A Critical Medical Anthropology Approach to Advocating for Social Justice and Policy Change in Pesticide Use and Practice to Reduce Health Risks Among Hispanic/Latinos in Central California

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This mixed methods research was conducted in the fall of 2014 to understand the perceptions and experiences of health risks and health outcomes due to pesticide exposure among community members (n=13) - concerned community members, agriculture workers and teachers- that live in the Central California agriculture counties of Monterey, Santa Cruz, Tulare, Fresno and Madera. This research explored: 1) The crops growing in participants' communities, and how exposure to pesticides used in these crops pose potential health risks to participants and their communities 2) How pesticide exposure is impacting Hispanic/Latino communities in Central California, particularly those that are most vulnerable including school children, agriculture workers, and community members 3) The major public health concerns of impacted communities 4) Feelings of empowered to advocate for community health and environment and 5) What impacted communities wish to see on behalf of government and agribusiness to protect public health from pesticide exposure and toxins.

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Chapter 1 Introduction

1.1 Research Subject: Health Risks Due to Pesticide Exposure

Central California is a major contributor of food production in the United States. Many of its farms are situated in rural areas. Despite the low population densities, the use of pesticides has had adverse health impacts on nearby communities, in that environmental elements such as wind cause pesticide drift, the spread of pesticides from agriculture sites to other areas. The side effects of pesticides are known to include degenerative effects on any individual that come in contact with them; however because they make up more than 50% of the population of Central California and the majority of the agriculture workforce, Hispanic/Latino/as are disproportionately impacted by pesticide exposure and poisoning (Faber, 2008; Jacobs et al, 2003).

Scientists, academics and government officials have produced population statistics and data on the toxicity of pesticides for decades. Scientific data has yielded many studies revealing the fact that exposure to pesticides and poisoning disproportionately impacts Hispanic/Latino/as communities in Central California, particularly those that are most vulnerable including children, pregnant women and agriculture workers (Bateman and Eddleston, 2011; National Institute of Health, 2011; Roberts and Karr, 2012). However data is not always connected to personal experiences and perceptions of individuals impacted by pesticides. In efforts to connect the gap, this research focuses on the perceptions and experiences of health risks and health outcomes due to pesticide exposure among individuals that live in the Central California counties of Monterey, Santa

Cruz, Tulare, Fresno and Madera. The following research questions are explored in this paper:

1) Which crops are growing in participants' communities? How does exposure to pesticides used in these crops pose potential health risks to participants and their communities?
2) How is pesticide exposure impacting Hispanic/Latino/as communities in Central California, particularly those that are most vulnerable including school children, agriculture workers, and community members?
3) What are the major public health concerns of impacted communities?
4) To what extent do impacted communities feel empowered to advocate for their health and environment?
5) What do impacted communities wish to see on behalf of government and agribusiness to protect public health from pesticide exposure and toxins?

1.2 Justification

Despite the understanding of the adverse health outcomes of pesticide exposure, communities residing in agricultural dominated counties are often composed of vulnerable populations that continue to lack political representation and protection. The influence of agribusiness lobbyists of government officials has swayed environmental policy, which perpetuates the health status of communities and environmental conditions in Central California (Action Group on Erosion, Technology and Concentration, 2008). Knowledge of community perceptions of pesticide exposure can be used as a tool to potentially advocate

for improved policies and procedures associated to public and environmental health in California. The goal is to learn about the community's perspectives of the health risks of pesticide exposure. Often it is easy to dismiss an issue if the issue is unknown. Calling attention to the issue by providing real life experiences can provide a compelling case in lobbying for policy change in pesticide reform.

1.3 Client: Californians for Pesticide Reform

The client for this thesis project is Californians for Pesticide Reform, an organization focused on social and environmental justice located in Oakland, California. Californians for Pesticide Reform (CPR) is a statewide coalition of approximately 180 organizations with a core staff and a steering committee composed of members from eight organizations. California for Pesticide Reform's mission is to protect public health, improve the environment and promote sustainable agriculture throughout California by influencing policy makers to further create stringent agriculture laws related to pesticide practice and use. CPR's goals are to "eliminate the most dangerous pesticides, reduce the use and reliance of pesticides, support safer forms of pest management, expand and protect the publics' right to know about pesticide use, exposure and impacts" (Californians for Pesticide Reform, 2015). Since 1996, Californians for Pesticide Reform has lobbied for policy reform through creating a rapport with government agencies as the Californian Environmental Protection Agency and California's Department of Pesticide Regulation, state and local politicians as in Governor Jerry Brown and Senator Bill Monning, and county agriculture commissioners.

Californians for Pesticide Reform is currently working on several campaigns to protect public health in California. One of CPR's main campaigns is Safe Air For Everyone (SAFE). This initiative focuses on the health of agriculture workers, their families and communities in agriculture areas by preventing pesticide and air pollution in the environment. Due to their high risk to pesticide exposure and high susceptibility to toxicity, children are a primary concern for CPR and public health organizations in California. Hence public schools and neighborhoods located in agriculture communities are primary concern areas. The SAFE campaign goals are to "phase out all fumigant and other pesticides that drift into the air, improve air quality by reducing pesticide use, establish state and local regulatory structures that are accountable to affected communities on pesticide drift issues and affirm and protect the public's right to know about the use and effects of pesticide air pollutants" (Californians for Pesticide Reform, 2015). Through the SAFE initiative, CPR is aiming at reducing and eventually eliminating dangerous pesticides and fumigants that are widely used throughout California with an emphasis on chlorpyrifos, 1,3-dichloropropene, and chloropicrin. These pesticides are known carcinogens, hormone disruptors, neurotoxins, and developmental or reproductive toxins. Californians for Pesticide Reform requests that the researcher gather information on the experiences of community members' exposure to pesticides in the Central California's Central Valley and Central West Coast. Therefore the researcher conducted interviews in five counties in order to understand community members' perceptions of health in accordance with pesticide exposure.

1.4 Deliverables

The proposed deliverables for Californians for Pesticide Reform are narratives and photos of the research participants from this research project. This will be provided as an assessment of perceptions of health and current presence of pesticides in Central California. The assessment will come in the form of a written report and will be given to Californians for Pesticide Reform. Documented narratives and media can potentially be used to update the Californians for Pesticide Reform website. Findings may be used to lobby for policy change and promote public health initiatives in California.

CH 2 The Research Content

2.1 An Overview of Pesticides

The 20th century experienced a shift in agriculture production due to the creation of chemical pesticides. Prior to the 1940s farmers relied on natural forms of reducing pest problems such as crop rotation and using crops that were naturally more resistant to pests. However these two methods were not reliable (Glare, 2012). Synthetic organic chemical pesticides emerged out of World War II as poisons. For example, organochlorines such as DDT were used as nerve poisons to combat insects that cause malaria, polio and other health ailments (Fishel, 2005). Chemicals were then used to control pests in agriculture. Without the use of chemical pesticides, pests destroy 48-83% of crops. Chemical pesticides lower this amount to 27-42% of crops destroyed (Glare, 2012). After

WWII various types of chemical pesticides were widely developed and used in agriculture.

Pesticides are substances used to control unwanted pests (plants, insects and animals). Two types of pesticides are biopesticides and synthetic organic chemicals or chemical pesticides. Biopesticides are environmentally friendly pesticide alternatives to chemical pesticides. They occur naturally in nature, plants, animals, minerals, and bacteria. According to the United States Environmental Protection Agency (2015) the three types of biopesticides are microbial pesticides, Plant-Incorporated-Protectants (PIPs) and biochemical pesticides. Microbial pesticides control bacteria, viruses, fungi, protozoa and nematodes through microorganisms (Glare et al., 2012). PIPs utilize genes in plants as a pesticide, and biochemical pesticides consist of naturally occurring chemicals as in insect pheromones (United States Environmental Protection Agency, 2015).

In contrast to biopesticides, conventional synthetic organic chemical pesticides contain man made synthetic materials that do not naturally occur in the environment. The term “organic” refers to their carbon compound (Park and Allaby, 2013). However this specific definition of “organic” does not refer to non-chemical pesticides alternatives, as specified in biopesticides. To minimize confusion, conventional synthetic organic chemical pesticide will simply be referred to as “chemical pesticides”. Four types of chemical pesticides are organophosphate pesticides, carbamate pesticides, organochlorine insecticides and pyrethroid pesticides. Chemical pesticides are used in insecticides,

fungicides, herbicides, rodenticides and other types of pesticides (Bateman and Eddleston, 2011).

Two types of insecticides are organochlorine (OC) and organophosphates (OPs). Most organochlorine pesticides were banned due to their high lead residue (Glare, 2006). OPs and carbamate pesticides have been used since the 1960s as a replacement for organochlorines. Due to their potential toxicity, OPs and carbamate pesticides are a major concern because they cause poisoning, long-term health problems and death. Poisoning can occur through repetitive exposure of low concentrations of OPs and carbamates. Pesticide exposure can occur through inhalation, ingestion, and dermal contact (Gilden et al, 2009). Toxicity increases with high tissue concentrations of OPs or carbamate pesticides and acetylcholinesterase. Acetylcholinesterase is a neurotransmitter that communicates between cells and muscle nerves, which promotes contraction of muscles (ie movement). Hence, both OPs and carbamate pesticides have the capability of causing acetylcholinesterase to shut down, causing paralysis (Roberts and Karr, 2012).

Herbicides are pesticides that control unwanted plants. A variety of herbicides exist based on their chemical structure. Herbicides stop plant growth by giving off a synthetic plant like hormone. The two common types of herbicides target monocotyledon weeds (single blade, grasses) and dicotyledons (broad-leaved plants) (Matthews, 2006). In comparison to other types of pesticides, herbicides are not as toxic to humans (Matthews, 2006).

Fungicides and rodenticides are two other chemical pesticides. Fungicides are chemical pesticides that kill fungi on plants. Parasitic diseases cause plants to grow fungi or spores, causing a plant to rot. Fungicides are intended to interrupt or prevent plant diseases from occurring (Columbia Encyclopedia, 2013). Rodenticides are uses to eliminate rodents, particularly rats in fields and buildings. A variety of rodenticides are sold on the market. However rodents have developed a resistance to some rodenticides including warfarin. There is concern of pets and predatory birds becoming poisoned by eating rodenticide pesticides or rodents that consumed pesticides (Matthews, 2006).

2.2 Major Pesticides of Concern: Chlorpyrifos, 1,3-Dichlorpropene, and Chloropicrin

Californians for Pesticide Reform and the California Department of Public Health have deemed chloropyrifos, 1,3-dichlorpropene and chloropicrin as pesticides of public health concern (California Department of Public Health, 2014). Pesticides of public health concern are pesticides that have active ingredients. Active ingredients are chemicals in pesticides intended to “kill, control or repel pests” (California Department of Public Health, 2014). Pesticides of public health concerns fall under six categories: carcinogens, reproductive and developmental toxicants, cholinesterase inhibitors, toxic air contaminants, fumigants and priority pesticides.

The three pesticides of concern to Californians for Pesticide Reform are all classified as insecticides, which are among the most dangerous types of pesticides. 1,3-dichlorpropene, chlorpyrifos and chloropicrin are all varieties of insecticides. In particular chlorpyrifos is an organophosphate insecticide, 1,3-dichlorporpene is an organochlorine (OC) and chloropicrin is used in all types of chemical pesticides including insecticides, herbicides, and fungicides (Matthews, 2006).

In the United States, the use and production of 1,3-dichloropropene and chloropicrin has increased as a replacement for a soil fumigant, methyl bromide. The production and use of methyl bromide is intended to be phased out by 2015 due to its degenerative environmental and health effects (Ji et al., 2012). According to DowAgro Sciences LLC, Telone C-35, the combination of 1,3-dichloropropene and chloropicrin, could increase the efficacy and cost of pest management in agriculture (Ji et al., 2012). Chloropicrin specifically targets fungi and 1,3-dichlorpropene controls for nematodes, fungi and weeds. In addition, chloropicrin is a fumigant, priority pesticide, and toxic air contaminant. 1,3-dichloropropene is a priority pesticide, toxic air contaminant, fumigant and carcinogenic. Chloropicrin and 1,3-dichloropropene are soil fumigants. Fumigants are prone to drift, or travel due to environmental elements such as water and air (California Department of Public Health, 2014). Hence, chloropicrin and 1,3-dichloropropene have the capacity to travel from a farm, their initial site of application, to nearby residential and work areas, exposing communities that live nearby.

Chlorpyrifos emerged as a chemical pesticide in 1965. Chlorpyrifos is the most used insecticide in the United States and the world (Callahan et al., 2014). Chlorpyrifos is a priority pesticide (California Department of Public Health, 2014). Due to the toxicity, chlorpyrifos has been eliminated in home use. It is stilled used to eliminate pests such as mosquitoes, corn rootworms, and cutworms on various crops, animals, commercial buildings and recreational spaces as golf courses (Beyond Pesticides, 2000).

Independently, the three pesticides of concern pose environmental and health risks that have varying persistence levels. California Department of Pesticide Regulation has deemed chloropicrin and 1,3-dichloropropene as restricted material that requires special permits for use. However, counties may further restrict these pesticides. Chloropicrin has a “low” chemical persistence in which the active chemical ingredients will stay active in the soil for four days and active in the air for eight hours. 1,3-dichloropropene has a “moderate to high” chemical persistence in which the active chemical can say in the environment for 69 days. Chlorpyrifos has a “high” chemical persistence; the active chemical in this pesticide can remain in the environment from 60 to 120 days (California Department of Public Health, 2014).

2.3 Effects of Pesticides on Health

2.3.1 Health Risks

Pesticide exposure can lead to acute and chronic symptoms and in the most sever cases, mortality. Acute symptoms can occur due to short-term exposures to chemical pesticides. Chronic symptoms can be caused by long-term exposure to chemical pesticides. The type of pesticide, dosage amount, length of exposure, and exposure route can contribute to adverse symptoms, mortality and morbidity. Pesticides can be carcinogens, hormone disruptors, neurotoxins, and developmental or reproductive toxins. Routes of exposure are oral, dermal, and respiratory or inhalation. Oral exposure occurs through intake of pesticides through the mouth, dermal exposure occurs through intake of pesticides through the skin or eyes, respiratory or inhalation occurs through intake of pesticides through the lungs.

Chlorpyrifos is toxic to mammals and algae, including humans, insects, and aquatic species (Beyond Pesticides, 2000). Chlorpyrifos affects the "respiratory system, central nervous system, peripheral nervous system [and] plasma cholinesterase (Center for Disease Control and Prevention, 2015). As a cholinesterase inhibitor, chlorpyrifos interferes with the brain's control of nerve impulses. Chlorpyrifos causes a range of acute symptoms including "numbness, tingling sensation, incoordination, dizziness, vomiting, sweating, nausea, stomach cramps, headache, vision problems, muscle twitching, drowsiness, anxiety, slurred speech, depression, and confusion" (Beyond Pesticides, 2000). High exposures of chlorpyrifos cause respiratory paralysis, unconsciousness, convulsions and death (Beyond Pesticides, 2000).

Oganophosphates and carbamates specifically, chlorpyrifos, can compromise the nervous system of children through seizures, coma and other health problems (Roberts and Karr, 2012). The chronic health effects among children vary due to the “diversity of toxicological properties of this broad group of differing chemicals” (Roberts and Karr, 2012). Risks include “cancer, abnormal neurodevelopment, asthma, perturbation of gestational growth and endocrine-mimicking effects” (Roberts and Karr, 202). Childhood cancer related to OPs and carbamate pesticides are leukemia, brain tumors and ewing sarcoma, a rare bone cancer.

Exposure to 1,3-dichloropropene primarily occurs on sites of direct contact as in farms or production plants. This chemical pesticide affects the kidneys, liver, central nervous system, respiratory system, eyes and skin of mammals (Center for Disease Control and Prevention, 2015). Acute symptoms of 1,3-dichloropropene due to inhalation and dermal exposure are difficulty breathing, dizziness, chest pain, mucous irritation of eyes, skin, and respiratory system, and allergic skin reactions, tearing of eyes (Agency for Toxic Substances & Disease Registry, 2008). Chronic symptoms are severe damage to the stomach and bladder. According to The Department of Health and Human Services, The International Agency for Research on Cancer, and The Environmental Protection Agency, 1,3-dichloropropene is possibly cancerous to humans (Agency for Toxic Substances & Disease Registry, 2008).

The seriousness of chloropicrin's toxicity is exhibited through its previous use as a wartime agent. Chloropicrin was used as a tear gas in World War I (Center for Disease Control and Prevention, 2015). Hence this chemical pesticide affects the eyes, skin, and respiratory tract. Acute symptoms may start out like flu like symptoms. However they can progress to respiratory and muscle problems (Roberts and Karr, 2012). The acute symptoms are irritation of the eyes, respiratory track, skin and gastrointestinal tract. Ingestion of chloropicrin can cause chronic symptoms such as gastrointestinal problems, neurological and musculoskeletal problems that can last for weeks to months (Center for Disease Control and Prevention, 2015). Other symptoms due to ingestion are burning of the mouth, stomach and esophagus, cyanosis (blue skin color), difficulty breathing or shortness of breath, headache, dizziness, nausea, vomiting, sore throat, stomachaches and lung damage (Center for Disease Control and Prevention, 2015). Symptoms due to inhalation are tearing of the eyes, irritation, coughing, choking, difficulty breathing or shortness of breath, nausea, vomiting, diarrhea, headache, dizziness, lethargy, anxiety, blue color skin, and tightness of the chest. Severe exposure can lead to "inflammation of the lower respiratory tract, with potentially fatal accumulation of fluid in the lungs" and potentially death (Center for Disease Control and Prevention, 2015).

2.3.2 At Risk Groups (Hispanic/Latino/as, Children, Pregnant Women & Agriculture Workers) and Pesticide Drift

As mentioned above, counties in Central California house many farms situated in rural areas. Despite the location of agriculture production, the use of pesticides has had adverse health impacts on nearby communities in both rural and urban areas. Environmental elements such as wind cause pesticide drift, the spread of pesticides from agriculture sites to other areas. Pesticides are known to have degenerative effects on individuals that come in contact with them. Latino/Hispanic populations are disproportionately affected by pesticide exposure because Latinos/Hispanics make up more than 50% of Central California counties and compose 70% of the agriculture work force in the United States (Faber, 2008). Hence, agriculture workers and residents of agriculture areas, particularly women and children of Latino/Hispanic heritage, have the highest exposure of pesticide exposure due to pesticide drift (National Institute of Health: 2011).

Pesticides drift or travel through the natural environment from the initial dispersal point to nearby areas impacts agriculture communities. Pesticides are administered through various methods as liquid or solid chemicals. Crop dusting and spraying are the two most common and dangerous methods of administering pesticides in agriculture. Ariel applications via crop duster or plane that sprays pesticides are the most dangerous as pesticides drift past the area in which they are sprayed in the air. 40% to 80% of pesticides in the form of dust have the capacity of traveling via air. In comparison, between 5% and 70% of pesticides sprayed can travel in the air (Waldbott, 1978).

Pesticide exposure can occur through inhalation, ingestion, dermal contact and through the placenta. Exposure can occur all over the environment; for example, indoors, outdoors, at home, school, at work, in water sources and in the air we breathe. Risks due to pesticide exposure are heightened for people that are in their developmental stages. Hence, children and pregnant women are at highest risk for adverse health outcomes due to pesticide exposure.

"Children are more likely to be exposed to pesticides and more susceptible to the health effects of pesticides" due to their behavior, physiological development and body size (California Department of Public Health, 2014). Behaviors that put children at a higher risk are putting objects in their mouths, spending time outside, and playing on the ground. Physiological development refers to the development of children's bodies, which makes them susceptible to "interruptions or delays in key developmental milestones" (California Department of Public Health, 2014). In reference to body size, "relative to their weight, children eat, drink and breathe more than adults, increasing their exposure on a per pound basis" (California Department of Public Health, 2014).

In addition to the multiple health outcomes listed above, adult exposure to pesticides can impact their offspring. Typically, researchers and governments assume that men primarily work as pesticide applicators. This notion fails to recognize that women also come in contact with pesticides as applicators, harvesting crops, washing laundry that contains pesticide residue, on food residue, and in the natural environment carried through pesticide drift via air and water (Jacobs et al., 2003). Health risks due to pesticides may differ between

men and women. Compared to men, women have higher body fat and lower body weight. Pesticides accumulate in fatty tissues, including breast tissue in women. Pesticides can be passed on from the mother to the child via breast milk and to the fetus in the womb. In turn, women's health is interconnected with the health of their children and families.

The largest risks to pesticide toxicity are due to exposure during the prenatal period of pregnancy, in the household, and at workplaces. Exposure to the embryo and fetus during different periods of development may determine adverse effects (Gilden et al, 2009). Adverse health risks for women exposed to pesticides are (but not limited to) reproductive and developmental issues, infertility, ability to become pregnant, early menopause, miscarriage, spontaneous abortion, fetal death, intrauterine growth retardation and other complications (García, 2003). Other effects of pesticides are neurological and behavioral disorders, birth defects, low birth weight, and fetal death (Roberts and Karr, 2012). As previously mentioned, adult exposure to pesticides can lead to the morbidity of their children including the development of various forms of cancer; leukemia, brain tumors, and bone cancer. Children have higher risk of leukemia if their mothers were exposed to pesticides at home or while working in agricultural fields during prenatal or utero stages of their pregnancy. Maternal occupational exposure in agriculture fields can also lead to brain tumors in children. Children are at risk for developing ewing sarcoma, bone cancer, when their mothers are agriculture workers and especially when the mothers handle pesticides, lived on farms, and have fathers working on farms during conception

and or pregnancy. Physical developmental effects due to pesticide exposure can occur to embryo and fetuses including intrauterine growth retardation, preterm birth, fetal death and congenital anomalies (Roberts and Karr, 2012). Congenital anomalies are a range of health problems, birth defects, disorders and malformations. Common birth defects are orofacial clefts (cleft lip), neural tube defects and limb defects. Neural tube defects are incomplete development of the brain, spine or spinal cord. This can lead to nerve damage and paralysis, and in severe cases stillborn or death (Roberts and Karr, 2012).

Occupational health risks are a primary concern for agriculture workers. Working on a farm that uses pesticides puts agriculture workers at risk for pesticide exposure and toxicity. Pesticides are found on crops, soil and in the air. Agriculture workers are constantly in contact with pesticides through applying pesticides, picking crops and other occupational tasks. Lack of following pesticide label instructions and not using protective equipment are two factors that contribute to the risk of pesticide exposure among agriculture workers. Often, agriculture workers and pesticide applicators are illiterate and or do not speak or read the language in which the labels are printed. Further, all foremen and growers (employers) do not provide proper protective equipment to protect workers' health (Jacobs et al., 2003). Agriculture workers often carry pesticide residue on their clothes when they go home; increasing the amount of pesticides in the home (Roberts and Karr, 2012). Agriculture workers are also at risk to pesticide exposure and are poisoned by not properly disposing used pesticide containers and reusing these containers, lack of water and washing facilities in

agriculture fields, lack of medical centers and poison control centers, and lack of knowledge about the health risks of pesticides mistaking symptoms of pesticide poisoning for common illnesses (Jacobs et al., 2003). Direct exposure to pesticides through dermal, oral, inhalation in agriculture fields cause many acute and chronic symptoms.

Farmers and agriculture workers are the occupational group of workers with the highest risk for asthma. Exposure to allergens from plants, animals and chemicals increase the risk of asthma. In the early 2000s research was conducted on 20,000 farmers who were licensed pesticide applicators in Iowa and North Carolina (Ernst, 2002). Farmers who reported wheezing were compared to those that did not in the previous year. Higher likelihood of wheezing was associated with using 11 of 40 pesticides. Wheezing is associated to several respiratory problems however the two associated to pesticides are asthma and inhaling pesticides (Ernst, 2002). A few of the health problems faced by agriculture workers and communities living in agriculture areas are cancer, low levels of acetylcholinesterase, sterility and reproductive complications. Types of cancers that have been reported in relation to pesticide exposure are stomach, prostate and testis, lung, liver, mouth, pharynx, lymphoma ovarian and breast cancer (Jacobs et al., 2003).

2.4 Central California: Central West Coast and Central Valley

Central California encompasses a large region of California that spans south of Northern California's San Francisco Bay Area and north of Southern

California's Los Angeles County. Particularly, this research focuses on the Central West Coast counties of Monterey and Santa Cruz, and the Central Valley counties of Tulare, Madera and Fresno. For this purpose of this project, all five of the counties in this research project will be considered as "Central California".

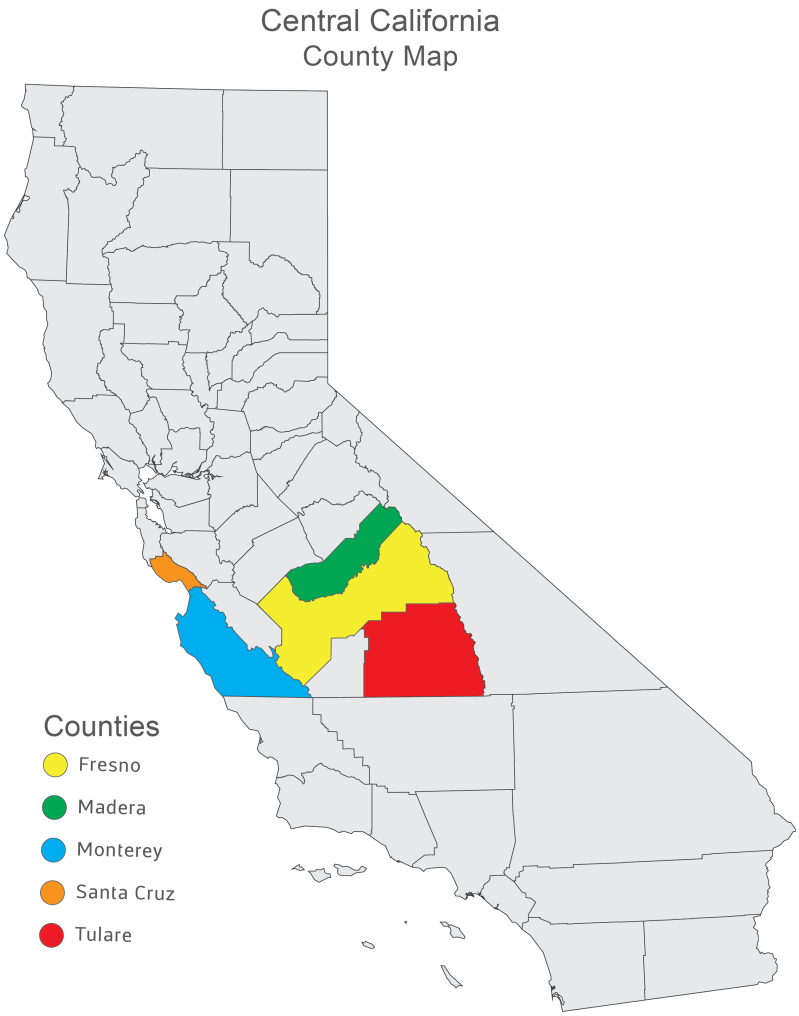

Figure 1: Central California County Map

(This map highlights the Central California counties in which this research was conducted in.)

California is a major contributor of food production in the United States. In 2012 California rank the highest in the nation for cash crop receipts. In other

words, California earned the highest U.S. dollars due to selling food crops in comparison to the rest of the states. With 80,500 ranches and farms, California was responsible for supplying the United States with one third of their vegetables and two thirds of the fruits and nuts (California Department of Food and Agriculture, 2014). In total, California produced over half of the fruits in vegetables in the United States (California Department of Public Health, 2014).

Nine out of ten top counties producing agriculture in the United States are in California. The Central Valley and Central Coast are two of the highest producing agricultural areas in California. In particular, Fresno, Tulare (Central Valley) and Monterey (Central Coast) Counties are top producers of agriculture in the state of California. According to California Department of Food and Agriculture's County Statistical Data, Fresno ranked as number one, Tulare as number three, Monterey as number four and the San Joaquin Valley was ranked number seven for the highest gross value of agricultural production from 2011 to 2012. Fresno, Madera and Tulare counties are all in the San Joaquin Valley (California Department of Food and Agriculture, 2014). Out of all 58 agriculture producing counties, Santa Cruz ranked 20th. Hence agriculture is a leading industry in Central California, which impacts communities that reside in those counties.

2.5 Central California: Demographic Information

Central California is a major agriculture area and home to many people of Hispanic heritage. Hispanics make up 70% of the agriculture work force in the United States (Jacobs et al, 2003). In particular, the majority of agriculture

workers are of Mexican heritage and most are undocumented workers (Faber, 2008). Agriculture communities in Central California are affected by pesticide exposure. These communities are diverse however pesticides disproportionately have affected families of low socio-economic status, and people of color, in particular agriculture workers and their families. 62% of these families live in poverty and are further affected by pesticide exposure (Jacob and Dinham, 2003).

Other than Santa Cruz County, each of these agriculture communities have similar demographic profiles. More than half of the population for each county is of Hispanic Heritage, a language other than English is spoken at home, more than a quarter of the population is foreign born and agriculture is the primary work force (United States Census Bureau, 2014).

More than half (56.8%) of the population of Monterey County is Hispanic or Latino (United States Census Bureau, 2014). Thirty percent were born in a foreign country, 52.6% speak a language other than English at home, 26.5% of the population is under 18 years old and 48.6% are women. Monterey County is the third largest agriculture county in the state with a large agriculture workforce. Over 25% of the jobs are in agriculture, more than any other industry in the county (Monterey County, Economic Development). Fresno County is composed of 51.6% Hispanic or Latino heritage. 21.9% are foreign born, 43.7% speak a language other than English at home (United States Census Bureau, 2014). 20% of all jobs in Fresno County are in agriculture (Fresno County Farm Bureau). In 2013, Madera County's population was composed of 55.7% of Hispanics.

Twenty-one percent were foreign born, 44.1% spoke a language other than English in their home (United States Census Bureau, 2014). Agriculture is 30% of the total workforce in this county (Fresno Regional Foundation). The population of Tulare County consists of 31.8% under 18 years old. Approximately 50% are female, 62.3% are Hispanic or Latino, and 22.8% are foreign born (United States Census Bureau, 2014). Approximately one quarter of the work force in Tulare County is employed in the agriculture sector (Tulare County Farm Bureau). Although Santa Cruz County is also known for agriculture, the county demographic profile differs from the other counties in this research project. Unlike the other counties, the population of Santa Cruz has a smaller Hispanic/Latino population of 32.9%, 18.3% are foreign born, and 31% speak a language other than English at home. Twenty percent of the population of Santa Cruz County is under 18 years of age and 50.3% are female (United States Census Bureau, 2014). One in 20 jobs (4.5%) in Santa Cruz are in the agriculture sector (Santa Cruz County Agriculture, 2013).

2.6 California Agriculture

California's agriculture sector is a complex system composed various entities and organizations. These entities vary from the top-level decision makers that create environmental health and public health policies, and big agriculture corporations to the middle-men of farm owners to those that are impacted by regulation including agriculture workers, agriculture communities, and environmental justice organizations. The two main state government

organizations in California agriculture are the California Environmental Protection Agency (CalEPA) and California Department of Pesticide Regulation (DPR). Agribusiness or agriculture corporations have a strong presence in California and are a major influence among agriculture policy. The farm system itself is composed of farm owners, growers, farmers, and agriculture workers. Lastly, communities in which agriculture areas are seated are also a part of the agriculture sector. This last group not only includes the community at large, but also farm workers, their families, and nongovernment organizations, non-profit organizations, public health organizations, and environmental justice organizations.

2.6.1 State and County Governments

Agriculture in the United States is dominated by a system of federalism in which state and county governments have the authority to protect agriculture interests while maintaining public health and environmental standards under the federal government. On a federal level, the United States government instills national policies that affect agriculture. However, the creation and implementation of agriculture policies and practices are left to the authority of the state and county governments. Hence, authority over agriculture is often the responsibility of local governments and their agribusiness corporate influencers.

On the federal level, The Environmental Protection Agency regulates pesticides through two federal acts. Under the Federal Insecticide, Fungicide and Rodenticide Act, the EPA registers pesticides and creates labels in order to

protect public health. The Federal Food, Drug, and Cosmetic Act gives the EPA the responsibility of establishing tolerance levels of the amount of pesticide residue aloud on food (Environmental Protection Agency, 2014). The Environmental Protection Agency uses documents as The Pesticide Data for pesticide regulation. The Pesticide Data Program was created by the U.S. Department of Agriculture and the Agriculture Marketing Service to conduct risk assessments that detect the smallest level of pesticide residue on food. The Environmental Protection Agency reviews the risk assessments, determines if a pesticide is safe to use, the levels of pesticide residue that is allowed on food and administers registration and licensing for pesticides (Punzi et al., 2005).

California's Environmental Protection Agency is the highest state authority on environmental regulation and protection under the federal government. The Environmental Protection Agency has regional offices throughout the United States, however California is one of three states that has their own EPA. Towards the end of the twentieth century, California established an EPA to further protect public and environmental health. CalEPA creates and implements state-wide environmental policies which are implemented through six agencies that make up CalEPA including the Air Resources Board, the Department of Pesticide Regulation (DPR), the Department of Resources Recycling and Recovery, the Department of Toxic Substances Control, the Office of Environmental Health Hazard Assessment and the State Water Resources Control Board. Of the environmental agencies, CalEPA and DPR are the two

agencies that focus on agriculture pesticide regulation, management, and public health.

The Department of Pesticide Regulation was implemented to protect agriculture workers and the general population by registering, granting permits, and providing trainings on pesticide use and safety. DPR must comply with federal and state pesticide regulations as posed by the US EPA and the CalEPA. However, DPR can implement more regulations on the state level as deemed necessary (Powell, 2001).

On the local level, each county in California has a department of agriculture that are responsible to implement regulations set out by DPR and CalEPA. An agriculture commissioner heads each department of agriculture. The agriculture commissioner creates a balance between the agriculture industry and public health. In accordance with federal and state regulations, the agriculture commissioner deals with local maintenance of farms, produce quality control, controls and oversees pesticide management, grants pesticide use permits and conducts weights and measure inspections to protect public health.

2.6.2 Agribusiness

Agribusiness represents the current state of agriculture inputs utilized to operate all aspects of agriculture. Traditionally farmers worked their land and supplied their own inputs. Inputs are materials that are staples in agriculture, such as seeds, farm equipment, and animal feed (Woolverton et al., 1985). Population growth created the need for the efficient and quick production of

crops. This was supported by advancements in technology and the development of agribusiness. Agribusiness then supplied farmers with input materials, which allowed farmers to focus their efforts on crop production (Woolverton et al., 1985). Eventually agribusiness began to provide the "total of all operations involved in the manufacture and distribution of farm supplies; production operations on the farm; and the storage, processing; and distribution of farm commodities and items made from them" (Woolverton et al., 1985).

Since the 20th century, small-scale agribusiness transformed to multinational corporations. California agriculture is dominated by agribusinesses. Agribusiness developed into the corporate control of agriculture. Large players in agribusiness hold monopolies over agriculture business in California, the United States and throughout the globe. Ten companies control 89% of the agrochemical market in the world. The top ten companies (in order from the top to the bottom) are Bayer, Syngenta, BASF, Dow AgroSciences, Monstanto, DuPont, Makhteshim Agan, Nufarm, Sumitomo Chemical and Ayrsta Lifescience. Of the ten mentioned multinational companies, six control the production of seeds, fertilizer, food processing machinery, distribution and retail. These companies are Dow AgroSciences, Monsanto, BASF, Bayer, Syngenta and DuPont (Action Group on Erosion, Technology and Concentration, 2008).

2.6.3 Agriculture Employees

The farms consist of multiple layers of workers. A landowner may rent or lease farmland to growers. However, in some cases the grower may also be a

landowner. Growers may own the farm, production, and the product(s). They may also sign a contract with agribusinesses; in which the agribusiness purchases, distributes and sells the product under their name. Farmers also known as farm workers and agriculture workers hold various positions in agriculture farm manager or farm hand. The jobs of farm hands vary including but not limited to picker, pesticide applicator, and farm equipment operator. Workers come from a variety of occupational backgrounds including migrant workers, and seasonal workers.

2.7 Research Field: Applied Medical Anthropology And Environmental Anthropology

Applied medical anthropology is a subfield of cultural anthropology that addresses social aspects of environmental health issues through praxis. This subfield looks at health and illness from the cultural perspective of individuals and communities (Hans et al, 2003). In particular, critical medical anthropology is a socially liberal approach to medical anthropology. It has been informed by theories of neo-Marxism, political ecology and political economy in response to biomedical systems in capitalistic nations. Hence, critical medical anthropology focuses on the relationship between classism and health (Hans et al, 2003).

Environmental Anthropology is concerned with the interaction of humans and their natural environment (McGuire, 2005). Major topics of concern are the intersection between communities and environmental degradation, renewable and non-renewable resources, human rights, and environmental rights.

Environmental anthropology utilized political economy and political ecology to highlight the experiences of communities studied and relationships with various social classes, socio-economic status, economies, environmental conditions, and policies. Anthropologists such as Arturo Escobar call for politicized political ecology in which the peasant class “protest against the nexus of power they find themselves in- to employ environmental discourse to invigorate social movements” (McGuire, 2005). Politicized political ecology is action oriented and mobilizes individuals and communities that are underrepresented and marginalized in social and political arenas.

2.7.1 Political Economy, Political Ecology & Environmental Racism

Political economy is a theory that focuses on law, politics, and the economy in relation to the creation and implementation of public policy. This theory is heavily based on the relationship of race, class, gender, and the capitalistic world system. Capitalism strives on the oppression of people based on race, class, and gender. Capitalism divides individuals and communities of various backgrounds, creating power differentials between groups. This separation of groups maintains a neoliberal economic class system. Social-economic status, distribution, and access to resources and education are based on a tiered class system. Class divisions separate the dominant class from other classes. The owning class is composed of a small minority of the population yet they are the wealthiest, control the functions of society, and create dominant norms that have a strong influence on policy. The dominant class controls mental and material production

in agriculture and other sectors in society. Hence, the dominant class controls social order by implementing their ideology, values and norms as the status quo (Singer and Baer, 1995).

Political ecology encompasses political economy as well as societal and environmental factors. Political ecology "calls for the recognition that a stable societal-environmental relationship is essential for human well-being" (Baer, 1996). This theory focuses on how the capitalistic economic system exhausts environmental resources, which leads to environmental degradation. Capitalism thrives on producing an abundance of products at the cheapest cost to drive maximum profit. This can be applied to agriculture and pesticide use. Agriculture in California is the perfect example of how capitalism deteriorates the environment and the people occupying that space through the exploitation of the environment, agriculture workers, and communities in farming areas (Hans et al, 2003).

Political economy and political ecology intersect together with environmental racism, in which minorities are denied a safe, healthy environment. Today's agriculture conditions and laws are based on environmental racism. In other words, people of color are disproportionately affected by environmental injustices. Environmental injustices that are experienced by people of color include occupational hazards, pollution, and contaminated potable water. These injustices are hidden by institutional racism, which has reinforced differences of political power, health, housing, education, and employment between poor people of color and affluent white people (Bullard, 2002).

Mexicans composed the largest racial group employed as agriculture workers. Ninety percent of agriculture workers are composed of people of color, in which most are undocumented workers and Hispanic/Latino/a (Faber, 2008). Agricultural pesticides poison approximately 313 thousand out of 2 million agriculture workers a year. This population is less likely to report poor occupational conditions due to fear of repercussions such as loss of a job and deportation (Faber, 2008).

The political power of a community often determines their environmental and health status. Marginalized communities typically do not have the resources necessary to protect themselves from environmental and health risks. These resources are knowledge (ie of exploitation and laws), education, money, and time (Faber, 2008). Communities of low socio-economic status are more likely to live and work in hazardous environmental conditions due to various needs for survival. On the other hand, more economically affluent and educated communities have the tools and political power to protect their health and environment through influencing government officials and the decision making process.

Agribusiness has a strong influence over the government through lobbying and funding business interests (Faber, 2008). Big corporations as agribusiness are known to monetarily fund elections to both democratic and republican candidates in the United States (Faber, 2008). These contributors are known to be “conservative, white, wealthy, males” (Faber, 2008). According to the Federal Election Commission, agribusiness contributed $74,949,995 to Republican and

Democratic politicians in 2014 (Center for Responsive Politics, 2015). In return, elected government candidates favor their supporters by creating tax cuts for the wealthy and favoring neoliberal laws that benefit the wealthy. However poor populations do not have the monetary capability of supporting government officials. Hence, government officials have provided more support to the rich then supporting the poor and ensuring their basic human rights of promoting environmental and social justice (Faber, 2008).

Strong environmental regulations that protect public health are a threat to capitalism and agribusiness. Large corporations (including agribusiness) strongly influence the government and benefit from lax laws, including laws on pesticide use in agriculture (Faber, 2008). Corporations benefit from government officials who are industry-friendly in the Environmental Protection Agency, the Department of Interior and other government agencies. The Environmental Protection Agency is known to employ "lobbyists, lawyers, politicians or scientists who have worked for" agribusiness corporations (Faber, 2008).

2.8 Model for Understanding Major Pesticides of Concern: California Department of Public Health 2014 Report

The California Department of Public Health's study *Agricultural Pesticide Use Near Public Schools in California* serves as a model for this research project for a few reasons: The study focuses on public schools that are ¼ mile from agriculture fields where pesticides are applied. This proximity is similar to the proximity in which the participants (of this research project) live to an agriculture

field. Other justifications for using this study is that it focuses on children, pesticides of public health concern, and this study is a major publication for the state of California and a concern for Californians for Pesticide Reform.

In 2010 the California Department of Public Health (2014) conducted a study, researching agriculture pesticide use near ¼ mile of public schools (grades k-12) in 15 counties in California. These 15 counties represent 25% of all 58 counties in California that experience the greatest pesticide use. These 15 counties account for 85% of pesticides used in the state and contain the most pounds of active pesticides applied in California. Active ingredients are chemicals in pesticides intended to "kill, control or repel pests". Eight hundred and twenty-five active ingredients were used in agriculture in 2010. Of these 825, 144 were applied ¼ mile near schools in the top 15 counties. One fourth of a mile was chosen because it "provided a reasonable 'drift' distance in the absence of more rigorous microclimate modeling and because ¼ mile is a common distance used for pesticide permitting regulations near schools" (California Department of Public Health, 2014).

The intent was to conduct surveillance to protect public health, particularly minimize children's exposure to chemical pesticides. This study assessed and monitored pesticides for six categories: carcinogens, reproductive and developmental toxicants, cholinesterase inhibitors, toxic air contaminants, fumigants and priority pesticides. The pesticides in this research are "pesticides of public health concern" (California Department of Public Health, 2014).

Four (Fresno, Tulare, Madera and Monterey) of the five counties that represent the sample size of this research study are among the top 15 counties of concern. Fresno ranked first for the most amount of pounds (27,777,500 lbs) of pesticides used in agriculture, Tulare ranked third (8,867,756 lbs), Madera ranked fifth (8,582,823) and Monterey ranked sixth (8,203,711) (California Department of Public Health, 2014).

Among the top 10 pesticides of concern, three are also a concern to CPR. California Department of Public Health ranked pesticides of concern in numerical order; the first pesticide is of highest concern. The first pesticide of concern is chloropicrin, the second is 1,3-dichloropropene and the eight is chlorpyrifos (California Department of Public Health, 2014). Over one hundred and fifty thousand pounds of chloropicrin, 136, 241 pounds of 1,3-dichloropropene and 7,769 pounds of chlorpyrifos were used ¼ mile near schools (California Department of Public Health, 2014). California Department of Pesticide Regulations has deemed chloropicrin and 1,3-dichloropropene as restricted material that requires special permits for use. However, counties may further restrict these pesticides. Chloropicrin has a “low” chemical persistence in which the active chemical ingredients will stay active in the soil for four days and active in the air for eight hours. 1,3-dichloropropene has a “moderate to high” chemical persistence in which the active chemical can say in the environment for 69 days. Chlorpyrifos has a “high” chemical persistence; the active chemical in this pesticide can remain in the environment from 60 to 120 days (California Department of Public Health, 2014).

Although the California Department of Public Health provided data on pesticides of concern and justifications for the concern, the 2014 report did not measure exposure to pesticides. The report stated “this study methodology does not attempt to measure schoolchildren’s exposures to pesticides and therefore, study results cannot be used to predict possible health impacts” (California Department of Public Health, 2014). Despite the direct associated of exposure to pesticides and health risk, this report provides a basis for further study that is supported by ethnographic and epidemiological research. Hence, this research project utilizes ethnographies of community members in Central California by collecting stories of pesticide poisoning and health risks associated to pesticide exposure.

Chapter 3 Methodology

3.1 Ethical Clearance and Research Permission

Ethical clearance and research permission was maintained from the Institutional Review Board (IRB) at the University of North Texas (UNT). All materials used were submitted for approval to the IRB. These materials consisted of a research guide and informed consent forms in English and Spanish. Prior to conducting an interview, the researcher presented the informed consent form to the participant, explained all aspects of the study, answered any questions that may have arisen and requested permission of the subject’s participation. Further, this document described purpose of the study, the study procedures, foreseeable risks, benefits to the participants, and procedures for

maintaining confidentiality. This information was shared in Spanish or English, depending on the subject's language preference.

3.2 Data Collection

Qualitative and quantitative data methods were used in this research project. Data collection occurred from October 2014 to January 2015. Seven face-to-face semi-structured interviews were conducted in various public spaces (participant's homes, a workers union and restaurants), over a 400 mile radius, from the meeting point of the Pacific Ocean, Monterey County and Santa Cruz County on the Central West Coast, expanding southeast to the Central Valley counties of Tulare, Fresno and Madera from October to December 2014. The researcher lived in Oakland, California and drove to each of these locations. The researcher drove a total of 1,416.8 miles, equating to 29 hours of driving time from her home location to the interview sites. In addition to face-to-face interviews, two interviews were conducted through an Apple computer/ IPhone application (FaceTime) and two interviews were conducted via phone call in December 2014 and January 2015. The length of each interviews ranged from 45 minutes to an hour. With permission, interviews were audio recorded and transcribed. Confidentiality was maintained as requested by participants. However a few participants agreed to include their names in this research project.

Research participants were recruited at event meetings with client organization, Californian's for Pesticide Reform. After the initial participants were

recruited, the snowball sampling method was utilized to further recruit participants. Participants were concerned community members (community activists), agriculture workers (farm workers) and teachers who live in agriculture areas in Central California.

The research guide was composed of several question sets; general questions and questions for concerned community members, farm workers, teachers, and government officials. Each set of questions was geared towards a particular audience living in agriculture areas. The questions gathered the perceptions of the impacts of pesticide exposure on health outcomes, risk perceptions, occupational hazards, overall concerns, political and social power, and demands towards the government and agriculture industry to protect public health. Participant groups were created based on the groups of people who are at the highest risk for pesticide exposure in California; Hispanic/Latino/as, particularly Hispanic/Latino/a children. Ethnicity in sample size is an important factor to consider due to the disproportionality in pesticide exposure in agriculture areas. The majority of the participants reflected the large Hispanic/Latino/a population in Central California. Central California is home to more than 50% of Hispanic/Latino/as. As ethnic minorities, Hispanic/Latino/as are disproportionately impacted by pesticide exposure. Therefore, it was important that the sample size reflected the demographic statistics.

The participants represented diverse occupational backgrounds from multiple agriculture counties that coincided with the research guide. A total of 13 participants were interviewed from five counties; Monterey, Santa Cruz, Tulare,

Fresno and Madera. Participants identified as public school teachers, administrators, community activists, agriculture workers, a retired nurse and a union worker. Four participants were community activists from the Central Coast (three from Monterey County and one from Santa Cruz County). Three of these participants were white and one was Hispanic/Latino/a. Nine participants were from the Central Valley (two from Tulare County, three from Fresno County and four from Madera County); all were Hispanic/Latino/a. 10 participants were agriculture workers in the past, in which two recently worked in farms (in 2014) as seasonal workers, one is a grower who owns and operates a small farm, and eight worked in farms when they were children until they were young adults. All of the participants who participated in agriculture work were of Hispanic/Latino/a heritage. The white participants did not report that they had previously been agriculture workers. Five participants represent school workers. Three of the participants are currently public school teachers from the Central Valley (Madera County), one participant is a retired teacher from Santa Cruz, and one participant is a school administrator from Madera County. One participant from Monterey County is a retired nurse. Further, all of the Hispanic/Latino/a participants had worked in agriculture. Hence, all of the Hispanic/Latino/a teachers were once agriculture workers. Out of the four community activists, one was Hispanic/Latino/a and previously an agriculture worker. In addition to being community activists, the white participants also represented a diverse occupational background consisting of a retired nurse, retired public school teacher, and a union worker. All of the participants were over the age of 18 years

old, concerned about pesticide exposure, and live in a county dominated by agriculture.

All 13 participants live near agriculture fields; from living directly on an agriculture field to living 2.5 miles away from an agriculture field. Agriculture fields surround four participants' homes. Two of the participants live on a farm. Three responded that they live right next to agriculture fields, in which two live 300 feet away from fields. Five live within a mile from agriculture fields. One participant lives approximately 2.5 miles from an agriculture field, marking the furthest distance to an agriculture field out of all participants. Three activists, who are White, live near organic farms on the Central West Coast. All other participants, who are Hispanic/Latino/a did not state that they lived near organic farms.

In addition to ethnographic data, CPR was provided with approximately 285 hours in observations in meetings with Californian's for Pesticide Reform (20 hours), and volunteering in the CPR office through translating documents (30 hours), conducting research (210 hours) and attending orientation/ training programs (25 hours). Volunteering with CPR required 18 hours of orientation, where the researcher learned about the objective, goals, history, and current projects of CPR. 20 hours of participant observation was conducted between October and December 2014. Participant observation consisted of attending monthly CPR steer committee meetings, weekly CPR coalition meetings, a meeting with the Safe Strawberry Working Group (a CPR coalition organization), a meeting with the Safe Strawberry Working Group and California Senator Bill

Monning, and a meeting with CPR supervisors and the California Environmental Protection Agency. With the exception of coalition meeting, all other meetings required driving to Monterey County or Sacramento, California. The primary task of the researcher was to conduct research for CPR. This research consisted of a media scan; finding, reading and analyzing media articles that depicted pesticides and agriculture. Other tasks were translating documents and op-ed articles from English to Spanish and attending two Center for Story Based Strategy (CSBS) training sessions. At CSBS trainings, the researcher collaborated with coalition members and social/environmental activists to develop campaign strategies necessary to advocate for pesticide reform.

3.3 Data Analysis

Data from the transcribed interviews was analyzed. Qualitative and quantitative analysis was utilized. Themes were identified that portrayed common perceptions of participants. Statistical analysis was used to understand the common themes. For example, analyzing aggregate data for perceptions of physical reactions lead to the understanding of the shared and isolated experiences of each participant. Although this information was collected utilizing qualitative methods, the analysis utilized a quantitative component. Analysis provided information regarding the perceptions of health risks due to pesticide exposure throughout five counties Central California.

3.4 Limitations of Study Methods

Limitations of this research project were traveling, participant recruitment, fulfilling a deliverable requested by the client, and possible reporting bias. Upon planning the research project, the sample size was proposed to consist of thirty participants with the aim of recruiting agriculture workers, community activists, teachers and government officials. All of the groups were interviewed except government officials. The field the researcher learned the challenges of the populations represented in the sample size. The perspective participants (community activists, teachers and agriculture workers) were hesitant to speak due to feelings of fear of political actions, deportation, losing their job, getting their family in trouble and being identified. The researcher contacted various government officials including the county agriculture commissioners from the five counties studied; however invitations to participate in interviews were either denied or a reply was not received.

Californians for Pesticide Reform requested that a picture of each participant was taken for their website. Prior to conducting interviews, the researcher asked permission to take a picture of the participant. Every participant decline due to the above mentioned concerns. In respect to confidentiality and request of participants, photos were not taken.

Conducting face-to-face interviews required that the researcher travel over 400 miles on multiple occasions throughout Central California. The researcher traveled 100 miles one way, from her home in Oakland to Monterey County in the

Central West Coast, and over 200 miles one way to the Central Valley to conduct interviews and observe meetings.

Despite the importance and benefits of this research, there are limitations to the research methods; specifically in qualitative research. Qualitative research relies on participants reporting their narratives and health outcomes through interviews. Interviews can result in reporting bias; in which participant's responses may be altered by various factors. Some factors may include lack of remembering pesticide incidences and health outcomes, and leaving out parts of the stories. Further, self-reporting pesticide exposure and linking it to poisoning or symptoms of illness can be perceived as subjective and require further study.

CH 4 Results

4.1 Crops and Pesticide Exposure in the Central California

Participants that lived in the Central West Coast reported that the agriculture fields near their homes consisted of mostly vegetables. Two farms cultivated broccoli and lettuce, which document the majority of the vegetables reported by participants living in the Central West Coast. Others reported vegetables in this area are asparagus, cauliflower, tomatoes, artichokes and organic strawberries. These crops were only reported once.

In contrast to the crops grown in the Central West Coast, the participants living in the Central Valley primarily reported nuts and fruits as crops growing near their homes. All nine participants living in the Central Valley reported living near grape vineyards. In addition to grape vineyards, all four participants from

Madera County (Central Valley) reported living near almond fields. The two participants living in Tulare County reported the most diversity in crops near their homes (total of nine crops). One reported olives, grapes, walnuts, pomegranates, cherries, plums and nectarines. The other Tulare community member reported grapes, oranges, peaches and olives. In total, grapes (9 respondents), almonds (4 respondents) and olives (2 respondents) were reported the most by the participants living in the Central Valley.

The U.S. Department of Agriculture's Pesticide Data Program provides risk assessments of pesticide residue on food that is primarily consumed by children (Pesticide Action Network, 2014). This risk assessment demonstrates which pesticides are found on food, their human health effects and environmental effects. Documented effects are carcinogenic, hormone disruptors, neurotoxins, developmental or reproductive toxins, and bee toxins. Ten out of 17 of the crops grown near the participants homes were documented by Pesticide Action Network's report on the Pesticide Data Program. Pesticide residue information was provided for five out of the seven crops identified on farms on the Central west coast. These crops are asparagus, broccoli, cauliflower, lettuce and tomatoes. Five out of the ten crops reported by participants living in the Central Valley were documented in the report. These five crops are almonds, cherries, grapes, oranges and peaches.

Crops	Number of Pesticides	Carcinogenic	Hormone Disruptor	Neurotoxin	Developmental or Reproductive Toxin	Bee Toxin
Asparagus	9	1	7	3	3	3
Broccoli	33	3	16	6	6	9
Lettuce	52	3	17	10	8	14
Cauliflower	15	0	15	6	1	9
Tomatoes	35	3	12	6	3	10
Total:	144	10	67	31	21	45
Grapes	56	8	17	10	4	19
Almonds	9	1	4	3	0	4
Cherries	42	5	20	7	8	14
Oranges	12	3	4	5	3	4
Peaches	62	8	24	12	9	20
Total:	181	25	69	37	24	61

Crops in Central West Coast Crops in Central Valley

Figure 2: Description of Crops and Pesticides in Participant's Communities

This figure demonstrates the number of pesticides found in 10 crops in Central California, and the number of pesticides in each crop that demonstrate human and environmental health effects. The totals highlight the aggregate number of pesticides used in all of the crops from both locations (Pesticide Action Network, 2014).

The two totals in the table above demonstrate the aggregate number of pesticides used in each crop. Many of these crops contain the same pesticide residues; some crops contain more pesticide residues than others. This brings up the concern of multiple exposures to many different pesticides sequentially or at the same time. Further, this documentation only represents residual exposure that is left over after the crop reached the consumer and it has been lightly

washed (without soap) for approximately 15 seconds (Punzi et al., 2005). At this stage the pesticide residue may not be as strong as it is in or near an agriculture field. Exposure may be more severe through directly handling pesticides or crops that have been sprayed with pesticides by working in an agriculture field and or being exposed to pesticides by pesticide drift.

Seven out of the 10 crops listed above contained chlorpyrifos, a pesticide of concern. These crops are asparagus, broccoli, tomatoes, grapes, almonds, oranges and peaches. As mentioned above chlorpyrifos is a neurotoxin, hormone disruptor and bee toxin, and it persists in the environment for 60 to 120 days (California Department of Public Health, 2014).

4.2 Aggregate Health Outcomes of Pesticide Exposure in Communities in Central California

As mentioned above, exposure to pesticides often leads to a variety of physical symptoms. This proves to be true in the sample as well (n=13). More than half of participants experienced the following acute symptoms: headaches (69%), burning eyes (62%), difficult breathing or shortness of breath (62%) and dizziness (54%). Less than half of the participants experienced a chemical taste in their mouth (39%), nausea (39%), rash or irritation (39%), allergy like reactions (39%), asthma (31%), vomiting (23%), stomachache (15%), and diarrhea (15%).

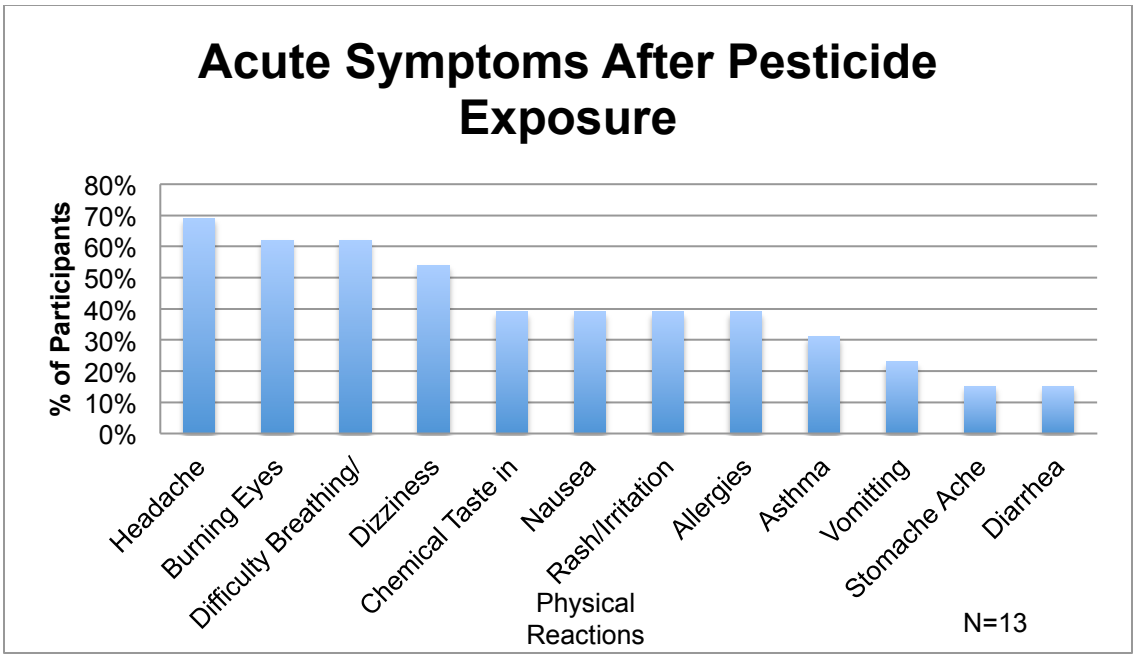

Figure 3: Acute Symptoms After Pesticide Exposure

In addition to the acute symptoms experienced after pesticide exposure, participants also reported other serious health ailments. These include sinus infections (23%), coughing (7%), becoming light headed (7%), vertigo (7%), migraine (7%), and fever (7%). One participant (7%) reported infertility, autoimmune disorders, early onset of menopause, thyroid dysfunction, hair loss, and cyst on ovary. Although these adverse health effects did not occur directly after exposure to pesticides, they developed some time after exposure and have been attributed to pesticides by the participants. In comparison to the common symptoms reported, these ailments are outliers or anomalies represented in the sample group.

4.3 The Impact of Pesticide Exposure on Communities in Central California

All 13 participants reported being exposed to pesticides presently and or in the past, at home, their place of employment (public schools and/or agriculture fields), or in their community. 12 of the 13 participants have identified pesticide exposure by smelling pesticides in any of those three locations. A community activist from Monterey said that pesticides are “in our environment, it’s so consistent. It’s in our environment … I am consciously aware that [pesticides] are everywhere.” The frequency and perceived normalcy of pesticide exposure is exhibited by the stories of participant’s experiences at home/in their communities.

4.3.a Impacts of Pesticide Drift

As mentioned above, communities situated in agriculture areas are a risk for pesticide exposure. A participant from Fresno discussed an incident of pesticide drift from an agriculture field to her home. A grower of a farm next door to the participant’s home uses a crop duster to apply pesticides to his fields. The crop duster would turn right over the participant’s home. In consequence, pesticides would fall onto her home and neighborhood. She commented that “They were spraying and it came all over the house. All the white stuff. The fence was all white when they were [spraying] those trees right there [with pesticides]. You could see it. The next morning everything was white, like it was snowing. That’s a lot and it’s really bad.”

A Tulare County participant explained that the frequency of pesticide application in agriculture fields in her neighborhood makes it difficult for her to

protect herself. She hears tractors (that apply pesticides) weekly and cannot keep track of how many times she hears them. She explained that in the agriculture fields near her home, pesticides are applied:

> "From twelve midnight to three or four o'clock in the morning. They spray in the morning but I guess that is the legal stuff. I didn't even know that they couldn't spray during the day, when people are outside. I thought it's normal because it happens so often. Sometimes we're outside and it goes inside our air conditioner and our whole house smells like it. If we went inside every time they sprayed, we'd be inside all the time."

> "Sometimes we are just having a barbeque and they are spraying. I believe there was a car crash not too long ago; crashed in the grape field. The owner didn't call the police or anything because he says that they were spraying at that time. He says 'we're spraying illegal pesticides and if they would come like at two or three in the morning, we could get fined.'"

4.3 b Environmental Contamination: Air and Water Quality

Four community members mentioned that pesticide contaminate the environment in agriculture communities, around neighborhoods and schools. The quality of air and water have been compromised due to pesticide contamination. Pesticides carried in the air have been attributed to causing allergy symptoms. Participants in Tulare County and Fresno County have specifically reported on water contamination issues in their neighborhood and at the school in which they are employed. A community member of Tulare is concerned about environmental health risks, particularly in water and air contamination. The air and water quality have been poor for so long that she considers contamination to be "normal". She explained that the water quality has been bad for over two decades, since her husband was a child. Her family avoids going outside due to the poor air quality in her town. Her son and husband "get bad allergies" when they go outside. She

has to give her family Benadryl prior to stepping outside of their home. However her husband avoids going "outside because the air has been terrible." This participant is also concerned with the contaminated ground water. Her city sent out a noticed that said, "Water isn't suitable for pregnant women or children under the age of six months." She cross-referenced this information with a water test from Home Depot.

> "[Home Depot will] check your water for free." Six months after she sent in a water sample from her home, "Home Depot said that it was beyond, on their chart levels of contamination, they couldn't even give a percentage on it. Nitrate levels are really high! Boiling it will increase the nitrate level. So we don't cook with it. Everybody around here does not drink the water!"

The water from her faucets is either an orange-red color or milky white and tastes like metal. She said that "I was just giving the dog water and it was orange-red. It stays like that. You have to let it run a while and it will be clear. It's really bad." The dog has exhibited health problems including frequent diarrhea.

To mitigate the water problem, this city in Tulare County has a contract with Collagen Water. City residents can sign a contract with Collagen Water to receive gallons of water every month. The participant and her family paid a one-time fee (on top of their monthly city ground water bill) to receive water for a year. Every two weeks her family receives three five-gallon jugs of water. Each gallon cost $6.25. Three five-gallon jugs of water is not enough water to sustain the participant, her husband, and their son for two weeks. If they run out of this water, they purchase bottled water from the store. During times when money is tight and the participant's family cannot purchase extra water bottles, the

participant will sacrifice her water consumption and drink contaminated tap water; leaving the remaining bottled water for her family.

Using and consuming the tap water in this town has resulted in various health problems. Although the participant and her family purchased bottled water, they continue to use tap water to take showers, wash dishes, and wash laundry. The water irritates her and her family's skin and eyes. Some of her neighbors cannot afford purchasing water from Collagen and they must drink the tap water. In consequence "their teeth are brown, they have a lot of cavities. They say they brush their teeth. They have been drinking the water so often, that's what they think it is."

4.3.1 Pesticide Exposure at Public Schools in Madera, Santa Cruz and Santa Clara Counties: Pesticide Drift and Environmental Contamination

Every year in the United States, children and school staff spend a significant amount of time at school. Children and school staff (including administrators and teachers) spend at least six hours a day on school campuses (Californians for Pesticide Reform, 2015). Schools are used during, before, and after school hours. Schools located near agriculture fields in Central California experience pesticide drift. In many counties growers are permitted to apply pesticides before and after school hours and on weekends. This is done in hopes of limiting children and school staff to pesticide exposure. However this does not necessarily prevent exposure to pesticide residue on the ground, drinking fountains, playground surfaces and on other objects as well as throughout the

environment. In severe circumstances pesticides may also permeate ground water leading to water contamination.

Schoolteachers and an administrator were asked a series of questions that reflected health risks and health outcomes of students and school workers associated to pesticide application on agriculture sites near schools. The insight of school workers is invaluable because they spend a great amount of time on school campuses with students. They witness their students' behaviors, health, school performance and any changes that may occur. Further, the teachers work at the same school for years and are exposed to pesticides for decades. Hence, they observe changes in populations, the community, agriculture fields and school campus, as well as observe the relationships between the community, teachers and school administrators, agriculture workers, growers and agriculture companies.

Five participants have worked in public schools in Central California. One is a retired teacher from Santa Cruz. Four participants work for Madera Unified School District in the Central Valley. One worked for Pajaro Valley Unified School District and Gilroy Unified School District on the Central West Coast. All of the teachers have been working as a teacher for several years; nine years, 19 years, over 20 years, 29 years and 30 years. All of the participants reported that their work places (public schools) are surrounded by agriculture fields. Four reported that grape vineyards surround their schools in the Central Valley; almond fields also surround two of these schools. One participant said that the school is so

close to the field that a kindergarten student was able to see her father work in the fields from a classroom window.

4.3.1a Pesticide Drift at Public Schools

All of the participants said that there have been pesticide drift incidents onto their school. Each participant said that pesticides could be detected either by identifying their scent or by experiencing symptoms due to exposure. One participant stated that there is a “strong chemical odor” while on the school campus. Another participant recounted a story in which she told her husband, “I bet they are spraying because I can smell it. Sure enough we drove by and there was a tractor spraying.”

The use of crop dusters (areal application of pesticides via airplane or helicopter) is a source of pesticide drift onto school campuses. According to the participants, by law, growers may not apply pesticides while school is in session. They must wait until before or after school hours, or the weekend to apply pesticides. For the most part, participants have reported that growers have upheld this practice in the last decade. From the mid 1980s to the 2000s, one participant witnessed crop dusters spraying during school hours. “Crop dusters use to spray during the day while school was in session. When that happened, I could feel my allergies and asthma flare up and my eyes would burn.” Another participant reported that growers spray early in the morning, on the weekend or when school staff and students go home. However the growers “have to go over

the school to hit all of their vineyards. Even though they spray on weekends, the residue is on equipment. Nobody washes that down. You still have it there."

Despite when pesticides are applied, pesticides still have a persistence period, when they are active in the environment. As previously mentioned, two of the schools are surrounded by both grape vineyards and almond fields. Chlorpyrifos residue has been found on both crops. This chemical can persist in the environment for 60 to 120 days (California Department of Public Health, 2014). Assuming that the grower applies chlorpyrifos to the grape and almond fields near these schools, children and school staff, are still at risk of chlorpyrifos exposure despite the day or time of day it was applied. Further children are more susceptible to pesticide exposure (than adults) due to behaviors, body size and developmental stage. In particular, chlorpyrifos puts these students and school staff at risk for neurotoxins and hormone disruptors.

4.3.1b Water Contamination at Public Schools

Water contamination and dried up ground water wells have been reported by a teacher and an administrator in Madera County. The Madera teacher explained that ground water at the school she works at as well as surrounding neighborhoods is contaminated. Contamination is demonstrated through the brown colored water, taste, and smell.

> "A lot of homes around our schools are dry and they have people work on them and they add to it. They say it's normal. The district sends out letters saying that the water is within the limits but it just doesn't taste right. Then they put chlorine to compensate for whatever's in there. As a mom, I just have my kids take water wherever they go."

> "I don't drink the water at our school because that's what we taste. Although they say that it is within the guidelines. All the pesticides have to go to the ground. Most of our water comes from pumps or ground water. I don't feel it when I walk around but when I taste the water out there, I do taste something."
>
> "I tell my students to bring a bottle of water. I don't drink it. I bring my own water. Recently with the water shortage, a lot of the wells have gone dry. We've been having trouble with our pump at school. Water comes out brown. They had people work on it and they say they changed the pipes. I advise my students to bring bottled water."

A Madera administrator addressed the water contamination issue in a Madera school by advocating for water testing and installing a new water pump in the school.

> "I am pushing for the water to be tested constantly. When I went there I asked a lot of questions that were never addressed because a former principle didn't pursue it. I started asking, "when was the last time the water was tested? When was the last time the water pump was updated? When was the last time someone came to monitor the water? How much information did the school get? This Thanksgiving vacation [Novermber 2014], we pushed so hard that they went out there and updated the pump. It was already deep enough but they made it deeper. They replaced a lot of things on the pump to make the water come out cleaner. They added a device that monitors for chemicals, which I was pushing for."

4.3.1c Accounts of Health Outcomes Due to Pesticide Exposure at Public Schools

The school staff participants have experienced a variety of symptoms and observed symptoms that their students contracted after pesticide exposure. Pesticide related symptoms have been considered as "seasonal" and they coincide with the agriculture schedule. One teacher from Madera said that symptoms are "Seasonal. Spring and fall are the worse. Summer and winter are fairly okay." An administrator from Madera shared the same sentiment:

> "Headaches vary around whenever agriculture season starts from March to November, it's pretty bad. That's because our agriculture here is fully active. It starts from March. Here where I'm at right now, they cut grapes until December to January. So where I'm working, it's almost the whole year around, [March to November]. That's when we suffer from headaches. [Headaches stop in] December because that's when we are on vacation. I go back to work at my school and my headaches continues. My headaches continue all the way to December.

Mary Flodin, a retired teacher expressed the same concern in Santa Cruz County.

> "One of the most pervasive health effects that we found was a constant flu like feeling. It always started around back-to-school, then ended around Christmas and then it would start up again in the spring. Finally we realized that's the fumigation schedule. This whole cough, runny nose, difficulty breathing, headache, lethargy, cloudy disoriented mind. Teachers would go to doctor after doctor, get antibiotics, 'Why isn't this working? Why don't I get better?'"

School staff self reported: sinus problems, respiratory problems (3 participants), asthma (2 participants), allergies, sinus infections (2 participants), cyst on varies, rashes (2 participants), dizziness (2 participants), headaches, migraines (2 participants), autoimmune disorder, vertigo, fertility problems (not able to conceive, 2 participants), early menopause, nausea/vomiting, chemical taste in mouth and burning eyes (unless noted, at least one participant experienced each of these symptoms). The school staff reported that their colleagues (teachers and other school staff) experience similar health issues including: sinus problems, respiratory problems, asthma, cyst on ovaries, rashes, coughing, bone cancer, and miscarriages. "The majority of our staff is asthmatic. The majority of our staff has worked in the fields. Some of them attributing fieldwork with asthma. I'm assuming that we've been exposed to pesticides in many situations."

All of the school staff expressed a concern about developing symptoms or worsening health outcomes when they started working at a school surrounded by agriculture fields. Mary Flodin said “I never had any breathing problems until I worked at that school”. Flodin went on to explain:

> “I remember that it was a particularly hot afternoon; I was preparing my class, my portable classroom, for back to school. I had all the doors and windows of the portable open because it was so hot and I remember looking out of the open door and noticing the plastic on the fields and swooning. Literally, the room was going around and I almost fell down. I put my hand out, and held myself up from falling down by holding on to a desk. I have that vivid memory. I do not recall having vertigo until that moment. Whether or not [caused by] pesticides, who knows, cause my condition at the time? I do not know.”

One Madera teacher said: “ I don’t recall as a child having problems with asthma or allergies. But as soon as I started working at our school, out in the country, I developed serious allergies, nasal infections, sinus infections, and eventually I had mild asthma. They just progressively have gotten worse. Now that I’m older I get sinus infections real easy.” She also noted that her and two other teachers from her school (3 out of 13 teachers at her school) had cysts on their ovaries. The three teachers contemplated if the cysts were in relation to their long history of pesticide exposure -they all worked in agriculture fields from their childhood to young adulthood, grew up in agriculture areas, and currently live and work near agriculture fields.

Further, two teachers mentioned a change to the way their bodies interact with medication since they have been teaching in agriculture communities and

exposed to pesticides. Flodin noticed that respiratory and flu like symptoms were constant and antibiotics were not adequate to treat symptoms. A teacher reported that since she started teaching at a Madera school, she developed sensitivity to her skin and skin rashes, and became allergic to Neosporin as a result of exposure to the sun.

According to a Madera teacher, symptoms are increasing due to the increase of agriculture fields near schools. The almond fields were placed next to the school two years ago. The first year the almond fields were up she did not notice many health problems among the students and the school staff. However the second year the almond fields were up, negative symptoms increased: “More respiratory problems are arising. I’m not sure if it is because of the pesticides or the contamination, the pollution. The fact that those fields are going up, more and more people are putting up almond fields. I think they are big corporations that are coming in and we are getting a lot of fields being planted. My fear is that the more fields that are planted, the more pesticides that will be up in the air.”

School staff recognized health problems with students in association to pesticide exposure. School staff reported the following symptoms that they observed among their students: sinus problems, respiratory problems, runny nose, asthma, allergies, asthma, rashes, bone cancer, flu like symptoms, learning disabilities, Asperger’s, and autism. A teacher from Madera said that there is a distinction between exposure routes to health outcomes. Students are known to get sick periodically and transmit illnesses throughout the classroom and campus. However this teacher attributed transmission due to environmental

exposure or pesticide drift. She said, " I wonder if it is environmental. I just always wonder. I know we're going to catch a flu, the cold here and there and pink eye but asthma isn't catchy. So why do we have a lot of cases for asthma?" She also noticed that many of her students get sinus infections, which also may be attributed to drift. "I don't know if it's the climate. The kids that live in the country, I know they live close to pesticides. They still spray. I don't know. We don't know really if that's a common denominator or a coincidence."

The severity of pesticide related symptoms have caused the use of medicine to attempt to correct health ailments to hospitalization and morbidity. An administrator from Madera pointed out that many students must take medication for their respiratory problems. He noted that these problems have increased since he has been working in schools throughout Madera County:

> "Right now what's so sad when you see a kinder [kindergarten student] take a pill for sinuses. When you see kids, first graders, take a pill for sinuses what is their life going to look like when they are in their twenties or even in our age? The second thing for them, inhalers. Boy do we have a lot of kids with inhalers. Before you would hear one or two students that we had to make sure they had an inhaler at school and one at home. Now its such a common thing we don't think. Let me give you an example. We have 10 or 15 kids per grade level using an inhaler. That was rare but now it's common. That can go away. A lot of kids don't want to participate in playing basketball, full court; playing soccer full court. They just stick to a corner and then stop. I attended the same school as an elementary student. I can see the difference from when I was there until now. There's a huge difference."

In one participant's classroom, illnesses related to pesticides have caused high numbers of student absences, which lead to hospitalization. This teacher stated that "[The students] are gone for a week or two sometimes. That adds up in a year. I've had two students out and this is the month of January. We've had

summer vacation; Christmas vacation and I've had some of those students already hit 20 days of absence. It's not everybody but its at least 3 students in my classroom. That tells you a lot." Another teacher from Madera said that she has two students who have been hospitalized twice and their illness that appeared to be a common cold "[Took] two to three weeks for them to recover". She added that all of her students live on farms and are exposed to pesticides at home and at school.

During her time working at a school in Watsonville (Santa Cruz County), Flodin reported that pesticide exposure have lead to a bone cancer cluster that resulted in death among students, teachers and other members of her community. One of Flodin's students died of a rare bone cancer. A parent who volunteered at Flodin's school as well as a local oncology ward told the participant that she witnessed patients with the same bone cancer in Watsonville. She reported that as a volunteer at the oncology ward, she saw babies being born with bone cancer. Flodin proceeded saying that the parent "Saw young men who were farm workers who should have been at the prime of health, 18 to 22 year olds, come in with this bone cancer."

4.3.2 Pesticide Exposure Among Agriculture Workers

Approximately 77% of the participants (10 out of 13 participants) have been employed as agriculture workers at a point in their lives. All of these participants are of Hispanic/Latino/a heritage and lived in agriculture areas for their entire lives, in the Central Valley or Central West Coast. Each participant

that identified as a school staff employee also said that they had previously worked in agriculture fields. Four participants recently worked in agriculture fields (in 2014); two as seasonal workers in Tulare County, one as a farm operator and agriculture worker in Fresno and two growers who own an agriculture field in Madera County. Only one of the growers on the farm in Madera County currently works as an agriculture worker. The farm operator and her family lease a small plot of land that they use to grow crops. The other six participants worked in agriculture fields in the 1960s to the 1980s.

4.3.2a Experiences Working in Agriculture Fields as Children

According to participants who worked in agriculture fields during the 1960s to 1980s, agriculture work in California was strenuous, dangerous and denied basic civil liberties. Five of the 10 participants that worked in agriculture started working in agriculture fields as child laborers and stopped working in agriculture fields in their early adulthood. Three started working in fields under the age of 10 years old (one participant worked from eight to 27 years old, one from nine to 18 years old and another from nine to 19 years old). The other two started working in fields as teenagers but did not specify their age when they started and stopped working on agriculture fields. Each participant worked to help his or her families. Some worked along side their parents and others worked independently or with other children. As agriculture workers, the participants were treated like adult agriculture workers. That said, they had to work under dangerous conditions, provide their own protective equipment and water, had to work as hard or harder

than adults and some were expected to work regardless of their health condition or school obligations.

> A Madera administrator recalled his treatment as a child worker "Back then some of those ranchers treated you as an adult. We had no special privileges. You had to carry whatever [adults] had to carry. I remember one day it was like 105 degrees or 107 and we didn't stop until the job was done; two or three o'clock in the afternoon. It felt like, boy, you were in a skillet. We were treated the same. If you didn't bring your own water that's on you." The administrator recalled "Vomiting, feeling dizzy. Like I said, we didn't think anything of it. We just continued with our everyday routine. They were days that I was so sick, we didn't miss a day of work. Even if we were really sick, we'd still show up. Even if we were feeling dizzy and vomiting, we worked the whole day until it was time to go home. Slowly we felt better but we didn't have the option to call in sick."

Child labor was mandatory work for participants. They spent their afternoons, weekends, school vacations, and the school year working in fields to help support their families. A Madera teacher said "during weekends we would go and help my parents work on the fields, or during the summer." An administrator from Madera explained that he and his family worked in agriculture fields when they immigrated to California in the 1970s. Due to his family's need, he had to miss school and work in the fields: "school starts in August but we wouldn't go until the major crops were done, maybe in October. We missed the first month and a half of two of school. For us, if we didn't work in those month and a half then we wouldn't have anything to eat in winter. Because it would be raining and we couldn't work."

During the 1960s to 1980s pesticide application laws were relaxed and did not ensure the safety of agriculture workers. Four of the five participants that

worked in agriculture fields as children reported a crop duster spraying pesticides while they were working in fields:

> A Madera teacher recounted a story that took place “Over 30 years ago, when I was working out in the fields, the planes would be spraying while we were working in the fields. That was here in the Central Valley, in Madera. All the exposure while we were working in the fields happened in Madera and Fresno counties. All the field hands were working in the fields and the plane would come down and just spray [on us]. They had no concern for their employees. They just had to spray the crops. Sometimes they wouldn’t spray directly over us but they would spray the field next to us but the pesticide would migrate to our side, where we were working. You could smell it. Some of the workers would feel dampness while we were out there in the field.”

A Monterey County participant had a similar experience while working in the fields.

> “As a young man in my early teens we were frequently sprayed with pesticides as we worked in the fields. For pesticides, a plane would come over our head and spray right before we were harvesting right in front of us. So everything we were picking up was all sprayed by the time we got to it. The plane would fly over our heads. Our parents would tell us ‘Duck your head and cover yourself up with your jacket’, which we would. But being young kids we’d always want to look up to see what was going on, to see the plane spray. It had beautiful colors of red, green, yellow, blue; rainbow colors of the chemical as it was coming out of the back tail of the plane. So that would look really interesting as a kid. We’d look at it and say ‘Wow! Look at that!’ You could smell the chemical. You could feel it and you could see it on the plants as we get to that place where they sprayed. By the time we’d get there, you could see it.”

An administrator from Madera also shared an experience of pesticide exposure from being directly sprayed by a crop duster in a field:

> “There was a crop duster. I don’t know if they did it on purpose. Sometimes you see the airplane open the valve and they would release the chemicals, sometimes you could see the chemicals. You’d see white. Sometimes you could see the pilot, when he went over us he wouldn’t stop spraying. It came right over us. Right into us like a fog. We felt it. Right away we got headaches, sinuses, but we kept on working. We weren’t aware of the consequences back then. We just continued working.

> For us it was kind of fun but we didn't realize. I was nine or ten when this happened."

Another Madera teacher recounted an experience of pesticide exposure while working in the fields:

> "Maybe two or three fields that we would be working adjacent with would have a crop duster that would be spraying while we were working. So you could definitely smell the odor there. To my knowledge there was one time when my mom was working by herself. She actually remembers drips falling on her. I guess the wind must have carried them. In my personal case, it was just the odor. I could smell those pesticides being sprayed. It was like two or three fields adjacent to where we were at."

4.3.2 b Experiences Working in Agriculture Fields as Adults

Eight of the 10 participants who have worked in agriculture fields, worked in agriculture as adults. As mentioned above, three school workers from Madera county worked in agriculture from their childhood to adulthood in the 1960s to the 1980s; ending agriculture work at the ages of 18, 19 and 27 years old. As of 2014, five participants worked in agriculture. Two participants in Tulare County were seasonal field workers in 2014. Three participants from Fresno County worked as growers or field operators in 2014; they operated or owned small fields and did not employ any agriculture workers. One of the growers works as an agriculture worker himself; the other two participants do not work directly on the agriculture fields.

Participant's stories have show that agriculture work is dangerous, despite the decade. Be it 1980 or 2014, participants expressed hazards of working in agriculture fields. In extreme cases, participants that worked in agriculture fields from the 1960s to 1980s reported being directly sprayed on by a crop duster.

However, such reporting did not occur for participants that have recently (in 2014) worked in agriculture fields. Nonetheless, participants have reported incidences of unsafe occupational practices within the last year. A seasonal agriculture worker from Tulare discussed an experience with pesticide exposure while working in a field in June 2014 in Kingsburgh (Fresno County):

> "When we went to work we smelled a lot of pesticides but we still entered the fields. Then the workers started to get a headache and feel nausea. We called the contractor but he didn't want us to leave the fields. The workers didn't want to go back into the fields because they felt sick. He finally let us leave but they wanted us to continue working."

Another seasonal agriculture worker from Tulare worked in agriculture fields for the first time in 2014: "If you think about it, the vines are long. So there is no air flowing through there. So they are breathing pesticides. Sometimes you just can't breath, you have to sit down. Some times people get so weak, they faint."

In contrast, the field operator and growers had different experiences working in their agriculture fields. In both situations, the growers and field operators did not report hazardous working conditions or great health risks due to pesticides. The field operator from Fresno said that her and her husband work on an agriculture field that they operate however they do not use pesticides, only water. Hence, she reported that they do not have any adverse health outcomes or experiences due to pesticides on their field. The two growers from Fresno County own a small grape vineyard. One of the growers said that he applies sulfur and Round Up to his vineyards. Yet they reported that they do not feel at

high risk for exposure since they do not apply as much pesticides as other farmers in their neighborhood.

4.3.2 c Protective Equipment for Child and Adult Agriculture Workers

Protective equipment is necessary while working in agriculture yet it is not provided or enforced by all growers or foremen. Participants were asked if growers/employers or agriculture workers were responsible for providing protective equipment. All 10 participants -as children and or adult agriculture workers- said that workers are responsible for providing their own protective equipment (from 1960s to present, 2014). Protective equipment that the agriculture workers provided themselves were minimal objects. At least two participants reported using a cloth mask or handkerchief, gloves, and pants. At least one participant reported using a respirator, hats, long sleeve shirts, and goggles. Two participants reported not using protective equipment when mixing or applying pesticides.

Participants that worked with their parents in agriculture fields as children were advised by their parents to wear particular clothing. A Madera participant said that her “mom and dad always made sure we wore a handkerchief over our heads. They made sure we had hats. Sometimes, depending on where we were working, they suggested that we wore a handkerchief over our face, like a mask and gloves. There were no other protectors.”

An administrator from Madera County (one out of 10 participants who have worked as agriculture workers) reported that the grower/employer

possessed protective equipment for agriculture workers. In theory, protective equipment was available to workers but the foreman told the participant “when you need it come and get it from me.” The participant explained that the employer provided equipment but it was not accessible or easily available to workers:

> “When you’re working we’re not going to call them and tell them ‘we’re already here at the job. Can you bring us the stuff?’ We just continued working and they knew. If we started at 7am and they showed up at 9 or 10 am. They asked us ‘Hey do you need the stuff?’ We’re already working. They had it, the face mask, the gloves for us to use but we didn’t use it.”
>
> “We showed up in t-shirts, pants. Sometimes we didn’t even use shoes. We just wore socks because we were trying to get our job done fast. Sometimes even our shoes got in the way. We worked faster in socks. So just t-shirt, pants, socks and that was it. Not even a hat. I guess they said that they tried but [we] didn’t listen to us. It wasn’t like heavily emphasize to the point where they gave us directions like ‘You will use these type of white suit when you’re dealing with pesticides and you wont touch anything without using gloves’.”
>
> “In certain years I had either prepared it or sprayed it. Like I said, my older brother and I worked for the same rancher. Either my older brother would prepare it and I would spray or vise versa. We were touching it and we did not use gloves. It almost looks like flour. We would put our hands in the containers. If we needed more, if we didn’t use gloves, we would stick in our hands without gloves. Sulfur, Yes, the other ones I don’t know the names because back then, we didn’t care. We thought this was a job. I’m a sixth grader preparing this. I didn’t care. Your hands felt warm. That didn’t stop. If you put it water on it, it actually got worse. We just used dirt on the floor. We just cleaned our hands with the dirt. That used to work better than water.”
>
> “When you work in the fields your first contact is your hands and your face. For us as young kids we didn’t listen to our parents. We didn’t use [protective equipment]. It was just t-shirt and jumping in. [Pesticides] came into our eyes, nose, mouth, everything.”

A grower from Fresno County said that his usage of basic protective equipment is dependent on the chemical of application and his reaction to it.

> "When I apply, I use mostly sulfur. That would be glasses, goggles to not hurt my eyes. I use a respirator or cover. You have to spray the opposite of the wind so you don't get it in your face. Just the eyes bother me so I cover the eyes. The other pesticide I use, Round Up, I don't use anything. I apply it when there is no wind at all, so there is no threat. I've been around that kind of chemical for all my life and I don't have any reaction to it. So I don't use anything."

Lack of protective equipment can potentially lead to a variety of negative health outcomes. As mentioned above, contact with pesticides can cause acute symptoms such as burn eyes, skin and respiratory tract.

4.3.2.d Accounts of Health Outcomes Due to Pesticide Exposure in Agriculture Fields

The general health outcomes of participants including agriculture workers, is listed in the graph above (Figure 3). However, in order to give a clear picture of the experiences of agriculture workers, the adverse health outcomes that were directly associated to pesticide exposure while working in an agriculture field is listed here: Three participants experienced asthma, dizziness, eye irritation and rash. At lease one participant experienced wheezing, coughing, difficulty breathing, chemical taste in mouth, vomiting, diarrhea, fever, headache, stomachache, thyroid dysfunction and hair loss. A participant in Monterey County reported that many of his adverse symptoms only occurred when he was a child agriculture worker: "As I no longer worked in the fields, the illness of asthma went away and mild headaches went away."

Participants reported that their family, friends and coworkers experienced the following adverse health outcomes due to working in agriculture fields:

headaches, sinus problems, miscarriages, cancer, congestive heart failure, birth defects (clef lip and down syndrome), learning disabilities (ADHD), asthma, rash and fever. Both seasonal workers from Tulare said that since they have worked as seasonal workers for a short period of time. They have not noticed any adverse health outcomes. However they reported coworkers, friends, and family that have worked in agriculture for a longer duration and experienced negative health outcomes:

> "In reality, pesticides haven't affected me much but I know other people that have been affected by them. I only worked in the fields for a short time but other people have worked in the fields for a long time. They have been affected by pesticides. They get hives and rashes on their skin. They are getting a lot of illnesses because of the pesticides."

> "I know one person who has worked [in the fields] for about 10 years. After a few years she got cancer. She worked in the grape fields, here in Kingsburgh. Asthma too. I know a little girl. She's not my family. But I know the mother. Her daughter suffers a lot from asthma. They say it's because of all of this, the bad air, the pesticides. It affects her too. She is eight years old."

A teacher from Madera attributed a variety of health outcomes to working in agriculture fields. This participant and her friends and family have all worked in agriculture in the Central Valley for several decades.

> "I attribute my hair loss to those pesticides. I started loosing hair at the age of 12 and 13. This was back in 1970s, early 1970s. I was going to school. But my parents, my mom, and dad were exposed to pesticides much longer than [me and my siblings] were. We believe the pesticides; she [my mom] passed away from cancer a year and a half ago. We believe that that [pesticides] contributed to some of her health issues. Because she had congestive heart failure and he was on oxygen 24/7. We believe that some of that was because she was out in the fields and exposed to pesticides." She went on to recount another loved one who experienced an adverse health outcome associated to pesticides. "Actually, we had a friend who had a baby with birth defects. They were field workers and their baby was born with birth defects. Both of the parents worked in fields. Their baby had clef lip and down syndrome."

4.4 Participant's Major Public Health Concerns and The Biggest Risks for Residents and Workers in Agriculture Communities

Participants were asked to identify major public health concerns and the biggest risks to pesticide exposure. The major public health concerns of participants fall under the following categories: dangers of pesticides and their possible health outcomes, children's health, environmental health, the precautionary principle to prevent illness, concerns about the government and agribusiness, and social justice. Seven out of 13 (54%) reported that dangers of pesticides and their possible health outcomes were a major public health concern for them. Five concerns were reported under this category. At least one participant reported concerns with cumulative pesticide exposure, and pesticides are a wartime chemical. At least two participants reported concerns due to residual exposure, short and long term affects of pesticides, and specific health problems of Lou Gehrig's disease and respiratory problems. Seven out of 13 (54%) reported children's health as a major public health concern. Specifically participants were concerned with children's increase in autism, asthma, sinus problems, and exposure to pesticides due to pesticide application around schools. Five participants (38%) held environmental health as a major public health concern. Specifically, four participants mentioned concern with the quality of water, air and water. At least one participant was concerned with pesticide drift and the impacts of pesticide on wild life. Two participants (15%) were concerned with employing the precautionary principle to prevent illness. Three participants

(23%) were concerned about decision makers, including government and agribusiness. One participant was concerned about the conflict of interest between school board members who are growers. Another participant was concerned about accountability and transparency of government and agribusiness. He stated that the industry is in denial of the health problems caused by pesticides. Further another participant is concerned about better regulation, specifically regarding pesticide application around schools. Lastly, one participant (7%) was specifically concerned about social justice as low socioeconomic communities, children of color, and people of color are disproportionately impacted by pesticide exposure and poisoning.

Participants identified 10 biggest risks for residents and workers in agriculture areas due to pesticide exposure. These risks were numbered based on the number of participants that reported the risk. However there are three risks in which 23% participants reported and six risks where only one participant reported. These risks are not ranked by a particular importance.

1) Environmental contamination & residual exposure (4 participants, 31%)
2) Lack of knowledge and awareness of farm workers about health risks and rights; doctors lack of knowledge of pesticides in order to properly identifying pesticide exposure and diagnosis; and challenges for agriculture workers including language barrier, access to health care and health insurance. (3 participants, 23%)
3) Lack of protective equipment for agriculture workers (3 participants, 23%)
4) Long-term health risks due to pesticide exposure (3 participants, 23%)

5) Respiratory problems (1 participant, 7%)
6) Trusting the government will protect public's health from pesticides (1 participant, 7%)
7) Keeping growers accountable for agriculture workers health (1 participant, 7%)
8) Other health problems: Alzheimer's and dementia (1 participant, 7%)
9) Children's health and neurodevelopment (1 participant, 7%)
10) Pesticide drift (1 participant, 7%)

4.5 Empowerment & Community Activism in Pesticide Reform: Reporting Pesticide Incidences

This section looks at reporting and other activities where community members felt empowered to advocate for their health, and social and environmental justice. To measure community activism and empowerment, participants in this study were asked if they have reported pesticide exposure or poisoning incidents. When an individual is poisoned by pesticides or has a concern about pesticide drift or pesticide exposure in Central California, it is customary that they contact the county agriculture commissioner. The agriculture commissioner must investigate the problem or take action as needed. Investigations include but are not limited to speaking to growers and community members, checking the growers' pesticide application permits, testing soil or air quality and when necessary, and finning growers.

Reporting incidences of pesticide poisoning or drift can affect policy,

specifically on the local level. Reporting is a way that community members can keep growers accountable to abide by county and state agriculture laws. If laws are relaxed or do not exist, a history of reports could be used to advocate for new public and environmental health laws or policy change.

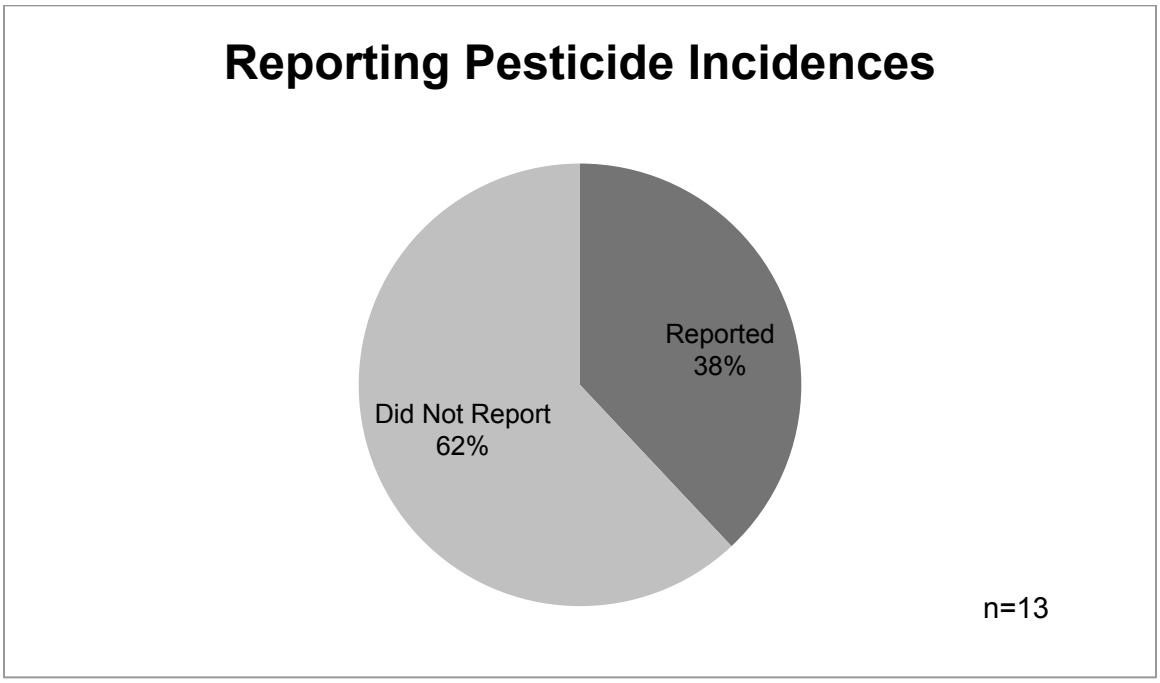

Figure 4: Reporting Pesticide Incidences

Five out of 13 participants (38%) have reported pesticide exposure or poisoning. 3 community activists from the Central West Coast and two school workers from Madera (a teacher and administrator) said that they have reported pesticide poisoning. Four specifically stated that they reported an incident to their county agriculture commissioner.

Eight out of 13 participants (62%) said that they have not reported a pesticide incident. 5 currently work in agriculture; two are growers and one is a farm operator in Fresno County, two are seasonal agriculture workers in Tulare County. Two are teachers who were agriculture workers during their childhood,

and one participant is a retired nurse and community activist in Monterey.

Nine of the participants (69%) said that they would report a pesticide incident in the future. One participant was not sure if she would report in the future. Two participants said that they would not report in the future. The lack of reporting or wiliness to report by growers may be due to a conflict of business interest.

Participants have collaborated with government officials, government agencies, nonprofit organizations, and nongovernmental agencies to change pesticide policy. Specifically, participants have reached out and or worked with senator Bill Monning, Watsonville assembly member Luis Alejo, public health officers, congressman Sam Farr, assembly member Mark Stone, former U.S. Secretary of Agriculture Michael Espy, and Governor Jerry Brown. They have spoken to members of California Department of Pesticide Regulation, county departments of agriculture, U.S. EPA, the Board of Supervisors, and the county health department. Other agencies/organizations that participants have worked with are California Rural Legal Assistance, California for Pesticide Reform, the Safe Strawberry Working Group, Earth Justice, and Pesticide Action Network. Three positive outcomes occurred from reporting to an agriculture commissioner and one positive outcome occurred from directly calling a grower. Reporting has resulted in local policy change including switching from applying pesticides with a crop duster to a tractor, fining growers for spraying during school hours, spraying at night instead of school hours, stopped spraying on school days, and mandatory pesticide warning signs in front of agriculture fields. However two

school workers have experienced negative outcomes; the Santa Cruz teacher experienced retribution and push back from DPR and pesticide companies, and the Madera administrator reported that although an investigation occurred, the amounts of pesticide found were too small to take any further action.

4.5.1 Accounts of Reporting Pesticide Exposure at schools

In the event that pesticide drift occurs due to the application of pesticides to agriculture fields during school hours and or the occurrence of pesticide poisoning on school campuses due to pesticide application at another time, teachers and administrator in this sample have contacted local government officials to mitigate the problem. According to an administrator from Madera County, schools have protocols to follow when there is a health or environmental problem due to pesticide drift. When such an issue arises, a teacher may contact the principle of the school. The principle or the teacher will then contact the county agriculture commissioner. The agriculture commissioner is responsible for maintaining public health, upholding state and federal agriculture laws on the local level, reinforcing these laws among growers, as well as maintaining a balance between public health and economic interest of the county. In response to an administrator or teacher, the agriculture commissioner should conduct an investigation and take necessary steps to protect the children and school employees. If need be, the agriculture commissioner will contact the grower, notify them of the issue, request that pesticide application is conducted in a lawful manner (before or after school and on weekends) and on rare occasions

the growers will be fined for a violation of local laws. Further, some counties have specific laws that outline a protocol for applying pesticides. According to a school employee in Madera, the growers must inform the agriculture commissioner if they are going to apply pesticides. In turn, the agriculture commissioner must notify the school district office. However the district office doesn't notify the administrator or the school that pesticide application occurred or will occur. A Madera teacher said that growers use to directly notify her school of pesticide application. They would provide the school with poster notices that said when they applied pesticides and what pesticides they applied. These signs were posted in front of the school and in the attendance office for teachers and parents to read. The participant has not seen such a posting sign in the last five years.

Three out of the five school workers in the sample reported incidents of pesticide drift and poisoning to the agriculture commissioner. Each one had a different outcome and experience with growers and government officials. The following are accounts from a teacher and an administrator from Madera Unified School District and a retired teacher who taught in Pajaro Valley Unified School District and the Gilroy Unified School District.

4.5.1a A Teacher and Administrator's Stories on Reporting Pesticide Drift in Madera Unified School District

Within the last two years, a Madera teacher called the agriculture commissioner when growers sprayed pesticides on almond fields that were in front of the school.

> "Some ranchers were fined because they flew over and [applied] their chemicals on a windy day when we were on recess. It affected the secretaries inside, the teachers, students. We couldn't stop coughing. A lot of people ended up going home that day, and kids too. A lot of us now that we are older, you can feel it. We call it allergies but it could easily be the affects of the spraying but we call it allergies. We called the ag commission. They had to come apologize to the school… They started just spraying at night. Which is better for us."

In late 2013 an administrator from Madera Unified School District reported pesticide poisoning to the agriculture commissioner of Madera County:

> "I was in my office and one student came early in the morning. They come around 7:25 AM. One student came vomiting and feeling dizzy. I thought maybe he ate something bad at home. Then another student came and a girl came. I started putting two and two together. I asked them 'When did you started feeling sick?' They said 'When we got off the bus in the morning, we smelled like rotten eggs. There was a funny odor in the air. After I smelled that I got a headache and started vomiting. I had to run off the bus and vomit.' I asked the other student 'When did this happen?' Same story over and over. Okay, they got exposed to something."

After the students told the administrator their symptoms, he called the agriculture commissioner. The agriculture commissioner sent inspectors to the school to investigate the problem and measure the amount of pesticides in the air:

> "Immediately they took my information. Because there were inspectors out in the field they were going to come back in a few hours to check what happened. Since there were kids involved they made it priority but it still took them a few hours before they got here. They set up these machines to read the air and went around the whole school taking readings. They said whatever was up there it was so minute that they couldn't detect it. They said there was something there but they couldn't detect it. They smelled it themselves but the machine couldn't pick it up. It was probably the residue."

The inspectors preceded the investigation by contacting the growers that sprayed the pesticides one mile around the entire school. They found out that the

growers did not have permits to apply pesticides. The administrator then found out that the growers sprayed half of the field. He stated that the growers “Don’t [spray] the whole field. They spray the other half that is away from the school. They’re thinking once school is over and the kids go home around five or six they start spraying. They’re not suppose to be spraying at all but they do.”

4.5.1b A Retired Teacher’s Story on Reporting Pesticide Drift in Pajaro Valley Unified School District and the Gilroy Unified School District.

Mary Flodin, a retired teacher and a community activist from Santa Cruz, reported pesticide poisoning to school administrators, the agriculture commissioner, and government officials on several occasions. Only one of her reports had a positive outcome.

Flodin first realized that students and teachers were being exposed by pesticides in the early 1990s at a school in the Pajaro Valley Unified School District in Santa Cruz County. When she expressed concern about pesticide poisoning, “A gag was put on [her and other] teachers. [They] were told ‘don’t talk about it. Don’t say the word pesticide in this school. Do not say it in the classroom. Do not talk to parents. Do not talk to the growers next to the school. Just put your nose down and teach.’” This response from administrators prompted Flodin to collaborate with other teachers and parents to form a community group, Farm Without Harm, to advocate for pesticide reform. Together, they contacted the agriculture commissioner, the county health commissioner, and the school administration, trying to gain assistance. “Instead

of assistance we got hostility and resistance," she said. According to the participant, lack of help was due to the friendly relationship that public officials had with commercial agriculture corporations. Farm Without Harm filed a permit challenge with California Department of Pesticide Regulation (DPR) for three growers who surrounded the school. When the teachers, parents, and other members of Farm Without Harm reached the permit challenge hearing, they were met by farm workers holding picket signs reading "Why are you hurting our jobs?" and other "Weird messages with the teachers named. [They were] all farm workers, speaking limited English or no English." Some of the bilingual teachers spoke to the farm workers who were protesting, "Trying to get a dialog going and the women would look away. Finally one of the teachers got them to admit that they were being paid huge money, like ten dollars an hour, to do this." When they entered the hearing room, they met with a CEO of a pesticide company and officials from DPR. The participant commented that "DPR is suppose to regulate [the CEO of the pesticide company] but he's the one who tells DPR when he's going to apply pesticides and how much." Despite the testimonies of the community and Farm Without Harm, the permit challenge was lost.

"Meanwhile we were trying to get data because they always tell you that there is no data to support a connection between poisoning and all of your crazy symptoms. You're just imagining things, you hypochondriac." The agriculture commission was suspected of "using out of date equipment and telling the [teachers] that there was no drift." The teachers knew that they were being exposed to pesticides via pesticide drift. Pesticide Action Network, an

environmental justice organization, supplied the schools with an air monitor that tracks pesticides. A farmer (next to the school) to let them set up the air monitor on his property because the school district would not allow one on their property.

To demonstrate that the pesticides used in the fields surrounding the school were safe, the county agriculture commissioner and nurses took blood samples of the teachers to measure the amount of pesticides after a fumigation. The blood levels did not show a high level of pesticides. Typically after the fields were fumigated the teachers could smell the chloropicrin (fumigant), which followed by symptoms. This did not occur after this fumigation. Hence, the teachers thought that the fumigation was staged. The next fumigation “Was very strong. It was after our permit challenge, which we lost. Vindictively they used twice as much chloropicrin and methyl bromide as usual. You could really tell. The fumigation was so overwhelming. The symptoms, everything, the headaches, the dizziness, the nausea.” After this fumigation, the teachers had their blood tested; the pesticide levels were “Off the charts”.

Flodin left Pajaro Valley Unified School District and taught at a public school in Santa Clara County because she was “tired of fighting” for pesticide reform. While working at the school in Santa Clara County, Flodin brought up her concerns about pesticide exposure with the agriculture commissioner; initially she received a positive outcome. This school was also located directly in between agriculture fields. She complained about a crop duster spraying over a school while children and teachers where outside. The pesticides landed on them. She immediately called the agriculture commissioner, who then called the

grower. Since then (late 1990s), the grower stopped applying pesticides during school hours. Despite her decision to call the agriculture commissioner she feared that she was going to get fired from her job if she reported a pesticide incident. Her other efforts to promote pesticide change in her county were not successful, neither were they received well by the county agriculture commissioner, the Department of Pesticide Regulation, and agriculture companies that had a huge presence in that area. In addition to her efforts to curtail pesticide use on/near school campuses Flodin reached out to governor Jerry Brown via email and she did not receive a response. She also spoke to (former) U.S. Secretary of Agriculture Michael Espy in person however neither of them showed support to her concerns.

4.6 Call to Action: Community Demands of Government and The Agriculture Industry

In response to adverse pesticide incidences that have contributed to the major public health concerns and the biggest risks of communities in Central California, participants have come up with demands for the government and the agriculture industry. The four major demands are safe alternatives to pesticides, accountability of government and agribusiness, public knowledge of pesticides and more restrictions on pesticide application/reinforce laws. 1) Safe alternatives to pesticides include: immediate and complete transition to sustainable energy, food, water, and transportation by reducing the amount of pesticides used in agriculture, rotating crops to reduce the dependency on pesticides, employing

non-chemical alternatives to pesticides, more organic farms and using the precautionary principle. 2) The government and agribusiness should be kept accountable for accepting that pesticides are dangerous substances, protecting public health; and growers should particularly be responsible for monitoring and protecting the health of agriculture workers by providing blood tests and protective equipment. 3) The public (agriculture communities, administrators and teachers, and agriculture workers) should be provided with information about pesticides. Information about pesticides (how to detect drift or poisoning and what to do if poisoning occurs) should be posted in every classroom in Central California. 4) California needs more restrictions on pesticides and or reinforcement of laws to protect public health. This includes creating buffer zones around schools, consistent standards for safe limits of pesticide dosage for children and adults, and growers should notify schools prior to spraying (if this law exists, it should be reinforced).

Chapter 5 Discussion: A Summary and Challenges to Reform

To summarize, Central California is the national leader in agriculture production and a large user of agriculture pesticides. Chlorpyrifos, 1,3-dichloropropene, and chlorpocirin are three pesticides that are widely used in California agriculture. The California Department of Public Health has deemed these three pesticides as major pesticides of concern due to their toxicity to humans and their chemical persistence in the environment. Pesticides travel via pesticide drift from agriculture areas -their initial area of dispersion- to nearby

communities. Hispanic/Latinos make up more than half of the population and the majority of the agriculture work force in Central California. Subsequently, Hispanic/Latinos, particularly children, pregnant women and agriculture workers are at greatest risk for pesticide exposure, poisoning, and acute and chronic health ailments. Hence, California for Pesticide Reform is promoting public health by influencing policy makers to create stringent agriculture laws that “eliminate the most dangerous pesticides, reduce the use and reliance of pesticides, support safer forms of pest management, expand and protect the publics’ right to know about pesticide use, exposure and impacts” (Californians for Pesticide Reform, 2015).

Considering that the results section consisted of participants narratives - that described the health outcomes associated to pesticide exposure, the vulnerability of school employees, children and agriculture workers, participants major public health concerns, empowerment to advocate for health and the environment, and demands for the government and agribusiness- the salient themes are political economy and political ecology. Political ecology provides insight to the current environmental state that influences public health in the participant’s communities of Central California. Political economy provided theory for understanding for the power dynamic between community members, government and agribusiness. Combined, political ecology and political economy show how and why participants have or have not taken action to advocate for public health and environmental justice in their communities.

The participants of this study have lived in agriculture communities in Central California throughout their lives. Throughout the past few decades, participants have witnessed and experienced changes in agriculture policies, the environment and their health. Hence, they are community experts that can identify pesticide drift and generally know when pesticides are applied to fields based on physical reactions experienced after application. Despite their experiences or knowledge of potential health risks of pesticides, participant's communities continue endure environmental degradation and health ailments due to pesticide application. Further, government and other players in agribusiness have not always been receptive to the concerns and demands of community members.

Agriculture laws that theoretically determine pesticide use and practice are influenced by the relationship between government and agribusiness. Growers and individuals representing agribusiness are known to hold local and state government roles in decision-making and or have the authority to sway political actions. Several participants described government officials and organizations (county government, agriculture commissioners, Cal DPR and California EPA) as friendly to agribusiness yet relationships between participants and government have varied. This influential relationship has created a disparity in public and environmental health among agriculture communities. Hispanic/Latinos living in these communities have little bargaining power with state and local governments to influence policy change. Despite the scientific knowledge and state produced data of the dangers of pesticides used in Central California, agribusiness is

typically favored through agriculture policies. Obstacles to obtaining an environment safe of pesticide are rooted in politics and laws. Some participants have advocated for the health and environment of their communities and have experienced success while others have not had luck or have not tried. Those that have not tried played an advocacy role, lack knowledge of their rights and or pesticides, and or feared the government or their employers.

5.1 Challenges in Advocating for Pesticide Reform

5.1a Reasons For Not Reporting

The participants provided three reasons for not reporting pesticide incidences. 1) Some participants lack knowledge that they can report pesticide incidences and or do not know who to report to. A Madera teacher recalled in the 1970's, discussing with her friends and family that growers "Would be spraying and something in that could be affecting our health. But we never reported it to the health department. We didn't know that we could do that back in the day. So it's lack of knowledge on our part." 2) As growers or farm operators, reporting is not in their interest. The farm operator in Fresno stated that she had not reported pesticide incidences but her husband has talked to growers about pesticide drift. As farm operators, the participant and her husband personally know growers who have fields near theirs. In their position, calling an agriculture commissioner and reporting pesticide drift would not be in their interest and it could jeopardize support and relationships with nearby growers and farm operators. The two growers in Fresno have not reported incidents of pesticide drift for similar

reasons. Since this couple applies pesticides on their crops, reporting would not be in their interest or the interest of other growers in their community. Reporting could threaten their business and livelihoods. Further they said that they do not use as much pesticides as other growers. This idea limits their acceptance of responsibility of pesticide drift or pesticide poisoning. 3) The third reason participants have not reported is due to fear of retribution from employers (growers and school administrators) and government. The retired teacher from Santa Cruz said, “Farm workers are scared to report”. This sentiment is due to fear of job loss and for undocumented workers, deportation. A Madera teacher stated this clearly “Sometimes our people [Hispanic/Latinos] are just afraid to admit that they were exposed to pesticides because of fear of retribution.” A seasonal agriculture worker reinforced this point by stating that Hispanic/Latinos “Get really scared because you don’t want problems with the government or the law coming and threatening you. A lot of people are scared of the government and the law. Some people don’t have papers.” Further, she said that she and others in her community have not been willing to report due to fear of job loss: “They don’t really tell them anything because they’re Mexican. Everyone here is Mexican. They know they need that job and they’re just doing their job.”

5.1b Conflict of Business Interest: School Staff and School Boards Members in Pesticide Reform

When asked if school staff and school boards should have a role in pesticide control, school staff had a variety of responses. As mentioned above,

three school staff members have participated in activities that promote pesticide reform. The teacher from Santa Cruz and an administrator from Madera have been active in working with their colleagues, parents, and students to reform pesticide application and promote safe behavior among students. During assemblies and in classrooms the school administrator teaches students how to properly wash their hands/wash off potential pesticide residue from hands, and to report any odd smells to teachers. Although school staff has made efforts to protect children and school staff in the classroom or school-wide, school board members and other community members also contribute to pesticide reform.

Three out of five school staff participants said that school staff or school board members should be apart of pesticide control. Two school staff from Madera differed. They explained that currently school board members are composed of growers. This has created a conflict of interest between public health and grower's personal economic interest. In some cases, a conflict of interest has also played a role in the relationship between school administrators and growers.

> A teacher in Madera Unified School District said "I would think that [school board members] should be apart of pesticide control but some of the school board members are farm owners. Would it behoove them? Would it be a double standard? They would probably say that they don't want to get involved because they would legally say 'Oh we spray.'"

The administrator from Madera spoke on the same terms about growers (ranchers) personal interest and their positions in the school board and local government offices. "Their regulations are big here but this is a billion dollar industry. Some of the [school] board members are ranchers themselves. Some of

these big people who are related, they are on city counsel. They themselves are ranchers." He said that principles and ranchers should work together but the growers don't want to work with school administrators. Adversity from growers is based on their past experiences with principles. According to this administrator "principles did not allow [growers] to spray at all. It [didn't] matter if it was in the morning or night. [They should] spray on Friday after 5pm because the kids won't come till Monday. That's a battle that's going on."

As an administrator, he feels as if the agriculture commissioner and the growers are more likely to respond to his calls than a teacher's concern. Although his school is located about an hour away from a major city, the agriculture commissioner will send out an inspector to his school immediately. However, he also stated "As a teacher they are going to ignore you. They really don't want to talk to you." In his experience, "When they are really angry, the ranchers won't talk to anyone except the principle. They will ignore and be rude to the people."

5.1c Limitations to What School Staff Can Do to Prevent Pesticide Exposure

Despite the fact that three of five of the school staff in this sample have taken action in reporting pesticide drift and poisoning to local government officials, all five participants believe that there are limits to school staff preventing pesticide exposure. Two of the school staff fear job loss due to advocating for public health and protection against pesticide exposure. An administrated contemplated: "Am I going to get repercussions? Sent back to a classroom or am

I going to written up?" Although he worries about possible repercussions, he encourages other administrators to "Speak up and not be threatened any shape or form that we're going to get in trouble for speaking up. So I'd like to see more principles doing what I did. Calling the agriculture commissioner and telling them 'I got some kids that got sick, these are the symptoms. Can you please help us?'" A Madera teacher stated that she is not sure if teachers are limited however they could better prevent pesticide exposure with proper resources.

Another Madera teacher alluded to lack of control of environmental issues posed by pesticide drift. She stated, "If it's up in the air the only thing we can do is push the ranchers to not spray during the day time." Hence, school staff feels that prevention to pesticide exposures requires social, political, environmental motivation and access to resources.

5.2 Importance and Benefits of Research

This research serves to amplify the marginalized voices of participants who are disproportionately affected by pesticide use and practices in Central California. Currently, there is a vast amount of scholarly data that reports the dangers of pesticides. However, this data is typically represented through quantitative research as in epidemiological studies. Qualitative, ethnographic research can compliment current quantitative research. Hence, members of the communities (agriculture workers, school workers, community activists, and other community members) that are specifically at risk were interviewed. The voice of community members can be used to explain how pesticides have impacted them.

Whereas epidemiological data or other forms of quantitative research serves to provide information on incidence and prevalence rates of pesticide exposure/toxicity and possible methods of controlling negative health ailments. The narratives collected in this research may potentially be used by Californians for Pesticide Reform to advocate for public health and environmental policy change in Central California.

Chapter 6 Recommendations for Californians for Pesticide Reform and Conclusion

6.1 Recommendations for Californians for Pesticide Reform and Conclusion

6.1a Resources Needed for Community Advocacy

Despite the current environmental and political state influencing pesticide policies and practices, participants remain hopeful in advocating for public and environmental health. Participants want knowledge about pesticides and their rights in order to protect themselves and advocate for community health. Participants expressed that although Hispanic/Latino communities are weary of the government, communities need their support in order to promote policy change. That said, communities are capable of mobilizing with proper support and resources to do so.

Everyone in the community needs information about pesticides, including how to identify pesticide poisoning, and what to do when someone is poisoned. This information should be disseminated throughout the community to agriculture, workers and teachers unions, community centers, and other

organizations that work with Hispanic/Latinos in Central California. Specifically, this information should be demonstrated on posters boards (in English, Spanish and or any other language spoken by the community members) and distributed to public schools in agriculture areas and placed in classrooms where the information can be easily accessed by parents, students, teachers and administrators. Further, agriculture workers need to be provided with proper protective equipment and knowledge about pesticide risks and their rights as workers. This information can be disseminated via public presentations at the aforementioned areas.

6.1b Further Research

A comprehensive study utilizing quantitative and qualitative research must be conducted to in order to minimize reporting bias, adequately justify the association between pesticide exposure and negative health outcomes, and convince policy makers of pesticide policy reform. Hence, ethnographic research and epidemiological studies must be coupled together. A pre-test or baseline study for environmental conditions and community health must be established first; then followed up with a post-test or further study. Air and soil samples, biomarkers (blood and urine samples) and narratives must be collected before and after pesticides are applied in an agriculture community. Biomarkers and urine samples show which pesticides and the dosage amount of pesticides that have accumulated in the human body. Biomarkers and other tests must be taken in a timely manner in relation to the time pesticides stay in the body and the

environment. Such blood and or urine test are available for 1,3-dichloropropene, chlorpyrifos and chloropicrin. For example, the test must be conducted one or two days after exposure to 1,3-dichloropropene. After this duration, the chemical leaves the body (Agency for Toxic Substances & Disease Registry, 2008). However the time in which chemicals stay in the body may vary for other pesticides of concern. Pre and post-test would reinforce ethnographic data and could be used to lobby for pesticide reform. Pre and post-tests should include qualitative interviews, focus groups, and or surveys regarding pesticide use and practices. A joint quantitative and qualitative study would require many resources however would be beneficial in providing reliable data that could be used to advocate for public and environmental health of agriculture communities in Central California.

6.2 Conclusion

Pesticide exposure is a serious problem that puts Central California residents at risk to various chronic and acute health outcomes. Despite the occurrences of pesticide poisoning and other negative health accounts related to pesticide exposure, California Department of Public Health's categorization of widely used pesticides in California as major pesticides of concern and other scientific research, dangerous pesticides continue to be used in agriculture throughout the state. In order to protect public and environmental health, specifically to marginalized Hispanic/Latino communities that are centered at the heart of agriculture areas, political action must occur. The narratives in this

research were brought together to potentially influencing policy change and more stringent agriculture laws.

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