

An Intensive, Regional Approach to Occupational Research Priorities for California Farm Workers

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C. Accomplishments in the Past Project Period

1. Agricultural Health and Safety Task Force: To better understand the range of priority issues regarding agricultural health and safety and, equally important, how those sets of priorities differ among stakeholder groups, the California Institute for Rural Studies (CIRS) has conducted a formal needs assessment at the behest of the Agricultural Health and Safety Center (AHSC) of the University of California. The AHSC called upon CIRS to undertake a formal needs assessment for the purpose of identifying occupational research and intervention priorities based on input from the region's stakeholder organizations and farm safety experts. The scope of the assessment includes health and safety issues relevant to all farm workers, including farmers, unpaid family members, and hired farm workers. The evaluation has focused primarily on California but has also solicited stakeholder input from Arizona, two of the four states that comprise the AHSC's region of responsibility. The evaluation will help guide the research and intervention priorities of the AHSC in the years to come.

As part of the assessment, CIRS identified and recruited a fourteen-member Agricultural Health and Safety Task Force to help direct the project. This volunteer group consists of a wide range of industry stakeholders, including two farmers, a farm labor contractor, a union representative, a U.C. Cooperative Extension representative, a current farm worker, a retired farm worker, a rural physician, a public health nurse, a worker advocate, an anthropologist, and two insurance industry representatives. A secondary goal of the task force has been to create an open dialogue for sharing divergent viewpoints about the problems of health and safety in agriculture.

During its initial meeting, Task Force members concluded that the incorporation of public input should be accomplished through two methods: (1) Telephone interviews and focus groups with key informants and constituencies (including farm workers) and (2) a public comment notice sent to a broad spectrum of agricultural associations and industry representatives. These elements were successfully completed with the project final report to the AHSC scheduled for March, 2001.

2. The California Agricultural Workers Survey (CAWHS): As part of its effort to conduct a multi-year comparative assessment of survey data drawn from several surveys of hired farm workers, CIRS has been engaged in a year-long process of cleaning, verifying, and analyzing a very large volume of occupational health and safety data generated by the CAWHS. This component of the larger project (aka Phase I) has been supported by the UC Davis AHSC during FY2000. Described in more detail in Section F. below, the survey is the first state-wide, randomized health study of farm workers conducted in the United States. The CAWHS dataset includes (1) levels of health care utilization by the participants' households, (2) current health status of the participant and children of female participants, (3) detailed work history of the past 12 months, (4) immigration status, (5) housing conditions, (6) wage rates and household income, and (7) occupational conditions, safety training, and injuries. In addition, the 968 participants were also asked to undergo complete physical exams and provide blood samples. As of March 1, 2001, CIRS has just begun its preliminary analysis of the occupational safety and health data.

D. Specific Aims of the Project

Specific aims of the project are related to three separate phases of the project: Phase I is currently underway and entails six months of data analysis and hypotheses development, Phase II consists of 12 months of intensive fieldwork conducted in Bi-National Health Survey (BHS)¹ and CAWHS field sites, and Phase III encompasses 12 months of data entry, analysis, and report preparation.

- A. Phase I – Bi-regional comparative analysis of CIRS' Bi-national Health Survey (BHS) and California Agricultural Workers Health Survey (CAWHS) data in order to (1) identify critical occupational health outcomes and risk exposure scenarios² and (2) posit associated hypotheses meriting intensive follow-on field research. The primary analytical objectives include:
1. Using data drawn from the San Joaquin and Central Coast regions (two of the six agricultural regions identified by the state of California that were incorporated into the BHS and CAWHS research design) assess regional variation in respect to occupational risk exposure and related health outcomes;
 2. Analyze the possible influence of variations in employer type in shaping occupational risk and health outcomes for the two regions;
 3. Identify the predominant crops and associated tasks that are most clearly associated with measured occupational trauma and risk exposure;
 4. Assess the work history of workers that share these occupational health problems as a pre-requisite for more intensive investigations as to injury onset, treatment, duration, and severity.
 5. Identify and evaluate weaknesses in California's implementation of the Worker Protection Standard in respect to (a) training effectiveness and (b) adequacy in minimizing workers' exposure to pesticides.
- B. Phase II – Using intensive, case study field interviews in targeted BHS and CAWHS communities within the two regions as the primary means of data collection, further develop, refine, and assess key hypotheses regarding the causes of the occupational health and safety outcomes (in each region) that were identified in Phase I. This will include the following objectives:
1. Development of a conceptual model of occupational health and safety for farm workers in California and the western region that incorporates the role of industry structure, bi-national and bi-cultural workforce factors, trends in technology and commodity production, health/safety access constraints, and health/safety delivery constraints;
 2. As a follow-up to Objectives 3, 4, and 5 in Phase I, conduct individual and group interviews with hired farm workers in CAWHS and BHS field sites in the Central Coast and San Joaquin regions centering on several commodity case studies³;

¹ The Bi-National Health Survey is described in Section E. It is a companion survey to the CAWHS that included interviews with former U.S. workers in eight sending villages in Zacatecas, Mexico as well as workers from those same villages currently working in the U.S. It did not include physical exams.

² Risk exposure primarily (but not exclusively) refers to instances of self-reported pesticide exposure documented in the BHS and CAWHS. It would also include patterns of self-reported failure to use personal protective equipment that are associated with certain crops and tasks.

³ While the focus of the commodity case studies will depend on the findings of Phase I, oranges, table grapes, and strawberries are likely targets.

3. Case study interviews with employers (both growers and farm labor contractors) in the same field sites regarding key occupational health outcomes and risk exposure scenarios, their underlying causes, and barriers to solutions;
4. Interviews with health care providers (including doctors, intake staff, clinic administrators, and community health workers) in these communities regarding (1) their understanding of key occupational health outcomes, (2) their analysis of barriers to better diagnosis and treatment of occupational trauma, (3) suggestions for the development of best practices for the diagnosis and treatment of occupational injury, and (4) their views regarding access to care constraints facing farm workers in respect to occupational trauma; and
5. Interviews with farm safety specialists in the private and public sectors in respect to (1) their interpretations of the negative health outcomes and risk scenarios identified in Phase I, (2) their assessment of barriers to improved workplace safety training and associated regulations, and (3) suggestions for new training protocols and/or related safety regulations that are needed to address these problems.

C. Phase III--Preparation of a final project report that:

1. Based on the regional case studies conducted in Phase II, summarizes key explanatory findings regarding the occupational risk scenarios and health outcomes identified in Phase I;
2. Includes additional recommendations regarding (1) the delivery of occupationally-related health care, (2) occupational safety education and outreach efforts, and (3) a characterization of current gaps in the regulatory safety net for farm workers in California and, to the extent possible, in Arizona, Hawaii, and Nevada; and
3. Explicitly seeks to provide the UC Davis AHSC research team, NIOSH, and other research entities with hypotheses to guide more focused research investigations.

E. Background and Significance

Several key points emerge from the relatively small but growing agricultural safety and health literature and, of particular interest here, the narrower body of research focusing on occupational issues for hired farm workers in the United States. First, in the context of the larger field of occupational safety and health, agriculture as a sector underwent a long period of neglect relative to the industrial sector, a fact that in no small measure was related to the stereotype of agriculture as a bucolic and benign occupation posing little threat to its workers (Schenker, 2000). Second, agriculture has until relatively recently been exempt from much of the regulatory scrutiny and strictures that have been imposed on the more traditional industrial sector. Origins of this pattern of 'agricultural exceptionalism' can be traced back to the New Deal exemption of agriculture from the National Labor Relations Act's extension of collective bargaining rights to U.S. workers. This pattern has been repeated in the context of agriculture's exemption from the purview of the Occupational Safety and Health Act of 1970 (Merchant, et al., 1989). Third, in addition to this lack of regulatory scrutiny, assessments of the occupational safety problems of hired farm workers must overcome several constraints related to the special characteristics of this population: (1) wages for hired farm workers are among the lowest of any sector of the U.S. economy, resulting in a predominance of foreign-born workers, primarily from Mexico, (2) the demographic and spatial fluidity of the hired farm worker population has posed a particular challenge for researchers seeking to determine injury rates among

this shifting population, (3) reports of injuries among hired farm workers are generally recognized to be incomplete due to language and cultural barriers as well as the failure of many states to implement a Workers Compensation-based system of collecting injury data, and (4) these reporting barriers are compounded by the fact that approximately 50 per cent of the nation's hired farm workers are undocumented and thereby are reluctant to communicate with U.S. institutions (Villarejo, 1998; U.S. Dept. of Labor, 2000).

Equally fundamental but less recognized by researchers in the field of occupational safety is agriculture's relatively weak position within the global food system. In simple terms the food system includes agricultural input suppliers (seeds, chemicals, etc.), producers (farmers/growers), commodity wholesalers and shippers, commodity processors, food wholesalers, food retailers (supermarkets and restaurants), and consumers. Within this system, agricultural social scientists have long recognized the relative market weakness of farm producers (e.g. Cochrane, 1979). That weakness is rooted in several factors: First, farmers have very little control over the cost of production inputs such as seeds and chemicals. Most of these inputs are produced by large corporations that have little difficulty in passing on their research and development costs to producers. Second, producers as a group are very numerous and unorganized relative to other food system firms. With few exceptions, they have never been able to successfully control the supply of a given commodity, particularly in the face of competitors from other regions and nations. Third, they are subject to the forces of nature in ways that other food system actors are not. Drought arrives, pests invade, and harvests are perishable. Fourth, with the exception of vertically integrated firms such as wineries that both grow the crop and sell a finished product, producers find it very difficult to pass on their costs of production like food retailers due to their dependence on bid-based marketing.

This market weakness is reinforced by a general trend towards greater competition from other regions and nations coupled with a concomitant incentive to adopt productivity-enhancing technologies (OTA, 1986). The end result has been marked cyclical variations in profit margins and producer viability. It is not surprising in the face of these macro-level processes that wages in agriculture are stagnant or declining and that producers of labor-intensive crops have and will continue to be dependent on foreign-born workers. It should also be noted that intense international competition, market volatility, and the inability to pass on costs has contributed to political resistance on the part of individual farmers and farm organizations to new costs of production related to either occupational safety or environmental regulations (Lighthall and Roberts, 1995).

Despite these production constraints and the overall trend towards declining labor requirements, on a national scale the western United States and California in particular have witnessed an ongoing labor intensification tied to a market-driven increase in the demand for fruit, vegetable, and horticultural (FVH) crops. For example, while California underwent substantial declines in total farmland, including rangeland, in the 1990s (approximately 139,000 acres per year from 1992 to 1997), the total acreage of harvested crops (primarily FVH commodities) increased by about 80,000 acres per year (USDA, 1997). As a result, there has been a net increase in the agricultural workforce, 91 per cent of which is of Mexican origin. A recent enumeration study (excluding livestock workers) estimated California's farm worker population to be about 704,000 (Larson, 2000). This compares to a national estimate of 2.5 million hired farm workers made in 1992 (Commission on Agricultural

Workers, 1992). Inclusion of livestock workers in the recent enumeration conducted by Larson suggest that about one third of all U.S. hired farm workers work in California.

Coincident with this process of labor intensification in California agriculture during the 1990s, the U.S. government, through the formation of NIOSH-funded agricultural health and safety centers, has made progress in addressing the high rates of occupational injury and fatalities in agriculture. While the impetus for these centers emerged from a Midwestern regional concern regarding the safety of farmers and family members, hired farm workers have recently begun to be the object of greater scrutiny. In particular, NIOSH convened a Work Group tasked to identify priorities for research and surveillance of hired farm workers in 1995. Pesticide impacts and musculoskeletal injury were the cited as top priorities in each area (NIOSH, 1999). In addition, the 13 member panel cited six obstacles that have hampered previous efforts to address occupational safety for hired farm workers:

1. worker factors, such as immigration status;
2. farm owner and labor contractor opposition to government regulations;
3. migrant clinic and clinician factors, such as the lack of training in occupational medicine;
4. weaknesses in the Workers Compensation insurance system;
5. limitations of current and previously used surveillance techniques;
6. the political climate toward agricultural labor.

Given these constraints as backdrop, it should also be noted that at that time there had been no cross-sectional studies that systematically assessed occupational safety and health issues for hired farm workers beyond a given community (e.g. Sherman et al., 1997) or commodity (e.g. McCurdy et al., 1994). Despite this lack of synoptic understanding, studies such as Sherman et al. (1997) and Bade (1999) revealed a broad spectrum of health problems facing the farm worker population of California that were related but were not exclusively tied to occupational causes, e.g. maternal health and very low levels of access to primary care.

Reflecting the research leadership in this field of CIRS founder and former Executive Director, Don Villarejo, CIRS was commissioned in 1997 by The California Endowment to prepare a scoping document that would assist the foundation address the problem of farm worker health (as part of its larger mandate to address the health problems of California's underserved population). Recognizing the limitations cited above in the literature and the NIOSH Work Group document,⁴ Villarejo made the case for a state-wide survey of hired farm workers in California. The goals of the study would be to (1) provide for the first time an overall cross-sectional characterization of the population's health status, (2) establish a baseline from which to objectively identify interventions on the part of the foundation, and (3) provide a baseline reference to measure the efficacy of future interventions.

This led to a major grant to CIRS from The California Endowment in 1998 to conduct such a study. As described in more detail below, the California Agricultural Workers Survey (CAWHS) was explicitly designed so that researchers at CIRS and elsewhere would be able to examine the interrelations between such problems as low access to care, high rates of undocumented status, and employment in high-risk, seasonal agriculture. At approximately the same time, CIRS received a second grant that would enable Dr. Richard Mines to conduct a Binational Health Survey (BHS) of

⁴ Don Villarejo and Daniel Williams of CIRS prepared the narrative for the NIOSH New Directions (1999) report.

hired farm workers based in the sending villages of the state of Zacatecas, Mexico. This survey would add a temporal dimension to the CAWHS in that it would capture additional occupational health outcome data from farm workers who had retired from the U.S. farm labor force.

Both of these surveys have been completed and the preliminary findings of the CAWHS have been published (Villarejo et al., 2000). The BHS report to the TCE will be delivered in April, 2001. While much analysis of this data remains to be done, particularly in respect to occupational safety and health, the surveys have been successful in capturing a very large body of data regarding the health and working conditions of California farm workers.

F. Preliminary Studies/Progress Report

The overall purpose of this section is to provide an overview of the BHS and CAWHS research projects conducted by CIRS. As stated above, each of these surveys provide a comprehensive window on key occupational safety and health outcomes for hired farm workers in California but not in the same manner. The strength of the CAWHS lies in the fact that it achieved high sampling fractions (averaging 25%) in representative communities in all six agricultural regions in California. In contrast, the BHS targeted a limited universe of sending villages that are part of well-established farm labor networks in California and elsewhere. However, because the BHS also interviewed workers in Mexico who were no longer active in U.S. agriculture, its strength lies in its capacity to assess occupational safety and health outcomes over time. The BHS also provides much needed insight into the binational health care received by the farm worker population. Over 90% of California's farm workers are Mexicans and the BHS shows that though they may work much of their adult lives in California, they receive much, if not most, of their medical care in Mexico or from non-institutional sources of care in the United States. As such, one of the primary goals of the proposed research will be to conduct a comparative analysis of occupational health data from each survey that consciously seeks to harness their complementary potential. The current Phase I analysis seeks a set of working hypotheses regarding possible causes for the outcomes measured by each survey. In turn these hypotheses will provide guidance for the proposed intensive fieldwork conducted in Phase II.

The instruments of both surveys, the CAWHS and the BHS, were derived largely from the National Agricultural Workers Survey (NAWS) so that the survey results can easily be compared with each other and with the NAWS. The NAWS represents a random sample nationally and in California of farm workers. Namely, it represents as close as possible the demography of U.S. farm workers.

The Bi-National Health Survey: The origin of the BHS occurred indirectly as a result of events in Washington, D.C. When NIOSH decided to fund a health supplement to the National Agricultural Workers Survey (NAWS), the Department of Labor (DOL) convened a group of 30 farm worker health experts, including many medical doctors and epidemiologists, from across the federal government.⁵ Together, they designed the questions which were to be tested by the DOL and later included in the NAWS health supplement. The missing element in this process was that the NAWS could not interview ex-farm workers and those returned to Mexico. As a result, the BHS was conceptualized as a necessary complement to the NAWS supplement. The components of the BHS

⁵ At that time, Dr. Richard Mines was the Director of the NAWS at the U.S. DOL.

followed closely the elements in the NAWS instrument, in all its sections, including demography, employment practices, and health elements. The design of the BHS survey form was supervised by an Advisory Committee of two U.S. and two Mexican specialists in farm worker health and was piloted by Dr. Richard Mines and supervisory staff. The interviews occurred between January and May of 2000.

The sample was chosen from universe lists of all eligible people raised in the eight participating villages who had worked a minimum of two seasons of farm work in the U.S. The staff obtained lists of 58 to 244 eligible people for each of the eight sites, depending on the size of the town, from village leaders. This sample frame served as the basis for random selection of prospective participants. Out of the 1,123 people on the universe lists, 467 or about 42% were enlisted as participants. There was no attempt to choose the villages randomly among all villages in Zacatecas, only the people within the villages. The villages were chosen purposively to obtain a variety of U.S. crops and a range of longevity in the village migrant streams. The villages specialize in one or two types of agriculture in a few destination locations in the United States. After training 11 interviewers, 8 of whom were Zacatecanos, 305 interviews were conducted in the villages and 162 primarily in core settlement communities in California. Interviews began in the villages followed by interviews with current and former U.S. farm workers in the filial communities in the United States. This approach facilitated the sampling and built confidence in the community. The method also included extensive ethnographic observations by the supervising interviewers which will be incorporated in future reports to provide a locational context for the quantitative analysis.

The advantages of the method, apart from the confidence created for the interview process by a slow building of rapport within defined networks, were the following: (1) the survey interviews respondents who are temporarily or permanently back in Mexico (2) it interviews ex-farm workers, and (3) it gathers information on the families and medical environment in places of origin of U.S. farm workers. These advantages complement other surveys, such as the NAWS and CAWHS, which interview only current farm workers on the U.S. side of the border. The method of choosing well-defined, cross-generational networks where confidence among the respondents can be assured due to familiarity with the interviewing staff represents a key means of overcoming the bias in much official survey data which tends to under-represent difficult-to-find populations and thus distorts demographic and health findings about immigrant groups.

The primary components of the BHS which closely mimic the CAWHS and the NAWS include the following (see Appendices (1) for the BHS survey instrument):

1. The demographics and some educational and employment traits of the household including members absent from the household.
2. The employment and migration history in detail for the entire life of the respondent.
3. The employment and workplace treatment data from the last farm job.
4. Injury history for the U.S. farm work experience of the respondent.
5. Pesticide and respiratory problems experienced by the respondent.
6. Pain episodes experienced by the respondent.
7. Disease history of the respondent and the household living with him when the female head of household was present.
8. Four psychological or mental health questions.
9. Use of tobacco and alcohol of the respondent.

10. Ethnospecific disease history of the respondent and family.
11. Utilization of doctors and dentists in the last two years.
12. Questions about health care insurance, payment, and type of provider in Mexico and the United States.

The California Agricultural Workers Health Survey: The overall goal of the CAWHS project is to generate a comprehensive, baseline data set that accurately reflects the health status, health care access and utilization, housing conditions, and workplace safety of California farm workers as a whole. The cross-sectional survey interviewed 968 farm workers in seven communities distributed across California's six agricultural regions. As such, the project retains the data intensity of earlier community-based studies while providing the geographic inclusiveness required for a baseline health needs assessment. (See Villarejo et al. (2000) for a more detailed description of the study's research design and initial findings.)

Study Site Selection and Survey Methodology: First, the role of geographic and cultural variability in shaping farm worker health outcomes was addressed by selecting at least one community in each of the six agricultural regions of the state (Desert, South Coast, Central Coast, North Coast, San Joaquin Valley, and Sacramento Valley). Within each of the regions, (sub-county scale) Medical Statistical Service Areas (MSSA) were used to identify a universe of eligible farm worker communities and associated census block groups based on their total agricultural employment and their relative contribution to the agricultural work force of the given region. A random selection procedure was employed to select a target community from among qualified communities in five of the seven cases. The number of farm workers to be interviewed in each community was determined by its region's overall contribution to the farm worker population of California. In the case of the San Joaquin Valley, its large proportion of farm workers led to a second community for study. It should be noted that a critical methodological limitation of the project was the need to characterize the region as a whole (and collectively, the state) based on information from only one or two farm worker communities. Given limited time and resources, this level of extrapolation was unavoidable.

Second, in order to capture a representative sample of farm workers within each community that are either currently working or temporarily unemployed, a household sampling strategy was used. This contrasts to other farm worker surveys such as the National Agricultural Workers Survey (NAWS) conducted by the U.S. DOL that use the workplace as the site of participant contact. This necessitated mapping all dwelling units no matter how unconventional within the census block groups. This technique was pioneered in the Parlier study (Sherman et al., 1997). A secondary advantage of this household approach is its utility as a survey of community housing conditions and a means of objectively assigning household type as an independent variable. Third, all dwelling units were assigned a map location and identification number and then entered into the sample frame. Dwelling units were then randomly selected for personal visits by interviewers recruited from the local community. And fourth, upon initial contact with the assigned dwelling, basic demographic data for eligible households were collected and a lottery table was used to select from among eligible farm workers (i.e., 18 or older who have done hired farm work in the past year). A sampling bias built into the lottery procedure is designed to increase the proportion of female workers from approximately 20 per cent to 35 per cent. The overall participation rate for the survey was 82.4 per cent (N=968).

Flyers and local contacts were used to solicit qualified, bilingual interviewers from the local population. The study also employed CIRS lead interviewers four of the seven sites. Following an orientation meeting and one-day training workshops, a team of interviewers was contracted to do interviews according to strict study protocol for a rate of \$60 per completed interview. The field site coordinators and field site assistants in each site assumed the responsibility for day-to-day oversight of the interviewer team. The complexity of the survey instrument combined with the relative inexperience of the local interviewers necessitated a high degree of supervision by field site personnel. Overall, the data entry and cleaning process revealed relatively few systematic errors.

Following the 1.5 to 2 hour health survey administered at the dwellings of the participants (See Appendix B), appointments for physical examinations were made in a local clinic. The exams entailed the following: (1) a blood sample and standard blood chemistry analysis, (2) a complete physical exam including pelvic exams for women (with lab analysis), (3) screening for syphilis, gonorrhea, and chlamydia, and (4) an additional 15 minute survey covering particularly sensitive topics such as sexual behavior and violence. Following the exam the participants received a \$30 honorarium and an appointment for a follow-up consultation where the results of the lab tests and physical were interpreted. Over 67 per cent of survey participants completed physical exams (N=652).

The survey instrument included the following components (See Appendices (2) for a copy of the CAWHS survey instrument):

1. Demographic profiles of each household member, including those not present in California as well as more detailed demographic information about the participant.
2. Access to and utilization rates for medical insurance, including type and source.
3. Detailed information about the participant's last visit to a range of health care providers, including cost, distance, method of payment, and reason for visit.
4. A comprehensive assessment of the current health status of the participant, based on a complete review of all health elements (dental, respiratory, musculoskeletal, gastrointestinal, eye, urinary, ear, traumatic injury, emotional illnesses, and ethnospecific illnesses).
5. A comprehensive assessment of clinical illnesses identified by a doctor. Additional data on duration of condition, treatment received, and provider of treatment was collected.
6. A complete work history of the participant for the preceding 12 months, including employer, crop, task, period of unemployment, duration of each job, and time spent out of agriculture and the country.
7. A personal work history covering length of tenure in farm work, current working conditions, means of transportation, and working hours.
8. Income from current job including payment rates and methods, health benefits if any, cost of health insurance, yearly income, household income, and income from non-farmwork.
9. Living conditions including the type of current dwelling, housing costs and method of payment, and size and quality of dwelling.
10. Use of social services such as food stamps, unemployment insurance, legal services, etc.
11. Health conditions in the workplace including experience of pesticide-related symptoms, use of protective equipment, and safety training.

12. Experience with pesticides including direct adverse reactions from acute field exposure, experience in handling, mixing, or applying, and any medical treatment received for pesticide exposure.
13. Field sanitation conditions including the provision of clean water, toilets, and washing facilities.
14. A compilation of any work-related injuries in the last 12 months including type of accident, cause, commodity, medical treatment if any, workman's compensation payments if any, and method of payment for health services received.

Personnel: Upon the retirement of Don Villarejo from CIRS at the onset of fieldwork (July 1, 1999) CIRS Executive Director Dr. David Lighthall, assumed the role of project director. CAWHS co-investigators included Dr. Stephen McCurdy, M.D., M.P.H., Associate Professor of Medicine at UC Davis whose specialization is occupational epidemiology and has conducted a number of prior health studies of Hispanic farm workers. Dr. Steven Samuels, Ph.D., a biostatistician at the UC Davis Agricultural Health and Safety Center, was contracted to provide statistical oversight for the project. Dr. Samuels has been involved in a number of farm worker health studies undertaken by the AHSC researchers. Dr. Bonnie Bade, Associate Professor of medical anthropology at CSU San Marcos was also a project co-investigator. Dr. Bade has an extensive background in conducting health-related research among farm workers in California and Mexico. She also supervised the Vista and Gonzales field sites. Other key CIRS staff included Project Manager Daniel Williams and Field Site Manager Ann Souter, R.N. An advisory committee of farm workers assembled by CIRS also played a critical role in the development of the survey instrument.

The preliminary findings of the CAWHS focusing on the health status of participants has been published (Villarejo et al., 2000). The emphasis of this report was on the high risk to long-term chronic disease facing this population that is compounded by the very low levels of access to care. Very little work has been done to date in respect to analyzing the large volume of occupational safety and health data. This is a reflection of the fact that The California Endowment (the primary funder to date) is not directly concerned with this element of the study although they were willing to fund extensive data collection in this area. A similar generalization applies to the BHS data. As such there is a critical need to insure that the full potential of this extensive occupational data is realized.

G. Research Design and Methods

As indicated above, the overall goal of the proposed research is to develop a set of firm conclusions regarding (1) the most important occupational safety and health problems facing hired farm workers who work in the predominant commodities grown in the Central Coast and Jan Joaquin regions, (2) the factors and processes that act to create these negative outcomes, (3) in the absence of such causal understanding, hypotheses that could serve to guide more targeted research endeavors, and (4) recommendations for future research strategies (particularly for the UC Davis AHSC) and policy development at the state and national level. These broad objectives reflect the exploratory yet comprehensive scope of the CAWHS and BHS datasets. Because of the study's broad empirical base, geographic scope, and topical breadth, its designation as a pilot project is well justified.

Phase I Methodology: The following represent fundamental methodological assumptions of Phase I, the statistical analysis of the BHS and CAWHS datasets:

1. The BHS and the CAWHS assessed farm worker health and occupational safety comprehensively while achieving high sampling fractions within the target communities.
2. For the CAWHS, variations in farm worker health and working conditions among each regions' eligible farm worker communities was reasonably low and very likely to be less than the variations between the regions overall.
3. Sample frame and randomization techniques achieved the goal of insuring that all farm workers in each community had approximately the same chance of being chosen to participate.
4. Participation rates in each study (and for the CAWHS physical exams) were relatively high, high enough to insure that the participants composed a representative sample of farm workers in the study area.
5. For the BHS, the sampling among sending villages in Zacatecas was sufficiently representative to characterize the sending region as a whole.
6. BHS participants interviewed in core settling areas/receiving communities within the Central Coast and San Joaquin regions provide a critical data supplement to data collected in the three CAWHS communities.
7. Overall, the two datasets provide a statistical basis for identifying occupational practices, risk exposure, and outcomes for the predominant Central Coast and San Joaquin commodities.

In summary, the survey methodology used in the two studies was designed to establish generalizable patterns of health and safety outcomes facing the California farm worker population. In order to accomplish this, a large sample was taken with a relatively large sampling fraction at each of the BHS sending villages and CAWHS sites. The large community samples accomplished three major tasks: Representativeness is central to the study, allowing generalizations to be made. Large samples also ensure that enough data are present to make descriptive comparisons across groups. Finally, large datasets also allow for analyses with sufficient statistical power when using inferential multivariate statistics.

The CAWHS survey was unique in that it has three components: (1) self-reported health and occupational data, (2) a physical examination, and (3) a blood chemistry laboratory workup. The use of three sources of data combines self-reported outcomes and objective medical data, allowing for cross-comparisons. Each data source has its advantages and disadvantages and by having all three, stronger inferences can be made. The CAWHS survey is extremely thorough, consisting of a wide battery of questions, including demographics, health-care utilization, injuries, crop and task work-histories, pesticide exposures, etc. With its multiple sites across agricultural regions, the CAWHS, allows for the assessment of inter-regional variation of health and occupational outcomes. The wide scope of the data allows for a comprehensive analysis of risk factors and outcomes.

Phase II Methodology: The proposed methodology employed in Phase II builds on both the strengths and limitations of the BHS and CAWHS datasets. The CAWHS focuses on taking a cross-sectional “snapshot” of the status of California farm workers, specifies outcomes, and is diagnostic. While the BHS does not include objective physical exam and blood chemistry data, it does provide an invaluable window on long-term occupational health outcomes and how those outcomes are being

addressed by both the U.S. and Mexican health systems. In toto, analysis of the BHS and CAWHS data is an ideal point of departure for more intensive, case study fieldwork that seeks a deeper, process-based understanding of how, why, and under what circumstances such factors as work practices, farm worker attitudes and beliefs, access to care constraints, employer-employee relations, and the health care delivery system lead to the negative outcomes revealed in the Phase I analysis. An integral element of this analysis centers on these questions: (1) Under what circumstances, e.g. level of trauma, do farm workers seek health care for occupational injury and how do these thresholds vary based on differences in crops/tasks, immigration status, employer type, and health care access? (2) At what point in time (in years) are workers generally incapable of sustaining work for those crop/tasks that are most associated with chronic injury, e.g. strawberry harvesting?

Although the BHS and CAWHS findings are necessary to understanding the primary occupational safety and health issues faced by immigrant farm worker networks, they are not sufficient to explain how and why they come about. While they do serve as a fertile source for hypotheses, the dependence on statistical inference precludes any deep understanding of the processes that underlie and account for key outcomes of concern. In order to institute appropriate remedial interventions, we need to understand what circumstances generate these negative outcomes. For this purpose, we propose a synthetic methodological approach that marshals the powerful data sets already at our disposal with a case study approach providing richer, fine-grained sources of information. We anticipate that the results of the Phase I analysis will indicate that each region has several commodity and task combinations that merit further case study investigation. The negative outcomes associated with these crop/tasks could include: (1) chronic musculoskeletal pain, (2) inadequate safety training, (3) patterns of occupationally-based health care, and (4) high proportions of pesticide exposure incidents relative to the other crop/tasks.

The proposed case study methodology for Phase II includes the following steps:

1. Development of a conceptual model⁶: A theoretical model that encompasses key functional elements of the agricultural safety and health landscape is a key prerequisite for conducting the Phase II analysis. These include shifts in commodity demand, binational and bi-cultural workforce factors, immigration push and pull factors, trends in production technology, health/safety access constraints, and health/safety delivery constraints. Specification of an a priori model will provide an overall template to guide the design and application of survey protocol. By the same token, the findings generated in Phase II will allow for the further refinement of the model. In turn, this final conceptual model can then be employed to guide further research and interventions in the western region and the United States as a whole.
2. Framing the case study investigations in a regional context: This process is an extension of the region- and commodity-based analysis conducted in Phase I. This regionalization of the research design is based on the presumption that each region is characterized by a relatively unique set of crop/tasks as well as clear differences in farm structure and employment arrangements. In turn, these regional differences create a set of associated negative outcomes in respect to points 1-4 above. Analysis of BHS and CAWHS data from each region will serve as the basis for developing a set of key

⁶ See Appendices (3) for an example of a comparable conceptual model encompassing the full range of health issues facing California farm workers from a binational perspective.

areas of concern and associated hypotheses regarding causes. Preliminary analysis of the CAWHS data, for example, reveals distinct inter-regional differences in compliance with WPS training requirements.

3. Designing regional data collection objectives and instruments: Once the research objectives are prioritized at a regional level, appropriate survey content and instruments will be designed. Unlike the BHS and CAWHS' focus on categorical knowledge regarding occupational health outcomes, the Phase II instruments must be capable of systematically gathering explanatory, process-based (qualitative) data. Drawing on the methods outlined by Miles and Huberman (1984) and employed by Lighthall (1995), the primary challenges will be to (1) create semi-structured interviews that pose similar questions to all respondents within a given category, e.g. workers, supervisors, or doctors, (2) allow for follow-up questions based on responses to initial queries and additional insights gained from previous interviews, (3) maximize efficiencies in data recording techniques in order to minimize the need for transcription, and (4) incorporate techniques for efficient reduction and display of qualitative data for comparative analysis. In addition to these objectives, each regional case study will require different sets of informants and survey content that reflect inter-regional differences in Phase I outcomes.

4. Intensive field interviews: Following two months devoted to Steps 1-3, a subsequent nine month period will be devoted to conducting field interviews in California under the supervision of Dr. Richard Mines with additional support from CIRS staff. As in the case of the CAWHS, interviews with workers will coincide with periods of peak labor demand in the six agricultural regions of California. This will allow for approximately five weeks can be allocated to each region. To the extent possible, field interview data will be condensed (via coding) and entered into computers in the field. The collection of occupational health data is planned to coincide with a companion research project that focuses on the non-occupational health issues uncovered by the CAWHS and BHS. Because field data for each project will be collected simultaneously, the fieldwork costs of both projects will be minimized.

In the pilot field site, interviews with workers will be conducted individually and in focus group settings in order to gauge the effectiveness of the latter. In most but not all cases, participants in the BHS and CAWHS surveys will be contacted for follow-up interviews. Interviews with ex-farm workers identified by the BHS will provide additional insights into long-term occupational health outcomes that are less apparent with current workers in the study regions. In addition to workers, interviews will be conducted with growers and labor contractors, agricultural chemical specialists, health care providers, clinic administrators, farm worker non-profit service personnel, safety experts from the public and private sectors, and agricultural extension agents. During this stage we anticipate a good deal of refinement in our explanatory hypotheses as new information and insights accrue. It is also most likely that this information will provide guidance in additional, more sophisticated analysis of the BHS and CAWHS data. All interviews will be tape recorded to the extent possible.

5. Data preparation: The remaining seven months of Phase II will be spent transcribing, condensing, and coding interview data under the supervision of Dr. David Lighthall. Given the considerable degree of time consumed in this process, staff at CIRS' Davis office will also be engaged in data transcription and coding during the fieldwork stage of Phase II as well.

Phase III Methodology: Given the possibility that some of the final steps outlined in Phase II above will spill over into the Phase III time period due to unforeseen delays, the final six months of the project are devoted to data analysis and preparing a final report on the project findings. The goal of the comparative analysis is a set of generalizable explanations for the key occupational health outcomes and risk scenarios associated with the two regions and corresponding crop/tasks. Key methodological objectives include the following:

1. Interview data for all workers within a given region and commodity who share a common occupational trauma or exposure must be condensed and prepared for comparative analysis. The same must be done for all interview data derived from expert informants (e.g. doctors and safety specialists) regarding the same occupational outcomes.
2. Each case of occupational trauma or risk exposure (per subject) will be accompanied by explanatory text derived from the field interviews. The goal of comparative analysis is to search for common explanatory processes across individual cases that can be subsequently posited as causal hypotheses. It is likely that a number of these processes will have been identified during the process of field interviews and would serve as the basis for corroborative interviews with other informed sources. If not, supplemental corroborative interviews may be conducted during Phase III. Other sources of data such as the Workers Compensation Insurance Rating Bureau of California summary reports for 1995-97 (currently held by CIRS) can also be used for corroborative evidence.
3. Extrapolation of results based on Agricultural Census and NAWS data: Once the regional- and commodity-based patterns of occupational trauma and risk exposure are identified, a demographic profile of corresponding California farm workers will be carried out based on California NAWS data collected from 1989 to 2000. In turn, national data drawn from the NAWS and the Agricultural Census can be employed in order to extrapolate estimates regarding the importance of these problems among the national population of 2.5 million hired farm workers.
4. Preparation of a final report: Target audiences for the report include: (1) researchers at the UC Davis Agricultural Health and Safety Center, (2) other academic and agricultural extension personnel in California, Hawaii, Nevada, Arizona, and the rest of the nation, (3) county and state regulatory agencies in California, (4) NIOSH and other relevant federal agencies such as the Migrant Health Service, (4) stakeholder organizations representing employers and farm workers, (5) health care providers in California and elsewhere, and (6) insurance companies and farm safety specialists.

Given the project's strong empirical foundation in the BHS, CAWHS, and NAWS, and assuming well substantiated explanatory data generated by the Phase II fieldwork, we believe the project will provide a sound basis for more targeted research efforts by the UC Davis AHSC research team and others. As such, CIRS will make every effort to share insights with and solicit input from AHSC researchers during all phases of the project.

H. Human Subjects

1. The population consists of three primary subpopulations: First, current Central Coast and San Joaquin region farm workers who were participants in the BHS and NAWS will be purposively contacted based on salient characteristics identified in the prior surveys. Second, former farm workers residing in these regions who participated in the BHS will be contacted using similar criteria. Over 95 per cent of these workers are Hispanic. And third, a wide range of informed sources including health care providers, farm employers, farm safety specialists, and representatives of stakeholder organizations will be interviewed in California and, to a limited extent, elsewhere. Between 50 to 75 participants will be interviewed. One exclusion criterion is that subjects not fluent in Spanish or English, or otherwise unable to understand and give informed consent in one of these languages, will be excluded. In addition, minor persons younger than 18 years of age will not be eligible.
2. Research material will consist of a series of semi-structured questionnaires corresponding to (a) region- and crop-based occupational issues, e.g. musculoskeletal problems among Central Coast strawberry workers and (b) informed source categories, e.g. physicians. Questionnaires will include a set of standardized questions that will serve as the basis for more targeted follow-up questions. Data will be collected for research purposes only.
3. Participants will be contacted in person or by phone by field researchers either at participants' residence or place of business and requested to participate. Personnel will describe the study, its goals, and answer any questions. Former BHS and CAWHS participants will be given published summaries of the respective survey findings in English or Spanish. An informed consent document will be presented and explained. Upon formal consent, the signed consent form will be given to participants and a copy retained by researchers. Participants will also receive a copy of the "Subject's Bill of Rights." Consent forms will be printed and explained in either Spanish or English, depending on the preference of the participant. Interviews will be conducted at a time and place that is convenient and non-threatening for the participant. The recruitment procedure and forms will be approved by the UC Davis Human Subjects Research Committee (IRB). Approval of the protocol is pending from the IRB and will be forwarded to the funding agency within 60 days of submission.
4. The risks of the interviews to the participants are low. It is possible that some subjects may be disconcerted by questions regarding unfortunate incidents or painful trauma. Current farm workers are the primary population facing risk if confidentiality is not preserved in all stages of the research process. For this reason every effort will be made to assure all participants that the success of the research project in no way will depend on the attribution of any information gathered to an individual participant.
5. All participants will be able to decline to answer questions or terminate the interview at any time. Confidentiality of the data will be maintained. Questionnaires and all records will be kept in locked files at the CIRS Davis office. Access will be limited to authorized project personnel. Computerized data files will not contain subject names. Data will be reported only in summary form and in a manner to protect the identity of individual participants.
6. The benefits of the study outweigh the risks to the participants. Their participation in the study will provide researchers, industry stakeholders, and decision-makers with a firmer basis for

improving farm safety and protecting workers from serious injury. Given the confidentiality protocol described above, the risks to participants are low.

I. Vertebrate Animals

Not applicable.

J. Literature Cited

- Bade, B. 1999. Is There a Doctor in the Field? Underlying Conditions Affecting Access to Health Care for California Farmworkers and Their Families. California Policy Research Center Report. Berkeley, California.
- Cochrane, W. 1979. The Development of American Agriculture: A Historical Analysis. University of Minnesota Press, Minneapolis, pp. 378-395.
- Commission on Agricultural Workers. 1992. Report of the Commission on Agricultural Workers. 1993 O-332-456 QL 3. U.S. Government Printing Office, Washington, D.C.
- Larson, A. 2000. Migrant and Seasonal Farmworker Enumeration Profiles Study: California. Prepared for Migrant Health Program, Bureau of Primary Health Care. Larson Assistance Services, Vashon Island, Washington.
- Lighthall, D. 1995. Farm Structure and Chemical Use in the Corn Belt. *Rural Sociology*. 60 (3): 505-520.
- Lighthall, D. and R. Roberts. 1995. Towards an Alternative Logic of Technological Change: Insights from Corn Belt Agriculture. *Journal of Rural Studies*. 11 (3): 319-334.
- McCurdy, S., M. Hansen, C. Weisskopf, R. Lopez, F. Schneider, J. Spencer, J. Sanborn, R. Krieger, B. Wilson, and D. Goldsmith. 1994. Assessment of Azinphosmethyl Exposure in California Peach Harvest Workers. *Archives of Environmental Health*. 49 (4): 289-296.
- Merchant, J., B. Kross, K. Donham, and D. Pratt. 1989. Agriculture at Risk: A Report to the Nation. National Coalition for Agricultural Safety and Health. University of Iowa, Oakdale, Iowa.
- Miles, M. and A. Huberman. 1984. Qualitative Data Analysis. Sage Publications, Inc. Beverly Hills, California.
- National Institute for Occupational Safety and Health. 1999. New Directions in the Surveillance of Hired Farm Worker Health and Occupational Safety. A Report of the Work Group Convened by NIOSH, May 5, 1995.
- Office of Technology Assessment (OTA), U.S. Congress. 1986. Technology, Public Policy, and the Changing Structure of the American Agriculture. Publication no. OTA-F-285. Washington, D.C.
- Schenker, M. 2000. Improving Health and Safety in the Agricultural Workplace: The History of Occupational Health as an Agricultural Concern. In Promoting Human Wellness: New Frontiers for Research, Practice, and Policy. Schneider Jamner, M. and Stokols, D., eds. University of California Press, Berkeley and Los Angeles, California.

Sherman, J., D. Villarejo, A. Garcia, S. McCurdy, K. Mobed, D. Runsten, C. Saiki, S. Samuels, and M. Schenker. 1997. *Finding Invisible Farm Workers: The Parlier Survey*. California Institute for Rural Studies. Davis, California.

U.S. Dept. of Labor, National Agricultural Workers Survey. 2000. *A Demographic and Employment Profile of United States Farmworkers*. Washington, D.C.: Office of Program Economics.

United States Department of Agriculture, 1997. *1997 Census of Agriculture, National Agricultural Statistics Service*. Washington, D.C.

Villarejo, D. 1998. Occupational Injury Rates Among Hired Farmworkers. *Journal of Agricultural Safety and Health* Special Issue 1: 39-46.

K. Consortium/Contractual Arrangements

See attached letter in Appendices (4).

I. Consultant and Collaborators

Not applicable.

M. Appendices

- (1) BHS Survey Instrument (in Spanish).
- (2) CAWHS Survey Instrument.
- (3) Sample Conceptual Model of Farm Worker Health
- (4) Letter of Intent from CIRS.