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Article in *Health & Place* · March 2015

DOI: 10.1016/j.healthplace.2014.12.016

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“Where they (live, work and) spray”: Pesticide exposure, childhood asthma and environmental justice among Mexican-American farmworkers

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ARTICLE INFO

Article history:

Received 21 February 2014

Received in revised form

30 December 2014

Accepted 31 December 2014

Available online 6 February 2015

Keywords:

Asthma

Pesticides

Environmental justice

Mexican American

Farmworker children

ABSTRACT

Asthma prevalence is reportedly low for children of Mexican descent compared with other ethnic groups and Latino subgroups. The results of our exploratory ethnographic research among children of farmworkers in California dramatically suggest otherwise. Unstructured and semi-structured open-ended interviews and photovoice methods were combined to explore the lived experiences of members of a marginalized farmworker community. This research gives voice to a population of families living in the highly toxic, yet agriculturally wealthy environment of the San Joaquin Valley. Little work has been reported employing photovoice, a community-based participatory research method, to study childhood exposure to pesticides. A rich narrative about perceptions of pesticide exposure emerged from the ethnographic interviews. Thematic analysis yielded beliefs about the relationship between air quality and childhood asthma. The findings suggest that childhood asthma should be reviewed within the context of local levels of environmental exposure and the principles of environmental justice.

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1. Introduction: pesticide nation

*Vision for the 21st century:
Every child in America will live,
learn, work, and play in
environments that do not cause
or worsen asthma.*

*President's Task Force on
Environmental Health
Risks and Safety Risks to
Children (1997)*

Grounded reality of the 21st century: *I would like it if they did not put... a lot of pesticides next to my school... so that my brother and I won't get sick.*

8-year-old Juan, Photovoice participant

Rosa talks quietly on a warm afternoon as we casually peruse the endless sky and acres of agricultural fields surrounding her small rented home. A pesticide applicator idly sits within close proximity to

the children's play areas, comprised of streets, agricultural fields, and empty lots surrounding the houses. When adults are not around children play on the truck, concerning their parents that they might contact the liquid pesticide inside. In the middle of our conversation, three-year-old Alicia comes out of the house and listlessly places her head on her mother's lap. It is an effort for her to breathe, even on a clear day. Neither Alicia nor her older brother, Emanuel, is allowed to play outside the house because of the air quality. During asthma episodes, which frequently occur at night, a neighbor drives Alicia to the emergency room in the nearest city for her nebulizer treatment. In-between emergency room visits, she has no primary care physician with whom to follow up, no refills of medication, and no written, or even verbal, asthma treatment plan. Rosa was told to return to the emergency room when Alicia becomes sick again. Rosa is not exactly sure what asthma is, and like many parents, does not have a clear understanding of how to administer the bronchodilator medication that was prescribed for her daughter; nor would she know whom to ask in her neighborhood. Alicia is emblematic of young children dealing the 'culture of asthma' that has affected the everyday lives of families of farmworkers in the San Joaquin Valley.

1.1. Environmental hazards, social vulnerability and place

Asthma prevalence is reportedly low for children of Mexican descent compared with other ethnic groups and Latino subgroups

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(Akinbami et al., 2011, 2012; Lara et al., 2006; Canino et al., 2006; Carter-Pokras et al., 2007; Hunninghake et al., 2006). The results of our research among children of farmworkers in California dramatically suggest otherwise. This paper elucidates the articulated voices of Mexican/Mexican-American farmworker families living in central California as they explore their perceptions of pesticide exposure, childhood asthma and the built environment. Children of farmworkers in the San Joaquin Valley of central California are exposed to agrochemicals on a regular basis due to the proximity of their homes and schools to commercial agricultural fields. Much has been written about the potential adverse effects of pesticides on the health of children, including early life exposure, the take-home exposure to pesticides, aerial spraying and residential proximity to nearby agricultural fields; as well as about the perceptions of mothers to the risks of pesticides (Raanan et al., in press; Eskenazi et al., 1999; Arcury et al., 2014c; Bradman et al., 2006; Doust et al., 2014; Coronado et al., 2011; Ye et al., 2013; Fenske et al., 2013; Arcury et al., 2014a; Gordon and Richter, 1991; Jaga and Dharmani, 2003; Rao et al., 2007). It is known that families of farmworkers in North Carolina experience significant exposure to hazards related to their living and work conditions (Arcury et al., 2014b; Arcury and Quandt, 2011). Less is known, however, about the phenomenologically rich experiences of Mexican American children of agricultural workers in California whose built environments are directly subject to pesticide exposure and high rates of childhood asthma. By examining the lived experiences of families residing in a rural community with heightened exposure to agricultural pesticides, we aim to reduce a gap in the scholarship of childhood asthma disparities and environmental justice. It is within the framework of Gottlieb's (2009) call to expand the agenda of environmental justice to include "where we live, work, play... and eat," that we examine the contemporary issues surrounding childhood asthma and pesticide exposure among subaltern farmworking communities in the San Joaquin Valley.

1.2. The environmental justice movement

Environmental justice advocates point to a "double jeopardy" of injustice in which those with the fewest resources are at the greatest risk of residing in "riskscape" communities characterized by a combination of low income, high concentrations of environmental health threats and limited polity (Morello-Frosch et al., 2001; Huang and London, 2012). Poverty and low socioeconomic status have been linked to asthma disparities and pesticide exposure in population studies (Alkis et al., 2010; Sheehan et al., 2010), and there is a growing body of evidence that exposure to pesticides can contribute to the etiology and exacerbation of asthma (Hernández et al., 2011:90).

Environmental injustice has been defined as "the inequitable and disproportionately heavy exposure of poor, minority, and disenfranchised populations to toxic chemicals, contaminated air and water..., and other environmental hazards" (Landigan et al., 2010). Marginalized communities, including those of agricultural workers and their families, have been subject to environmental health disparities, such as direct and indirect exposure to agrochemicals (Brulle and Pellow, 2006; Mohai et al., 2009; Smedley et al., 2002; Carter-Pokras et al., 2007; Eskenazi et al., 1999; Loewenherz et al., 1997). Taylor (2014; 2000) argues that environmental racism or environmental discrimination is evidenced by racial disparities including the increased likelihood of being exposed to environmental hazards. In their analysis of the early pesticide campaign of the United Farm Workers Organizing Committee, Pulido and Peña (1998) argue that pesticide exposure per se does not necessarily constitute an environmental justice issue, but that careful attention must be paid to the

structures of inequality with a specific social formation. In line with this observation, it was recently found within the San Joaquin Valley that those areas that have the highest levels of respiratory risk house the highest percentage of Hispanic residents (55 percent), and that those with the lowest levels of respiratory risk house the lowest percentage of Hispanic residents (38 percent) (Joint Center for Economic Studies, 2012).

Noting exposure to environmental sources of pollution as one of the driving forces of environmental justice organizing, Brown (2007) points to asthma activism as a core element of many environmental justice groups addressing the unequal distribution of environmental hazards and the disproportionate impact on the poor. In his environmental inequality model Pellow (2000) emphasizes the sociohistorical nature of environmental inequality and the need to understand the "shifting interests and allegiances" of the multiple stakeholders involved. Pulido (1996) recognizes the direct opposition of environmental justice efforts to the prevailing powers of such stakeholders and notes that "subaltern struggles" over environmental issues are often as much about the forms of structured inequality and institutionalized forms of domination as about the environment.

1.3. Asthma

Asthma is a multifactorial, immunologically-mediated illness that can cause repeated episodes of wheezing, breathlessness and nighttime or early morning coughing (Centers for Disease Control and Prevention, 2011). It is the most common of chronic childhood illnesses worldwide and is globally recognized as a leading cause of health disparities among minority and low socioeconomic groups (World Health Organization, 2011; Wright and Subramanian, 2007). The epidemiology of pediatric asthma is complex, with wide variations in prevalence occurring between countries and over time (Subbarao et al., 2009; Asher et al., 2006). Socially, asthma can be a stigmatizing condition, impacting the participation of children in everyday life, making them feel different from other children and preventing them from engaging in normal age appropriate activities (Lambert and Keogh, 2014).

For reasons that may include the role of pesticides and poor air quality, asthma has steadily increased in the U.S. over the past decade (Loftus et al., 2015; Akinbami et al., 2012, 2011; Centers for Disease Control and Prevention, 2011). Environmental and social determinants of childhood asthma may include low socioeconomic position (Corlin and Brugge, 2014), sub-standard housing (Nelson, 2014), air pollution and pesticides (Sarnat and Holguin, 2007; Garry, 2004), all of which are evident in the San Joaquin Valley.

As discussed by Brown et al. (2003), asthma is not restricted to dense urban areas. Valet et al. (2009:1220) also note that "rural US populations with a large proportion of minority or low-income residents seem... to have an exceptionally high prevalence of asthma". However, much of the literature focuses on needs of the urban community (Bryant-Stephens 2009; Weiss, 2007), with a disproportionate lack of research and program development in rural environments.

Mexican American children aged 1–17 in the San Joaquin Valley exhibit a higher prevalence rate of asthma compared with the national statistics provided by the Centers for Disease Control and Prevention (CDC)—16.4 and 11.6 percent, respectively (California Health Interview Survey (CHIS), 2014; Centers for Disease Control and Prevention, 2013). Within the San Joaquin Valley, the rural/urban comparison of 18 and 15.8 percent, respectively, goes against the expected outcome of higher urban than rural rates. Anecdotal evidence and data on the county level that do not reach

statistical significance suggest that the numbers are underreported (California Health Interview Survey (CHIS), 2014).¹

1.4. Pesticide exposure and child health

Early life exposure to toxic chemicals, including agrochemicals, is an important contributing factor to childhood disease and dysfunction (Landrigan and Goldman, 2011; Hawkes and Ruel, 2006; Wigle et al., 2007; National Research Council, 1993). Approximately 5.2 billion pounds of pesticides are applied worldwide each year, of which over 1.1 billion pounds are applied in the United States (Grube et al., 2011). Under the Food Quality Protection Act of 1996 "children are presumed more vulnerable to pesticides than adults unless evidence exists to the contrary". Due to their small size, children absorb environmental toxicants into their lungs at a much higher rate than do adults. Exposure to certain chemicals early in life may affect the developing child's neurological system, resulting in a comorbid health outcome and contributing to "life-long functional deficits and disease" (Salam et al., 2004; Grandjean et al., 2007:74). The World Health Organization recommends reducing the risks to children by minimizing the use of pesticides, especially those deemed to be most hazardous and by reducing exposures to pesticides when it is not practical to eliminate their use altogether (United Nations Environment Programme, 2004).

Carter-Pokras et al. (2007:309) report that "Mexican Americans as a group have disproportionately higher exposures to several agricultural pesticides, including organophosphate pesticides, the organochloride pesticide DDT, and the herbicide 2,4-D" and that "factors that place all children at risk from environmental exposures are compounded for Latino children... [who] are at greater risk of morbidity and premature death from such conditions as asthma" (2007: 312). Brulle and Pellow (2006:112) report that, "Latino children are much more likely to suffer from asthma... and exposure to... pesticides" than their white counterparts. The results of risk analyses and ethnographic research conducted in agricultural regions of Latin America indicate that many parents are not fully aware of the risks that pesticides pose to their children and that they sometimes engage in high-risk practices, including bringing children to the fields with them and leaving containers of pesticides within easy reach of the children (Wilbur, 2011; Hunt et al., 1999; Schwartz, 1999, 2004 ; Schwartz and Pepper, 2009).

In a study conducted on Latino mothers' perceptions of risk associated with pesticide exposure, participants in the eastern United States assumed that children "were at less risk because they do not enter the fields" (Rao et al., 2007:344). In a similar qualitative study conducted among mothers in the state of Washington, it was noted that one of the children who has asthma does not enter the fields (Strong et al., 2009). Contrary to these cases described in the literature, many rural homes in the San Joaquin Valley are situated in close proximity to agricultural fields and children regularly play in the fields due to a lack of any other outdoor play space.

In a pilot study conducted by Bradman et al. (1997) considerably higher concentrations of pesticides were evident in farmworker homes in California's Central Valley than in

non-farmworker homes. The results of a study conducted in Eastern Washington State on organophosphate pesticide exposure and residential proximity to nearby fields suggest that residential proximity to pesticide-treated farmland is an important pesticide exposure pathway (Coronado et al., 2011). We posit that children of farmworkers in the San Joaquin Valley have greater exposure to agricultural pesticides than children of farmworkers in other communities who may not live or play within close proximity to commercial agricultural fields. Further research needs to be conducted to explore this theory.

1.5. The research setting

California employs approximately one-third of the nation's farmworkers, many of whom are housed in the San Joaquin Valley, constituting the largest concentration of farmworkers in the US (CCRH, 2014). Located in the southern half of California's Central Valley, the San Joaquin Valley is one of the most productive and wealthiest agricultural regions in the world, yielding an annual income of billions of dollars (San Joaquin Valley Agriculture, 2013). However, this "food basket of America" is marked by some of the worst air quality in the nation, levels of poverty comparable to those found in Appalachia, and rates of childhood asthma significantly higher than the national average (American Lung Association, 2010; Cowan, 2006; Ngo et al., 2010). Contributing to the local burden of poor health outcomes is the lowest percentage of medical doctors, primary care physicians and specialists in California. Each of the valley's eight counties contains medically underserved areas—a region or area in the US that has a deficiency of healthcare resources—and all have shortage designations for primary, dental and mental health care (Riordan, 2007).

Composed of a 450-mile stretch of land that is enclosed on three sides by mountainous terrain, the valley is known for its elongated bowl-shaped topography. Such topography creates a distinctive trap in which poor-quality air tends to linger. In what has become dubbed "the other California" (Haslam, 1990), residues of agricultural burning, bovine gas, toxic waste dumps, chemical factories and the diesel fuel exhaust associated with a major international truck route running from Mexico to Canada become trapped in low-lying "Tule fog" of the Valley, without circulating air flow to help them escape. As a whole, the San Joaquin Valley is one of the most polluted places in the United States. Of the Valley's eight counties, four stand out as particularly problematic for air quality; three of them—Fresno, Tulare and Kern—are ranked among the top agricultural producing counties in the United States, and along with Merced County, are ranked amongst the top 10 most ozone-polluted counties in the country (San Joaquin Valley Agriculture, 2013; American Lung Association 2010, 2012).

2. Methods

The current investigation, which is situated in a small agricultural community in Tulare County is part of a larger multi-site study. It follows an initial ethnographic study that was conducted in the San Joaquin Valley and explored issues of perceived childhood asthma causality, ethno-anatomy and ethnopharmacology. It was during that study that the first author was introduced to farmworker communities through one of the co-authors on this paper and became informed about issues of heightened concern to them; in particular, pesticide exposure, especially aerial spraying. She was graciously invited to return to the field to live with a farmworker family and observe aerial spraying first-hand by a father who described having to cover his children's faces while they slept in order to protect them from pesticide drift during overnight aerial spraying.

A binational team of co-investigators from Mexico and the United States was formed to collaborate with local, bilingual

¹ The biennial California Health Interview Survey (CHIS) is cross-sectional, continuous, household interview telephone survey of the California civilian non-institutional population. The questions asked are comparable to those in the National Health Interview Survey (NHIS) as reported by the Centers for Disease Control and Prevention (CDC). According to the Centers for Disease Control and Prevention (2011:84), "NHIS routinely includes two questions that are used to estimate national asthma prevalence: "Have you ever been told by a doctor or other health professional that you had asthma?" and "Do you still have asthma?..." Respondents were considered to have current asthma if they answered "yes" to both questions". The latest published data as of this writing is from 2012.

research assistants to carry out the current investigation. Research assistants were professional children of Mexican farmworker families who were raised in the San Joaquin Valley and thoroughly familiar with the context of the research site. Employing a qualitative multilevel research design as outlined by Morse and Niehaus (2009), we conducted ethnographic interviews simultaneous with an adaptation of photovoice methodology. Triangulated methods traditionally employed in medical anthropology were used. These included participant observation in the field site and of the daily life of community members as well as in-depth and semi-structured interviews based on Kleinman's (1980) explanatory models of illness. Extensive ethnographic field notes were maintained. Key informants in this study were those with unique perspectives on the experiences of pesticide exposure among children of farmworkers. Photovoice techniques, added as an adjunct had the added advantage of greater community participation.

A snowball sampling design was used to recruit participants, the majority of whom we met through an informal community meeting and by walking around the neighborhood. Data were collected by an iterative process involving ethnographic data collection, analysis and follow-up ethnographic data collection.

The research was approved by the Colegio de la Frontera Norte, Tijuana, Mexico and the California State University Fresno Human Research Ethics Committee. Signed informed consent was obtained from the children's parents or guardians for interviews and photovoice and verbal assent were collected from children under the age of 18.

2.1. Photovoice

Photovoice methodology is based upon the theoretical underpinnings of critical consciousness, feminist theory and empowerment (Wang and Burris, 1997). As a participatory action research strategy, photovoice has the potential to engage the politically disenfranchised in the research process by combining citizen photography and a grassroots social action agenda. It has been applied globally in the context of diverse problems, and has been shown to combine well with grounded theory (Lopez et al., 2005). It has shown promise for environmental health education and youth development in farmworker communities (Madrigal et al., 2014). In line with the philosophical framework of community-based participatory research, photovoice methodology includes the involvement of participants in all aspects of the research and is often conducted in partnership with local nonprofit organizations (Catalani and Minkler, 2010; Hergenrather et al., 2009). As defined by Wang (1999:186), "photovoice is a method that enables [participants] to control the photographic process in order to express, reflect and communicate their everyday lives." The primary goals of photovoice include "enabling people (1) to record and reflect their community's strengths and concerns, (2) to promote critical dialog and knowledge about personal and community issues through large and small group discussion of their photographs, and (3) to reach policy makers," in order to foster social change (Wang and Burris, 1997:369).

Photovoice methodology is used here as an adjunct to rich ethnographic data collection and analysis. Five dyads of children and their mothers were guided specifically to photograph and document their indoor and outdoor environments and to record assets and challenges to their respiratory health.

Inclusion criteria for photovoice participation were defined as

- Self-described Mexican-American or Mexican-origin, and
- Member of selected agricultural community in medically underserved area, and
- Parent, grandparent or guardian of child with diagnosed asthma or chronic breathing problems, and

- Child 8–17 years of age with diagnosed asthma or resident of county with greater than 20 percent asthma prevalence.

The lower age limit of eight was determined under the assumption that younger children would have difficulty conceptualizing the assignment and focusing the camera.

Photovoice data were collected between June 2009 and May 2010. The number of training sessions typically ranges from 2–20 (Catalani and Minkler, 2010) and is decided by the participants in conversation with the photovoice trainers; in this case it was determined that three sessions were sufficient. The training sessions were held in the home of a community leader/key informant who participated in the study with her granddaughter. Participants were first asked as a group to identify and discuss places and/or things that support or are barriers to active living and healthy breathing: 1) the places, things or persons related to breathing problems or asthma; 2) places or things that can cause breathing problems or asthma, and 3) persons or things that can help or improve breathing problems or asthma. Responses were listed and revisited and discussed at length throughout the recursive exploration process. After the initial answers were compiled and discussed, participants were trained in basic camera use and etiquette and asked to take photographs of the people, places and things that were named on the lists they had developed. Each photovoice participant was then asked to select two to three photographs for discussion.

They gathered in a group to share and discuss their developed photographs, in a process called "SHOWeD", resulting in narratives referred to as "freewrites" (Wang, 1999). The SHOWeD discussion guideline asks the participants to consider the following aspects of their photographs, leading them to reflect upon and discuss progressively deeper causes and potential solutions to the problem:

- S—What do you See happening here?
- H—What is really Happening?
- O—How does this relate to Our lives?
- W—Why does this problem/condition/asset exist?
- D—What can we Do about it?

Once the photographs were developed, we again met as a group where the participants codified the issues and themes according to the methods outlined by Wang (1999). The results, in the form of individual photovoice "posters", were presented and discussed at a final meeting with the participants who requested that the results be published.

2.2. Ethnographic interviews

Open-ended and semi-structured ethnographic interviews were held with two key informants and two mothers of children with asthma who were too young to participate in the photovoice process, as well as with each of the photovoice participants. Semi-structured questions were based on Kleinman's (1980) explanatory models of illness; which explores the individual's perceived illness experience and individualized understanding of etiology, ethnophysiology and modes of treatment. Participating families and key informants were compensated once with a \$25 gift certificate and snacks were provided at each meeting.

2.3. Data preparation and analysis

The recorded interviews were transcribed verbatim and participants were assigned pseudonyms. A thematic analysis of the data using MAXQDA (MAXQDA, 2014) qualitative software was guided by our research objectives and theoretical constructs on

farmworker knowledge, child health, and pesticide exposure. Open coding (Strauss, 1987; Strauss and Corbin, 1998; Charmaz, 2006) was performed to search for patterned responses (Miles et al., 2013) and produce textual elements that provide a means to explain the data. Themes and key categories were derived from the interview text, field notes and responses to photovoice questions and were reviewed and discussed collaboratively several times between the co-Principal Investigators and study participants to ensure consistency of the analysis. It is important to note that the photovoice data analysis comes from the photovoice process itself. Our results are presented in terms of the themes identified by the participants, and enriched by information obtained in ethnographic interviews.

3. Results

Following are the results from a small, rural community in Tulare County, which, according to the California Environmental Health Tracking Program (2014) had the highest percentage of schools with any pesticides applied within 1/4 mile (63.4 percent). Four socio-environmental constructs emerged as key factors that contribute to the collective burden of worry about children's exposure to pesticides and respiratory health: (i) residential proximity to agricultural contaminants, (ii) school boundaries, (iii) lack of environmentally friendly play places, and (iv) improper containment of pesticides. Ethnographic interviews and photovoice results complement and add texture to one another. The photovoice method, by virtue of operating without the obtrusive presence of a researcher, provided us with visual data that contribute to a richer phenomenological understanding of the research question, as well as allowing us entrée into settings that would otherwise be off limits to outsiders—particularly researchers with cameras. The following sections describe results according to the four areas of concern that emerged from the analysis.

4. Residential proximity

Participants documented housing and schools which are situated on the boundaries of commercially owned agricultural fields. Many local residents reflect that even a generation ago, the air was clearer and asthma was not as pervasive as now. The disproportionately high incidence of asthma among Mexican Americans in the San Joaquin Valley has been a concern to the farmworking community for a number of years. In a casual conversation near a school ground in a previous study, one farmworker animatedly responded to the question of whether asthma is an issue: "asthma, asthma, asthma. We never had asthma. Now, three of my 10 grandchildren have asthma!".

As we walk through the orchards, Matilda, a long-term community leader and grandmother who has been working closely with a nationally recognized advocacy organization expresses her concerns for the environmental health of local children in historical and spatial perspectives:

One of the major problems that we have here is due to being surrounded by orchards. A problem that worries me the most is that they spray pesticides all around the foundations of the school buildings, making our children sick. Before, we didn't know why the children were getting sick. Now we've discovered that pesticides are dangerous... that pesticides were harming our children in school and at home and everywhere; because any way you look at it it's all around us... They're applying a lot of pesticides in this whole area... They spray the grapes over there and the people live right here...

Eugenio, an immigrant from central Mexico reflects on her family's personal geography of pesticide exposure and childhood asthma:

When I was not living in this area, my son did not have asthma. It began when we moved to this area... No one [in my family] had asthma. These are the first children to have asthma... [Where I am from] fields do not surround the houses. All the fields are there, in the hills, where they can't be seen. Therefore, the children grow healthier. They are almost never sick. There are no chemicals there.

Night spraying is of particular concern to participants; not just for the health of their children, but for the applicators, as well. As related by one mother:

Three weeks ago they sprayed the street that runs through here and they pass over the grape fields that are immediately in front of our houses. You can see from where I live that the field is there, where they spray. I think that there, on the road at night, is when they start to spray here. They are afraid that photos will be taken or people will report them... They are exposed to the same spray that we are. I am scared at night. When the sun rises all the people are sick with runny noses and pasty eyes and a lot of cough due to the smell.

While growers may have reasons for the nocturnal application of pesticides, the health concerns of the local residents do not appear to be explicitly addressed. This lack of vertical communication contributes to a perception of isolation and resentment on the part of residents. The mother above expressed her concern that the applicators flying at night because they are afraid to be seen during the day. In addition to direct pesticide exposure, participants described sociopolitical situations they believed put their community at risk of respiratory distress. None of the study participants know the names of the landowners, nor do they have a means of communicating with them; but, said one mother, "I only know that the owner of the fields buys all of this to put on the grapes and it affects the air my children breathe".

5. Bounded schools

Throughout the valley, we observed schools bounded by cotton, almond and other agricultural products associated with contributing to respiratory problems. Participants ascertained that the problem is not the almonds or cotton per se, but the chemicals applied by growers:

Maria: The children are in school, but the fields are near the school. Sometimes they have sprayed chemicals while the children are there... There is a certain time that they have to do it. But the fields are very close to the schools. And at times they put up an announcement with a skull and cross bones, but sometimes they don't put it... and people who don't know enter.

Some progress has been made recently in regards to school boundaries. As we continue to walk, Matilda motions that:

The plane was over here (pointing) spraying alfalfa... There was nobody saying that they could not do it. Now at least they have a restriction that they must not be spraying near the school. They also have another little caution; now... they spray on Friday (when the children are not in school).

Concerned about the health of her own grandchildren, Matilda provided testimony at an event that was staged in a nearby farmworker community, where the results of a study showed

excessive levels of chlorpyrifos, a moderately toxic organophosphate, in participants' urine. Having worked in the fields herself, Matilda's political involvement in environmentalism stems from her familial and community ties: "during a meeting in my grandchildren's school I was surprised to see that they were spraying the field beside the school while the children played outside. Some of the children got dizzy and one of them began to vomit but in the school they said that it was because he had been running a lot". After the demonstration the school agreed to post the dates that spraying would take place. By involving herself in a national environmental advocacy organization and learning about the health effects of pesticides, Matilda demonstrates what [Brown et al. \(2003:455\)](#) have termed the "politicized illness experience", in which "people with asthma make direct links between their experience of asthma and the social determinants of their health". Further, she contributed to her own sense of personal agency, or power. As discussed by [Bourke et al. \(2012:501\)](#) in their application of Giddens's theory of structuration to rural health, "Power can also be enabling in rural health where the actions and leadership of individuals can change models of care... and/or demand political recognition and resourcing." Having lived in the United States for many years, Matilda is familiar with the US political structure and has a greater sense of personal and social agency than some newer residents who expressed that their voices are being ignored and that there is no political leadership willing to discuss the sociopolitical context of their children's health.

6. Lack of environmentally safe play places

The lack of environmentally safe and sound play places is a key issue of concern woven into many levels of discussion and is of widespread concern throughout the valley. Here, photographs taken by children reflect the inaccessibility of "breathable" places in which to play. Aspects of their daily environment such as plowing, burning of fields and pesticide-laden orchards were illustrated, along with explicit examples of clean and dirty air.

[Photo 1](#) was taken by a teenage girl who attributes her breathing problems to the presence of pesticides when she runs in the citrus orchard. She notes that the silvery sheen on the leaves is dried agrochemical residue.

This is a photo of where I run and sometimes... there are pesticides. This makes it hard to run because it's hard to breathe. We live around a lot of places that have pesticides, so there is no place where I can run. (16-year old Mariana).

[Photo 2](#) was chosen by the girl's mother to represent the health problems associated with pesticide exposure and depicts her association of aerial spraying with her daughter's inability to live a healthy life. She responded to the photovoice question "what do you see here" as follows:

The airplane was on the [television] news because it affects the community... how we breathe, our organism and health... The pesticides from the airplane affect our breathing and sleeping. When my daughter runs in school she just stands there because she can't breathe. She can't sleep; she feels dizzy. They should not use the plane to spray. My daughter... plays outside the house, close to the grape and alfalfa fields.

Another mother whose son has uncontrolled asthma discussed her concern about him riding his bicycle in a field after it was sprayed: "it is his *only* access to a place to play outdoors."

Matilda commented that the living situation in her community has been improving, but when asked about what still needed to be done, she responded:



Photo 1. Citrus orchard also used as a place to jog.



Photo 2. Aerial spraying is shown on television.

There are still many things... For example, there needs to be a place where children can play, where they can do projects and different things, because there's no place for them. There's no park, nothing; no place for them to be outside. They play there in the street, they play ball where it's dangerous. In the afternoons if you look over there a couple of blocks, you see children playing outside in the highway.

Rogelio, a Mexican immigrant farmworker, has lived in the San Joaquin Valley for many decades and has grandchildren with asthma. His four year old grandson, Alex, uses a nebulizer every day and demonstrated for the film crew and researchers how he is able to administer the medication himself—a point of pride for Alex. Rogelio confirms that asthma is a growing problem in the valley and that prior generations did not suffer from asthma. He shares his concern about children playing in the fields and eating unwashed fruit. The first author and a film crew observed children in the grape fields directly across from Rosa's house, the little girl introduced at the beginning of this paper who is not allowed to play outside and uses the emergency room as her place of primary care. Walking amongst the grape pickers, we observed children playing "hide and seek" in the fields:

N.S.: Do children work in the fields?

Rogelio: Yes, well on Saturdays they go with their parents to help them work.

N.S.: How old are they?

Rogelio: Five and older, as long as they can walk... They eat grapes, pick fruit, run around... [They eat] everything, even unwashed fruits because when they cut off the fruit it has to be washed in water first, but these kids don't; they just come and grab a bunch and eat it, along with all the chemicals.

N.S.: How does it affect these children to eat these grapes?

Rogelio: ...I see that it affects them because they eat a grape and soon after they start coughing and coughing and it's because of the chemicals on the grape and even more so when it is sprayed the day before. Right now the people that didn't see the plane that was spraying are going to eat it with all the spray.



Photo 4. Open pit with pesticide deposits.

7. Containment of pesticides

[Photo 3](#) was contributed by the mother of a young girl who describes her concern over the proper storage of agrochemicals, as well as the problem of dispersion: "Those pesticide tanks are left on the street or in front of the houses. The pesticides in the tanks are sprayed and the air takes it everywhere."

The same mother took another photo ([Photo 4](#)) showing an open pit containing chemical residue. She recalls:

They recycle pesticide here. All this white stuff that you see it's a type of pesticide called Roundup (sic) that damages the air and dirt and causes us breathing problems.

[Photo 5](#), taken at a locked storehouse not available to the researchers, represents an awakening to the importance of the problem and a move in the direction of personal and social agency. While not yet comfortable talking with political leaders themselves, some of the participants in this study, as well as in the initial ethnographic exploratory study, asked the researchers to share their collective voices with a wider audience and to partner with them to help establish a more focused community-based participatory research.

These are the pesticides they use for the grape. This affects my son (Juan) a lot as well as the rest of the people that live here that are sick like my son. I would tell them [policy makers] to please not use so many chemicals, to think about all the children's health. I think it has a lot to do with the breathing problems, especially what this chemical contains.

The herbicide contained in the boxes, Gramoxone, contains paraquat, a toxic chemical that was banned by the European Union in 2007.

The same mother took a photograph ([Photo 6](#)), showing what she claims is chemical residue left by the irrigation of grape fields:



Photo 5. Stored boxes showing the names of chemicals used in the workplace.

What you see here is not cement; it is what is left in the dirt from all the chemicals that are in the water they use to water the grapes. The image has a lot to do with the breathing problems.

Most of the community members that we interviewed were unfamiliar with the names of the chemicals, but they are aware that the ingredients have potentially long-lasting effects on their children's health. They also suggest that supervisors are providing inaccurate information about the dangers of these chemicals. These results coincide with findings obtained by studies carried out among female agro-business farmworkers in northern Mexico, where the women do not know the names of the agrochemicals but do understand their danger and the symptoms of acute pesticide intoxication, although most of those interviewed had not received training in the proper use of chemicals ([Camarena, von Glascoe, Arellano and Martinez, 2011](#)). Said one mother:

If we know that [a field] has been sprayed and that we cannot enter, we prefer not to enter. Before, we would enter [the sprayed fields]. They sent us in [and] told us that it wasn't dangerous, that [the chemicals] had no secondary effects, but they do.

8. Policy concerns: "We are tired of not being heard"

During the gathering in which the photovoice results were presented, participants discussed what they would like to share



Photo 3. Pesticide storage tank left in front of house.



Photo 6. Residue left by irrigation.

with policymakers. The following excerpts reveal some of their concerns:

- My children play outside my house and around the fields because here we have nowhere for the children to play.
- I feel a lot of anger and impotence when I see everything the owner of the fields uses. As a mother I can't tell him: 'stop using that, poison for my children'.
- They need to stop using every type of pesticide... We are tired of not being heard. Children and elders who cannot stand so much filthy air nearby are dying.
- I hope that someone from the government will see these photos. They give you shivers. I hope they see the danger we are in because of these pesticides.
- I am very angry to see that they care so much about their crops and not for the people.

8.1. Discussion

The adult migrant farmworker population of the San Joaquin Valley can be considered to be a "vulnerable, undervalued and understudied" population (Salazar et al., 2004; Rao et al., 2007); their children even more so. This paper explored farmworker families' perceptions of the relationships among pesticide exposure, childhood asthma, place and environmental justice in one of the most productive, yet polluted, agricultural regions of the United States. Juan's parents, who emigrated from Mexico in order to make what they thought would be a better life for their children, now believe that their children would have been healthier had they remained in Mexico. According to one mother in an earlier study when asked if anyone had spoken to them about the relationship between pesticide exposure and their children's health: "nobody talks to us here" (Schwartz and Pepper, 2009).

Braveman and Gruskin (2003:254) refer to inequities in health as systematically putting "groups of people who are already socially disadvantaged... at further disadvantage with respect to their health... Equity is an ethical principle; it is also consonant with and closely related to human rights principles." The childhood asthma disparities and inequities presented here contribute to the discussion of the need for multilevel "research that examines the complex relationships among factors at the socio-economic, health care system, and individual level that increase the risk for poor asthma outcomes among the poor and racial/ethnic minorities" (Canino et al., 2009:1214).

The results of our descriptive qualitative study are summarily parallel and support Arcury and Quandt's (2009:123) declaration that "the exposure among farmworkers and their families to pesticides is an injustice." Copek (1993) argues that "justice" can only be achieved if the rights of the affected community are restored—including the right to receive accurate information about the given situation and to democratically participate in deciding the future of the affected community.

The right to accurate and complete information can go beyond the affected community to a much broader one. As a final question, I asked Rogelio what he would like to share with political decision-makers. He informed me that food grown in the San Joaquin Valley is globally distributed and that pesticides are applied early in the growing process. They are present inside as well as outside of the produce. The message that he would like to communicate with a wider audience is that: "we all eat this food!".

8.2. Limitation of the study and future plans

It was part of the original plan for the photovoice participants to present the findings at a meeting of legislative decision-makers. However, it was collectively decided that it would be of greater value for us to devote our efforts to the creation of a community advisory board in order to be able to make a stronger case to such decision-makers in the future. We are currently organizing such a board, consisting of parents, children, educators, scientists, clinicians and researchers. It represents a number of rural, isolated counties in the San Joaquin Valley with similar health concerns and interests to those expressed by residents of Tulare County. As a result of this study, we are designing a pilot project that will involve students as partners in developing a research question and collecting, analyzing and presenting scientific data they deem relevant to the health of their community. In this way, the researchers help to empower community participants to present their voices to appropriate decision-makers in appropriate venues.

9. Conclusion

Mexican American children are more likely than other ethnic groups to be uninsured, have parents with less than a high school education, have no usual source of healthcare (Lara et al., 2006) and receive less information about asthma management strategies than other ethnic groups (Akinbami et al., 2011). The development of the environmental justice movement in the San Joaquin Valley dates back to the International Workers of the World in the 1920s and the United Farm Workers in the 1960s and 1970's (Huang and London, 2012). The movement grew, in part, as a reaction by activists of the 1960's to the lack of attention being paid to race and class issues by mainstream middle-class white male environmentalists, who appeared to be more concerned with the preservation of wilderness sites than the health and wellbeing of heavily impacted minority populations (Bullard et al., 2014).

The results of this study inform the literatures on health disparities and environmental justice by documenting the lived experiences of Mexican-origin farmworkers and their children living in communities with inexplicably high rates of asthma. As a part of a larger vision of anthropologists based in Mexico who are charged with studying immigration and health, the purpose of this research was to engage in an initial critical dialog with Mexican-origin community members and help them present their voices to those who can make a difference in the health of children. What we learned, is that attaining the goal of that vision is going to require a lot more time, resources and concerted teamwork than was provided in the original plan.

Social scientists, including medical and environmental anthropologists, can contribute to the understanding of asthma disparities in relation to pesticide exposure and environmental justice by illuminating the cultural contexts, social inequalities and power structures in which the changing environment and subsequent health effects occur. The confluence of environmental justice and grounded anthropological research is a powerful conduit through which socio-eco-political change can be effected. There is a need to bring biological and social scientists together at the same table, alongside community stakeholders and policy planners to visualize and materialize future locally relevant research designs based on the expressed needs and desires of the community. Such interdisciplinarity facilitates the effectiveness of community-based participatory research and can be used to inform the work of biomedical and public health researchers and other concerned scientists. As suggested by Johnson (2002: 147) "anthropology engages environmental justice in crucial ways... At one point or another in our lives we all are analysts, advocates, activists, and troublemakers. We influence change in subtle and sometimes surprising ways." Finally, there is a need to design viable community-based participatory projects to complement the work of other science researchers to ensure that the study results are shared within the community as well as with relevant policy makers (see Balazs and Morello-Frosch (2013), Big-Canoe and Richmond (2014) and Fenske et al. (2005)).

Acknowledgments

Funding for this project was provided by the Health Initiative of the Americas Programa de Investigación en Migración y Salud (PIMSA). We would like to thank Dr. Joan Ablon for her invaluable comments on this paper, as well as Cristina Gomez-Vidal and Enrique Jimenez for project assistance. Owen Palmquist and film crew not only documented us in action, but offered moral support when we needed it most. The greatest of thanks, of course, go to the study participants for the unwavering support and patience with this process. A preliminary presentation of this paper was made at the annual meeting of the Society for Medical Anthropology, Yale University (October 24, 2009).

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