BROOKLYN COLLEGE

Air Quality in Brownsville

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TEACHERS PREPARATORY SCHOOL

Abstract

This project was aimed at measuring air pollution levels in Brownsville, Brooklyn. Air pollution is a very serious problem in Brooklyn. It causes many life-threatening diseases, such as asthma, lung cancer, emphysema, etc. Experiment 1 was aimed to estimate the levels of PM10 and determine the local hotspots and critical time periods of PM10 elevation. Experiment 2 was aimed to study the acidity levels of rain in order to estimate the levels of sulfur dioxide in Brownsville. Experiment 3 was aimed to determine how air pollution affects asthma levels in Brownsville community. Experiment 4 was aimed to estimate Carbon Monoxide levels and educate the community about its dangers. Experiment 5 was aimed to calculate whether there were enough trees present in order to combat the carbon dioxide emissions by local cars. It was found that PM10 levels were high near the park as well as near the highway. In addition there was clear evidence of acid rain suggesting the presence of sulfur dioxide in the air. Asthma rates were found to be higher in locations closer to the highways. While most community members appeared to be aware of carbon monoxide dangers, many still used the stove to heat the apartment. Finally, it was found there were not enough trees to counteract the carbon dioxide emitted by local cars. Clearly air pollution is a problem in Brownsville and clean air reform is needed in order to prevent further air pollution.

Experiment 1

• Particulate Matter is defined as tiny particles that are suspended in the air or liquid. The smaller the particles are, the more dangerous they are. PM10 are particles smaller than 10 micrometers; they can actually enter the lungs and cause asthma, lung cancer, heart disease and death. This experiment was set to determine the PM10 hotspots in Brownsville. It was predicted that more PM10 would be found near the highway than in the park since there are cars on the highway, resulting in more particulate matter being suspended into the air.

Methods

• 4 slides were placed in 2 different locations: 2 were placed in the park and 2 were placed near highway
• Slides were subbed with Vaseline
• Slides were taken down after 2 weeks
• Pictures were taken of each slide with a Proscope (100 times magnification) and particles that were smaller than 10 micrometers were counted and averaged across the slides in the same location.
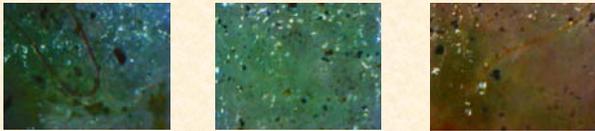
Results and Conclusions

Surprisingly, there were slightly more PM10 particles found near the park than near the highway. This could be due to the fact that the park is surrounded by a busy street on both sides. In addition, two of the samples (one from each location) were stolen, so the sample size was small. It is possible that we would get different results with a larger sample.
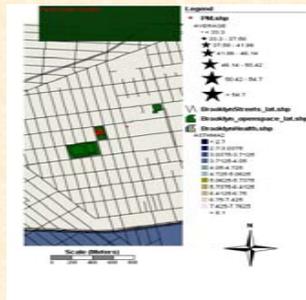
The map on the left shows the locations where the samples were taken. The big red dot indicates more air pollution and smaller dot indicates less air pollution.

Experiment 2

• Sulfur Dioxide emitted from large factories often results in acid rain. Acid rain is very dangerous, it kills plants, animals, and fish. This experiment was aimed to determine whether there is acid rain in Brownsville.

Methods

• Six rain samples were collected on the rooftop of the Teachers Preparatory school and nearby buildings. A pH meter was used to measure the acidity of water. A pH lower than 7 is acidic, a pH level higher than 7 is basic (or alkaline).

Results
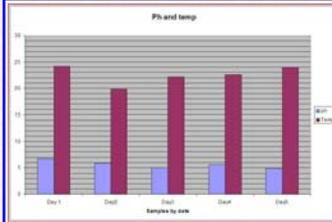
• The results on the left indicate that four out of six samples were acidic. The pH values were: 7.3, 6.8, 5.9, 5.0 ,5.6, 4.9. These results show evidence of acid rain and suggest that there are high amounts of sulfur dioxide in Brownsville.
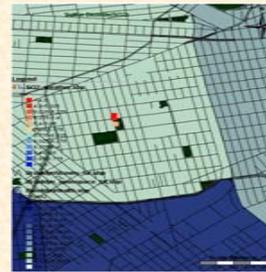
• The results (on the right) demonstrated that the samples were acidic, suggesting that there is acid rain in Brownsville. The red color indicates samples that were more acidic, less red samples were less acidic.
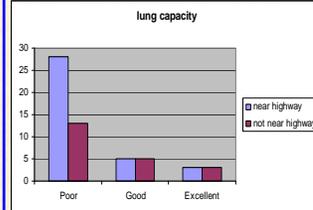
Experiment 3

This experiment was aimed to determine how air pollution affects health. It is expected that people who live closer to highways will be more likely to have asthma in the family and will have worse lung capacity values.
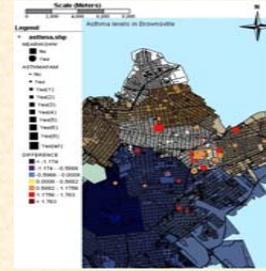
Methods

• Seventy students were given a survey regarding their health and health of their families (whether they have asthma or not). In addition, the students were asked to take a breath into the FEV1 (Forced Expiratory Volume in the first second) monitor. The FEV1 value was taken for each student and compared to the scientifically predetermined normal FEV1 value. If the students' FEV1 value was lower than the normal FEV1 value, it was assumed that the student has a lower than expected lung capacity. At the end of the experiment, the differences between the normal and the obtained FEV1 values ("the lung capacity values") were plotted on a map in order to determine whether there is a relationship between where the students live and their lung capacity.

Results

• The results on the left demonstrate that location had an effect on lung capacity for those students with worst FEV1 scores, suggesting that if they lived near a highway, their lung capacity was more likely to be affected than if they lived further away from the highway. This result shows that air pollution has a negative effect on health.


• The map on the right shows the lung capacity levels (values closer to red are the worse values, values closer to blue are better lung capacity values). The shape of the mark indicates whether they live near a highway (roads are also shown on the map), the circles indicate highway locations and squares indicate that the student did not live near the high way. Finally, the size of the square or circle shows how many family members have asthma, the bigger the shape, the more members have asthma. The map shows that students who live closer to highway have worse lung capacity and more family members with asthma.

Experiment 4

- This study aimed to study whether the community is aware of the dangers of Carbon Monoxide (CO). Many people use the gas stoves in order to heat their houses in the winter not realizing that CO from the gas stove can be very dangerous. In addition to studying the Carbon Monoxide awareness in Brownsville, this study also aimed at educating the community of about this "silent killer" in order to minimize amount of CO related deaths.

Methods

• Thirty-three surveys were collected from the community members which included questions about whether the people knew what carbon monoxide is, whether they have a CO monitor at home, whether it has batteries, whether they have any respiratory problems, and whether they use the gas stove to heat the apartment. All the people surveyed were given an information sheet regarding the dangers of carbon monoxide.

Results
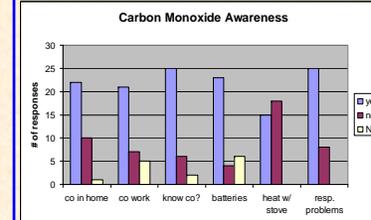
• Even though many people said that they knew how dangerous CO is, many of them still use gas stoves to heat the apartment and many report that they have respiratory problems.
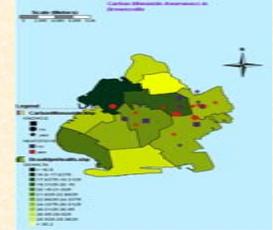
• The map on the right shows how many people know about CO (star shape) and how many don't (circle). The square shows the people who did not respond to this question. The red shapes are the people who heat the apartment with gas stove and the blue shapes are the people who don't.

Experiment 5

• This experiment aimed to estimate the levels of carbon dioxide in Brownsville and determine whether there are enough trees to take in the carbon dioxide emitted by the cars. A single mature tree can absorb carbon dioxide at the rate of 48 pounds a year and release enough oxygen back into the atmosphere to support two human beings (http://www.coloradotrees.org/benefits.htm).

• Cars and trees were counted around an 8 block perimeter shown on a map below

Results
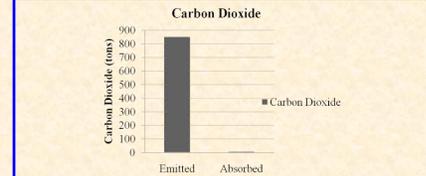
It was determined that **850.59 tons** (1,701,180 pounds) of carbon dioxide are **emitted** by the cars in the 8 block perimeter, but only **5,088 tons** (10,176 pounds) **are absorbed** by the trees there. Approximately 35,230 more trees are needed in order to absorb all the carbon dioxide emitted by the cars on those 8 blocks!

General Conclusions

• The results of these experiments suggest that there is an air pollution problem in Brownsville. Experiment 1 found that there was a lot of PM10 near the highway as well as near the park. Experiment 2 evidence of acid rain in Brownsville, which is alarming because it means that our plants and animals may be affected. Experiment 3 showed that air pollution affects pulmonary (lung) health, where people who live closer to the highway tend to have higher asthma rates. Experiment 4 found that although many people know what CO is, they still use gas stoves to heat their houses, exposing themselves to dangerous levels of CO. Finally, Experiment 5 showed that there is more carbon dioxide emitted by the cars than is absorbed by the trees and that we need a lot more trees in order to counteract the air pollution emitted by the cars. All of these studies show that clean air reform is needed in order to fix the air pollution problem in Brownsville.

Asthma Survey