Project Title: Community Health Intervention With Yakima Agricultural Workers: Exploring the Issues.

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LIST OF TERMS AND ABBREVIATIONS

CAB – Community Advisory Board
PB – Proyecto Bienestar (The Well-Being Project)
Core Team – Partnership of four founding organizations that manage the research project
NCEC/KDNA - Northwest Communities Education Center/Radio KDNA
YVFWC – Yakima Valley Farm Workers Clinic
EPA – Environmental Protection Agency
CARE cooperative agreement – Community Action for a Renewed Environment
NCAC - Northwest Community Action Center
DEOHS - Department of Environmental and Occupational Health Sciences
UW - University of Washington
IRCA - Immigration and Reform Act
PAR – Participatory Action Research
KI – Key Informant

ABSTRACT

The primary purpose of this project is to develop a permanent partnership that will empower the Hispanic agricultural worker community in the Yakima Valley, Washington State, to effectively identify, characterize and respond to the many occupational and environmental risks they face. The target population is the seasonal and migrant agricultural workers in the middle Yakima Valley. The Northwest Communities Education Center/Radio KDNA, the Yakima Valley Farm Workers Clinic, the University of Washington and Heritage University formed a partnership in this multi-disciplinary project. This project organized and sustained a community advisory board (CAB) comprised of unions, church groups, community members and other representative community groups. Through the guidance from the CAB, a community process was developed a prioritized research and action agenda. The activities of the project use a participatory action research (PAR) approach as a means to obtain new perspectives and an ecological framework to identify and prioritize occupational and environmental health stressors. The plan includes frequent community communication and education, an interactive evaluation process, curriculum development for Heritage University students and ConneX summer trainees and further data collection by students and community members. Technical expertise is tapped from the University of Washington Schools Nursing and Public Health and Heritage University. Preliminary data collection will support the development of new research proposals. The products of this process are a sustainable community-academic-clinical partnership, an empowered cadre of young people from the community and improved occupational and a prioritized list of environmental and occupational health concerns of the farm worker community in the Yakima Valley, Washington.

HIGHLIGHTS/SIGNIFICANT FINDINGS

Highlights/significant findings are described below according to the specific aims of the project:

Aim 1: Develop structures and processes to facilitate the Hispanic community's involvement in the identification and prioritization of occupational and environmental stressors among farm workers in Yakima Valley;

Both a Core team and Community Advisory Board (CAB) were formed during this project, which continue to work together currently as a partnership under additional grants. The Core consists of the University of Washington, Northwest Communities Education Center/Radio KDNA (NCEC/KDNA), the Yakima Valley Farm Workers' Clinic, and Heritage University. The CAB represents a variety of interests within the community and although it has 14 positions, it has oscillated in size over the years. These groups currently meet together every second month and uses a consensus based decision making process in its work. In addition, facilitation is shared and rotated each meeting so that all members participate. When necessary, additional meetings are scheduled. The group communicates weekly via email and phone to discuss project progress. Throughout the grant period, ad-hoc committees within the Core Group and CAB have formed to address specific project needs such as communications, funding, priority areas, etc. A series of policies were formed for the Core group and CAB and a training/orientation was given early in the project to the CAB members (December 2004).

Aim 2: Create opportunities and mechanisms for this community to understand and actively participate in decision-making related to their occupational and environmental health;

Several qualitative and quantitative research projects have been developed to identify occupational and environmental health stressors in the farm working community of the Yakima Valley. Key informant interviews were conducted with each of the Core Group partners and the 12 members of the Community Advisory Board in 2004-2005. Over the past five summers (2004 – 2008), annual community surveys have been conducted with a total of 937 surveys. Each year, the survey was modified to address the current project information needs. The first 2 years identified issues of concern. The third year addressed the issues that appeared more frequently in the initial surveys. In 2007 (the fourth year), the survey focused on understanding how community members might want to receive health and safety information (via paper, video, through clinics, managers, etc). Finally, in the fifth year, the survey involved water screening for nitrates and related questions about water quality and knowledge.

A Town Hall Style Meeting was held on April 7, 2006 to prioritize the environmental and occupational health issues that had been identified. At this meeting, there was an opportunity for community members to add concerns to the list before voting began. The top four issues that emerged were: pesticides, workplace illnesses, workplace injuries and abusive workplaces.

The fourth year of the community surveys (2007) helped us examine and refine the ways in which we are trying to reach the agricultural community. Farm worker participants cited supervisors as the most common source for reliable information about workplace safety and health and who they are mostly likely to turn to when facing unsafe working conditions. This indicates that supervisors may play an important role in disseminating workplace information and may be effective players in health interventions. Second, participants most commonly requested more information on workers' rights issues, followed by pesticides and chemicals, how to deal with workplace abuses, and work related injuries. They stated that they would like to receive this information mainly through brochures, radio programs, information sessions/trainings/public meetings and television programs.

Aim 3: Develop an issues driven action plan that focuses on the needs articulated by Hispanic agricultural workers;

The development of the issues driven action plan has primarily occurred through additional grant writing and subsequent work. In October 2007, the El Proyecto Bienestar collaboration was awarded an EPA CARE cooperative agreement of approximately $78,000 to identify, prioritize and develop an action plan for environmental health issues in the Yakima Valley. This funding, combined with the NIOSH/NIEHS grant allowed PB to conduct tests for nitrates, lead and arsenic in private wells in August 2008. The group is voting in December to determine future action plans on this issue.

In addition, the PB collaboration was awarded a 2-year NIH Partners in Research grant of $100,000 in the fall of 2008 to develop and test *radio novelas* (Spanish language radio dramas). This responds to the community's survey answers about wanting information through radio programs. The radio novelas will be based around the prioritized health issues identified in the NIOSH/NIEHS grant.

Aim 4: Cultivate a cadre of new investigators with preliminary training related to the investigation and remediation of occupational and environmental health threats;

The summer community surveys were conducted with college level students from the ConneX program. The University of Washington augmented the regular summer program conducted through the Northwest Community Action Center (NCAC) and YVFWC to add a four credit course, "ENVH 499: Introduction to Field Research in Environmental and Occupational Public Health". Each summer staff and/or graduate students from the Department of Environmental and Occupational Health Sciences (DEOHS) at the University of Washington (UW) teach this course, which provides an overview of environmental health, occupational health and how to conduct field work and analyze data with a practical experience (community survey). Over the five years of community surveys, 63 undergraduate students have been trained through this course. ConneX students and/or interns have presented their findings at regional and national conferences each year. This program is often their first encounter with environmental and occupation health topics, as well as field work and is one of the projects most successful efforts.

In addition, two summer undergraduate interns based out of UW under Matthew Keifer have also been involved in teaching the ConneX course as "teaching assistants" and involved in the field work portion in 2006 and 2008.

Finally, numerous graduate students have participated in the ConneX program and PB in general. Five graduate student theses have come out of this project. These have focused on: 1) analysis of perception data from key informant interviews; 2) analysis of environmental and occupational health issues from key informant interviews;
3) evaluation of the ConneX program on the students; 4) analysis of seasonal fluctuations of asthma hospitalizations in the Yakima Valley; and 5) evaluation of power structure and participation in el Proyecto Bienestar (different stakeholders).

Aim 5: Develop a sustainable partnership among the following entities: the Hispanic community in Yakima Valley, community organizations: Northwest Communities Education Center (NCEC)/Radio KDNA and Heritage University, health care providers from the Yakima Valley Farm Workers Clinic (YVFWC), and scientists from the University of Washington.

This partnership has grown tremendously since the initiation of the grant. It has sustained the life of the grant, into two additional grants. All Core member organizations have expressed a sincere desire to keep

moving forward and working together. In addition, we have some of the original CAB members that continue to participate as well as new members over the years.

TRANSLATION OF FINDINGS

El Proyecto Bienestar has highlighted some important findings for working with the Latino farm working community and putting research into practice. To date, there are not any developed interventions that can be implemented in the workplace, but methods for effective communication and issues of high priority to the farm working community have been well identified.

The top four prioritized areas for work with the farm working community in the Yakima Valley are: pesticides, workplace illnesses, workplace injuries and abusive workplaces. Below, is the longer list of topics identified throughout the numerous research projects of the grant. This list was presented to the community at the Town Hall Meeting. The issues are organized according to exposure, outcome and contextual factors. This list can provide researchers a more comprehensive view of the community's concerns. The Latino farm working community is a hard to reach community and this information can provide a valuable starting point for future research, saving valuable time and enabling researchers to align their work with community needs.

List of Health Issues Developed from Community Input

A) Exposures

1. Indoor air at work
    a. Smoke/exhaust
    b. Smells
    c. Toxic gases
2. Methamphetamine labs
3. Noise
4. Nuclear plants/Hanford
5. Quality/availability of food
6. Air pollution
    a. Dust
    b. Diesel
    c. Burning
    d. Feedlots
7. Pesticides and chemicals
8. Soil contamination
    a. Lead
    b. Arsenic
9. Extreme workplace temperatures
    a. Heat and cold in indoor and outdoor workplaces
10. Water contamination

B) Outcomes

1. Cancer
2. Respiratory problems
3. Dehydration/Heat illness
4. Food Bourne illness
5. Diabetes/obesity
6. Developmental problems
    a. ADD
    b. Learning disabilities
7. Skin problems
8. Work related illnesses/conditions
    a. Musculoskeletal problems like back and wrists

b. Loss of hearing
c. Skin
d. Work related respiratory problems

9. Work related injuries
    a. Ladders
    b. Eye
    c. Tractors
    d. Machinery
    e. Falls, breaks, strains
10. Reproductive problems and birth defects

C) Contextual Factors

1. Health and safety training
2. Housing
3. Workplace conditions
    a. Access to bathrooms
    b. Access to water
    c. Management complaints
    d. Hours worked
4. Unsafe communities
5. Community sanitation
    a. Garbage collection
    b. General upkeep
    c. Garbage disposal
6. Stress
7. Access to healthcare
8. L&I (Claims)
9. Racism/discrimination
10. Wage structure/job instability
11. Education and literacy

In addition, the farm working community has identified how it best receives and understands information. Farm worker participants cited supervisors as the most common source for reliable information about workplace safety and health and who they are mostly likely to turn to when facing unsafe working conditions. This may be an important point of contact for employers and researchers when trying to reach farm workers. This indicates that supervisors may play an important role in disseminating workplace information and be key players in health interventions. Additional resources for training supervisors in health and safety issues may be an important way to decrease workplace illnesses and injuries. Second, stated that they would like to receive information mainly through brochures, radio programs, information sessions/trainings/ public meetings and television programs. The typical academic papers and materials that researchers exchange will not be as effective with this population.

Finally, the PB collaboration may serve as a partner for future researchers in the Yakima Valley. This partnership has successfully been funded through three separate grants and worked together over five years.

OUTCOMES/RELEVANCE/IMPACT

1) Potential outcomes – findings, results, or recommendations that could impact workplace risk if used;

Using the community identified methods for communication with the farm worker population to address environmental and occupational health issues will likely be a highly effective way to impact workplace risk. The community identified supervisors as the most common source for reliable information about workplace safety and health. They also identified brochures, radio programs, information sessions/trainings/ public meetings and television programs as the best forms to disseminate information. In addition, the community has identified the top four priority areas for work in environmental and occupational health in the Yakima Valley to be pesticides, workplace illnesses, workplace injuries and abusive workplaces.

2) Intermediate outcomes - how findings, results, or recommendations have been used by others to influence practices, legislation, product design, and so forth;

A large part of this grant has been dedicated to clearly identifying the environmental and occupational health concerns of farm workers in the Yakima Valley. These findings and local events have influenced the PB collaboration to focus on the issue of community well water in summer 2008 and in the EPA CARE co-operative agreement. With the interest of the community in water testing with the ConneX students in August 2008 and prior studies, the EPA is beginning to focus on groundwater contamination in the Yakima Valley.

In addition, the collaborative efforts and the consensus decision making process that has been created by PB partnership are important advances for research in this community. Creating the structures for individuals to have a voice and a role in environmental and occupational health research that affects their community is essential to creating healthy places to live and work. This has opened communication with a group that has had little previous input in research in the past and provided new insight for researchers.

3) End outcomes - how findings, results, or recommendations have contributed to documented reductions in work-related morbidity, mortality, and/or exposure

This research project has not directly contributed to documented reductions in work-related morbidity, mortality, or exposure. However, it is likely that information discussed at CAB meetings about dangers and risks have been shared with workers through the project's CAB members. CAB members include/have included farm workers (field worker, dairy worker, warehouse worker), adult educators, church members, community based organization representatives, grower group representatives, individual growers, health professionals, single mothers in agriculture, Native Americans, researchers, and students. We have not been able to quantify this data, but do think that knowledge has been shared and behaviors changed to some degree. In addition, the majority of the ConneX students come from farm working families. They also disseminate the information to the grant's target population and carry it forward in their own work and studies.

SCIENTIFIC REPORT

Background

Demographic and economic overview of Yakima County.

The Yakima Valley is located in central Washington State, an agriculturally rich region that is among the leaders in the nation in the production of apples, hops, cherries, and grapes. It ranks number two in the state in agricultural sales in 2002 (market value of crops were $844 million), just behind Grant County ($882 million) (Washington State Department of Agriculture 2002). Yakima County has an estimated population of 233,105, spread between the large urban center and smaller outlying rural towns (U.S. Census Bureau 2006). The population of Yakima County is generally your, poor, suffers from frequent unemployment, has little formal education, and is increasingly of Hispanic origin. In 2006, approximately one third (39.3%) of the population in Yakima County was of Hispanic origin (U.S. Census Bureau 2006). This high concentration of Hispanics (8.8% of Washington State's population are Hispanics) can be explained partially by the agricultural productivity of the region and the high demand for farm laborers. This may also help to explain higher levels of poverty among the Hispanic population, 33.8% of Hispanics live below the poverty line compared to 11.7% on non-Hispanics (based on estimates from data) (Kirschner, Irion 2006).

Estimates vary about the number of agricultural workers in Washington State. The Washington State Employment Security Department estimated that there were 93,582 agricultural workers in the state in 2006. Due to the part time and migratory nature of the work, the actual total number of individuals is much higher. According to Larson, there are over 185,000 migrant and seasonal farm workers and an additional 100,000 people dependent on farm workers (Larson 2000). Disparities similar to those seen between Hispanics and non-Hispanics can be seen when comparing farm workers and non-farm workers. In Washington State in 2004, farm workers in general were estimated to earn $17,400 annually, while fruit and nut farm workers (fruit crops account for a large part of Yakima's agriculture) averaged $14,300 annually (Stromsdorfer 2007). The average annual household income Washington State in 2004 was $53,005 (Office of Financial Management 2006). Hispanics in Washington, the average household income in 2005 was $37,146 (DeNavas-Walt et al. 2006).

The 1997-1998 National Agricultural Workers Survey found that the majority of the agricultural workers in the U.S. worked about one half of the year, and most had incomes below poverty level (U.S. Department of Labor 2000). In 1995, the unemployment rate for Yakima County was 12.5 percent (Labor Market and Economic Analysis Branch 1997). Moreover, in 1999, over 15 percent of families in Yakima County were living on income below the poverty level. Twenty-five percent of households receive public assistance or non-cash benefits. According to the Yakima County Profile, "Unemployment in Yakima County has traditionally been greater than the state as a whole, and much of this is because of the agricultural a base of the bounty's economy. An economy with a large, labor-intensive agriculture sector will generally have higher unemployment than in other economies. The seasonality of farm labor coupled with the vagaries of weather and its effect on harvests contribute to this 'gap' factor" (Labor Market and Economic Analysis Branch 1997). Unemployment in the county follows an annual cycle based on crop production cycles. For the period January 1997 through December 1999, the average unemployment rate for Yakima County was 10.1 (Washington State Employment Security Department 2000). Only 4 counties in the state had a higher unemployment for that period. Thirty-eight percent of industry in Yakima County was reflected in the unemployment insurance claims filed in the county. In the period from July 1994 to July 1995, three occupational groupings accounted for 57 percent of the unemployment insurance claims filed in Yakima County. They were agriculture (32 percent), processing jobs (12 percent) and packing and material handling (14 percent), all of which are based in the agricultural economy (Labor Market and Economic Analysis Branch 1997). In 1990, Yakima County had the lowest percentage of high school gradates of any county in Washington.

Yakima County presently has the highest number of migrant and seasonal Hispanic farmworkers in the state estimated to be 52,500 (Larson 2000). Much has been written about Hispanic labor migration and the influence that this pattern has had in the Washington State apple industry and agriculture in general (Qazi 1998; Krissman 1999; Jarosz and Qazi 2000). The passage of the Immigration and Reform Act (IRCA) in 1986 is one reason for the influx of Hispanic migrants. It led to the legalization of more than 2.5 million undocumented workers in the U.S., including an estimated 20,000 in Washington State (Qazi 1998; Krissman 1999; Jarosz and Qazi 2000). Krissman notes, "the documentation of millions Mexicans increased resettlement of many former migrants in the U.S., and attracted new waves of undocumented immigrants, many of whom are family members of those legalized under IRCA's provisions" (Krissman 1999). The changing structure of agriculture, especially the apple industry, during this period including increased production volumes and increased labor requirements was another impetus for Hispancis to move to Washington's apple growing regions (Jarosz and Qazi 2000). Of course, there are numerous "push" factors as well due to poor economic conditions in Mexico. The majority of agricultural workers in Washington State are Latino migrants and at least half are estimated to be here illegally (Mapes 1998).

In summary, a substantial number of migrant and seasonal Hispanics work in agriculture in the Yakima Valley. These workers are at the bottom of the social ladder, and are the lowest paid workers in the State.

Agricultural Workers' Hazards and Risks

Several reviews of health status, living and working conditions and access to health care for migrant farmworkers appeared over 15 years ago (Meister 1991; Slesinger 1992). Unfortunately, their findings that agricultural workers experience poor health due to occupational and chemical exposures, dangerous machinery, squalid living conditions, contaminated water, poor nutrition form lack of cooking facilities and low income, and increased risks for chronic disease, remain true today. Immigration, economics, legal, and cultural barriers prevent many agricultural workers from accessing safer working conditions and better access to health care.

Agricultural workers and their families are at disproportionate risk for exposure to occupational and environmental health hazards (Larson 2001). Migrant and seasonal farm workers may have enormous numbers of different exposure to many different job tasks and crops (Engel, Keifer et al. 2001). They are also at greater risk of fatal injury. Over 700 farmers and ranchers die in work-related accidents yearly and an additional 150,000 agricultural workers suffer disabling injuries from work-related accidents (National Safety Council 2000).

Latinos appear to be over-represented in hazardous job categories, and more likely to suffer occupational illness and injury than the rest of the UW population. Although Latinos make up about 7 percent of the US workforce, they represent 10 percent of the workers in higher risk blue collar occupations such as operators, fabricators and laborers, farming, fishing, and forestry, and service occupations (Friedman-Jimenez and Ortiz 1994). According to one estimate, the unadjusted relative risk for occupational illnesses and injuries compared to white men was 2.2 for Latino men and 1.5 for Latino women (Friedman-Jimenez and Ortiz 1994).

Conceptual Theory and Framework - Empowering communities

Empowerment is a participative process designed to assist individuals or groups of individuals to make decisions that will advance their health and well-being. The process of empowerment involves mutual participation, active listening, and individualized or group knowledge acquisition (Ellis-Stoll and Popkess-Vawter 1998). In his book Pedagogy of the Oppressed, Paulo Freire describes 'empowerment' education as a mechanism for liberation from the cycle of oppression (Freire 1970). He purported that education is socially determined, that collective action and learner participation are key to the learning process, and that social justice leads to liberation. Another way of saying this is that empowerment education will enable individuals within communities to more effectively advocate for social reform and

this in turn will lead to an improved quality of life for all within that community. Freire describes three steps to empowerment education: first, actively listen to issues and concerns of the group, second, dialogue about the issues and possible solutions, and third, initiate action that will lead to change (Lugo 1996). For the purposes of this study, empowerment will target not only individuals and groups, but also community-based organizations regarding occupational and environmental health issues (Israel, Checkoway et al. 1994). Positive consequences of empowerment are self-determination, independence, and self-sufficiency.

Critical social theories have emerged as one response to the everyday struggles of oppressed groups and communities. Critical social theory provides a means for affected groups or communities to reflect on their own experiences and to actively participate in developing strategies for change (Holter 1988; Stevens and Hall 1992; Clark, Barton et al. 2002). Stevens and Hall describe the underpinnings of critical social theories as follows: The theories assume that "all research, theory, and practice are political because they are intimately affected by the social, economic, and political processes of society," that oppressive power relations are common in society, and that "liberation from oppressive constraints is an indispensable part of the process of any group's pursuit of well-being and integrity" (Stevens and Hall 1992). Dialogue or mutual interaction is needed to raise consciousness about issues of concern, and action aimed at bringing about change consists of "informed, deliberate, and meaningful behavior by those experiencing health-damaging constraints." In order to apply critical theory in practice, community health professionals must begin to ask critical questions regarding oppressed conditions. For example, questions relevant to this project include: What does the community view as its primary occupational and environmental health stressors? What factors have contributed to these issues? How did these stressors develop? What resources are available? Through egalitarian dialogue, we can begin to identify and target concerns and problems that are identified by the community, rather than imposing views on their world that may not be consistent with the community's perspectives. The health professional and scientist's roles then become asking these critical questions that will assist communities to reflect on their issues rather than presenting solutions.

Conceptual Theory and Framework - Participatory Action Research

Participatory action research (PAR) is a research process that is intended to "create local knowledge through investigatory practices and applying what is learned to collective concerns. In this sense, the intent of PAR is knowledge development leading to social action." (Lindsey, Sheilds et al. 1999). Participatory Action Research shares some of the same characteristics as critical theory, that is, it focuses on oppressed populations, it advocates and facilitates individual and community empowerment strategies, and it is aimed at increasing community competence. Some describe PAR as the research form of critical theory (Lindsey, Sheilds et al. 1999). A critical element of PAR is the active participation of the constituents or the community that is affected by the research. This participation must occur at every step of the process including the assessment, priority setting, planning, implementation, data collection, reporting, and evaluation. PAR provides a means to obtain new perspectives on occupational and environmental health stressors among agricultural communities.

Participatory Action Research is a systematic learning process that depends on the collaboration of communities, health care providers, and scientists. For this study, PAR will provide a means to actively involve agricultural workers in the research process and to understand the lived experience of these workers. Participatory research typically begins with small groups of collaborators and then gradually expands so that an increasing number of persons who may be involved or affected by the research are included. Thus as the project progresses, members of the community who have a vested interest in the issues affecting this population will be added to the research team. PAR provides opportunities to develop research that has increased validity, more opportunities for innovative intervention, and an increased number of collaborators (Campbell 1995). The information obtained through this process is used to inform subsequent actions aimed at improving the health and well-being of a population.

Conceptual Theory and Framework - Using an Ecological Approach

Ecological theory was used by Bronfenbrenner to describe and explain human behaviors and experience (Bronfenbrenner 1977). In his model, humans and the contexts in which they were situated were in reciprocal transactions. Thus, human behaviors and experience could be best understood if they were viewed in context, and the context could be viewed as various levels of organizational complexity. In order to be effective, programs must consider and target not only individual or group's behaviors or characteristics, but also the multiple contextual factors that influence the behaviors. Since Bronfenbrenner's original treatise (Bronfenbrenner 1977), scientists have applied this approach to various areas, including health promotion (McLeroy, Bibeau et al. 1988), mental health (Cochran 1988; McLoyd 1990), and occupational and environmental health (Samuels 1998; Blix 1999; Salazar and Beaton 2000).

Medical ecology is a similar approach used by anthropologists to study health and health problems (McElroy and Townsend 1989; McElroy and Townsend 1996). Two key aspects of this approach are the holistic inclusion of any and all factors that influence health and the multidisciplinary techniques and theoretical perspectives used. For example, an ecological model will use environmental data, clinical data, epidemiological data, and behavioral, social and cultural data, as well as evaluation of historical and political-economic factors. An ecological model of health and disease recognizes that environmental factors are not limited to the physical environment but also include culturally constructed institutions that impact on the constraints and opportunities within which an individual lives (McNicoll 1980; Greenhalgh 1990; Evans, Barer et al. 1994; McElroy and Townsend 1996; Goodman and Leatherman 1998; Arcury, Austin et al. 1999).

Typically an ecological framework consists of multiple nested levels of interacting contexts. As an example, a recent study of adolescent farmworkers' perception about pesticides (Salazar, McCauley 2004) identified four levels of contexts that could serve as a template for this work. The levels included: the macroenvironment, the organizational environment, the social/community environment, and the microenvironment. The microenvironment refers to the environment that is closest to the person. It is the level that has the most direct and immediate effect on the worker or group of workers. It includes the physical features of the work and home environment, the characteristics of co-workers and supervisors, the structure of the job, the content of the job, and the interactions that a worker experiences. The organizational environment consists of all of the structures and functions that represent a work organization. In this case, it may include the farms in the Yakima Valley including the growers and the management, the packing houses or places where the farm product is prepared for consumers, and other such entities. The social/community environment includes the interrelationships and interaction among various systems with the community in which the organization is embedded. It can also include the social agencies, the health care system and providers, schools and agencies that have the potential to affect agricultural workers' lives (Corin 1994).

Finally, the macroenvironment is the larger societal context in which the other three levels of the contexts are embedded. It consists of the cultures, values, norms, the community's attitudes toward and perceptions about immigrants, the governmental and economic policies. One important aspect of the macroenvironment is the ideologies that are used to justify one's own actions and the actions of others. Thomas states "Social ideologies provide a shared system of symbols that reduce conflict and function as a social control mechanism by providing a non-coercive social glue that helps keep things orderly" (Thomas 1993). Social ideologies have been used to build and sustain oppressive systems of racial, class, and gender relations in which certain groups benefit from dominating others and define themselves and others through their domination (Krieger 1993). Members of the oppressed groups, including non-English speaking immigrants, face a wide range of discrimination. Discrimination against the oppressed groups at work not only produces job stress, but also increases their risks of occupational injury and illness (Gannage 1999; Salazar, McCauley 2004).

Specific Aims

The primary purpose of this project was to develop strategies that would enable the Hispanic community in the Yakima Valley, Washington State, to effectively respond to the many occupational and environmental risks related to agricultural work. This was addressed through a collaborative process. The target population includes seasonal and migrant farmworkers and other agricultural worker in the Yakima Valley.

The specific aims are to:

1. Develop structures and processes to facilitate the Hispanic community's involvement in the identification and prioritization of occupational and environmental stressors among farm workers in Yakima Valley;
2. Create opportunities and mechanisms for this community to understand and actively participate in decision-making related to their occupational and environmental health;
3. Develop an issues driven action plan that focuses on the needs articulated by Hispanic agricultural workers;
4. Cultivate a cadre of new investigators with preliminary training related to the investigation and remediation of occupational and environmental health threats;
5. Develop a sustainable partnership among the following entities: the Hispanic community in Yakima Valley, community organizations: Northwest Communities Education Center (NCEC)/Radio KDNA and Heritage University, health care providers from the Yakima Valley Farm Workers Clinic (YVFWC), and scientists from the University of Washington.

Procedures and Methods

"The most powerful aspect of community participation in health intervention projects is that it forces the projects to address the health concerns of community members rather than the concerns of health professionals." (Arcury, Austin et al. 1999). A central goal of this project is to develop relationships between university researchers and community members that lead to relevant, scientifically sound research and intervention projects. The methods described in this section are attentive to the project aims and to the specific categories of activities described in the RFA. The first stage of the process focused on the development of the project team, including the Community Advisory Board (CAB). The second stage was designed to identify and prioritize risks. The third stage, development of an issues-driven action plan, included implementation and dissemination. Communication and program evaluation was integral to the entire project and occurred throughout the process.

Stage 1: Building coalitions and partnerships

This stage focused on the first and second aims of the study which were to develop methods to facilitate the community's involvement in the project and to create opportunities and mechanisms for the community to understand and actively participate in decision-making related to their occupational and environmental health; but it was also attentive to the fifth aim, that was to develop sustainable partnerships among multiple groups. The Participatory Action Research model was the basis for all work. In order to bring people from various community groups together, a community organization approach was used. Following the three principles described by Kinne et al, the first step was to clearly define the community of interest (Kinne, Thompson et al. 1989). This was defined as the farm working community in the Yakima Valley. The second step was to use existing community structures to reach and organize community members. These members were responsible for defining problems, proposing solutions, and making "change happen using methods with which they are familiar" (p. 226). The third principle was that the "organizer's input is temporary, which is to say that the University of Washington will not always be organizing this effort in the Yakima Valley, but that it will be led from within the Valley, by the affected community.

As a first step, the core group developed criteria for membership on the Community Advisory Board (CAB). The goal was to have a membership that is generally representative of the community of agricultural workers and service providers. Fourteen positions were outlined for the CAB. These included: adult educator, churches, community based organizations, dairy workers, farmworker organization, field worker, grower group representative, health professional, individual growers, mothers of children in agriculture/single mom, Native American, research, students, warehouse workers, and three at-large spots. For the selection process, the core group proposed names of potential candidates. These candidates completed applications and the core group voted for acceptance. Once the CAB was formed, the PB collaboration agreed to use a consensus decision making process to ensure that all voices around the table were heard.

Data Collection

The identification and prioritization of risks occurred throughout the project, with the identification of risks occurring over the first three years and the prioritizing occurring in the third year. During the first year, the CAB discussed what was known at that point about occupational and environmental stressors through the input and experiences recounted by CAB members, through relevant literature, and through other informal means.

Information collected during the first year was used to guide the development of key informant interviews that were conducted with the Core team and CAB members. In order to assure the identification of the full range of occupational and environmental stressors, the ecological model was used as a guiding framework during the second year. The ecological model provided a strategic and systematic means to assess array of stressors that affect the health and safety of agricultural workers in this community. These included historical perspectives, cultural and social issues, and socioeconomic and political constraints and opportunities that affect the work and health of community members. Prior to data collection, the community advisory board reviewed and critiqued the framework; it was modified and further developed with the input from the members of the CAB. Once the framework has been approved by the board, the data collection instrument was be developed and then also modified and approved by the CAB.

In addition, each summer (2004 – 2008), a community survey was developed by the PB collaboration. This was administered in conjunction with the ConneX program (Connecting Students to Health Careers), a summer academic program for economically or educationally disadvantaged students from the Yakima Valley who are interested in health professions. The University of Washington worked with PB to create a four-credit course within the existing structure to introduce these students to environmental and occupational health and field work. As part of the field work component of the course, students conducted these community surveys with community about environmental and occupational health issues. Data was collected on PDAs (personal data assistants) and downloaded into Excel for students to analyze. Students received training in interview techniques, informed consent and basic statistics from the course instructors and the local project coordinator of El Proyecto Bienestar. A convenience sample was used due to safety concerns associated with students going door-to-door in pursuit of a random sample. Interviews were conducted during one week periods in August in public places such as grocery stores, soccer games, and flea markets. Students approached potential participants and introduced the project. If the person expressed willingness to participate and was at least 18 years old, the students obtained verbal consent and interviewed the participant in English or Spanish.

Each year, the survey was modified to meet the data needs of the project. There were a total of 937 surveys over the five years of community surveys. The first 2 years identified environmental and occupational health issues of concern. The third year addressed the issues that appeared more frequently in the initial surveys in more detail. In 2007 (the fourth year), the survey focused on understanding how community members might want to receive health and safety information (via paper, video, through clinics, managers, etc). Finally, in the fifth year, the survey involved water screening for nitrates and

related questions about water quality and knowledge. The demographic questions remained the same over the years to give a means for comparison. These included: age in years, gender, race/ethnicity, self-reported health status, time since arrival in Yakima Valley, parental status, household income, education, and English and Spanish literacy.

To prioritize the risks that were identified in the key informant interviews and community surveys, PB held a Town Hall Style meeting on April 7, 2006 to prioritize the environmental and occupational health issues that had been identified. Approximately 60 community members attended this meeting. A list of concerns was compiled from the data collection. These issues were explained by the PB team and then there was an opportunity for participants to add concerns/issues to the list through an "open mic" portion of the meeting. People were given three minutes to state their concern and provide contextual information. Participants were then given the dots with which to vote. At each table, there was a table monitor to help clarify any remaining questions. Participants then voted for their top concerns, using the dots on separate issues, or on the same issue if they felt strongly for one topic. After the results were tabulated, the prioritized list was reviewed by the CAB and Core groups and approved as the list of issues to use in the action planning phase.

Data analysis

The data analysis aimed to identify the full range of factors that participants identify as contributing to their occupational and environmental health including both risk factors and factors that ameliorate or reduce hazards.

Data analysis of KI interviews was performed by a graduate student using QSR N6 software for qualitative data analysis. The interviews were transcribed, entered into the software program and coded. Following initial coding, the data was reviewed and new codes were created through an inductive process of analyzing the data that did not fit within the original coding framework. The original coding framework was based on the first community survey. Following initial coding using the deductive (a priori) framework and the inductive (grounded) framework, a second level of coding took place. During this step in coding, more codes were developed to separate ideas that had been prematurely lumped into one code.

Validity of the coding framework and the analysis was addressed in several ways as suggested by Mays and Pope[50]. First, two researcher participated in creating the coding framework. Second, negative case analysis was used. This method requires that the researcher actively search for cases that discredit or disprove emerging themes in order to develop a more accurate analysis of the data. Finally, as is done in most qualitative research, reflexivity was practiced throughout the analysis. This methodology requires that the researcher keep a research journal and memos throughout the entire analysis process resulting in a paper trail that aims to make the analysis a transparent process. If a comment combined two topics, it was double-coded.

Again, the ecological model was used to systematically review and organize the data. Once the factors are identified, forms of communication with special consideration of literacy levels and language skills were developed. The nature of these communication strategies was determined by the CAB and Core

Development of an Issues Driven Action Plan

Aim 3 of this project was to develop an issues driven action plan that focus on the needs articulated by key community groups in the Hispanic community. It was planned that the action plan would include at a minimum, the development of curriculum(a) to be used for education and training of members of the local community. Additional specific interventions that target some of the stressors that were identified during the course of the project were also a goal of this grant.

Development of a community-generated proposal

Aim 4 of this project was to cultivate a cadre of new investigators with preliminary training related to the investigation and remediation of occupational and environmental health threats. A goal throughout this project was to begin to identify community leaders who may be able to contribute to future research efforts. These 'new investigators' actively participated in CAB activities and they assisted with the data collection and analysis and with the development of an action plan.

Developing sustainable partnerships

Every stage of this project had a focus on the development of sustainable relationships between the partners. We built on the rich relationships that already existed among the partners, and actively looked for additional partners who support the goals of our work, that is assuring the occupational and environmental health or agricultural workers and assuring the fair and equitable distribution of resources and services within the community.

Communication and Dissemination

The dissemination of the work of the CAB and other associated work occurred throughout the project. Particular attention was paid to producing materials in both Spanish and English, and possibly indigenous languages. One mechanism for internal communication was the development of meeting minutes. KDNA was an extremely valuable resource in terms of assuring communication to the local community. That, after all, is their business. They made occasional public service announcements on the radio.

Program Evaluation

Program evaluation was integral to the entire project and occurred at every stage of the process. Program evaluation focused on the achievement of the goals of this program. The evaluation, which was be guided by an ecological framework, used an action research approach involving a close and collaborative working relationship between the community, service providers, and the scientists of the research team. The ecological framework provided a means to strategically examine the full range of external influences that affect the progress of project activities. Action research evaluation has been proposed as a method that is most effective in understanding community empowerment and its effects (Eng and Parker 1994). This type of evaluation is a departure from traditional evaluation methods that detaches the evaluator from the evaluated. Although the ultimate goal of this effort was to decrease the occupational and environmental risks that exist in agricultural communities, the evaluation also focused on successes related to social justice, political efficacy, and community control over the community's quality of life. In order to consider the interests of all stakeholders involved in this project, the evaluation was iterative and characterized by collaborative inquiry. The group worked together to identify the focus of the evaluation to define and construct measures, to develop data collection techniques, and to determine methods to analyze data.

Results

Throughout the five year grant cycle, this collaboration has developed a strong and lasting set of structures and processes that facilitate communication and work between researchers, community groups and the community (specific aim 1). Both a Core team and Community Advisory Board (CAB) were formed during this project, which continue to work together currently as a partnership under additional grants. The Core consists of the University of Washington, Northwest Communities Education Center/Radio KDNA (NCEC/KDNA), the Yakima Valley Farm Workers' Clinic, and Heritage University. The CAB represents a variety of interests within the community and although it has 14 positions, it has oscillated in size over the years. These groups currently meet together every second month and uses a consensus based decision making process in its work. In addition, facilitation is shared and rotated each meeting so that all members participate. When necessary, additional meetings are scheduled. The group communicates weekly via email and phone to discuss project progress. Throughout the grant period, ad-hoc committees within the Core Group and CAB have formed to address

specific project needs such as communications, funding, priority areas, etc. A series of policies were formed for the Core group and CAB and a training/orientation was given early in the project to the CAB members (December 2004).

In order to fully hear the concerns of the farm working community, several qualitative and quantitative research projects were developed to identify occupational and environmental health stressors in the farm working community of the Yakima Valley (specific aim 2). Key informant interviews were conducted with each of the Core Group partners and the 12 members of the Community Advisory Board in 2004-2005. Over the past five summers (2004 – 2008), annual community surveys have been conducted with a total of 937 surveys. Each year, the survey was modified to address the current project information needs. The first 2 years identified issues of concern. The third year addressed the issues that appeared more frequently in the initial surveys. In 2007 (the fourth year), the survey focused on understanding how community members might want to receive health and safety information (via paper, video, through clinics, managers, etc). Finally, in the fifth year, the survey involved water screening for nitrates and related questions about water quality and knowledge.

Below, find the list of issues and concerns identified throughout this data collection process. These have been grouped into exposures, outcomes and contextual factors by the Core and CAB.

A Exposures

1. Indoor air at work
    a. Smoke/exhaust
    b. Smells
    c. Toxic gases
2. Methamphetamine labs
3. Noise
4. Nuclear plants/Hanford
5. Quality/availability of food
6. Air pollution
    a. Dust
    b. Diesel
    c. Burning
    d. Feedlots
7. Pesticides and chemicals
8. Soil contamination
    a. Lead
    b. Arsenic
9. Extreme workplace temperatures
    a. Heat and cold in indoor and outdoor workplaces
10. Water contamination

B Outcomes

1. Cancer
2. Respiratory problems
3. Dehydration/Heat illness
4. Food Bourne illness
5. Diabetes/obesity
6. Developmental problems
    a. ADD
    b. Learning disabilities
7. Skin problems

8. Work related illnesses/conditions
    a. Musculoskeletal problems like back and wrists
    b. Loss of hearing
    c. Skin
    d. Work related respiratory problems
9. Work related injuries
    a. Ladders
    b. Eye
    c. Tractors
    d. Machinery
    e. Falls, breaks, strains
10. Reproductive problems and birth defects

C Contextual Factors

1. Health and safety training
2. Housing
3. Workplace conditions
    a. Access to bathrooms
    b. Access to water
    c. Management complaints
    d. Hours worked
4. Unsafe communities
5. Community sanitation
    a. Garbage collection
    b. General upkeep
    c. Garbage disposal
6. Stress
7. Access to healthcare
8. L&I (Claims)
9. Racism/discrimination
10. Wage structure/job instability
11. Education and literacy

A Town Hall Style Meeting was held on April 7, 2006 to prioritize the environmental and occupational health issues that had been identified. At this meeting, there was an opportunity for community members to add concerns to the list before voting began. Each participant was given three voting dots that they could place on any three topics, or repeatedly on one or two topics. The top four issues that emerged were: pesticides, workplace illnesses, workplace injuries and abusive workplaces.

The fourth year of the community surveys (2007) helped us examine and refine the ways in which we are trying to reach the agricultural community. Farm worker participants cited supervisors as the most common source for reliable information about workplace safety and health and who they are mostly likely to turn to when facing unsafe working conditions. This indicates that supervisors may play an important role in disseminating workplace information and may be effective players in health interventions. Second, participants most commonly requested more information on workers' rights issues, followed by pesticides and chemicals, how to deal with workplace abuses, and work related injuries. They stated that they would like to receive this information mainly through brochures, radio programs, information sessions/trainings/public meetings and television programs.

The development of the issues driven action plan (specific aim 4) has primarily occurred through additional grant writing and subsequent work. In October 2007, the El Proyecto Bienestar collaboration

was awarded an EPA CARE cooperative agreement of approximately $78,000 to identify, prioritize and develop an action plan for environmental health issues in the Yakima Valley. This funding, combined with the NIOSH/NIEHS grant allowed PB to conduct tests for nitrates, lead and arsenic in private wells in August 2008. The group has just finished a second prioritizing process, again involving using dots to vote on issues of concern. The outcomes of this meeting will focus the PB collaboration on developing a resource center and develop a more comprehensive water testing program/study in the Yakima Valley.

The piece of the action plan that was not fully realized was the development of the curriculum. The pesticide curriculum has been worked on in implemented in some classes at Heritage University, but additional curricula were not developed.

In addition, the PB collaboration was awarded a 2-year NIH Partners in Research grant of $100,000 in the fall of 2008 to develop and test *radio novelas* (Spanish language radio dramas). This responds to the community's survey answers about wanting information through radio programs. The radio novelas will be based around the prioritized health issues identified in the NIOSH/NIEHS grant.

One of the areas where the PB collaboration has been more successful is in training new researches and investigators to become a new cadre of public health professionals in the Yakima Valley (specific aim 4). The summer community surveys were conducted with college level students from the ConneX program. The University of Washington augmented the regular summer program conducted through the Northwest Community Action Center (NCAC) and YVFWC to add a four credit course, "ENVH 499: Introduction to Field Research in Environmental and Occupational Public Health". Each summer staff and/or graduate students from the Department of Environmental and Occupational Health Sciences (DEOHS) at the University of Washington (UW) teach this course, which provides an overview of environmental health, occupational health and how to conduct field work and analyze data with a practical experience (community survey). Over the five years of community surveys, 63 undergraduate students have been trained through this course. ConneX students and/or interns have presented their findings at regional and national conferences each year. This program is often their first encounter with environmental and occupation health topics, as well as field work and is one of the projects most successful efforts.

In addition, two summer undergraduate interns based out of UW under Matthew Keifer have also been involved in teaching the ConneX course as "teaching assistants" and involved in the field work portion in 2006 and 2008. Finally, numerous graduate students have participated in the ConneX program and PB in general. Five graduate student theses have come out of this project. These have focused on: 1) analysis of perception data from key informant interviews; 2) analysis of environmental and occupational health issues from key informant interviews; 3) evaluation of the ConneX program on the students; 4) analysis of seasonal fluctuations of asthma hospitalizations in the Yakima Valley; and 5) evaluation of power structure and participation in el Proyecto Bienestar (different stakeholders). This has provided a more in-depth and multiple views of the project and enriched the work that has resulted. All of these young investigators (ConneX students, interns and graduate students) have advanced their public health knowledge and careers through this project.

Finally, specific aim 5 was fully realized. Over the course of the five years of collaborative work, the partners and community have committed to continue this project through additional grants and have stated their desire to move together into future work. This was greatly aided by the detailed project assessment by Professor Mary Salazar. Periodically, short surveys were taken by both the Core and CAB to make sure that the project stayed on course with goals and people felt involved. At the end of the project, Dr. Salazar conducted one-on-one interviews with the majority of CAB and Core members to gather members' perspectives about how things had gone for the duration of the project. The interviews consisted of open-ended questions that focused on the structures, processes and outcomes that

characterized this project. This served as a good tool to learn from and modify behavior. In addition, it created a common understanding and sense of working together to achieve the partnership and its goals.

Discussion

The partnership views this five year grant as a successful endeavor, albeit with several challenges. We successfully built an effective and strong partnership among researchers, community groups and the community; engaged the community in data collection and issue prioritization; started an issue driven action plan; trained approximately 70 young academics in environmental and occupational health; and developed a sustainable partnership. We have been able to involve the community in most steps of the research process, as community based participatory research principles state.

However, it is hard to say definitively if we fully overcome every challenge that we have faced, but the collaboration has accomplished and/or made significant progress toward many of the project's goals/aims. One of the largest challenges that we faced along the way was the interface of two different time schedules: community processes and university/research processes. This conflict often came during the IRB process because the community is not familiar with the IRB. In addition, waiting several weeks to carry forward with a plan is often frustrating for the CAB. In order to address this issue, we tried to make the process as transparent as possible so that the CAB understood the processes that we must pass through as researchers and why this is important in protecting the community in research in general. During this project, the overall feeling about research by the community improved. At times, research has been viewed as taking data and leaving. After years of working together, our CAB understands that this is not how we conduct our research and have become more invested in the project.

Despite the challenges encountered, we have been able to create spaces for active participation in the various stages of research: study conception and design; data collection; data analysis, interpretation and drawing conclusions; and communication of results. The study design began with the action of a community activist who suggested a project to one of the university researchers.

During data tool design and data collection, the community was very active. Community members participated in the key informant interviews through the CAB. Then, they advised and revised each of the five community survey tools. In addition, local university students (through ConneX) conducted the surveys and analyzed the results. Community members on the Core created the voting system for the Town Hall Meeting and CAB members suggested the order of events for the evening, as well as participating in the event itself.

Data analysis, interpretation, drawing conclusions and communication were more difficult areas in which to involve the community, but some mechanisms were successfully created. A community member was invited onto the thesis committee of the graduate students who conducted their research through this process. This ensured that the community stayed aware of what was being shared in academic circles and outside of their own community. It provided a chance for the community to ensure that the work and data was properly represented. For the ConneX surveys, local students learned to do basic analysis and presented the results to members of the community through a power point presentation. In addition, each year the ConneX results were presented at a larger regional or national conference. At the Town Hall Meeting, the general public was invited to see the data analysis we had done (the list of environmental and occupational health issues we had created based on the key informant interviews and the community surveys) and comment on it. All of these opportunities were helpful in involving community members in data analysis. Their input and attention to the community's true words added important perspectives to the interpretations and final results.

Although it has required more time to conduct certain parts of this project, the inclusion of community members at each of these steps has allowed El Proyecto Bienestar develop a long and detailed list of

environmental and occupational health concerns of farm workers in the Yakima Valley. This collaboration has learned that by involving the community, valuable insight has been added that outside researchers could not know on their own. This has made the action planning phase more responsive to the community's needs and resulted in greater participation and more meaningful research and intervention plans.

Conclusion

El Proyecto Bienestar offers a range of examples for ways to create meaningful participation of community members in the research process. Community members, including the youth of the community, can be included in decision making about the study, designing data collection instruments, data collection, data analysis, and communication of results. This project has learned that the youth are a very powerful constituency to work with. They are motivated and have fresh minds and may develop into health professionals in the future. Being exposed to these processes and issues at a young age may better prepare them for more effective work in the future. In addition, the larger community has always responded very well when the youth of their community engages with them on health topics of concern. However, certain challenges remain unresolved but are now recognized and can be discussed openly with community participants. The largest of this being the difference in time between community action and research processes. Our experience with El Proyecto Bienestar has shown that involving community members in all stages of research can be a very good model for addressing the environmental and occupational health concerns of Hispanic farm workers and their families. Although more time is needed on the initiation, to form partnerships and trust, the strong and committed team that emerges can be very effective.

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Program Director/Principal Investigator (Last, First, Middle): Keifer, Matthew

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: Community Health Intervention with Yakima Agricultural Workers

Total Enrollment: 988 **Protocol Number:**

Grant Number: #1 R25 OH008143

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race

Ethnic Category	Sex/Gender			
	Females	Males	Unknown or Not Reported	Total
Hispanic or Latino	445	470		915 **
Not Hispanic or Latino	22	24		46
Unknown (individuals not reporting ethnicity)	5	1	21	27
Ethnic Category: Total of All Subjects*	472	495	21	988 *
Racial Categories				
American Indian/Alaska Native	18	14		32
Asian	2	3		5
Native Hawaiian or Other Pacific Islander				0
Black or African American	2	7		9
White	445	470		915
More Than One Race				
Unknown or Not Reported			27	27
Racial Categories: Total of All Subjects*	467	494	27	988 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)

Racial Categories	Females	Males	Unknown or Not Reported	Total
American Indian or Alaska Native				
Asian				
Native Hawaiian or Other Pacific Islander				
Black or African American				
White	445	470		915
More Than One Race				
Unknown or Not Reported				
Racial Categories: Total of Hispanics or Latinos**	445	470		915 **

* These totals must agree.
** These totals must agree.

MATERIALS FOR OTHER INVESTIGATORS

This project does not have many materials to pass onto other investigators, however it has a strong working partnership between the University of Washington, Northwest Communities Education Center/Radio KDNA, the Yakima Valley Farm Workers Clinic and Heritage University that may be consulted when working the with occupational and environmental health concerns in the Yakima Valley. In addition, below you will find the list of concerns identified by the community for use in future research.

A Exposures

1. Indoor air at work
    a. Smoke/exhaust
    b. Smells
    c. Toxic gases
2. Methamphetamine labs
3. Noise
4. Nuclear plants/Hanford
5. Quality/availability of food
6. Air pollution
    a. Dust
    b. Diesel
    c. Burning
    d. Feedlots
7. Pesticides and chemicals
8. Soil contamination
    a. Lead
    b. Arsenic
9. Extreme workplace temperatures
    a. Heat and cold in indoor and outdoor workplaces
10. Water contamination

B Outcomes

1. Cancer
2. Respiratory problems
3. Dehydration/Heat illness
4. Food Bourne illness
5. Diabetes/obesity
6. Developmental problems
    a. ADD
    b. Learning disabilities
7. Skin problems
8. Work related illnesses/conditions
    a. Musculoskeletal problems like back and wrists
    b. Loss of hearing
    c. Skin
    d. Work related respiratory problems
9. Work related injuries
    a. Ladders
    b. Eye
    c. Tractors
    d. Machinery

e. Falls, breaks, strains

10. Reproductive problems and birth defects

C Contextual Factors

1. Health and safety training
2. Housing
3. Workplace conditions
    a. Access to bathrooms
    b. Access to water
    c. Management complaints
    d. Hours worked
4. Unsafe communities
5. Community sanitation
    a. Garbage collection
    b. General upkeep
    c. Garbage disposal
6. Stress
7. Access to healthcare
8. L&I (Claims)
9. Racism/discrimination
10. Wage structure/job instability
11. Education and literacy