

# Combating Homelessness: A Data Driven Approach

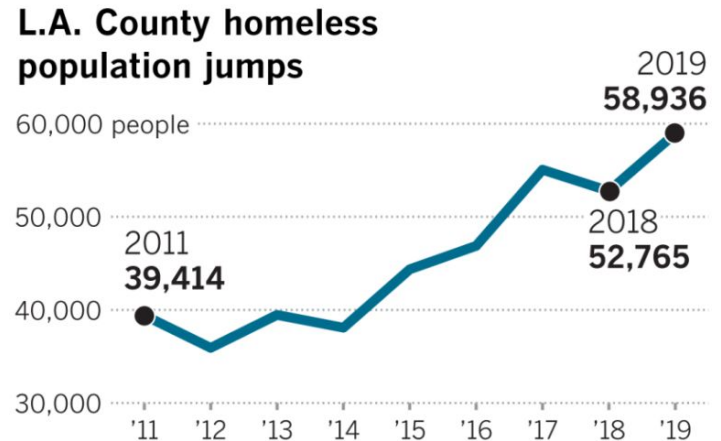
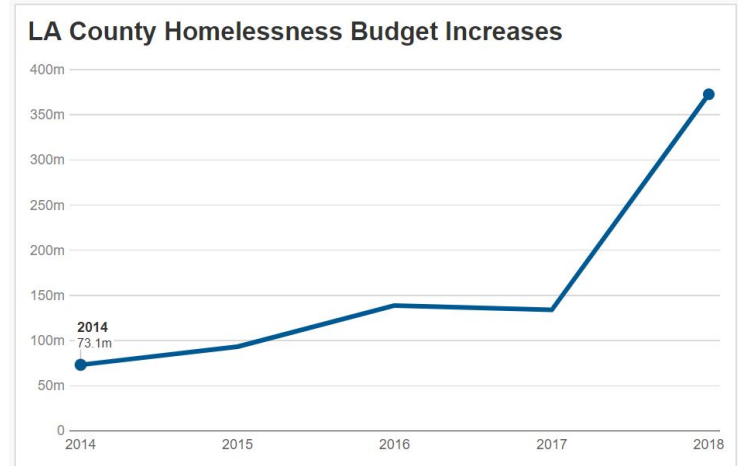


By: Kaushik Devireddy, Raymond Kuan,  
Martin Liu, and David Shao

# Background and Introduction

Homelessness in the US is a broad issue influenced by a myriad of variables. With the homeless population across the entire United States at an all time high, it is imperative for city governments to purpose the money dedicated to relieve homelessness purposefully. Our project investigates the City of Los Angeles, after observing that LA's budget for homelessness is constantly increasing, yet trends in homeless population show minimal sign of decrease.

Homelessness in LA county has been steadily increasing in the past years, rising from 39,414 people in 2011 to 58,936 people in 2018. Clearly, this is an issue desperate for new insights - ones we can discover through statistics.

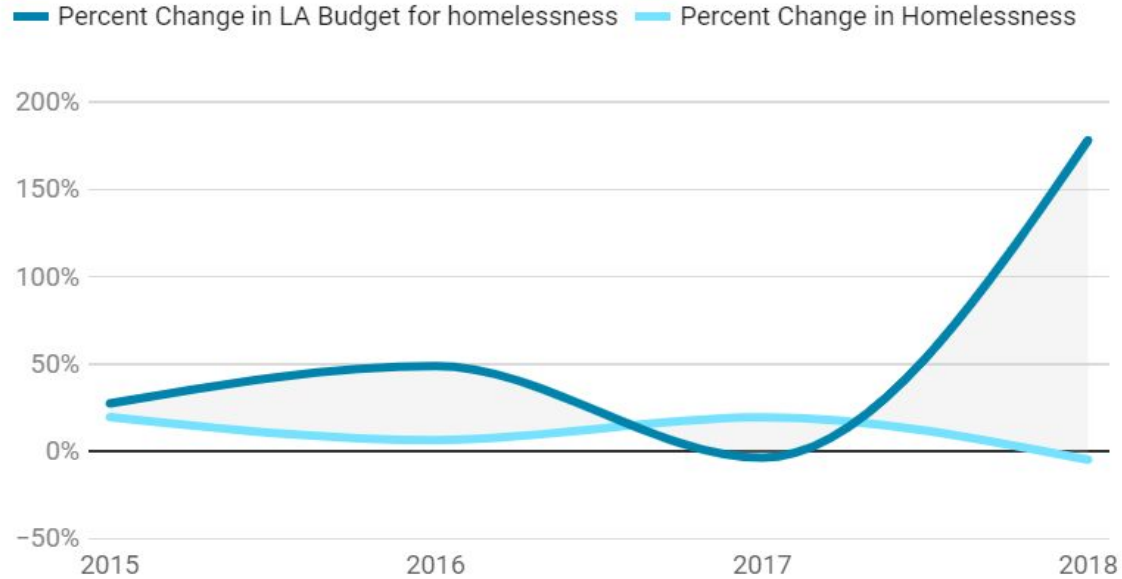


Source: Los Angeles Homeless Services Authority

# Current Situation

- Throughout the past couple years, the City of Los Angeles has greatly increased the budget for tools to combat homelessness, as seen in the **178% increase** in budget specially dedicated to homelessness from 2017-2018.
- Despite this, we only see a slight decrease in the homeless population (**4.74% decrease from 2017-2018**)
- The plot reveals that even though LA is “throwing money at the problem”, we don’t see the homeless population decreasing.
- This project aims at **clearing public misconceptions** of homeless shelters to **allow for better implementation and approval** of public policies to combat homelessness.

## Percent Change in Homelessness vs. Year



**Figure 1.** In an attempt to determine the current state and effectiveness of LA’s budget increase for homelessness, we accessed LA City’s Finance Dataset and plotted the rate of change (in percent) of the budget dedicated towards homelessness and the homeless population in LA from the years 2015-2018.

# OUR APPROACH AND METHOD

01

## IDENTIFY THE PROBLEM

What are the root causes of the constant increase of homelessness in LA County and how can we address them?

02

## PUBLIC MISCONCEPTIONS

What does the general public think about homeless shelters?

03

## DATA RESEARCH

What does the data say about these public misconceptions?

04

## STATISTICAL TESTING

How can we use statistical tests to discredit public misconceptions?

05

## PROPOSE SOLUTION

What actions should be taken based on the statistical conclusions?

06

## FUTURE DIRECTIONS

What other avenues should we explore to further combat homelessness?

# Data Utilized

Ten homeless shelters were selected in LA County due to the ease of access in crime rate and housing price data for those shelters

- LA County Historical Crime Data
  - From the LA County Sheriff Department
  - Records from 2005-2018 regarding time of crime, type of crime, and location of crime were used
- LA County House Prices
  - From Zillow.com API: Real Estate, Apartments, Mortgages & Home Values
  - Records from 2010-2018 regarding housing prices for neighbourhoods around homeless shelters were used
- LA Homeless Population Count
  - From Los Angeles Homeless Service Authority
  - Records from 2011-2018 regarding LA homeless population count were used

# Crime Rate

- **Misconception of Homeless Shelters and Crime**

- As recent as October 8, 2019, hundreds of protestors came together at Los Angeles City Hall to protest the new initiative to build homeless shelters near the downtown districts. Their concern? If homeless shelters were to be established near their houses and schools, the crime rate in the area will grow significantly

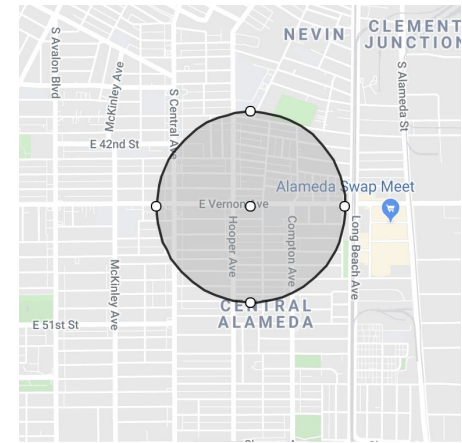
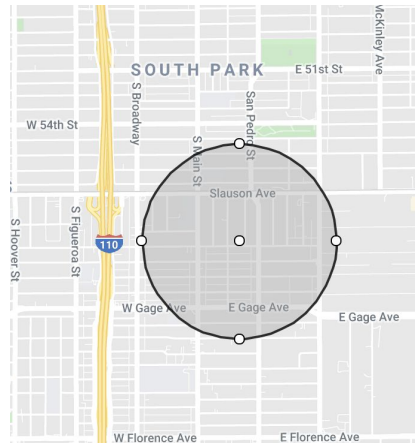
- **LA County Historical Crime Data**

- We used **geospatial** analysis to determine each individual street within 0.4 miles (the standard radius of interest for land developing) of the homeless shelters we chose to analyze. We programmatically matched these results to the LA County Historical Crime dataset, to record the number of incidents per street for each shelter address. (Note that we excluded crimes unrelated to homelessness such as Domestic Violence.)
- With this new dataset, we attempted to investigate misconceptions regarding the question of whether or not crime rate



## Column: Housing the homeless hits NIMBY wall in 'progressive' Venice

**Case Study 1.** Many citizens in LA County have misconceptions on the effects of homeless shelters regarding crime rates and house prices



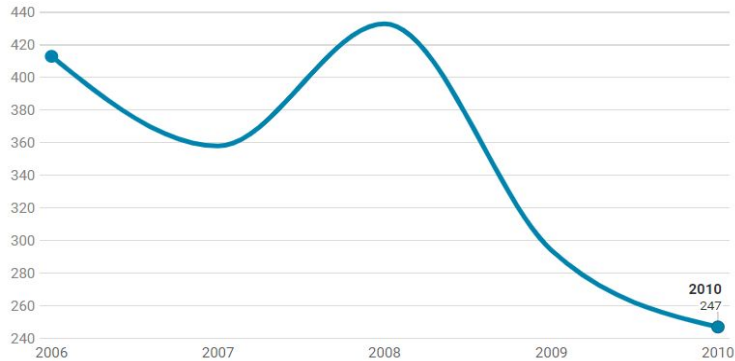
**Figure 2.** Example of analyzed region. The circle represents a 0.4 mile radius surrounding the homeless shelters we analyzed. Streets intersecting this geometry were included in our analysis

# Statistical Analysis of Crime Rate

## 2 Sample T-Test for difference in Mean Assumptions

- ✓ *Sampling method is simple random sample*
- ✓ *Samples are independent*
- ✓ *Each population is at least 20 times more than sample*
- ✓ *Sample distribution is approximately normal*

"Brighter Beginning Housing" Crime Incident Count



**Figure 3.** Visualizing data from years prior/post to the establishment of homeless shelters (2006-2010). This specific shelter was established in 2008. A **dramatic decrease in crime rate** can be observed.

Using the LA County Sheriff Department Historical Crime Data, we analyze the mean number of crimes committed in streets < 0.4mi to a shelter

$H_0$ : The mean crime incidents,  $\mu_c$ , in years before the establishment of the homeless shelter are the same as the years after.

$H_a$ : The mean crime incidents,  $\mu_c$ , in years before the establishment of the homeless shelter is greater than in years after.

Crimes before establishment:  $\bar{x} = 385.8$ ,  $n = 46$ ,  $s = 30.1194$

Crimes after establishment:  $\bar{x} = 270.5$ ,  $n = 46$ ,  $s = 25.4792$

$t = 19.82217$        $df = 87.59$

Since  $p\text{-value} = 1.9731 \cdot 10^{-34} < \alpha = 0.01$ , we reject  $H_0$ .

Based on the data collected, there is sufficient statistically significant evidence to conclude that crime incidents actually decrease, which is counter to public fear of increase.

(Performing the T-Test for difference in means against multiple data sets yields the same conclusion)

# Housing Prices

- Common Misconception
  - In addition to misplaced fears regarding crime, residents worry about homeless shelters negatively impacting the property values surrounding the shelter. This obstructs any meaningful policy regarding shelters from being implemented.
- Housing Price Changes Dataset
  - We queried Zillow's API for a list of 1 bedroom properties surrounding various shelters. We then queried their housing prices endpoint with these properties. The API responded with a time series dataset of property values for the past 10 years.

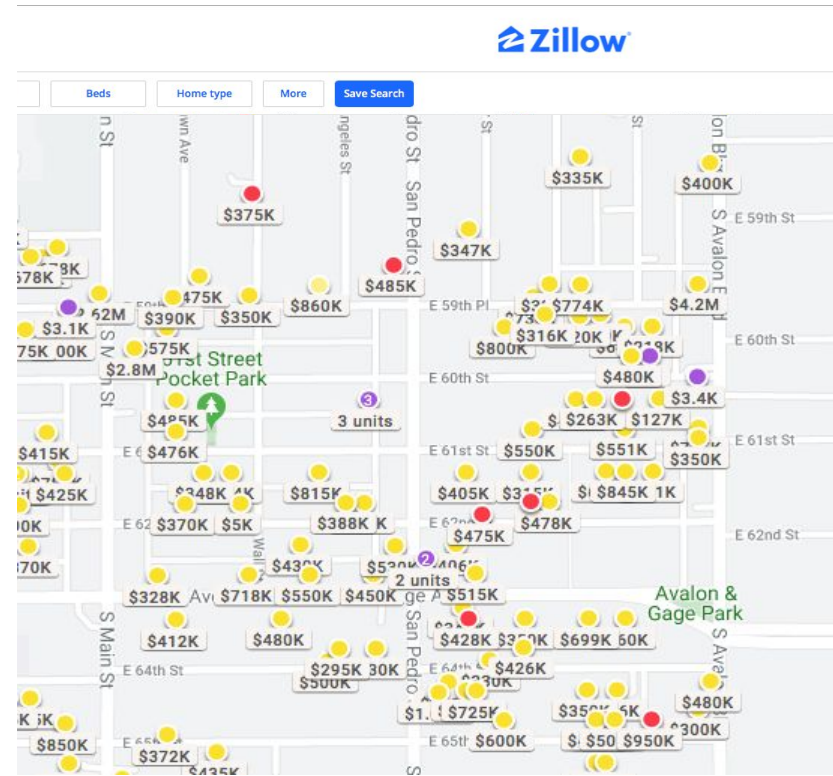


Figure 4. Graphical representation of an example property set. A numerical representation of their historical price trends will be analyzed to determine the influence of a proximate homeless shelter on their appreciation rate.



# Statistical Analysis of Housing Prices

## 2 Sample T-Test for difference in Mean Assumptions

- ✓ Sampling method is simple random sample
- ✓ Samples are independent
- ✓ Each population is at least 20 times more than sample
- ✓ Sample distribution is approximately normal

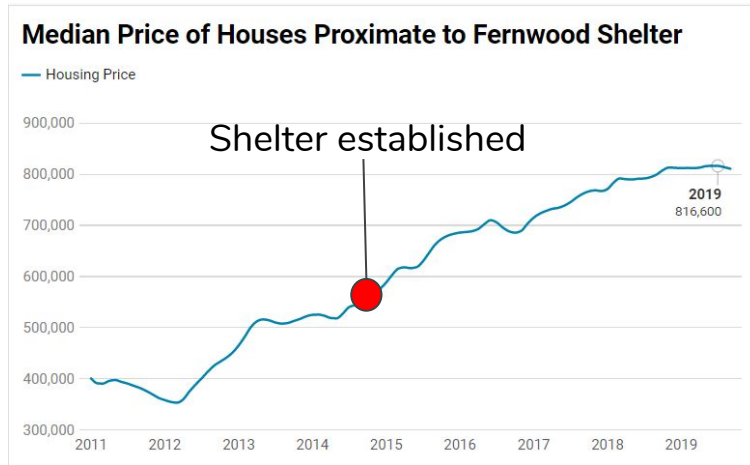


Figure 5. Visually, the establishment of a homeless shelter does not appear to slow the appreciation of proximate property values

Using historical price data from Zillow, we analyze how the trend of a property values is influenced by the establishment of a proximate shelter

$H_0$ : The mean rate of increase in housing price,  $\mu_p$ , in years before the establishment of the homeless shelter are the same than years after

$H_a$ : The mean rate of increase in housing price,  $\mu_p$ , in years before the establishment of the homeless shelter is less than or equal to years after

Rate of increase before establishment:  $\bar{x} = 0.0039$ ,  $n = 32$ ,  $s = 0.00433$

Rate of increase after establishment:  $\bar{x} = 0.0148$ ,  $n = 32$ ,  $s = 0.00681$

$$t = -7.640602 \quad df = 52.54411$$

Since  $p\text{-value} = 2.2174 \times 10^{-10} < \alpha = 0.01$ , we reject  $H_0$ .

**Based on the data collected, there is sufficient statistically significant evidence to conclude that surrounding housing prices, contrary to popular arguments against shelters, do not decrease with the establishment of a shelter; in fact, they continue to appreciate in value.**

(Performing the T-Test for difference in means against multiple neighborhoods with newly established shelters yields the same conclusion)

# Tackling the Homelessness Crisis: A Compound Response

- In this project, we attempted to set up a data analysis framework and answer the question of whether or not establishing homeless shelters negatively affect the surrounding neighborhood and community.
  - Through statistical analysis we were able to discredit two main arguments against protestors resisting social policies to reduce homelessness: that homeless shelters decrease house prices and that homeless shelters increase crime rate.
  - By addressing and negating these conceptions, we hope to allow for more smooth and acceptance for implementations of public policies, leading to better spending of public budgets.
- One potential solution that we suggest is a well-known solution for homelessness: rapid rehousing. It consists of three core components: housing identification, rent and move-in assistance, and case-management and services.
  - Pros:
    - Members of rapid rehousing leave the shelters faster than those in emergency shelters
    - Members of rapid rehousing are far more likely to find permanent housing after their stay compared to emergency shelters (Gubits et al. 2015; 2016)
- One interesting direction for future research is to forecast effective locations for the establishment of rapid rehousing, or shelters in general. We've uploaded a dataset involving incidents with the homeless in LA - useful for creating visualizations to identify these potential locations.
  - The dataset can be found here: <https://github.com/kloading/ADAdata>