Title: Urban Oil Drilling and Community Health: Results from a UCLA health survey

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Abstract: The community of Wilmington, located within the city of Los Angeles, is home to most of the oil wells in Southern California. Oil well drilling and maintenance uses chemicals that are known to cause adverse health effects. Oil wells are not evenly distributed within Los Angeles, clusters are often found in areas with low income or minority populations. Through a community health survey, we sought to determine whether there were adverse health effects within the community of Wilmington by comparing them to a community with an oil well in West Los Angeles (West Pico) and a control site in Pacoima. The survey consisted of health questions, demographic questions for comparison against available census data, along with opinion questions to support personal narratives of residents. Results showed that the residents of Wilmington are less likely to be satisfied with their community and are at a higher risk of certain health conditions than W. Pico and Pacoima.

Introduction

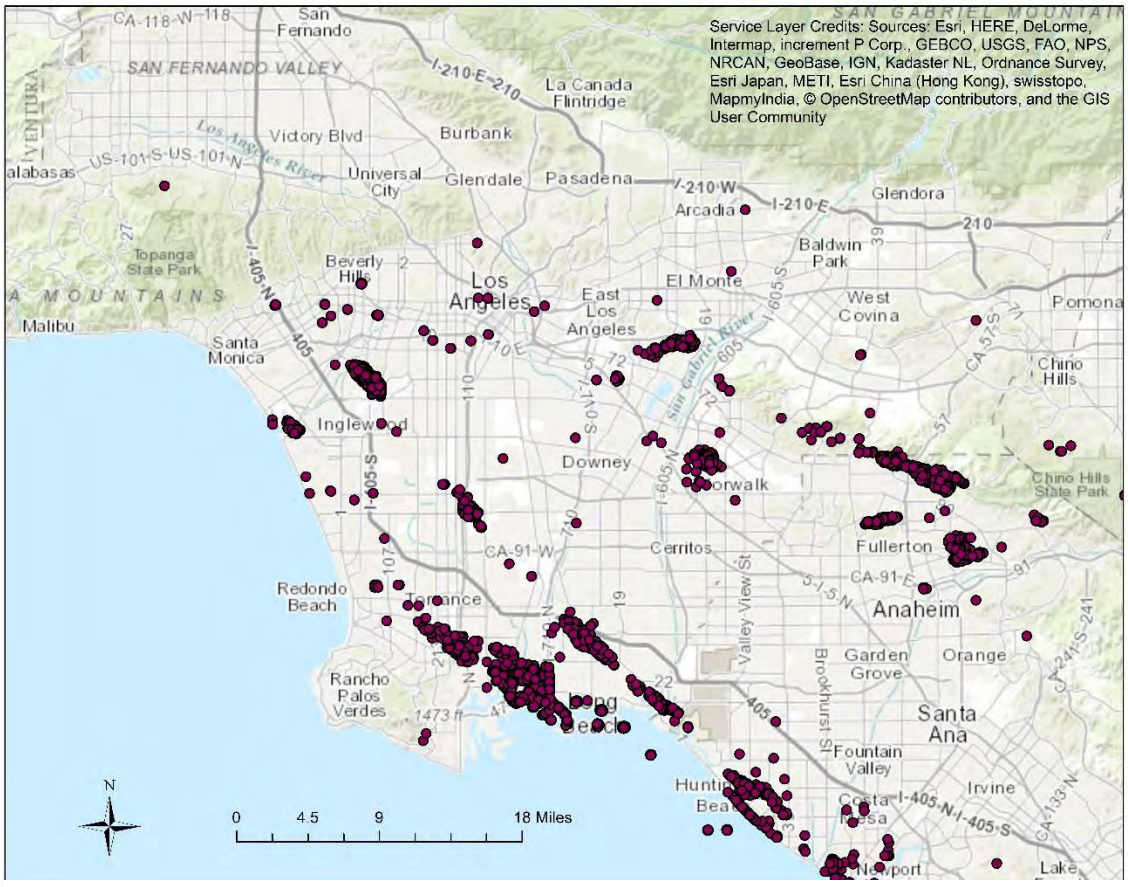

Figure 1 - Active Oil Wells across Los Angeles County

Oil and gas companies have and continue to direct investments to Los Angeles, considered one of the most prolific petroleum locations in the nation, with a large portion of drilling and oil

production coming from the Wilmington field (Refer to Figure 1) ("Top 100 U.S. Oil and Gas Fields" 2015, 100). As the seventh largest oil producing field in California, Wilmington generated 9.7 billion barrels in 2015 from active oil wells (Long et al. 2015). Additionally, oil and gas production is expected to continue. The number of active wells has increased by 16% over the last 10 years and the Los Angeles Basin is predicted to have another 5 billion barrels of recoverable oil (Gautier et al. 2012)

Los Angeles County is home to over 5,000 active oil and gas wells (Community Health Councils 2015). About one third of Los Angeles County residents live within one mile of a drilling rig and more than half a million live within a quarter mile. People of color are more likely to live near oil and gas wells in Los Angeles County: 44% of African Americans, 37% of Latinos, and 38% of Asians compared with 31% of whites (Srebotnjak, T. 2014). Furthermore, low income areas usually have more oil activity than higher income areas. The low-income areas of South Los Angeles and Wilmington have sites that are on average 260 to 315 feet closer to residential areas than oil sites in the higher income areas of West LA and Wilshire (Community Health Councils 2015).

There is also a significant economic difference between the West LA/Wilshire community areas which have an annual median household income of $78,000 compared to $33,000 in the South LA/Wilmington communities (Community Health Councils 2015). The racial makeup differs as well given a 90% of people of color living in the South LA and Wilmington communities in contrast to 69% White racial makeup of the West LA and Wilshire communities (Community Health Councils 2015). Furthermore, the Zoning Administration has required stricter regulation on hazards, odor and noise caused by oil sites in the West LA and Wilshire Community Plans because of their classification as "quality residential neighborhoods" (Community Health Councils 2015). Clearly, there is a gap in community protection across socioeconomic status, and possibly race.

What is also concerning is the rapid expansion of oil sites that is occurring in the South LA and Wilmington communities. Community Health Councils (CHC) reports that there were 22 new wells drilled in Wilmington in 15 months in contrast to 0 in the West LA and Wilshire communities (Community Health Councils 2015). The stricter regulations in more affluent neighborhoods can be a discouraging factor for oil companies to pursue development in said communities. Oil companies then turn to community areas where inadequate oil drilling regulations facilitate new drilling sites.

Potential Health Risks

Populations living close to urban oil drilling sites are often exposed to hazards via inhalation of contaminated air, the ingestion of contaminated water and food, and absorption of pollutants through the skin (O'Callaghan-Gordo, Orta-Martínez, and Kogevinas 2016).

Oil drilling, extraction, and development is associated with a variety of "health-damaging air pollutants" (Kassotis et al. 2017; Community Health Councils 2015; Gong et al. 2014). Petroleum air toxics pose a risk when they are within 1,000 feet of people and can permeate the air for up to 3,000 feet (Eckerle, E. 2013). Minor symptoms include headaches, nausea, sleeplessness, and nosebleeds while more severe symptoms include incidents of: asthma, respiratory and cardiovascular illnesses, autoimmune diseases, liver failure, and cancer (Nakatani, K. 2016).

Health effects of oil and gas development have been associated with diseases across the medical fields of "dermatology, neurology, oncology and urology" (Jemielita, Thomas et al. 2015). Research is continuously conducted to identify the biochemical pathways of specific contaminants and resulting ailments (Refer to Figure 3); (Webb et al. 2014). One notable volatile organic compound (VOC) related to oil and gas extraction is benzene, this compound is of special interest because it is a known human carcinogen. The American Cancer Society reports exposure to benzene can cause drowsiness, mucosal membrane inflammation/infections and prolonged exposure can lead to some forms of cancer (American Cancer Society 2016).

Most studies have predominantly investigated the adverse health effects of oil and gas extraction on subjects that are employed in these facilities (Levy and Nassetta 2011); (See Appendix A). Occupational health studies give us insight into how the community is affected; but, a focus on the health effects on residents that live near the oil and gas drilling sites is extremely important, given that their exposure to harmful chemicals is prolonged and constant. The exposure routes of people living next to urban oil and gas drilling sites tend to be indirect; thus, when compared to workers, difficult to unequivocally relate to oil extraction. Because residents in Wilmington are very close to oil drilling sites, they may be exposed to harmful chemicals that are negatively impacting their health. Therefore, it is important to study oil drilling effects in this area in order to have a more comprehensive idea of how oil drilling is affecting vulnerable populations.

Methodology

Survey

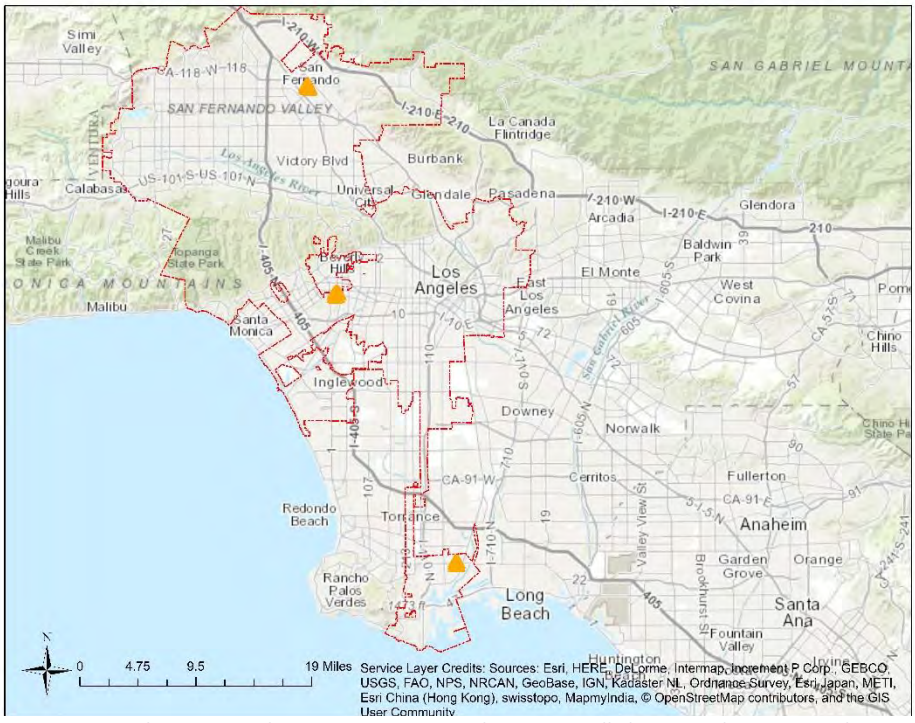

Figure 2 - Sample sites in Wilmington, W. Pico, and Pacoima. All chosen within Los Angeles City (outlined).

A survey was generated with a series of opinion, demographic, and health questions (see Appendix B). The team utilized information from prior health surveys and then adjusted questions accordingly. The survey was then translated into Spanish. The questionnaire totaled nineteen questions and took approximately five minutes to complete if the

survey was completed via researcher interview and approximately eight minutes to complete if the survey was completed by resident.

Site Selection: An active oil site was isolated in Wilmington and in West Pico near Beverly Hills in Los Angeles. A control site was chosen in the community of Pacoima without an active oil well. The locations in W. Pico and Pacoima were chosen as comparison frames that could help to distinguish any potential confounding variables related to race and socioeconomic status. Figure 2 depicts the sites chosen within the City of Los Angeles boundary. These locations were intentionally chosen within Los Angeles City to control for any variations in oil drilling regulations across cities. Based on 2010 census data, we had already concluded that Wilmington and Pacoima were primarily Latino, low-income community and W. Pico was a majority white, high-income community. Active oil wells were isolated in W. Pico and Wilmington using the January 2017 California Department of Gas and Geothermal Resources GIS data portal. Oil sites were chosen to be as isolated as possible from other oil sites. Then, a buffer zone of 0.25-mile radius was set up from the oil site or in Pacoima's case the buffer was generated around a random home. Each of the buffer zones contained approximately 500 homes or residential buildings. The team chose to conduct 50 surveys within each of the three buffer-zones for a cumulative total of 150 surveys (see Figures 3-5).

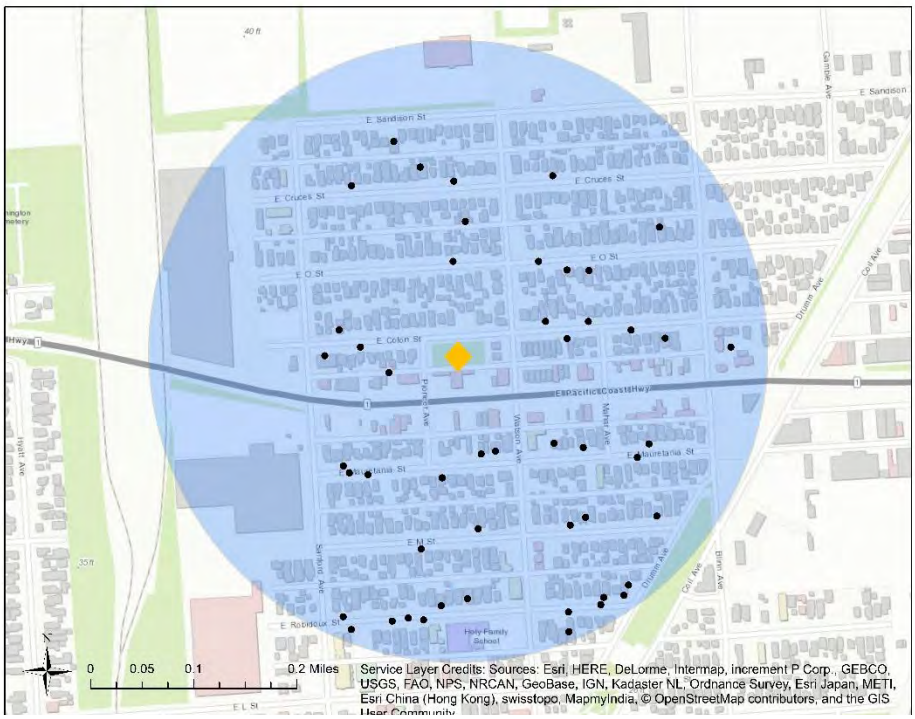

Figure 3 - Wilmington Active Oil Wells study site. Diamond marker indicates location of wells. Points indicate location of survey sample recorded.

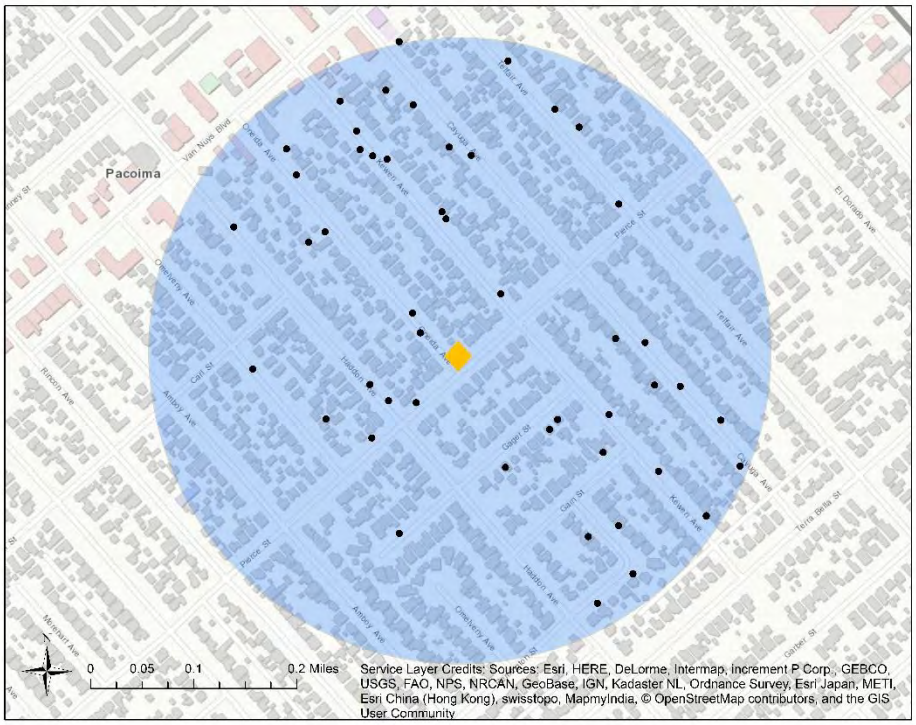

Figure 4 - Pacoima Control study site. Diamond indicates center of buffer. Points indicate location of survey sample collection

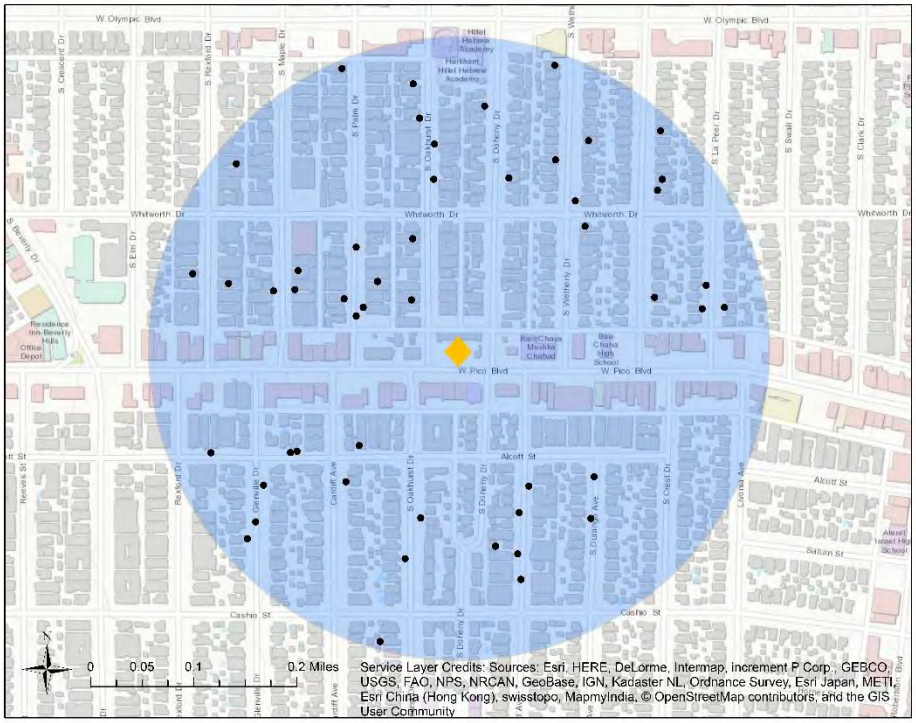

Figure 5 - W. Pico Active Oil Wells study site. Diamond indicates location of oil wells. Points indicate location of survey sample collection.

Data Collection:

Data was collected via door-to-door knocking from February 2017 through April 2017. Groups of two or more students would go to each of the sites per schedule listed in Appendix C. Surveys were conducted on varying days of the week and between the hours of 9am and 6pm. Researchers would approach a residence and knock on the door. If no answer, group would move on to the next adjacent residence. If a resident answered, researcher would give a brief description of what we were there to do in either English or Spanish depending on the resident's preference. If resident refused, group would move on to next residence. If resident approved, then the survey would be administered in one of three ways: resident self-completed all questions, researcher

asked all the questions aloud, or researcher asked some questions aloud and other questions were marked by the resident.

Immediately post survey collection, team members entered the hardcopy survey responses into Survey123 for ArcGIS, an application made by ERSI specifically to record location, record responses, and upload metadata to ESRI ArcGIS online so that the data was accessible in its entirety. Before proceeding to next residence, one team member would use their phone to enter the resident's responses onto Survey123 in addition to the residence's location via GPS coordinates, date, time, respondent's gender, type of residence, and surveyor initials.

Upon returning to a site, the group would reference an ArcGIS mapping application, specifically made to provide a live feed of surveys collected. The mapping application showed the researchers where a survey had previously been collected, which streets had already been completed, where the buffer zone ended, and the current location of the user. The mapping application prevented duplication of samples, prevented the team from returning to a home that had previously refused to participate in the survey, and prevented the team from sampling outside of the buffer zone.

Data Processing: Upon completion of all surveys, hardcopy surveys were labeled for tracking purposes. Online data was reviewed to verify all samples had a corresponding hardcopy survey and any discrepancies were corrected using the hardcopy version. Statistical analysis of data was run using a χ^2 test for independence with a Fisher's exact correction for small and uneven sample sizes ($\alpha = 0.05$).

Results

Opinion

The first section of the community health survey consisted in obtaining opinion responses focused on the experience by community members living in the two experimental sites and the control site. Table 1, shows the seven different questions that the community members answered. In addition, the community members taking the survey had five specific options on how they

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My neighborhood is a safe place to live:	O	O	O	O	O
My neighborhood is a healthy place to raise my children:	O	O	O	O	O
The well-being of my neighborhood's residents is prioritized in local government:	O	O	O	O	O
I like living in my neighborhood:	O	O	O	O	O
I consider my neighborhood safe from pollution:	O	O	O	O	O
I am concerned about environmental issues in my neighborhood:	O	O	O	O	O

Table 1: Seven opinion questions with specific answering options

could answer each question. The options included: strongly disagree, disagree, neutral, agree and strongly disagree. The reason we used these five options it was to eliminate open ended answers.

This method allowed us to compare answers across each of the sites. This allowed us to obtain frequencies for each of the questions. In addition, to further simplify the responses of the community members we combined the responses of strongly agree and agree in one category. This coupling of the answers was also done for the strongly disagree and disagree. Out of the seven questions two of them showed the most significant differences between the Wilmington and West Pico site. The first one being, "I consider my neighborhood safe from pollution" and the second one being, "the well-being of my neighborhood's residents is prioritized in local government." (Appendix D contains results for the other opinion questions).

The results for "I consider my neighborhood safe from pollution" showed that 78% of the Wilmington community members in the study disagree that their neighborhood is safe from pollution. In contrast, the community members in the study for West Pico only had 22%. In addition, the results for "the well-being of my neighborhood's residents is prioritized in local government" showed that 44% of the community members sampled in Wilmington feel that their local government does not care about their wellbeing. In contrast, only 8% of the community member in West Pico felt that their local government does not care about their wellbeing. Figures 6 and 7 depict results for each of the two questions mentioned above.

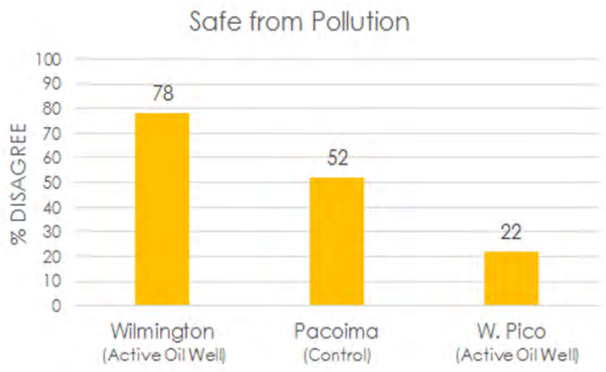

Figure 6- Opinion result

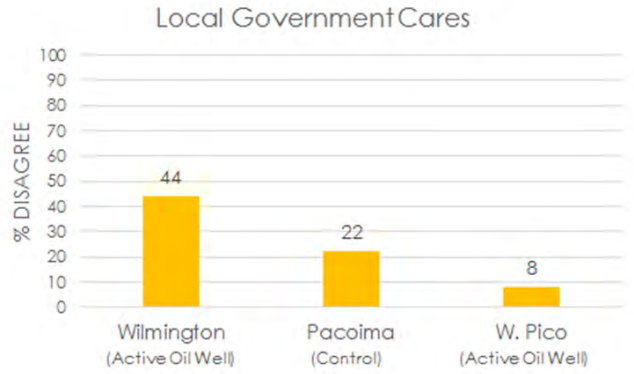

Figure 7- Opinion results

Demographics

Race

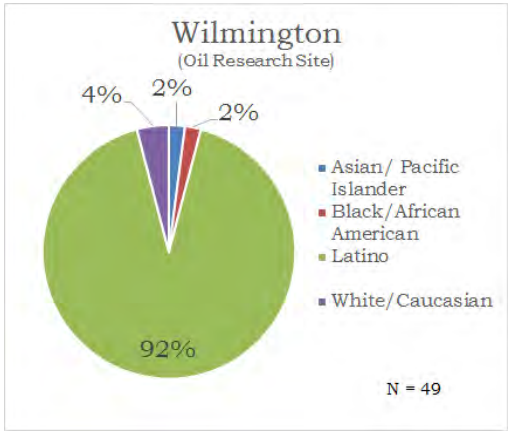

Figure 8 - Pie graph depicting race distribution for Wilmington (N=49 responses)

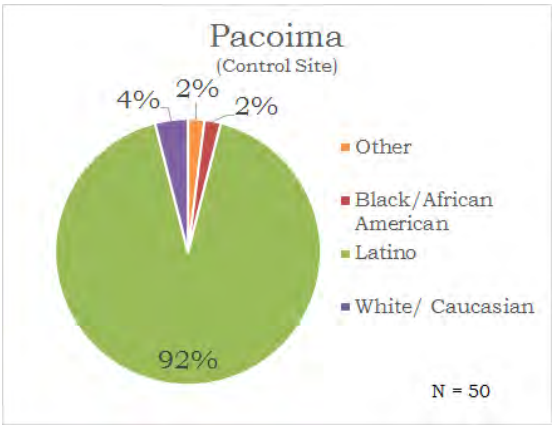

Figure 9 - Pie graph depicting race distribution for Pacoima (N =50 responses)

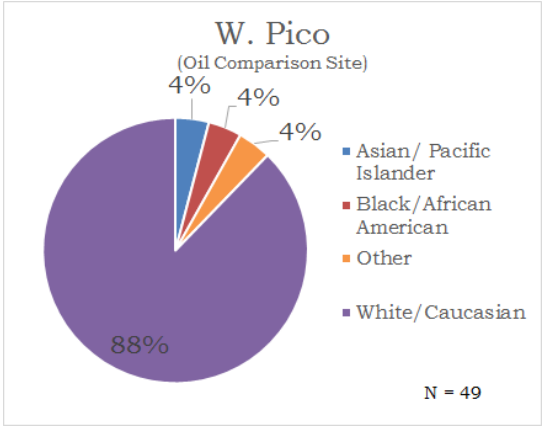

Figure 10 - Pie graph depicting race distribution for W. Pico (N=49 responses)

The second section of the survey included demographic questions. Results showed that 92% of the respondents were Latino in the community of Wilmington. Similarly, in the community of Pacoima, 92% of the respondents were Latino. Finally, in West Pico 88% of our respondents were White/Caucasian (Figures 8, 9, and 10).

Education

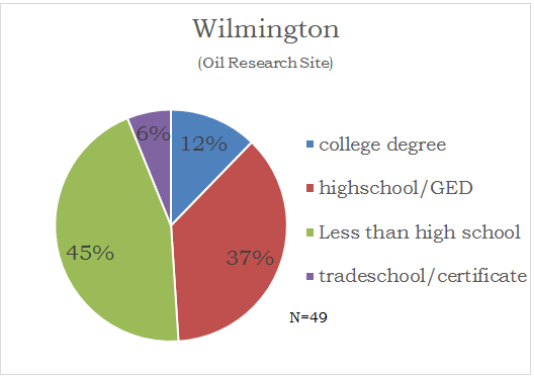

Figure 11- Level of education distribution in Wilmington

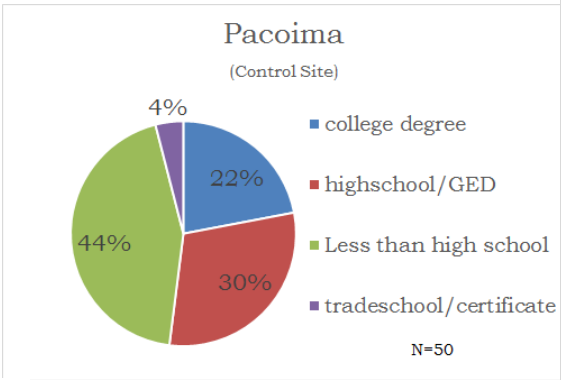

Figure 12 - Level of education distribution in Pacoima

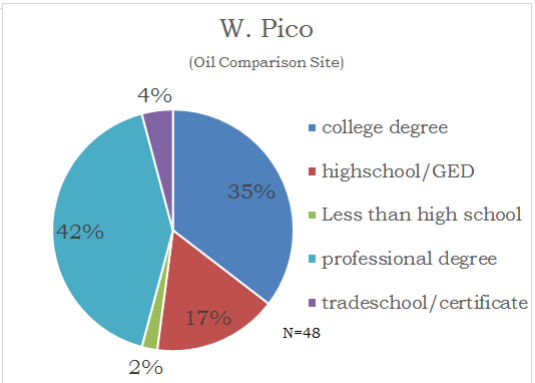

Figure 13 - Level of education distribution in W. Pico

In the community of Wilmington nearly half of the respondents (45%) had less than a high school education completed. Wilmington also had only 12% of their respondents having a college degree. Likewise, in the community of Pacoima, close to half of the respondents (44%) did not have a high school education completed. However, 22% of the respondents did have a college degree as opposed to (12%) in Wilmington. On the other hand, in the community of West Pico, only 2% of the respondents did not have a high school education. Also, 77% of the respondents in West Pico had a college degree or higher (Figures 11-13); (Appendix E contains additional demographic question results).

Health

A χ^2 test for independence with a Fisher's exact correction for small and uneven sample sizes ($\alpha = 0.05$) was utilized to find the significance of health symptoms and health conditions reported by the respondents in each of the respective communities (See Appendix F for additional health results).

Disease: Coronary Heart Disease	Wilmington	W. Pico	Pacoima	Total
Coronary Heart Disease	5	0	1	6
No Coronary Heart Disease	45	50	49	144
Total	50	50	50	150
Expected	Wilmington	W. Pico	Pacoima	
Coronary Heart Disease	2	2	2	
No Coronary Heart Disease	48	48	48	
chi-square= 7.29				
DF = 2				
P-value = 0.0261				

Table 2 - Chi-squared analysis of residents reporting coronary heart disease.

Disease: Throat Infections	Wilmington	W. Pico	Pacoima	Total
Throat Infections	13	4	6	23
No Throat Infections	36	45	44	125
Total	49	49	50	148
Expected	Wilmington	W. Pico	Pacoima	
Throat Infections	7.61	7.61	7.77	
No Throat Infections	41.4	41.4	42.2	
chi-square= 7.02				
DF = 2				
P-value = 0.030				

Table 3 - Chi-squared analysis of residents reporting throat infections.

Data: Total Conditions/Disease	Diseases Observed	Diseases Expected	Total
Wilmington	70	48	118
W. Pico	31	48	79
Pacoima	45	48	93
Total	146	144	290
Chi-squared= 7.843			
DF = 2			
P-value= 0.01981			

Table 4 - Chi-squared analysis of total diseases reported per location

Symptoms	Wilmington	W. Pico	Pacoima	N	DF	χ^2	p-value (α = 0.05)
Skin Irritation	12	7	6	149	2	2.865	0.22587
Headaches	23	15	15	149	2	4.117	0.12763
Nosebleeds	5	2	1	150	2	3.433	0.17969
Nausea/Vomiting	7	2	1	150	2	6.643	0.036101
Dizziness	13	3	5	150	2	9.302	0.00955
Fatigue/Weakness	18	14	7	150	2	6.445	0.039857
Breathing Issues	9	6	4	150	2	2.29	0.318
Chest Pain/Tightness	10	1	3	150	2	10.557	0.005101
Phlegm/Mucous	16	8	9	150	2	4.429	0.10921

Table 4 - Chi-squared analysis of residents reporting symptoms

Discussion

Potential Health Impacts

After analyzing the data, the symptoms that were statistically significant for Wilmington were Nausea/Vomiting ($p < 0.05$), Dizziness ($p << 0.05$), and Chest Pain/Tightness ($p << 0.05$) (Table 4). Therefore, these results demonstrate that there is a difference between Wilmington, West Pico and Pacoima when it comes to these symptoms. These results are important because they correspond with what symptoms have been reported by other residents near oil drilling sites (Nakatani, K. 2016). They are also the same symptoms that have been linked to oil drilling by past studies (See Appendix A). It is also important to note that fatigue/weakness was significant for both Wilmington and West Pico, which have oil drilling sites, as compared to Pacoima, which doesn't have an oil drilling site.

The health conditions that were statistically significant for Wilmington were Coronary Heart Disease ($p < 0.05$), Throat Infections ($p < 0.05$) and the Total Disease/Conditions ($p < 0.05$) listed in the survey. These conditions have also been linked to oil drilling sites by other studies (See Appendix A). Additionally, although these results were significant, we expected to see a significant difference between Wilmington and the other two sites when it came to other respiratory issues such as asthma (See Appendix F for more health outcomes).

Implications of Results

The disparity of health symptoms and conditions in Wilmington may be indicative of environmental injustice. Wilmington, a low-income community of Color experiences disproportionate exposure to oil wells; a potential cause for the significance of nausea/vomiting, dizziness, fatigue/weakness, and chest pain/tightness in Wilmington compared to the West Pico area. The case of environmental injustice is relevant because of the apparent demographic differences between Wilmington and West Pico, a community of color and a white community, respectively. Race is considered the major determining factor of environmental injustice; and thus, the health disparities present in Wilmington are evidence for environmental injustice (Clough, Emily 2016). The inequities present in Wilmington are urgent and must be addressed; however, their impact surpasses the regional level. Los Angeles is considered a microcosm of the world because of its diverse cultures and contributions; however, this description is also true because the environmental injustices faced in the Los Angeles region are representative of injustices faced around the world. Historically, the demographic makeup of Wilmington has been disenfranchised and its current health disparities are representative of the environmental injustices faced by marginalized people all around the world.

Limitations

Out of 500 homes, in each respective location, a response rate of only 10% resulted in only collecting 50 surveys per site. Six researchers knocked door to door, for would often result in only five successful surveys completed after two to three hours. Time and manpower limited the amount of surveys the team conducted. Therefore, the results of this survey cannot be readily generalized as causational effect on the Wilmington community. The demographic questions were included for control purposes and they did reflect the census data of each site. However, the sample size should be increased in future studies to increase confidence in the data. Field surveys are subject to uncertainty, since respondents and surveyors are prone to bias or

miscommunication. Although all of the questions made sense on paper, some of the questions were confusing in practice. Occasionally respondents would not understand a question or they would refuse to answer an uncomfortable question, such as annual household income or obesity as a health condition. Specifically, the sample size for income was much lower for each site due to discomfort around or lack of knowledge of income. Therefore, it might be useful to use census data for a reliable comparison between communities, with the caveat that it might not be a precise reflection of the population surveyed. In instances where a respondent did not indicate they were obese/overweight, it became the surveyor's choice to include whether a person appeared obese but did not respond accordingly; however, the addition of observed respondents as obese/overweight was not consistent across all surveyors. This made knowing the true number of obese respondents impossible, which may have had an impact on the results since obesity is linked to diseases like coronary heart disease and hypertension (Anderson and Konz 2001). Spatial analysis of health conditions was also challenging to determine, since the prevailing wind patterns, atmospheric conditions, and watershed of each area differed, along with this type of analysis being out of our scope of knowledge. Health conditions may be underreported due to inadequate access to health care, which results in undiagnosed conditions. Therefore, symptoms were included to mitigate this potential disparity between populations but they were subject to recall bias or misunderstanding of symptoms.

Further Research

While this study found significant differences in health conditions disproportionately effecting the Wilmington community, it is an introduction to the type of assessment that should be continued. It is recommended that a health professional further assess the health symptoms and conditions in the Wilmington community and relate findings to the presence of oil wells. To do this, a similar study should be conducted for the entire community of Wilmington, including a larger sample size, which can be used to support the results of this study while also being reflective of the larger Wilmington community with various oil well locations. Through a larger survey study, the time required for a spatial analysis would be justifiable and more meaningful.

Conclusion

The results of this study are suggestive of a disparity between the predominantly low income, Latino community of Wilmington and the predominantly high income, white community of West Pico. While they are both located within a quarter of a mile radius of an oil well, there are major differences in the health effects they experience. They do not appear to be related to a low socio-economic status, since the community of Wilmington experiences a higher incidence of conditions and symptoms than the control community of Pacoima, as well. The Wilmington community surveyed is less likely, than both Pacoima and West Pico, to be satisfied with their community and more likely to experience health conditions and symptoms. Further research is needed to support these specific results, however, current support for the adverse health outcomes indicated in this report are associated with close proximity to oil wells.

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Appendix A

Literature Review: Relevant Community Health Research

A cross sectional study conducted in counties of the Amazonian basin of Ecuador looked at the incidence of cancer related to the exposure of oil and gas operations (Hurtig and San Sebastián 2002). Results showed that the relative risk of stomach, skin, kidney, and cervical cancers present in the population were higher in the regions that had oil and gas drilling operations. The exposure to the contaminants was hypothesized to derived from the exposure of toxic chemical to water ways as most of the population depends on these unregulated water ways for drinking and sanitation.

A study in India surveyed regions that were located close to coal mines, paper factories and oil drilling sites (Dey et al. 2015). One component of the study focused on the extent of environmental pollution in air and soil. Air samples of the region where taken for a period of a year in regions close to the drilling site and up to 120 km away from the drilling site (Dey et al. 2015). The air samples were analyzed to determine the amount of particulate matter, carbon dioxide and sulfur dioxide at both regions. Soil conditions were evaluated near the oil drilling facility, which revealed elevated levels of lead, manganese, and arsenic. These compounds have been linked to major health problems including cardiovascular problems, liver damage and cancer.

Additionally, the study examined liver health of the subjects to gauge how liver condition was effected by distance from the oil drilling site. The study focused on the liver because the enzymic activity of the liver becomes inhibited with chronic exposure to chemical toxicants released by an oil and gas drilling well. The results revealed correlation between an individual's proximity to the drilling region, increased air pollution, and liver "abnormality" or "damage" (Dey et al. 2015). The findings of this report provide context about how distance from extraction sites relates to population health and the importance of generating a buffer zone to protect the community. Still, it is difficult to assign causation as any gradient of health condition or disease may be the result of other confounding variables.

A similar study conducted in Pennsylvania examined the correlation between oil and gas drilling wells present per km^2 and the incidence of visits to the hospital from people living in specific zip codes. This study also showed a correlation between the distance a person lived way from an oil well operation and the impacts on the individual's health. The methods used to obtain the incidence of causes that can be attributed to the exposure to the oil were determined by using the zip codes obtained from the hospital in to which the people had checked in (Jemielita, Thomas et al. 2015). The results showed that the zip codes that had higher number of visits correlated with those regions that had more oil well operations per km2. Furthermore, the study determined specific health categories and their correlation to the area with high activity of wells. The study reports on zip codes from 2010-2011 that initially started with no wells and obtained 0.17-0.70 wells per km2 the cardiology in patient prevalence for that region would increase by fourteen percent (Jemielita, Thomas et al. 2015). The methods of this study can be replicated in other regions to determine the effects of oil and gas facilities on specific members of a zip code. This can facilitate longitudinal studies for patients that live around a neighborhood that has active oil and gas wells.

Another study conducted in the City of Fort Worth, Texas used air quality monitoring and data modeling to test the efficiency of the buffer zones applied between gas drilling facilities and residents of Fort Worth. Their findings and modeling showed that the buffers implemented by the city complied with the goal of protecting the public health of the residents living close to the gas drilling cite (Fry 2013). Nonetheless, a study by Matthew Fry showed that buffer regions between the residents living around a gas drilling site have variability of effectiveness, making them useless for the protection of residents (Fry 2013). Fry determined that the buffer distances did not represent the "empirical research", instead they represent political decision disregarding the public health of the residents affected by urban drilling (Fry 2013) Other studies have determined that the number of contaminants that can affect a nearby community will vary. Because of this assigning buffer regions between communities and gas drilling facilities cannot be treated with the same conditions (Witter et al. 2013). These studies show that is crucial to understand the differences between the levels of hazards between oil and gas drilling facilities. The variability of the health effects should determine the distances that will buffer the effects and not treat all facilities as having a similar hazardous potential to a community. More studies should be conducted on the health effects of communities living close to oil and gas drilling facilities. Further studies should focus on the prolonged effects given that many of the chemicals used in this industry have shown to have endocrine disruptors (Kassotis et al. 2017). Endocrine disruptors can lead to many health effects in the population that come exposed to them through contaminated water sources.

A health impact assessment was conducted in the city of Hermosa Beach, California to determine the health risk of developing oil and gas drilling. The authors of the study concluded that the building of approximately 36 wells around the city would not have "substantial" effects on the community's health (McCallum, Lindsay et al. 2015). The decision was determined by the new mitigation and development measures proposed by the oil company E&B Natural Resources. Their reports show that only a few health effects would be seen in the community if the oil project is to be allowed to continue. This report is based their results on speculations and by determining probable violations of clean air act to already existing air problems in the region. The study obscures the actual hazard that these community could face as we have previously mention the results of studies done in Ecuador, India and Pennsylvania. Fortunately, the city voted to ban the project and the community manage to stop the urban drilling in their community. An important observation that needs to be made is that the community in Hermosa was informed. In other locations where the papulation has language barriers or lack political power urban oil and gas facilities are given the opportunity to operate despite the adverse health effects that can be brought upon the community.

Appendix B: Survey in English and in Spanish

UCLA **Community Health Survey**
Thank you for your participation 1

1. Check the O that indicates how you agree (or disagree) with the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My neighborhood is a safe place to live:	O	O	O	O	O
My neighborhood is a healthy place to raise my children:	O	O	O	O	O
The well-being of my neighborhood's residents is prioritized in local government:	O	O	O	O	O
I like living in my neighborhood:	O	O	O	O	O
I consider my neighborhood safe from pollution:	O	O	O	O	O
I am concerned about environmental issues in my neighborhood:	O	O	O	O	O

2. Do you:

a. Rent this residence b. Own this residence

3. Approximately how many miles away from home do you work? _____ or N/A

4. Which of these phrases best describe your work? (Check all that apply)

- ❑ I work primarily outdoors.
- ❑ I work primarily inside an office.
- ❑ I work primarily indoors in a factory or other manufacturing.
- ❑ I work in retail.
- ❑ I do a lot of physical manual labor for my job.
- ❑ I wear face protection to protect myself from exposure to contaminants.
- ❑ None of these

5. How long have you lived at this address? _____

6. How many people live in your household (including yourself and any children)? _____

7. To the best of your knowledge, indicate which of the following are in your neighborhood (check all that apply):

- ❑ Solar panels
- ❑ Wind turbines
- ❑ Coal mining
- ❑ Oil wells/drilling
- ❑ Geothermal plant
- ❑ Manufacturing plant

Completed by: Res Surv Both Type of Res: A H O GPS Coordinates:

Surveyor ID: Location: Sex: M F

Date: Time: Comments:

❑ Mapped
❑ Survey Entered

8. What is your Age? _____

9. What is your highest level of education completed?
   a. High School Diploma/GED
   b. Trade School/Certificate Program
   c. College Degree (AA, BA, BS)
   d. Professional Degree (JD, MD, MPH, MBA, PhD)
   e. Does not apply

10. What is your total household income?
   a. 0-$9,000
   b. $9,001-$20,000
   c. $20,001 - $30,000
   d. $30,001 - $ 45,000
   e. $45,001 - $ 60,000
   f. $60,001 - $ 80,000
   g. $80,001 and above
   h. N/A

11. What is your primary race/ethnicity?
   a. White/Caucasian
   b. Black or African American
   c. Asian or Pacific Islander
   d. Latino
   e. Native American
   f. Other_____

12. While living at this address, **have you or anyone in your household** had a miscarriage or had a child born with a birth defect/learning disability?
   a. Yes (how many:___)
   b. No
   c. Does not apply

13. How many hours do you spend inside your home on most workdays?
   a. 0-2 hours
   b. 3-5 hours
   c. 6-8 hours
   d. More than 8 hours
   e. N/A

14. How many hours do you spend outdoors (in your neighborhood) on most workdays?
   a. 0-2 hours
   b. 3-5 hours
   c. 6-8 hours
   d. More than 8 hours
   e. N/A

15. On a typical non-work day (e.g., weekend), how many hours are you inside your home?
   a. 0-2 hours
   b. 3-5 hours
   c. 6-8 hours
   d. More than 8 hours
   e. N/A

16. On a typical non-work day (e.g., weekend), how many hours do you spend outdoors in your neighborhood?
   a. 0-2 hours
   b. 3-5 hours
   c. 6-8 hours
   d. More than 8 hours
   e. N/A

17. Have **you** experienced any of these symptoms while living at this address? If so, how often?

	Always:	Very Often	Sometimes	Rarely	Never
Skin Irritation	O	O	O	O	O
Headaches	O	O	O	O	O
Nosebleeds	O	O	O	O	O
Nausea/Vomiting	O	O	O	O	O
Dizziness	O	O	O	O	O
Fatigue	O	O	O	O	O
Breathing Issues (coughing, wheezing, shortness of breath)	O	O	O	O	O
Chest tightness/pain	O	O	O	O	O
Phlegm/Mucus	O	O	O	O	O

18. Since you have lived at this address, please check all the conditions that apply to **you**:
   - ❑ Cancer
   - ❑ Asthma
   - ❑ Bronchitis
   - ❑ Pneumonia
   - ❑ Coronary heart disease
   - ❑ Lung infections
   - ❑ COPD (Chronic Obstructive Pulmonary Disease)
   - ❑ Throat infections
   - ❑ Heart attack
   - ❑ Obese/overweight
   - ❑ Smoker
   - ❑ Emphysema
   - ❑ Stroke
   - ❑ Kidney Disease
   - ❑ Endocrine/Thyroid Issues
   - ❑ Reproductive Issues

19. Since you have lived at this address, please check all the conditions that apply to **members of your household**:
   - ❑ Cancer
   - ❑ Asthma
   - ❑ Bronchitis
   - ❑ Pneumonia
   - ❑ Coronary heart disease
   - ❑ Lung infections
   - ❑ COPD (Chronic Obstructive Pulmonary Disease)
   - ❑ Throat infections
   - ❑ Heart attack
   - ❑ Obese/overweight
   - ❑ Smoker
   - ❑ Emphysema
   - ❑ Stroke
   - ❑ Kidney Disease
   - ❑ Endocrine/Thyroid Issues
   - ❑ Reproductive issue

We sincerely appreciate your participation in this survey. If you would like to know more about the purpose or results of this survey, feel free to email mhrubens@ucla.edu or visit the UCLA IoES website at www.ioes.ucla.edu for more information. Thank you.

UCLA Encuesta de Salud de la Comunidad
Gracias por su participación.

1. Marque la O que indica como esta de acuerdo (o desacuerdo) con las siguientes afirmaciones:

	Muy en desacuerdo	Desacuerdo	Neutral	De acuerdo	Totalmente de acuerdo
Mi vecindario es un lugar seguro para vivir:	O	O	O	O	O
Mi vecindario es un lugar saludable para criar a mis hijos:	O	O	O	O	O
El bienestar de los residentes de mi vecindario se prioriza en el gobierno local:	O	O	O	O	O
Me gusta vivir en mi vecindario:	O	O	O	O	O
Considero que mi vecindario esta a salvo de la contaminacion:	O	O	O	O	O
Estoy preocupado por los problemas ambientales en mi vecindad:	O	O	O	O	O

2. Usted:
   a. Alquila esta residencia b. Dueño/a de esta residencia
3. ¿Aproximadamente a cuantas millas esta su trabajo de su casa? _____ o No se aplica
4. ¿Cual de estas frases describe más su trabajo?
   - ❑ Trabajo principalmente al aire libre
   - ❑ Trabajo principalmente dentro de una oficina
   - ❑ Trabajo como comerciante
   - ❑ Trabajo principalmente dentro de una fábrica
   - ❑ Hago mucho mano de obra en mi trabajo
   - ❑ Uso protección facial contra la exposición a contaminantes
   - ❑ Ninguno de esos
5. ¿Cuanto tiempo ha vivido en esta direccion? _____
6. ¿Cuanta gente vive en su hogar, incluyendo a usted? _____
7. A lo mejor de su conocimiento, indique cuales de los siguientes son en su vecindario (marque todo lo que corresponda):
   - ❑ Paneles solares
   - ❑ Turbinas de viento
   - ❑ Mineria de carbon
   - ❑ Pozos de petroleo / perforación
   - ❑ Planta geotérmica
   - ❑ Plan de fabricacion

Completed by: Res Surv Both Type of Res: A H O GPS Coordinates:

Surveyor ID: Location: Sex: M F

Date: Time: Comments:

❑ Mapped
❑ Survey Entered

8. ¿Cual es su edad? _____

9. ¿Cual nivel de educacion completo?
   a. Diploma de la Preparatoria
   b. Certificado en escuela de Comercio
   c. Titulo Universitario
   d. Titulo Profesional
   e. No se aplica

10. ¿Cual es su ingreso anual en el hogar?
    a. 0-$9,000
    b.$9,001-$20,000
    c. $20,001 - $30,000
    d.$30,001 - $ 45,000
    e. $45,001 - $ 60,000
    f. $60,001 - $ 80,000
    g. $80,001 and above
    h. N/A

11. ¿Cual es tu origen principal?
    a. Caucasico
    b. Africano
    c. Asiatico
    d. Latino
    e. Nativo Americano
    f. Otro _____

12. Durante el tiempo que ha vivido en esta dirección, ¿usted o alguien en su hogar ha tenido un aborto involuntario o ha tenido un niño con un defecto o discapacidad de aprendizaje?
    a. Si (cuantos) _____ b. No C. No se aplica

13. ¿Cuantas horas pasa dentro de su casa en la mayoría de los dias de trabajo?
    a. 0-2 horas c. 6-8 horas e. No se aplica
    b. 3-5 horas d. Mas de 8 horas

14. ¿Cuantas horas pasa fuera de casa en su vecindario, en la mayoria de los dias de trabajo?
    a. 0-2 horas c. 6-8 horas e. No se aplica
    b. 3-5 horas d. Mas de 7 horas

15. En un dia típico de no trabajo, como los fines de semana, ¿cuantas horas pasa dentro de su casa?
    a. 0-2 horas c. 6-8 horas e. No se aplica
    b. 3-5 horas d. Mas de 8 horas

16. En un dia típico de no trabajo, como los fines de semana, ¿cuantas horas pasa fuera de su casa en su vecindario?
    a. 0-2 horas c. 6-8 horas e. No se aplica
    b. 3-5 horas d. Mas de 8 horas

17. ¿Usted ha experimentado alguno de estos síntomas mientras ha vivido en esta dirección? En el caso que sí, ¿con qué frecuencia?

	Siempre	Seguido	Aveces	Raramente	Nunca
Irritación de la piel	O	O	O	O	O
Dolores de cabeza	O	O	O	O	O
Hemorragias nasales	O	O	O	O	O
Náusea/Vomito	O	O	O	O	O
Mareo	O	O	O	O	O
Fatiga	O	O	O	O	O
Dificultad para respirar (tos, sibilancias)	O	O	O	O	O
Opresión en el pecho	O	O	O	O	O
Flema/Mucosidad	O	O	O	O	O

18. Durante el tiempo que tu has vivido en esta dirección, por favor, marque todas las condiciones que se aplican a **usted**:

- ❑ Cáncer
- ❑ Asma
- ❑ Infecciones pulmonares
- ❑ Enfermedad pulmonar obstructiva crónica
- ❑ Infección de garganta
- ❑ Bronquitis
- ❑ Neumonía
- ❑ Enfermedad coronaria
- ❑ Ataque al corazón
- ❑ Obesidad / sobrepeso
- ❑ Fumador
- ❑ Enfisema
- ❑ Derrame cerebral
- ❑ Problemas renales
- ❑ Problemas de tiroides
- ❑ Problemas reproductivos

19. Durante el tiempo que has vivido en esta dirección, por favor, marque todas las condiciones que se aplican a **miembros de su hogar**:

- ❑ Cáncer
- ❑ Asma
- ❑ Infecciones pulmonares
- ❑ Enfermedad pulmonar obstructiva crónica
- ❑ Infección de garganta
- ❑ Bronquitis
- ❑ Neumonía
- ❑ Enfermedad coronaria
- ❑ Ataque al corazón
- ❑ Obesidad / sobrepeso
- ❑ Fumador
- ❑ Enfisema
- ❑ Derrame cerebral
- ❑ Problemas renales
- ❑ Problemas de tiroides
- ❑ Problemas reproductivos

Apreciamos sinceramente su participación en esta encuesta. Si desea saber más sobre el propósito o resultados de esta encuesta, no dude en enviar un correo electrónico mhrubens@ucla.edu o visita el UCLA IoES sitio web a www.ioes.ucla.edu para mas información. Gracias.

Appendix C

Surveying Schedule

FEBRUARY

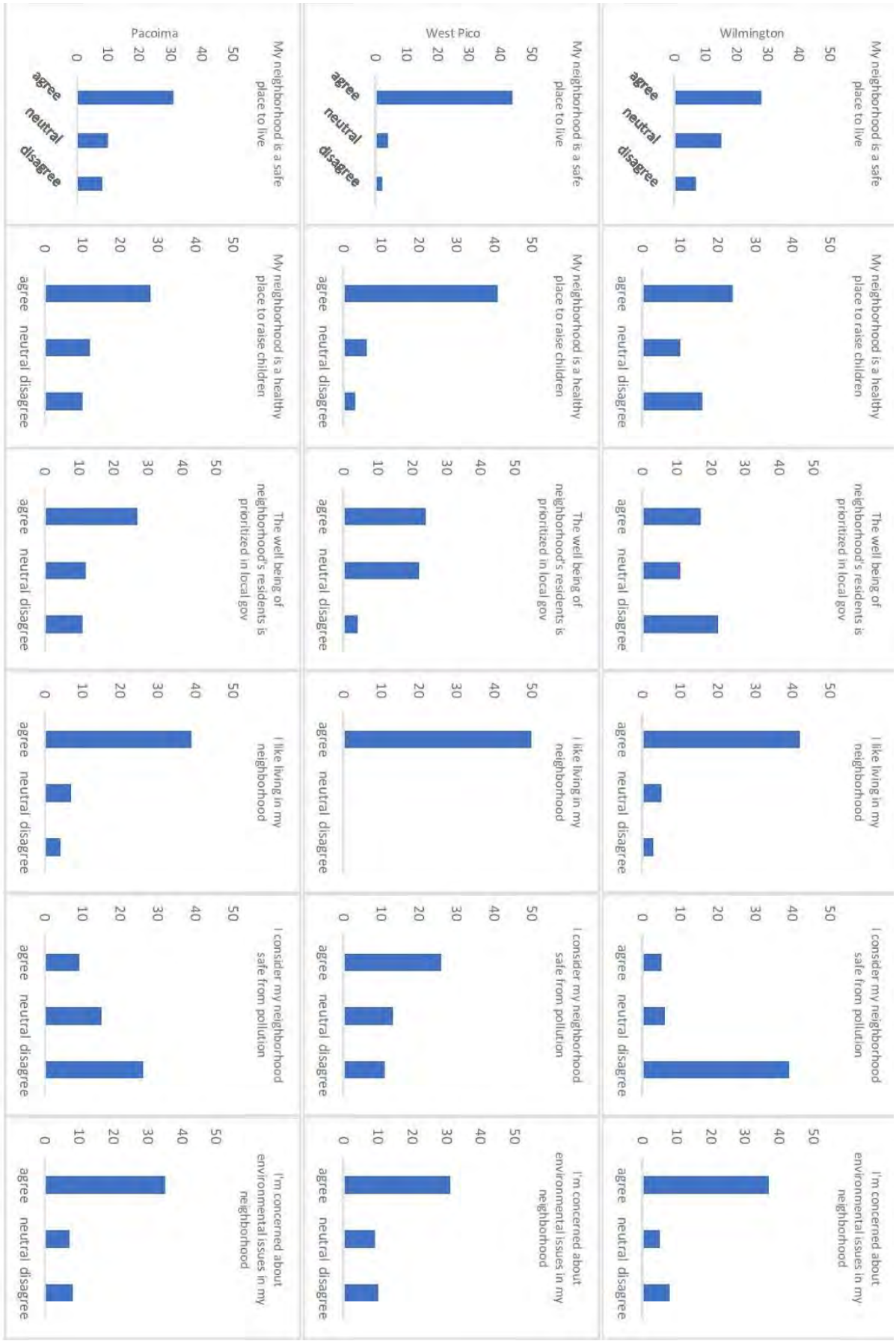
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	9	10
11	12	14	15	16	17	18
19	20	21	22	23	24	25 Maggie, Erick, Tony @ 12:00PM, Jefferson PILOT 1
26	27	28				

MARCH

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4 Lizet, Maggie, Erick, Tony, Francisca @ 10:00AM, Wilmington PILOT 2
5	6 Tony, Francisca @ 12:00PM, Wilmington	7	8	9	10	11
12	13	14	15	16	17 Lizet, Erick @ 10:00AM, Wilmington	18 Maggie, Francisca, Tony, Erick @ 9:00AM, W Pico
19	20	21	22 Erick, Francisca, Lizet, Anakaren,Tony, Maggie @ 12:00pm, W. Pico	23 Erick, Anakaren, Lizet, Maggie @ 9:00AM, Wilmington RESCHEDULE	24 Anakaren, Francisca @ 10:00AM, Wilmington RESCHEDULE	25

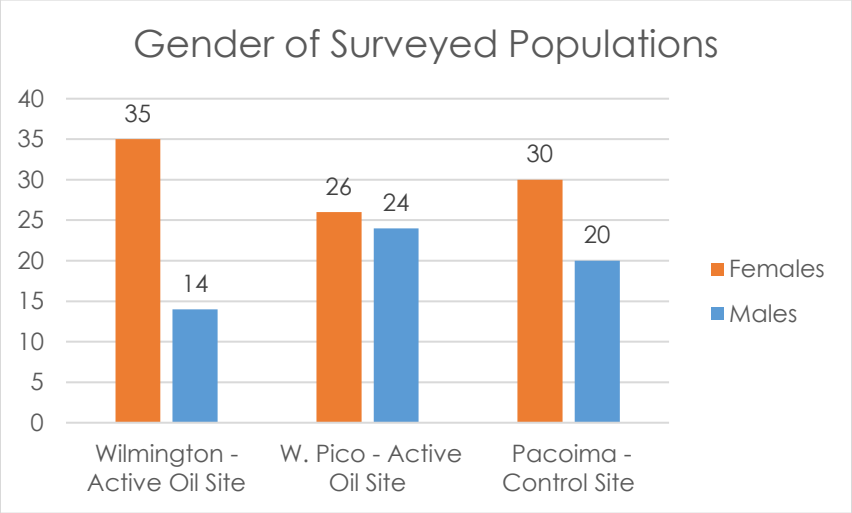
				E		
26 Tony, Erick @ 12:00PM, Pacoima	27. Erick, Anakaren @ 9:00am Wilmington	28. Maggie, Lizet @ 9:00AM W. Pico	29. Erick, Anakaren, Maggie, Tony @ 9:00AM Wilmington FILMING PT. 1	30	31	
APRIL						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6 Lizet, Anakaren @ 9:00AM, W Pico (10)	7 Francisca, Anakaren, Tony, Erick, Lizet @ 9:00AM, Wilmington (12) FILMING PT. 2	8 Maggie, Lizet @ 9:00AM Pacoima (11)
9 Maggie, Anakaren, Erick, Francisca @ 9:00AM, Pacoima (13) knocked on 58	10 Anakaren, Francisca @ 10:00AM, Wilmington (7) FINISHED WILMINGTON!	11	12	13	14 Francisca, Anakaren, Lizet, Maggie @ 11:00AM, Pacoima (10)	15 Erick, Tony @ 10:00AM, Pacoima FINISHED PACOIMA!!!! (7)
16 EASTER	17 Tony, Maggie 11:00AM, W. Pico (4)	18 Francisca, Lizet @ 4PM, W. Pico (0)	19 Anakaren, Maggie @ 9:30AM (5) W. Pico	20 Tony, Lizet @9:30AM W. Pico (3)	21 Erick, Anakaren @ 10AM (6), W. Pico	22
23	24 Erick, Tony @ 9:00AM, W. Pico (6) FINISHED!	25	26	27	28	29
30						

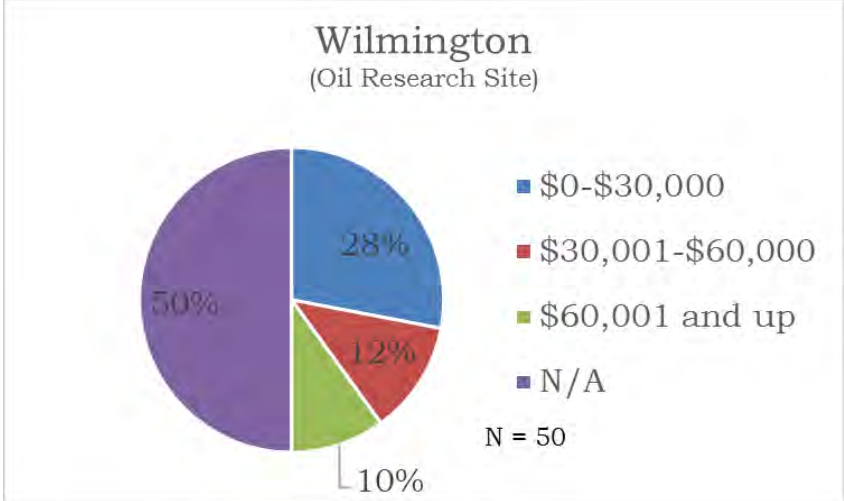
Appendix D: Results for all the seven opinion questions across all sites.

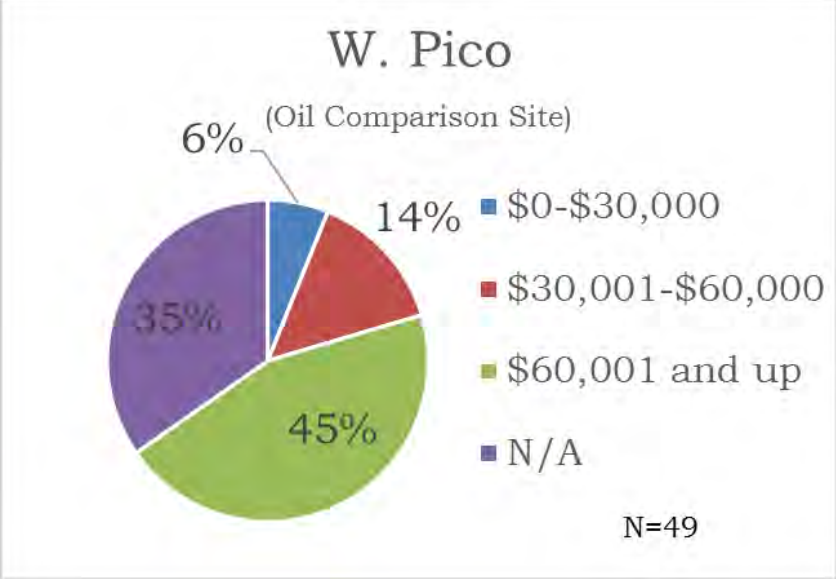


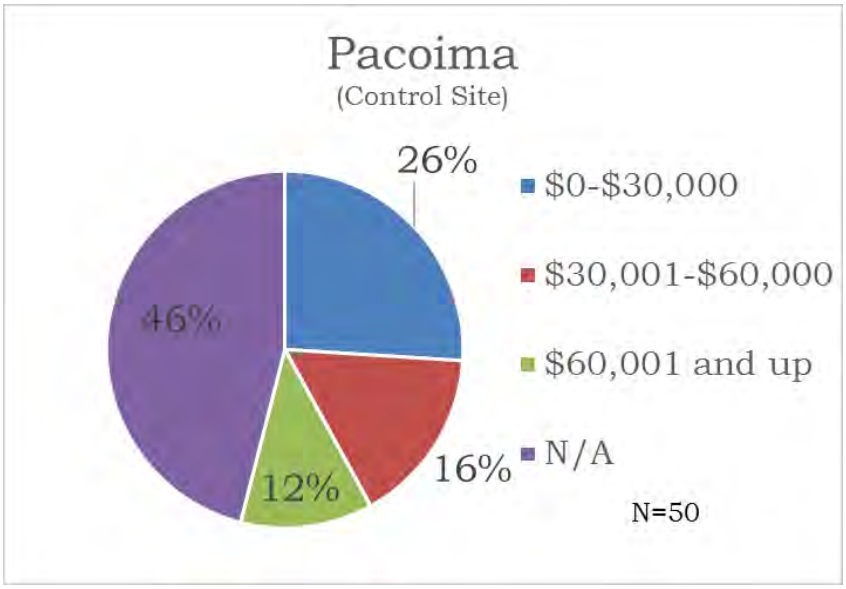
Appendix E

Additional Demographics of Surveyed Populations








Pacoima
(Control Site)
26%
46%
12%
16%
$0-$30,000
$30,001-$60,000
$60,001 and up
N/A
N=50

Appendix F: Other Disease Statistics Results

DATA	Wilmington	W. Pico	Pacoima	Total
Asthma	5	2	4	11
No Asthma	45	48	45	138
Total	50	50	49	149
Expected	Wilmington	W. Pico	Pacoima	
Asthma	3.36	1.34	2.68	
No Asthma	30.2	32.21	30.2	
chi-square= 1.381				
DF = 2				
P-value = 0.50338				

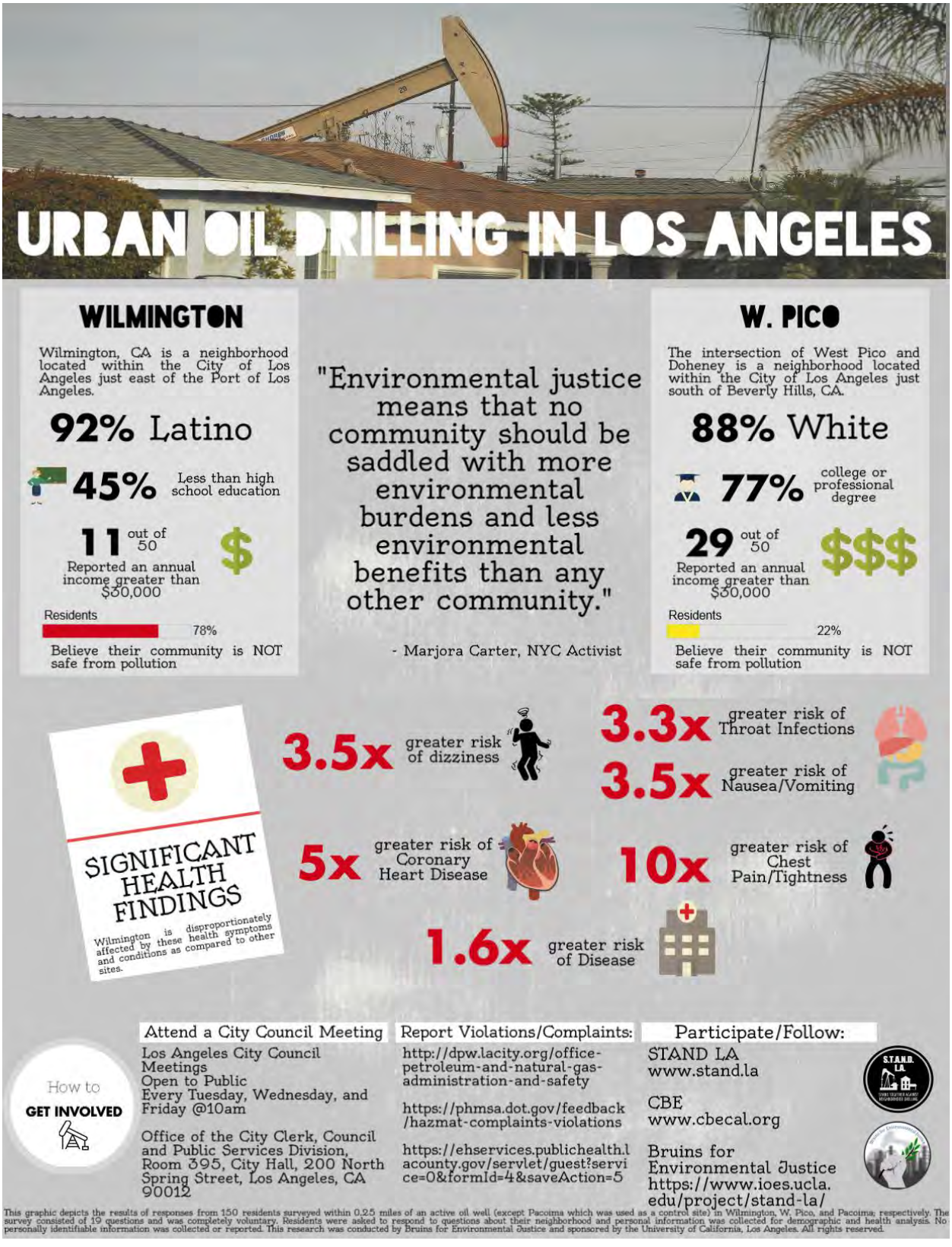
DATA	Wilmington	W. Pico	Pacoima	Total
Bronchitis	5	2	3	10
No Bronchitis	44	47	46	137
Total	49	49	49	147
Expected	Wilmington	W. Pico	Pacoima	
Bronchitis	3.33	3.33	3.33	
No Bronchitis	45.7	45.7	45.7	
chi-square= 1.50				
DF = 2				
P-value = 0.43193				

DATA	Wilmington	W. Pico	Pacoima	Total
Pneumonia	2	0	3	5
No Pneumonia	48	50	47	145
Total	50	50	50	150
Expected	Wilmington	W. Pico	Pacoima	
Asthma	1.67	1.67	1.67	
No Asthma	48.33	48.33	48.33	
chi-square= 2.897				
DF = 2				
P-value = 0.234975				

DATA	Wilmington	W. Pico	Pacoima	Total
COPD	1	0	0	5
No COPD	49	50	50	149
Total	50	50	50	150
Expected	Wilmington	W. Pico	Pacoima	
Asthma	0.33	0.33	0.33	
No Asthma	49.67	49.67	49.67	
chi-square= 2.013				
DF = 2				
P-value = 0.365419				

DATA	Wilmington	W. Pico	Pacoima	Total
Thyroid Issues	5	2	4	11
No Thyroid Issues	45	48	45	138
Total	50	50	49	149
Expected	Wilmington	W. Pico	Pacoima	
Thyroid	2.67	2	1.33	
No Thyroid Issues	30.67	31.33	32	
chi-square= 0.709				
DF = 2				
P-value = 0.70145				

Appendix G: Facts Sheet of Results in English and Spanish



PERFORACION DE PETROLERA URBANA EN LOS ANGELES

WILMINGTON

Wilmington, CA es una vecindad ubicada dentro de la Ciudad de Los Angeles justo al este del Puerto de Los Angeles.

92% Latinos

45% Menos de educación secundaria

11 de 50 reportaron un ingreso anual mayor de $30,000

Residentes 78%

Creen que su comunidad NO está a salvo de la contaminación

"La justicia ambiental significa que ninguna comunidad debe cargar con más cargas ambientales y menos beneficios ambientales que cualquier otra comunidad."

- Marjora Carter, NYC Activista

W. PICO

La intersección de West Pico y Doheney es una vecindad ubicada dentro de la ciudad de Los Angeles justo al sur de Beverly Hills, CA.

88% Caucásico

77% Universidad o título profesional

29 de 50 reportaron un ingreso anual mayor de $30,000

Residentes 22%

Creen que su comunidad NO está a salvo de la contaminación

Datos significativos sobre la salud

Wilmington es afectado desproporcionadamente por estos síntomas y condiciones de salud en comparación con otros sitios.

3.5x Mayor riesgo de mareos

3.3x Mayor riesgo de infecciones de garganta

3.5x Mayor riesgo de náuseas / vómitos

5x Mayor riesgo de enfermedad coronaria

10x Mayor riesgo de dolor de pecho/ opresión en el pecho

1.6x Mayor riesgo de enfermedad

Cómo Puede Involucrarse

Asista a una reunión del Concejo Municipal:

Reuniones del Consejo Municipal de Los Angeles
Abierto al público
Todos los martes, miércoles y viernes a las 10am.

Oficina del Secretario de la Ciudad, del Consejo y de la División de Servicios Públicos, Sala, 395, City Hall, 200 North Spring Street, Los Angeles, CA 90012

Reporte violaciones/quejas

http://dpw.lacity.org/office-petroleum-and-natural-gas-administration-and-safety

https://phmsa.dot.gov/feedback/hazmat-complaints-violations

https://ehservices.publichealth.lacounty.gov/servlet/guest?service=0&formId=4&saveAction=5

Participe/Siga:

STAND LA
www.stand.la

CBE
www.cbecal.org

Bruins for Environmental Justice
https://www.ioes.ucla.edu/project/stand-la/