

# Unbreathable: A Study of Community-Perceived Cancer Mortality from Industrial Toxins along the Houston Ship Channel through Spatial-temporal Analysis in a GIS Environment

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## 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

	1990 - 1994	1995 - 1999	2000 - 2004	2005 - 2010
Premature Cancer Death (n)	13887	14113	14048	17953
SEX				
Male	7606	7645	7477	9476
Female	6281	6468	6571	8477
RACE				
White	10045	9859	9655	11796
Black	3478	3650	3956	4930
Hispanic	130	237	314	477
Asian	217	342	416	709
American Indian	8	9	11	20
Unknown	9	11	10	21
EDUCATION				
≤12 yr	8596	8449	8222	10302
13-16	3924	4126	4279	6216
≥ 16 yr	875	1108	1235	1180
Unknown	492	430	312	255

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

## RESULTS

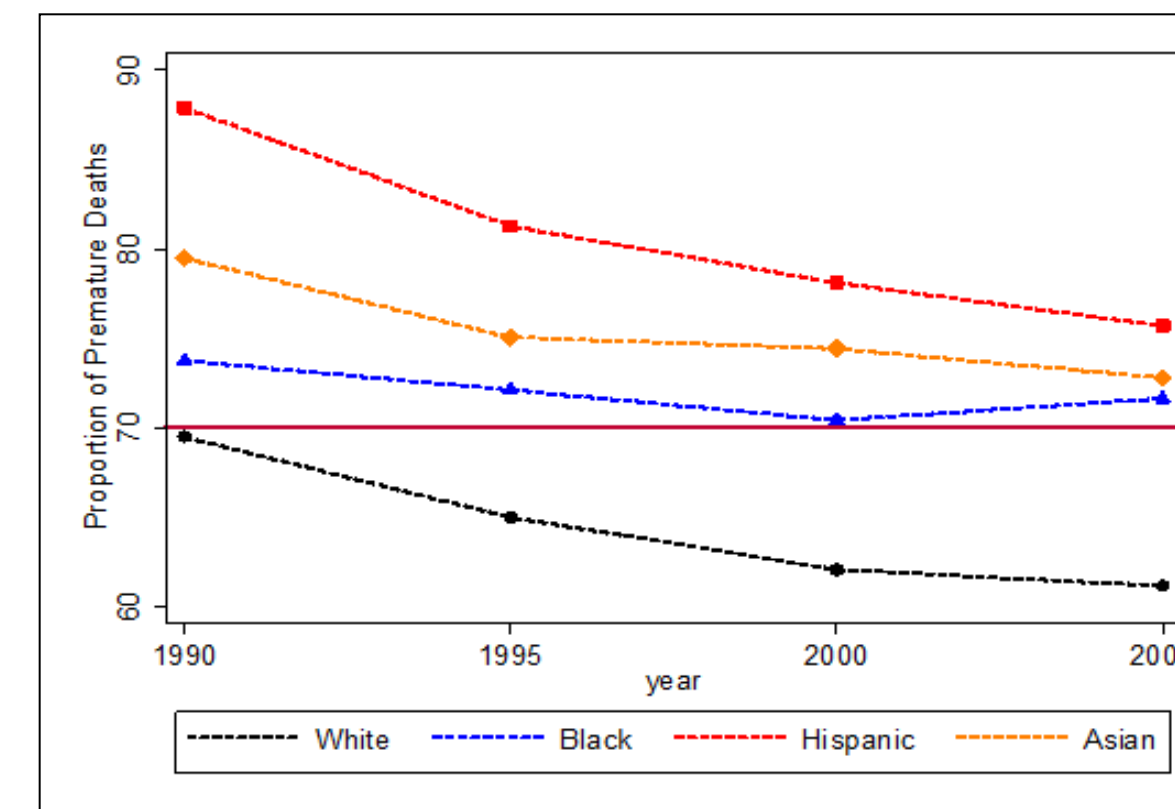


Figure 1. Premature deaths by year and race/ethnicity

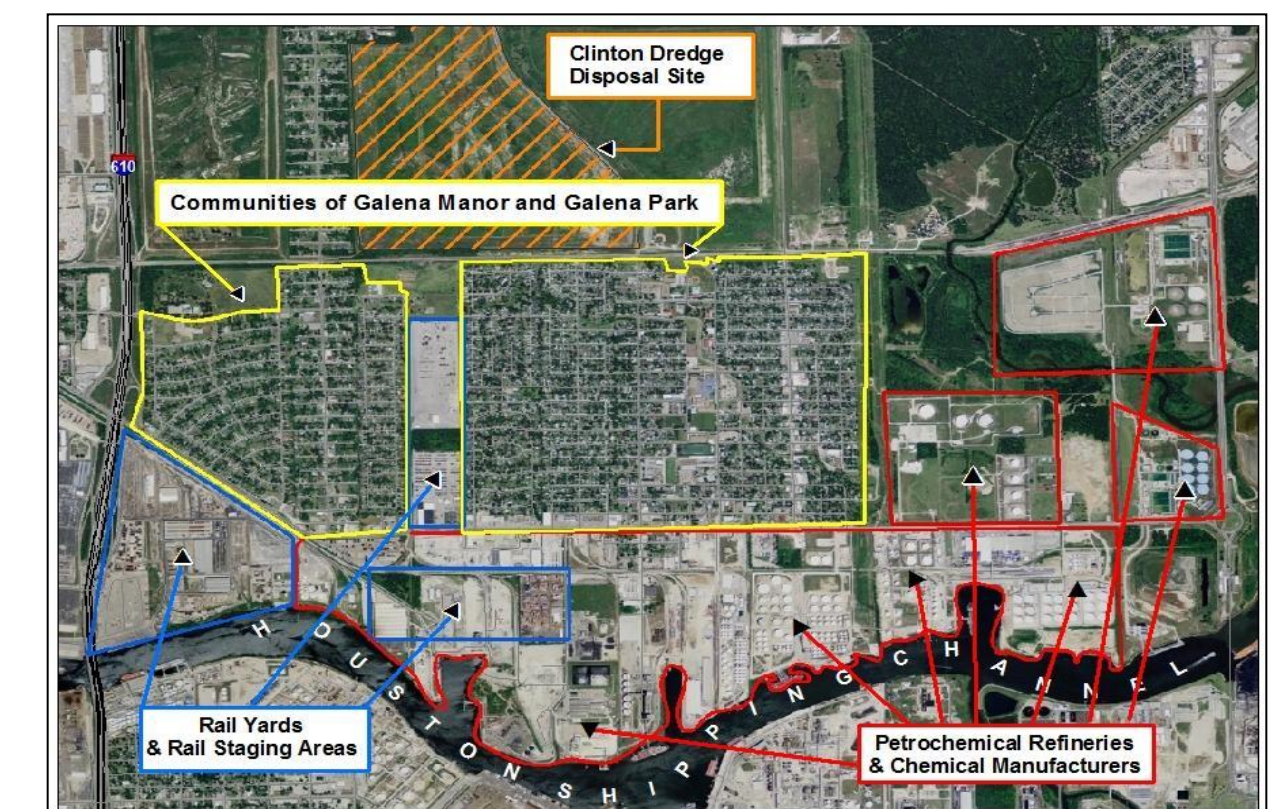
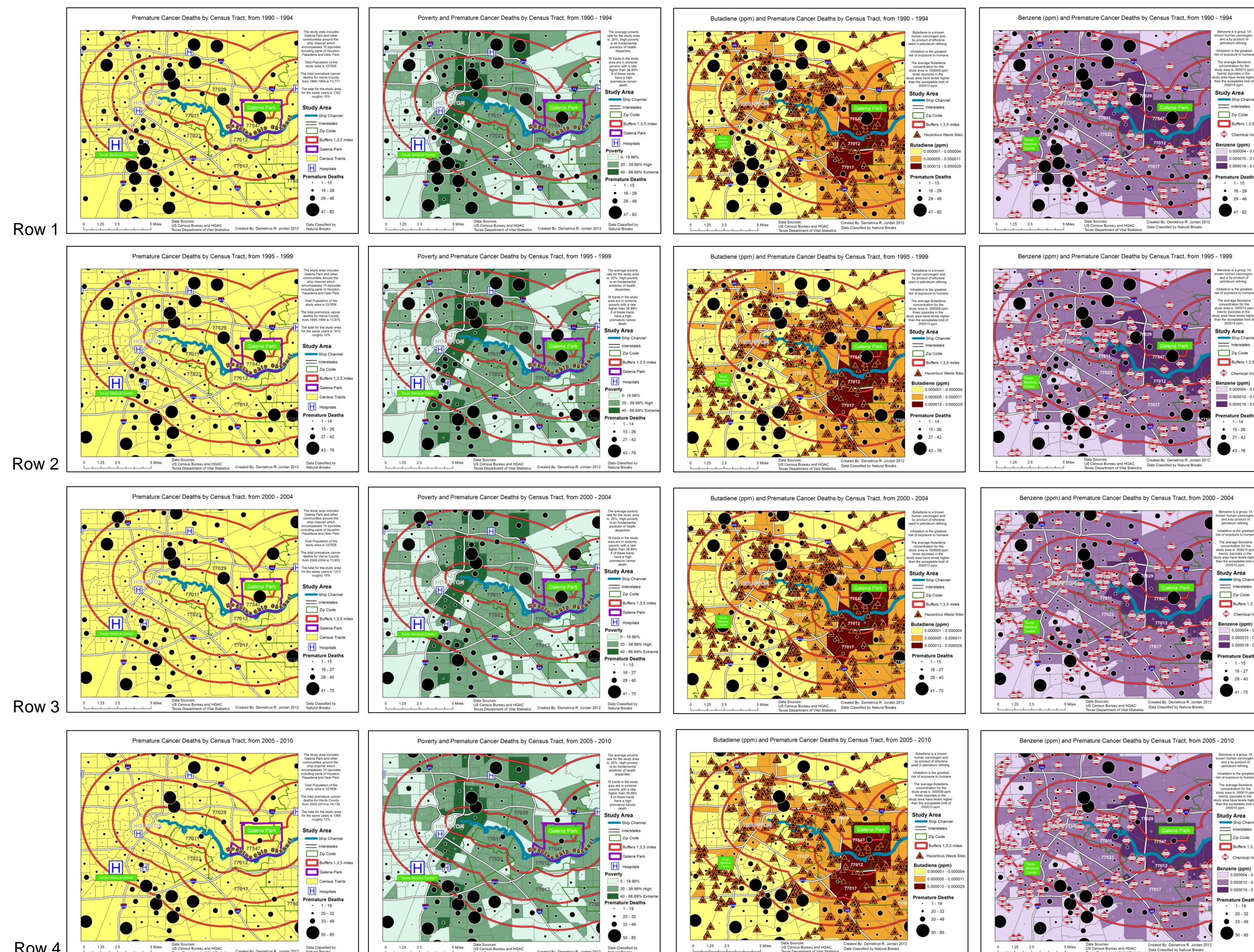


Figure 2. Aerial of the Galena Park study area



## 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.

The overall results show that pcm decreases from 1990 to 2010. However, pcm is higher in each time interval in areas of economic disadvantage (higher poverty) than in areas characterized by low poverty.

Spatially, the maps reveal an east-west divide regarding pcm, primarily, along segments of I-45 N and 288 S, with higher pcm values to the east and lower pcm values to the west. The pcm divide is especially evident in the maps on Row 1 (1990-1994), Row 2 (1995-1999), and Row 4 (2005-2010).

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

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