Introduction

Industrial pollution has been shown to have a significant impact on the health of residents in close proximity. Prolonged exposure to toxins such as, benzene and 1,3 butadiene can result in high cancer mortality.

Recent studies have revealed an increased risk of cancer for port communities, similar to Galena Park, Texas located along the Houston Ship Channel; however, these studies did not investigate mortality concerns. This project investigates the community-identified concerns regarding cancer-related death clusters within the Galena Park community and other communities located along the Houston Ship Channel, from 1990 thru 2010.

Benzene is a group 1A known human carcinogen and a by-product of petroleum refining. Benzene can be persistent although it does not bioaccumulate. Benzene is also easily leached from the soil into groundwater. 1,3 butadiene is a by-product of ethylene used in petroleum refining and a known human carcinogen. 1,3 butadiene is also prevalent in hazardous waste and has a negative impact on ozone, and is most harmful to humans if inhaled.

Methods

- We conducted an investigative spatial analysis of premature mortality using death certificate data obtained from the Texas Department of Vital Statistics from 1990 to 2010.
- Analysis was based on specific cancer related deaths over a 21 year period (90,189 total deaths were analyzed of which 60,001 met the study’s exclusion criteria).
- We extracted data from records in which the primary cause of death was cancer or a cancer-related condition; filtering for cancers directly related to inhalation of benzene or 1,3 butadiene, premature (<75yr according to US Dept. of HHS).
- Butadiene and benzene data obtained from EPA/NATA 2005 dataset
- Information on gender, race, and education were obtained from death certificates.
- US census variables were used to characterize the study areas socioeconomic patterns and urbanicity.
- The 2010 hazardous waste facility and chemical company dataset was used to determine land use around the study area.
- Data were geocoded and analyzed using ArcMap 10.1.

Results

Table 1. Distribution of summed premature deaths by multi-year group and demographic characteristics (n = 60,001)

<table>
<thead>
<tr>
<th>Year Group</th>
<th>Premature Deaths by Race/Ethnicity</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-1994</td>
<td>White</td>
<td>785</td>
<td>849</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>638</td>
<td>702</td>
</tr>
<tr>
<td></td>
<td>Hispanic</td>
<td>120</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td>Asian</td>
<td>317</td>
<td>342</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,552</td>
<td>1,696</td>
</tr>
</tbody>
</table>

Discussion and Results

The maps of the Houston Ship Channel’s 5 mile census tract study area encompass the time period between 1990-2010 for the following variables: 1) premature cancer mortality (pcm) 2) poverty inequality 3) ambient air concentration 1,3 butadiene 4) ambient air concentration benzene.

Rows 1-4 characterize the relationship of pcm to poverty and specific air pollutants for 5-year time intervals at the census tract level.

In summary, the findings illustrate that economically disadvantaged areas in close proximity to the Houston Ship Channel are characterized by historically higher pcm and higher ambient air pollutant levels when compared to more affluent areas in the region. However, additional analysis is required to determine how predictive income and specific air pollutants might be in determining premature age at cancer death.

Acknowledgements

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References