farm workers, yet the health of this population is not well understood. What is clear is that poverty status, lack of health insurance, and cultural and language barriers prevent a very large share of these workers from obtaining the health care services they need. Whether it is delayed immunization among children, undetected and untreated infectious diseases, untreated dental problems, or adverse chronic health indicators, too many workers simply do without care until the problem becomes too acute to ignore.

At the same time, many investigators appear to have found it too difficult to administer a minimal physical examination and rely heavily only on self-reported data. Since nearly nine out of ten hired farm workers are Hispanic, and nearly all of these Mexican or Mexican American, there is an apparent assumption that studies of the health of Hispanic residents of the United States will provide needed information about hired farm workers. But this assumption has yet to be tested. After all, only relatively small numbers among the Hispanic population are hired farm workers. The CAWHS and the BHS show major differences between the health status of hired farm workers and that of Hispanic residents of the United States, most obviously in chronic health indicators.

Therefore, future health studies in this population should include a minimal physical examination as an essential feature of the work, no matter how difficult this may prove to implement. Only by systematically monitoring health status using proven measurement methods will it be possible to accurately assess progress or the real effectiveness of interventions.

In addition, the NAWS, the BHS, and the CAWHS have all shown that it is possible to access even the most difficult-to-reach members of this labor force. It is now therefore within the grasp of the research community to conduct substantial prospective studies of farm worker health that spans years and crosses borders.

Finally, enough data are now available to demonstrate that the Migrant Health Program, vital and essential though it is in many communities, is only a stopgap measure. Until and unless the major barriers to health care access in this population are directly addressed, and sufficient funding is provided, too many workers, their spouses, and their children will continue to have difficulty accessing care.

USEFUL CONTACTS FOR ADDITIONAL INFORMATION

Migrant Clinicians Network, http://www.migrantclinician.org; National Institute for Occupational Safety and Health, Agriculture Programs, http://www.cdc.gov/niosh/topics/agriculture/default.html; National Center for Farmworker Health, http://www.ncfh.org; Farmworker Eye Network, http://www.fenet.org. For a more complete literature review used in the preparation of this article, see http://www.DonVillarejo.com.

LITERATURE CITED

1. Aversa SL, McCoy HV, Crandall LA. 1999. Crack users' intentions to use condoms with different partner types. *Popul. Res. Policy Rev.* 18(1–2):137–53
2. Bade B. 1993. *Problems Surrounding Health Care Utilization for Mixtec Migrant Farmworker Families in Madera, California.* Davis, CA: Calif. Inst. Rural Stud.
3. Bechtel GA. 1998. Parasitic infections

among migrant farm families. *J. Community Health Nurs.* 15(1):1–7
4. Bechtel GA, Shepherd MA, Rogers PW. 1995. Family, culture, and health practices among migrant farmworkers. *J. Community Health Nurs.* 12(1):15–22
5. Berry DE. 1993. The emerging epidemiology of rural AIDS. *J. Rural Health* 9(4): 293–304
6. Bloch AB, Onorato IM, Ihle WW, Hadler JL, Hayden CH, Snider DE Jr. 1996. TB surveillance: the need for epidemic intelligence. *Public Health Rep.* 111(1):26–31, discussion 32–33
7. Brammeier M, Gould G, Miller J, Chow J, Bolan G, Lighthall D. 2002. *Sexually Transmitted Disease Risk Behaviors Among California Agricultural Workers: Results From A Population-Based Survey.* Sacramento, CA: Calif. Dep. Health Serv.
8. Comm. Agric. Workers. 1992. *Report of the Commission on Agricultural Workers.* Comm. Agric. Workers, Washington, DC
9. Cent. Disease Control. 1990. Transmission of *Plasmodium vivax* malaria—San Diego County, California, 1988 and 1989. *MMWR* 39(6):91–94
10. Cent. Disease Control. 1992. HIV infection, syphilis, and tuberculosis screening among migrant farm workers–Florida, 1992. *MMWR* 41(39):723–25
11. Cent. Disease Control. 1992. Prevention and control of tuberculosis in migrant farm workers. Recommendations of the Advisory Council for the Elimination of Tuberculosis. *MMWR Recomm. Rep.* 41(RR-10):1–15
12. Cent. Disease Control Prevent. 1997. Pregnancy-related behaviors among migrant farm workers—four states, 1989–1993. *MMWR* 46(13):283–86
13. Centers for Disease Control and Prevention. 1999. Farm worker illness following exposure to carbofuran and other pesticides—Fresno County California, 1998. *MMWR* 48(6):113–16
14. Ciesielski S, Hall SP, Sweeney M. 1991. Occupational injuries among North Carolina migrant farmworkers. *Am. J. Public Health* 81(7):926–27
15. Ciesielski SD, Seed JR, Esposito DH, Hunter N. 1991. The epidemiology of tuberculosis among North Carolina migrant farm workers. *JAMA* 265(13):1715–19
16. Ciesielski S, Handzel T, Sobsey M. 1991. The microbiologic quality of drinking water in North Carolina migrant labor camps. *Am. J. Public Health* 81(6):762–64
17. Ciesielski SD, Seed JR, Ortiz JC, Metts J. 1992. Intestinal parasites among North Carolina migrant farmworkers. *Am. J. Public Health* 82(9):1258–62
18. Ciesielski S, Seed JR, Estrada J, Wrenn E. 1993. The seroprevalence of cysticercosis, malaria, and *Trypanosoma cruzi* among North Carolina migrant farmworkers. *Public Health Rep.* 108(6):736–41
19. Ciesielski S, Esposito D, Protiva J, Piehl M. 1994. The incidence of tuberculosis among North Carolina migrant farmworkers, 1991. *Am. J. Public Health* 84(11):1836–38
20. Colt JS, Stallones L, Cameron LL, Dosemeci M, Zahm SH. 2001. Proportionate mortality among US migrant and seasonal farmworkers in twenty-four states. *Am. J. Ind. Med.* 40(5):604–11
21. Das R, Steege A, Baron S, Beckman J, Harrison R. 2001. Pesticide-related illness among migrant farm workers in the United States. *Int. J. Occup. Environ. Health* 7(4):303–12
22. Davidoff AJ, Garrett B. 2001. Determinants of public and private insurance enrollment among Medicaid-eligible children. *Med. Care* 39(6):523–35
23. Decker SD, Knight L. 1990. Functional health pattern assessment: a seasonal migrant farmworker community. *J. Community Health Nurs.* 7(3):141–51
24. Dentinger CM, Heinrich NL, Bell BP, Fox LM, Katz DJ, et al. 2001. A prevalence study of hepatitis A virus infection in a migrant community: Is hepatitis A vaccine indicated? *J. Pediatr.* 138(5):(5):705–9
25. Dep. Health Serv. 1992. *McFarland Child*

Health Screening Project, 1989. Draft Rep. Calif. Dep. Health Serv., Emeryville, CA
26. do Pico GA. 1996. Lung (agricultural/rural). *Otolaryngol. Head Neck Surg.* 114 (2):212–16
27. Fenske RA, Lu C, Barr D, Needham L. 2002. Children's exposure to chlorpyrifos and parathion in an agricultural community in central Washington State. *Environ. Health Perspect.* 110(5):549–53
28. Garcia JG, Matheny Dresser KS, Zerr AD. 1996. Respiratory health of Hispanic migrant farm workers in Indiana. *Am. J. Ind. Med.* 29(1):23–32
29. Goldsmith LJ, Ricketts TC. 1999. Proposed changes to designations of medically underserved populations and health professional shortage areas: effects on rural areas. *J. Rural Health* 15(1):44–54
30. Gwyther ME, Jenkins M. 1998. Migrant farmworker children: health status, barriers to care, and nursing innovations in health care delivery. *J. Pediatr. Health Care* 12(2):60–66
31. Ikeda J. 1990. *Food Habits of Farmworker Families. Tulare County. California. 1989*. Visalia, CA: Univ. Calif. Coop. Ext. Serv.
32. Johnston HL. 1985. *Health for the Nation's Harvesters: A History of the Migrant Health Program in its Economic and Social Setting*. Washington, DC: Natl. Migr. Worker Counc., Inc.
33. Jones JL, Rion P, Hollis S, Longshore S, Leverette WB, Ziff L. 1991. HIV-related characteristics of migrant workers in rural South Carolina. *South. Med. J.* 84(9):1088–90
34. Kupersmidt JB, Martin SL. 1997. Mental health problems of children of migrant and seasonal farm workers: a pilot study. *J. Am. Acad. Child Adolesc. Psychiatry* 36(2):224–32
35. Larson OW 3rd, Doris J, Alvarez WF. 1990. Migrants and maltreatment: comparative evidence from central register data. *Child Abuse Negl.* 14(3):375–85
36. Larson K, McGuire J, Watkins E, Mountain K. 1992. Maternal care coordination for migrant farmworker women: program structure and evaluation of effects on use of prenatal care and birth outcome. *J. Rural Health* 8(2):128–33
37. Lee CV, McDermott SW, Elliott C. 1990. The delayed immunization of children of migrant farm workers in South Carolina. *Public Health Rep.* 105(3):317–20
38. Maldonado YA, Nahlen BL, Roberto RR, Ginsberg M, Orellana E, et al. 1990. Transmission of *Plasmodium vivax* malaria in San Diego County, California, 1986. *Am. J. Trop. Med. Hyg.* 42(1):3–9
39. Martin PL, Martin, D. 1994. *The Endless Quest: Helping America's Farmworkers*. Boulder, CO: Westview
40. Martin SL, Gordon TE, Kupersmidt JB. 1995. Survey of exposure to violence among the children of migrant and seasonal farm workers. *Public Health Rep.* 110(3): 268–76
41. Martin SL, Kupersmidt JB, Harter KS. 1996. Children of farm laborers: utilization of services for mental health problems. *Community Ment. Health J.* 32(4):327–40
42. McCauley LA, Lasarev MR, Higgins G, Rothlein J, Muniz J, et al. 2001. Work characteristics and pesticide exposures among migrant agricultural families: a community-based research approach. *Environ. Health Perspect.* 109(5):533–38
43. McCurdy SA, Arretz DS, Bates RO. 1997. Tuberculin reactivity among California Hispanic migrant farm workers. *Am. J. Ind. Med.* 32(6):600–5
44. McVea KL. 1997. Lay injection practices among migrant farmworkers in the age of AIDS: evolution of a biomedical folk practice. *Soc. Sci. Med.* 45(1):91–98
45. Mehta K, Gabbard SM, Barrat V, Lewis M, Carroll D, Mines R. 2000. *Findings from the National Agricultural Workers Survey (NAWS) 1997–1998: A Demographic and Employment Profile of United States Farmworkers*. Washington, DC: U.S. Dep. Labor, Off. Assist. Sec. Policy, Off. Program Econ.

46. Mills PK, Kwong S. 2001. Cancer incidence in the United Farmworkers of America (UFW), 1987–1997. *Am. J. Ind. Med.* 40(5):596–603
47. Mines RA, Mullenax N, Saca L. 2001. *The Binational Health Survey: An In-Depth Study of Farmworker Health in Mexico and the United States*. Davis, CA: Calif. Inst. Rural Stud.
48. Nurko C, Aponte-Merced L, Bradley EL, Fox L. 1998. Dental caries prevalence and dental health care of Mexican-American workers' children. *ASDC J. Dent. Child* 65(1):65–72
49. Organista KC, Organista PB. 1997. Migrant laborers and AIDS in the United States: a review of the literature. *AIDS Educ. Prev.* 9(1):83–93
50. Padgett R, Barrus AG. 1992. Registered nurses' perceptions of their communication with Spanish-speaking migrant farmworkers in North Carolina: an exploratory study. *Public Health Nurs.* 9(3):193–99
51. Pres. Comm. Migr. Labor. 1951. *Migratory Labor in American Agriculture*. Washington, DC: U.S. GPO
52. Public Law 87-692. 1962. Public Health Service Act. CFR 42, Chapter 1, Part 56
53. Poss JE. 2000. Factors associated with participation by Mexican migrant farmworkers in a tuberculosis screening program. *Nurs. Res.* 49(1):20–28
54. Rangel MC, Sales RM, Valeriano EN. 1999. Rubella outbreaks among Hispanics in North Carolina: lessons learned from a field investigation. *Ethn. Dis.* 9(2):230–36
55. Ratcliffe SD, Lee J, Lutz LJ, Woolley FR, Baxter S, et al. 1989. Lead toxicity and iron deficiency in Utah migrant children. *Am. J. Public Health* 79(5):631–33
56. Rodriguez R. 1993. Violence in transience: nursing care of battered migrant women. *AWHONNS Clin. Issues Perinat. Womens Health Nurs.* 4(3):437–40
57. Rodriguez R. 1999. The power of the collective: battered migrant farmworker women creating safe spaces. *Health Care Women Int.* 20(4):417–26
58. Rust GS. 1990. Health status of migrant farmworkers: a literature review and commentary. *Am. J. Public Health* 80(10): 1213–17
59. Salgado de Snyder VN, Diaz Perez M, Maldonado M. 1996. AIDS: risk behaviors among rural Mexican women married to migrant workers in the United States. *AIDS Educ. Prev.* 8(2):134–42
60. Schenker MB. 1996. Preventive medicine and health promotion are overdue in the agricultural workplace. *J. Public Health Policy* 17(3):275–305
61. Schulte JM, Valway SE, McCray E, Onorato IM. 2001. Tuberculosis cases reported among migrant farm workers in the United States, 1993–97. *J. Health Care Poor Underserved* 12(3):311–22
62. Siem H. 1997. Migration and health—the international perspective. *Schweiz. Rundsch. Med. Prax.* 86(19):788–93
63. Singer JD, Davidson SM, Graham S, Davidson HS. 1998. Physician retention in community and migrant health centers: Who stays and for how long? *Med. Care* 36(8):1198–213
64. Skaer TL, Robison LM, Sclar DA, Harding GH. 1996. Financial incentive and the use of mammography among Hispanic migrants to the United States. *Health Care Women Int.* 17(4):281–91
65. Slesinger DP. 1992. Health status and needs of migrant farm workers in the United States: a literature review. *J. Rural Health* 8(3):227–34
66. Smith MW, Kreutzer RA, Goldman L, Casey-Paal A, Kizer KW. 1996. How economic demand influences access to medical care for rural Hispanic children. *Med. Care* 34(11):1135–48
67. Stanley E. 1993. Female farmworkers raise issues. *El Sol del Valle* (*Fresno Bee*). Fresno, CA
68. Stein LM. 1993. Health care delivery to farmworkers in the Southwest: an innovative nursing clinic. *J. Am. Acad. Nurse Pract.* 5(3):119–24
69. Velasco-Mondragon HE, Martin J,

Chacon-Sosa F. 2000. Technology evaluation of a USA-Mexico health information system for epidemiological surveillance of Mexican migrant workers. *Rev. Panam. Salud Publica* 7(3):185–92

70. Villarejo D. 1999. *Health Care Among California's Hired Farm Farmworkers. Expansion of Health Care to the Working Poor.* Univ. Calif., Berkeley: Calif. Program Access Care. Calif. Policy Res. Cent.
71. Villarejo D, Baron S. 1999. The occupational health status of hired farm workers. *Occup. Med. State of the Art Rev.* 14(Spec. Popul.):613–35
72. Villarejo D, Lighthall D, Williams D III, Souter A, Mines R, et al. 2000. *Suffering in Silence: A Report on the Health of California's Agricultural Workers.* Davis, CA: Calif. Inst. Rural Stud., Calif. Endow.
73. Villarejo D, Lighthall D, Williams D III, Souter A, Mines R, et al. 2001. *Access to Health Care for California's Hired Farm Workers: A Baseline Report.* Univ. Calif., Berkeley: Calif. Program Access Care. Calif. Policy Res. Cent.
74. Villarino ME, Geiter LJ, Schulte JM, Castro KG. 1994. Purified protein derivative tuberculin and delayed-type hypersensitivity skin testing in migrant farm workers at risk for tuberculosis and HIV coinfection. *AIDS* 8(4):477–81
75. Watkins EL, Larson K, Harlan C, Young S. 1990. A model program for providing health services for migrant farmworker mothers and children. *Public Health Rep.* 105(6):567–75
76. Watson JM. 1997. Alcohol and drug abuse by migrant farmworkers: past research and future priorities. *NIDA Res. Monogr.* 168: 443–58
77. Weatherby NL, McCoy HV, Metsch LR, Bletzer KV, McCoy CB, de la Rosa MR. 1999. Crack cocaine use in rural migrant populations: living arrangements and social support. *Subst. Use Misuse* 34(4–5): 685–706
78. Wilk VA. 1993. Health hazards to children in agriculture. *Am. J. Ind. Med.* 24(3):283–90
79. Zahm SH, Blair A. 2001. Assessing the feasibility of epidemiologic research on migrant and seasonal farmworkers: an overview. *Am. J. Ind. Med.* 40(5):487–89