Abandoned.

Final project for Information Visualization and Presentation (I247), Spring 2017.

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Table of Contents

Project Goals

Abandoned properties are often portrayed in the media as must-see places and sites that have beautifully and magically morphed over time. Even though sometimes they do serve as venerable tourist attractions for cities, abandoned properties have been a little recognized but huge problem across many cities in the United States. Since the very beginning of their existence, cities have continued to struggle with how to mitigate the effects of abandoned properties to the neighborhoods. These properties can lead to a large variety of problems. For example, they can cause unnecessary costs for the cities to repair or demolish, attract crimes, create accidental fires that could spread to occupied properties, and decrease values of properties in close proximity.

Taking into account all the risks and issues that abandoned properties represent to the community, our project aims to do three things:
- Create awareness on the extent of the issue of abandoned property across the United States
- Emphasize the negative consequences of high numbers of abandoned homes on the neighborhood and the city
- And familiarize site visitors with a range of possibilities to tackle that problem

In order to provide the site visitor with an engaging narrative, we will focus on one of the major cities in the U.S. for which an extensive dataset on abandoned properties is available to the public - Chicago. Using eye-catching visualizations and interactive designs to retain the user's' attention, this project will provide a better understanding on why abandoned properties are a huge problem for the city, how the city has been trying to solve this problem, and what the current state of affairs is.
For the last part of our website, we hope to introduce suggestions or call-to-action items for viewers when they identify an abandoned property and assess the potential risks after reading about the negative consequences and monetary impacts to the neighborhood.

Overall, we aim to create a well-designed, coherent website that achieves to engage and educate users about an important topic in American public policy.

Related Work

Abandoned properties are not a recent phenomenon. Due to the fact that abandoned properties have been a concern for major cities in the United States for a long time, there are many papers published to cover enactment of policies and projects started by local governments or organizations to recognize this issue and formulate strategies around it. These readings and projects had different goals, ranging from presenting research findings, such as national statistics and impacts on the neighborhood, or recommending calls-to-action with a very specific audience in mind (eg. home buyers, city officials). A main takeaway from our research was that the majority of the papers and websites did not offer interactive features or even many visualizations to summarize their findings or other useful information. Even though these websites included very informative research and recommendations, there was a lack of focus on basic information that define abandoned properties and making the connection between them and better known characteristics of a city that people will recognize and understand (e.g. unemployment rate, median home value).
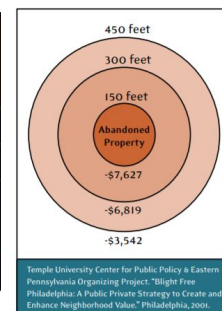
"Vacant Properties - The True Costs to Communities" (2005) by National Vacant Properties Campaign
Link: https://www.smartgrowthamerica.org/app/legacy/documents/true-costs.pdf
The mission of the National Vacant Properties Campaign is to prevent the spread of different types of abandoned properties in communities by empowering practitioners and decision-makers to take action. In this report, they summarize what these properties are and identify the various costs they impose on the communities. By quantifying each of these costs they pulled together from specific sources, such as St.Paul, Minnesota's budget for maintaining vacant buildings, they present a very strong case about current conditions and impacts (6). The table below and the concentric circles graphic are two of the few visualizations they used to summarize their findings regarding the impact of abandoned property on home values. This report established our fundamental understanding of abandoned properties and became a useful resource throughout our project. We were inspired by the idea to show the impact on adjacent property and subsequently combined it with our interactive map to layer impact information onto the geographic location.

Region	Number of Cities Reporting Abandoned Property Data	Average % of Vacant Land to Total Area	Average Number of Abandoned Structures per 1,000 Inhabitants
Northeast	7	8.3	7.47
Midwest	10	11.3	3.16
South	20	17.1	2.98
West	23	15.7	0.62
All Regions	60	14.8	2.63

Source: Pagano & Bowman p. 7

Temple University Center for Public Policy & Eastern Pennsylvania Organizing Project. "Blight Free Philadelphia: A Public Private Strategy to Create and Enhance Neighborhood Value." Philadelphia, 2001.

"Foreclosures and Foreclosed Homes for Sale" by Zillow
Link: https://www.zillow.com/chicago-il/foreclosures/
Zillow is a well known online real estate database providing consumers with the knowledge they need about houses and regions to buy, sell, rent and more. One of their features is to look for foreclosures and foreclosed homes, meaning that the owner (usually financial institutions) has repossessed mortgaged properties because the previous owner failed to keep up with their mortgage payments. It confirmed other reports in indicating that a lot of residential houses become vacant and abandoned when owners fail to pay the mortgage and leave without letting anyone know. Even though their audience is more specific to home buyers and foreclosures do not capture the entire picture of abandoned homes, there is a relationship between the state of the economy at a given location, the number of foreclosures, and number of abandoned properties. Below is a screenshot of how these houses are depicted in Chicago, IL as an example.
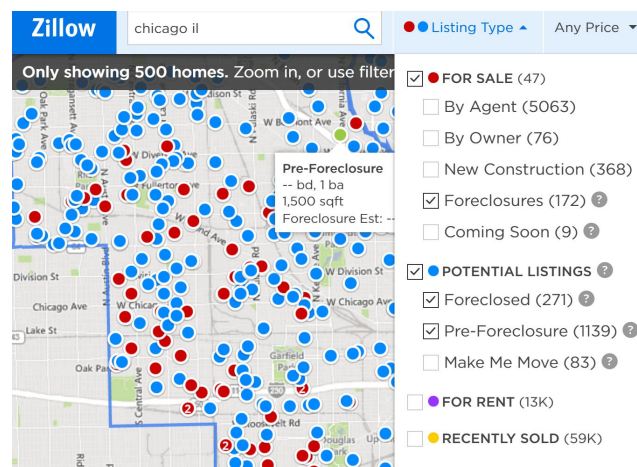
"Vacant Spaces into Vibrant Spaces" by Center for Community Progress
Link: http://www.communityprogress.net/
Center for Community Progress is a nonprofit organization dedicated to creating communities without any vacant or abandoned properties by providing advice and resources. They highlight negative impacts and challenges that these properties have on the residents, such as tax delinquency and unfair share of burden. In order to counter these problems and transform abandoned and problem properties into vibrant places, they take a more specific approach by providing direct services and solutions to help communities and local governments, such as "technical assistance, leadership and education, and policy and research."

"Documenting the Vacant, Abandoned, Blighted Property Problem in Maryland" (2016) by Community Development Network of Maryland
Link:
http://communitydevelopmentmd.org/wp-content/uploads/2017/01/CDN_policy_vacant-property-survey-results_final_designed_Jan2017.pdf
The Community Development Network of Maryland is an organization focused on improving the communities and neighborhoods in Maryland by giving opportunities to people of all income levels. The report they published is similar to our project's case study focused on Chicago's current status with vacant and abandoned properties and the type of actions they have been taking. This report summarizes the findings from the surveys they sent out to local government officials that asked questions about challenges they faced with vacant and abandoned properties, their perception towards them, and actions they are taking concerning them, if any. However, their report did not offer any recommendations or call-to-action based on the survey results, but simply summarized them. The graph below is a visualization of responses for one of the questions about the most common reason behind vacant and abandoned property such as families walking away and mortgage foreclosures.
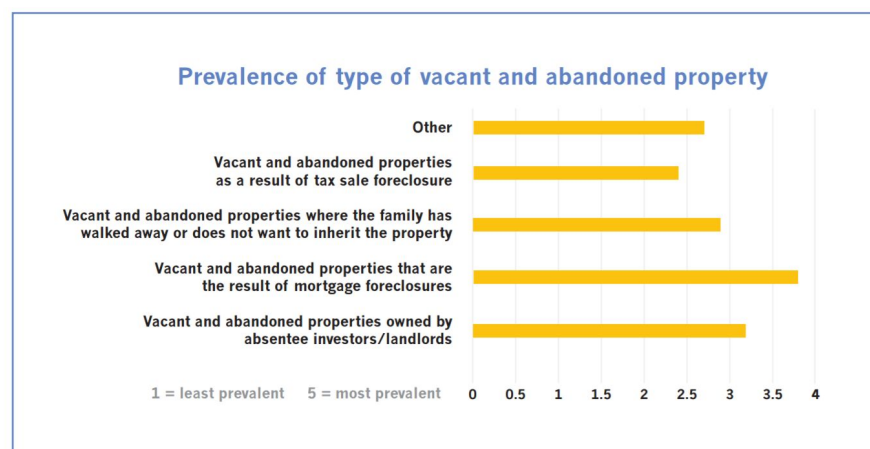
"These maps visualize Baltimore's blight" by Stephen Babcock
Link: https://technical.ly/baltimore/2015/06/04/baltimore-blight-maps-ouazad-elszasz/
Similar to our project's visualization of the map that plotted vacant properties in the City of Chicago, an economist named Amine Ouazad produced a map to show the "number of Baltimore vacant properties, based on the U.S. Census Bureau's American Community Survey data." In addition to the city center though, he also focused on the entire metro area to highlight the contrast between the city center and the surrounding counties. The map also allows some interaction, where the readers can zoom in and out of the map. Rather than plotting individual property as we do in our case study, this map is colored based on the range of vacancy rate in the particular region. The map does a nice job showing the difference between the city and the surrounding neighborhoods, as well as highlighting the fact that the problem most exclusively belongs to Baltimore City.
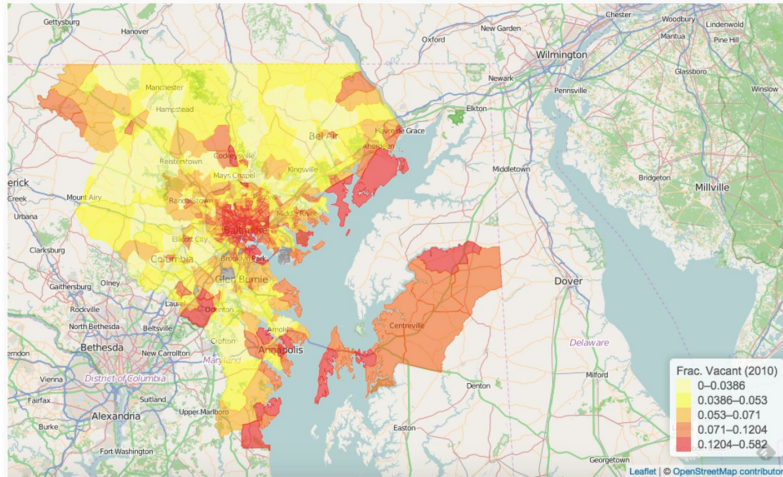
Amine Ouazad's map of Baltimore vacant houses. Dark red represents the highest density of vacants.

"No Property Left Behind: An Exploration of Abandoned Property Policies" (2014) by Margaret Louise Smith, University of Pennsylvania
Link: http://repository.upenn.edu/cgi/viewcontent.cgi?article=1568&context=hp_theses
This paper by Margaret Smith from the department of Historic Preservation describes several types of policy work that cities have adapted to address abandoned properties for the purpose of providing resource and guidance to the audience of the paper, or the historic preservationists. Her approach and outline of the paper is actually similar to our project's main objective. She first defines vacancy (where she acknowledges that there is no "universally accepted definition and measurement system") and its problems, then delves into 5 specific policy tools that cities are currently correctly using. She also uses similar graphical representation to visualize her statements, such as change in populations in major cities in the U.S. with the graph below. In addition, during the process of laying out the 5 tools, she highlights the major problems cities face with abandoned properties that the policies address, comparable to our presentation of the negative impacts. Her conclusion is that her audience should have more awareness of the issues and have understanding of what is working and what is not.
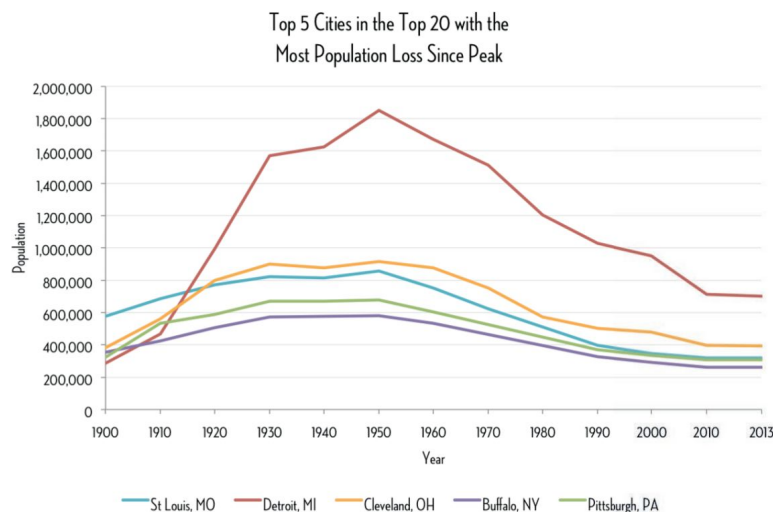
"Vacant Buildings" by City of Chicago Department of Buildings
Link: https://ipiweb.cityofchicago.org/VBR/
With the data that the City of Chicago has been accumulating from the 311 calls about abandoned properties (the same data we used to visualize our map of Chicago), they're trying to implement a similar approach to obtain and track information about vacant buildings. They have a more specific audience in mind when they use the visualization and require them to take certain actions. For example, the city is requiring building owners to register their property with the city once the building has been vacant for more than 30 days. They also make the search of abandoned properties interactive for the users by allowing them choose the category of the search term, such as address, building grid, and police district. However, for people who are not aware of these categories, they would have a harder time either finding a service request or if a property has already been registered. If they do indeed successfully search for a specific location using one of the nine categories, they would see a map such as the example below. One of the positive features is the color scheme for different property types. In our visualization, we tried to keep the same level of granularity by including that information in our tooltip.
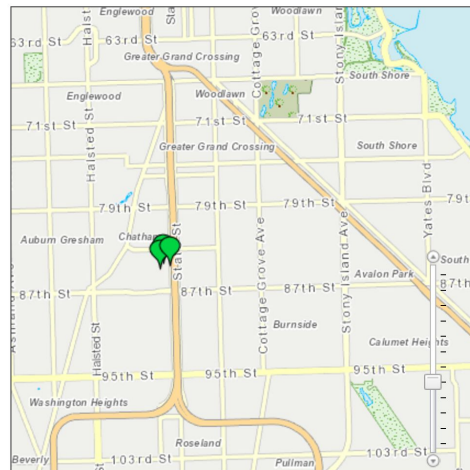
"The Impact of Abandoned Properties on Nearby Property Values" by Hye Sung Han (Department of City and Regional Planning at University of North Carolina)
Link:
https://cdr.lib.unc.edu/indexablecontent/uuid:3296ba2a-147f-4d73-abda-ab65c1044986

This paper takes a different approach at the impact of abandoned properties on other properties in its vicinity. It tries to answer whether abandoned properties have plummeted the values nearby, or abandoned properties are generally more common in neighborhoods with already low property value. This study inspired the section in our project where we look at the 'vicious cycle of abandoned properties'. There, we state that finding the exact cause and effect of abandonment is very complicated since the issue is interconnected with many other problems that a city faces. Digging into it further, Hye Sung Han looks at different characteristics of abandoned properties such as duration of vacancy and specific location of neighborhood in order to determine the property's function in the neighborhood and the order of events. Additionally, the author makes a strong connection between economic decline and rise of vacancy rate, but lacked the visual appeals to show the findings and other relevant information. The authors used some variety of visualizations, including simple line charts to show relationship of abandoned properties with dropping property value.
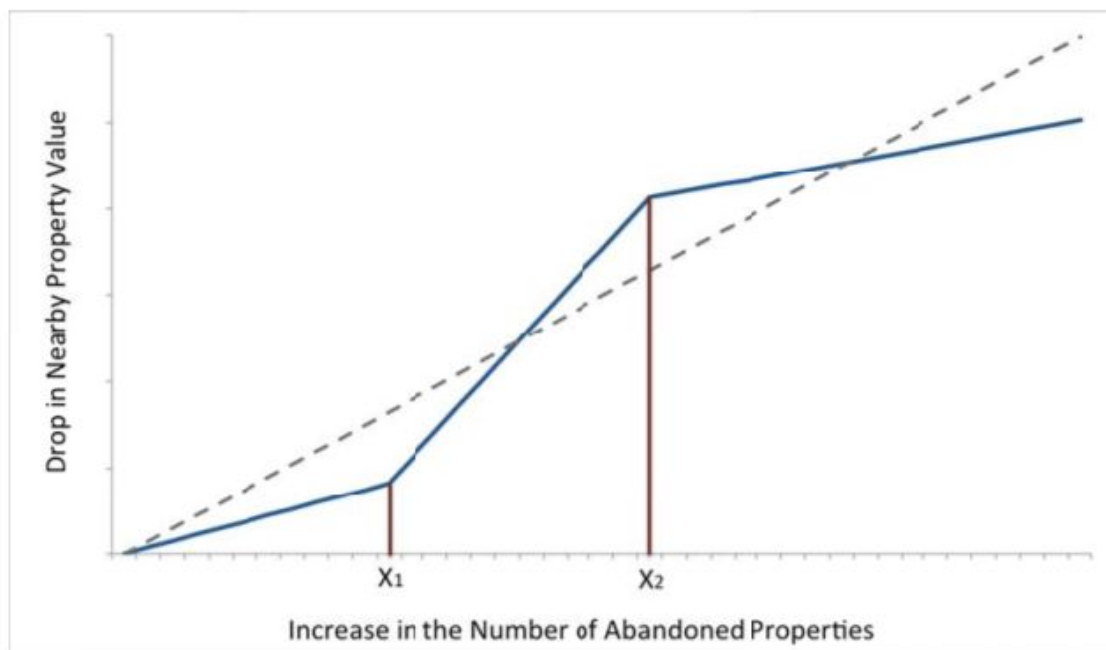
"Distressed Properties: Pathways of Decline and the Emergence of Public Safety Risk" (2016) by Len Garis, Larry Thomas, and Alex Tyakoff
Link: https://www.surrey.ca/files/Distressed-Properties%202016%2005.pdf
Similar to the study done by Hye Sung Han, this study by these 3 authors make numerous claims about the ambiguity in the cause and effect of abandoned property. A research question they try to answer in this study is if there is a "sequence of events that lead to distressed residential properties and neighbourhood distress" (8). In the end, the study states that the difficulty in pinpointing a specific trigger that initiates residential distress and neighbourhood decline, which is also one of our main conclusions from our research and visualizations. As we show the vicious cycle of abandoned properties in relation to a city's economic state in our project, these authors

talk about the 5 stages of decline (in table below) that neighborhoods typically experience, and each stage is also deeply connected to economic drivers and demographic shifts.

	Five Stages	Indicators
Proactive	Incipient decline	Low-value structures built on high-value land; property tax arrears and delinquent taxes
	Imminent decline	More dwellings shift from owner to renter occupancy
Reactive	Clearly declining	More single-parent headed families; and widespread minor deficiencies in home repair (unsightly properties)
	Accelerating decline	Fewer residential vacancies; start of spot residential abandonment
	Abandonment	Abandoned properties; increased calls-for-service

Source: Garis, Thomas, and Tyakoff (2016)

Description of Visualization

Our website presents a narrative with captivating visualizations, telling a story about abandoned properties in the United States. From basic definition of abandoned properties to their overall impact on communities to a focused case study, we designed a flow that readers can follow along. Using relevant data and interactive charts, we engage the readers and convey a message that could apply to abandoned properties in our own neighborhoods.

Landing Page

We chose to use a fullscreen picture of a scene from within an abandoned property - a bedroom - to create an esthetic and intriguing first moment of interaction with our site. We want users to have at the back of their heads that abandoned properties are commonly seen as something beautiful, esthetic, and adventures - a stark contrast to what reality regarding abandoned homes is like for America's cities.

Definition

The purpose of this section is to introduce the readers to abandoned properties and establish a common understanding of what they are as they look through the narrative and visualizations. We found these definitions from a well-known literature and used icons for quick visualization of the definitions.

What are abandoned properties?

Abandoned properties fulfill at least one of the following conditions:

They pose a **threat to public safety**, meeting the definition of a public nuisance

or

The owners or managers **neglect the fundamental duties of property ownership** such as failing to pay taxes or utilities or defaulting on mortgage payments

Types

After a fairly static and simple first section, we wanted to reward the user for interacting with the page and actively wanting to learn. Therefore, we decided to convey information on the different types of properties that can be abandoned via icons - hiding any further information from the user. Only once the user hovers over an icon, more information - we tried to pick interesting examples that people would enjoy reading and learning about - would be revealed.
For example, did you know that Cincinnati has a half-finished, non-working subway system that lies abandoned beneath the city's surface?

Hover over the icons to find out more.

TRAIN STATIONS
Numerous train stations lay abandoned or closed across America. For example, the Cincinnati Subway was initiated in 1920s and eventually cancelled during the Great Depression after WWI. Initially planned to be completed with $6 million, it would now cost nearly $100 million to revive this system for subway use.

Impact on Communities

In the next section, we want to educate visitors of the website on the negative impact that abandoned properties have. To this end, we list the negative properties in text on the left and introduce a moving d3 visualization of a circle on the right.
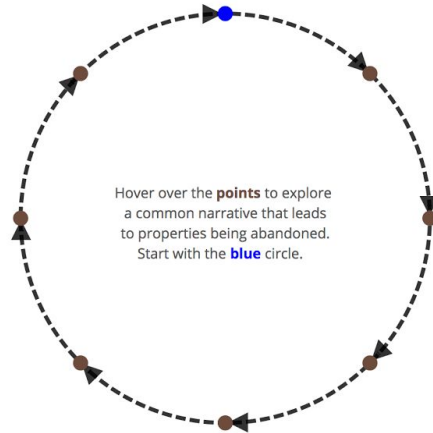We feel we could have done a better job visualizing the different types of problems abandoned homes are associated with but we ran out of time and lacked a good idea, as well.
We had several things we wanted to try (small visualizations representative of each point) but we felt it was too much to process so we reverted to the pure text form - not the ideal solution.
The circle created with d3 on the right represents the vicious cycle of abandoned properties - each dot on the circle, when hovered over, reveals more information. Upon receiving initial user feedback that they didn't know where to start, we colored a good starting point with blue. We also received user feedback to include icons instead of the points - we tried and in the short time available didn't find a good way of doing so. This will be left for future work over the summer.

But why exactly are abandoned properties a problem?

- **Crime:** Vacant properties often become a breeding ground for crime, tying up an inordinate amount of police resources.

- **Arson and Accidental Fires:** The US Fire Administration reports that over 12,000 fires in vacant structures are reported each year in the US, resulting in $73 million in property damage annually.

- **Public Nuisances and Health:** The local governments must clean and care for abandoned property to prevent a buildup of trash, illegal dumping, and rodent infestations. In some cases, abandoned properties contain toxic waste, particularly in the case of abandoned industrial buildings.

- **Lost Tax Revenue:** Vacant properties reduce city tax revenues in three ways:
  - they are often tax delinquent
  - their low value means they generate little in taxes
  - and they depress property values across an entire neighborhood.

- **Lower Property Values:** Vacant properties generate little in taxes – but, perhaps more importantly, they rob surrounding homes and businesses of their value. Explore the map here to understand what that means.

Hover over the **points** to explore a common narrative that leads to properties being abandoned. Start with the **blue** circle.

Deepdive: Relationship with Other Common Problems in the U.S.

After informing the readers of the vicious cycle of abandoned properties at a high level, we extracted some of the points from the cycle and laid them out in different charts with actual data and numbers. First bar graph represents data for cities with the biggest population change since 1950. We could have used percentages rather than absolute values to enable direct comparison of population change, but we also wanted to represent which cities actually have the most population and where they stand in the ranking of highest to lowest percent change.
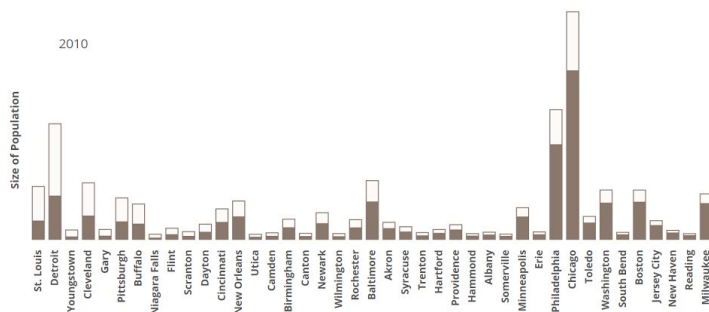
Property abandonment is just a symptom of an underlying disease
Declining population, economic crises and rising poverty are among the key non-natural factors that are associated with this phenomenon.

Explore the declining city populations in the charts below
(ordered from highest to lowest percent change)

A gradual **reduction in city population** can cause higher vacancy rate of homes and other property types within that city. The cities on the right are the ones that have lost at least 20% of their population since 1950. Detroit presents a glaring example - its population has declined by 62% since 1950 after the city's lifeblood, the automobile industry, could not profitably compete globally anymore.

Play again

2010

Size of Population

St. Louis, Detroit, Youngstown, Cleveland, Gary, Pittsburgh, Buffalo, Niagara Falls, Flint, Scranton, Dayton, Cincinnati, New Orleans, Utica, Camden, Birmingham, Canton, Newark, Wilmington, Rochester, Baltimore, Akron, Syracuse, Trenton, Hartford, Providence, Hammond, Albany, Somerville, Minneapolis, Erie, Philadelphia, Chicago, Toledo, Washington, South Bend, Boston, Jersey City, New Haven, Reading, Milwaukee

In addition to the population change, we also visualize the points about the number of foreclosures, median home values, and poverty level from the vicious cycle and connect them to the economic situation in the U.S. We merge the data together and put them on the same charts

in order to show the close relationship between these variables over time as well as to the economic recession of 2008-09 which we highlight in the charts.

Economic crises can cripple cities affecting large scale **foreclosures and declines in property values,** making them less attractive to buyers. Detroit shows a glaring example of this phenomenon during the economic resession of 2008, when tax foreclosures increased significantly and home values dropped in addition to continuous flight of people.
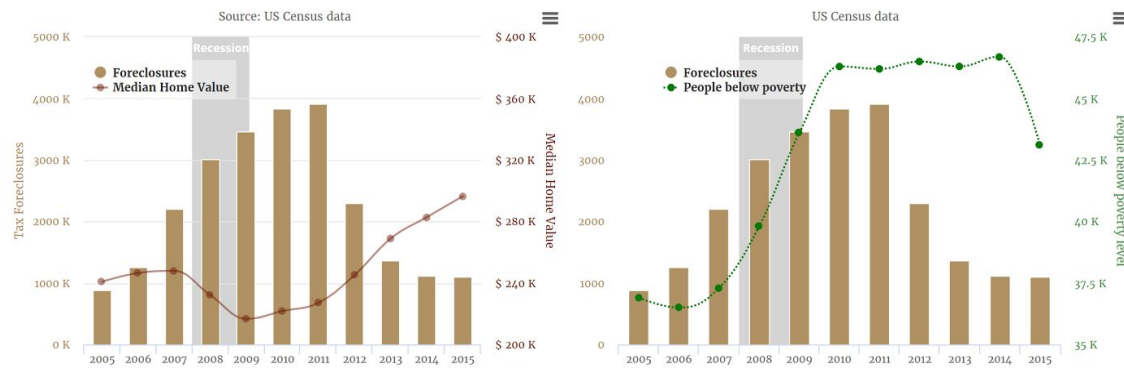
Finally, we connect the previous sections about related problems faced by major cities in the U.S. back to abandoned properties. We chose 20 major cities to plot in this visualization - 10 cities with the highest vacancy rate in red and 10 cities with the lowest vacancy rates in green - and see how these cities position in relation to different factors we introduced. More specifically, we show the relationship between vacancy rates and unemployment rate, population change, crime, and median home value. We also draw the national average for each of these characteristics to give another perspective into these cities' current state.

13

Vacancy Rate Compared with Other City Characteristics

In addition to the underlying disease of abandoned properties, there are multiple characteristics about a city that have correlation with property vacancy rate. The graph below represents this relationship for 20 cities in the United States - 10 cities with the highest vacancy rates in **red** and 10 cities with the lowest vacancy rates in **green**. Click on the buttons below to look at this relationship.

Case Study on Chicago - Facts & Stats

After focusing on the impact of abandoned properties and their relationship with other issues faced by major cities, we narrow down our project to a case study on one city, Chicago. This section follows a visually appealing section separator that serves to break continuity and help people realize that a new section with a different focus begins.

We start by sharing relevant information on Chicago. The fact that it's the 3rd largest city in the US, the city has seen an increase in crime and it's population growth rate of 1% is below the national average of 3.8%. We use simple large icons and little text to make a simple, non-overburdening introduction, using the visualization principle of proximity to link image and icon together.

Let's first take a look at Chicago's facts.

| 3rd Biggest City	Increase in Crime	+1% in Population since 2010
Chicago is the 3rd biggest city in the US by population, after New York City and Los Angeles.	In recent years, there has been an increase in different type of criminal activities in Chicago such as homicides, shootings, and robberies.	From 2010 to 2015, Chicago's population grew by 1%.

Not surprisingly, the number of violations related to vacant property in Chicago
has also steadily increased in recent years – the vicious cycle in action.
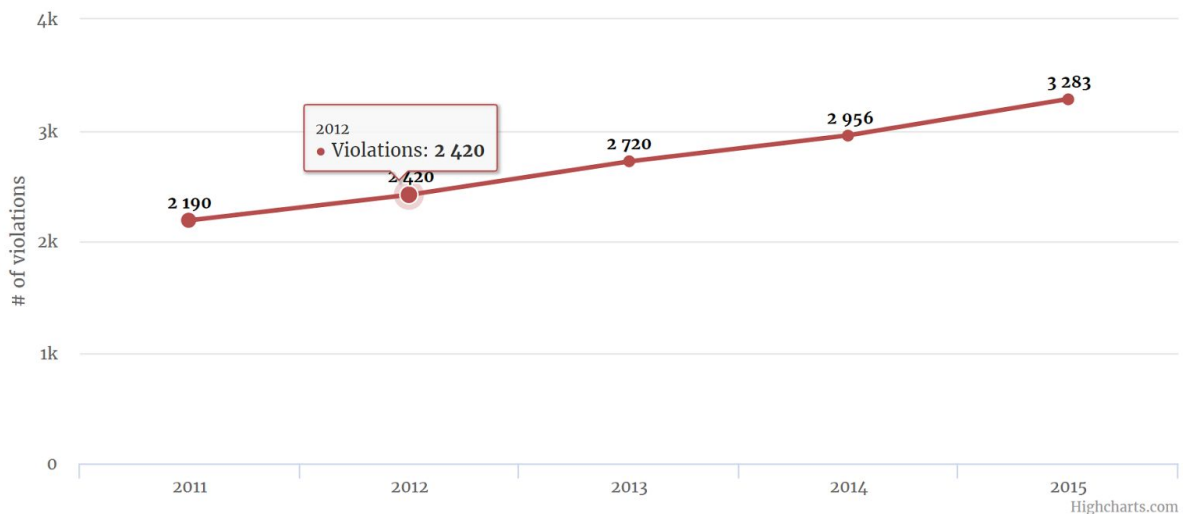
Next, we created a timeline to convey a message on how abandoned property has been Chicago's concern for a long time and the city has made continuous efforts. We also wanted to inform the readers that while some policy work and projects helped fight against abandoned properties, there were unfortunately some that worsened the effect.

Chicago's efforts to fight vacancy rates go back to the 1940s
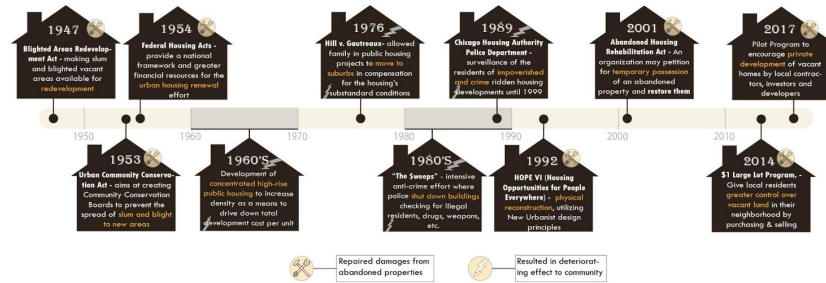
For the timeline, we chose to use houses for text boxes to create a strong visual link to the topic of the project. We also decided to indicate which efforts had an overall positive effect vs. a negative effect by adding either a tools symbol or a crack to the houses along the timeline.

Case Study on Chicago - Finding Abandoned Properties

After introducing the timeline of events concerning vacancy rates in Chicago, we focus on one recent initiative that Chicago has implemented. We provide a brief description about the project, where residents can now call 311 to report properties that seem abandoned and provide basic descriptions about them (e.g. boarded, occupied). Chicago is publicly sharing this dataset on its open data platform. In order to take advantage of the geolocation information in the data, we decided to plot the locations of the abandoned homes on a map, combining the information on when the city received the call, whether the property is boarded, and whether it is occupied or vacant. The most important feature about this map is its interaction. Readers are able to input a Chicago address and look at abandoned properties within vicinity, if any. Along with the location, we also wanted to provide information about the monetary impact they cause to properties within a certain radius, which we depict by adding colors to each plot.
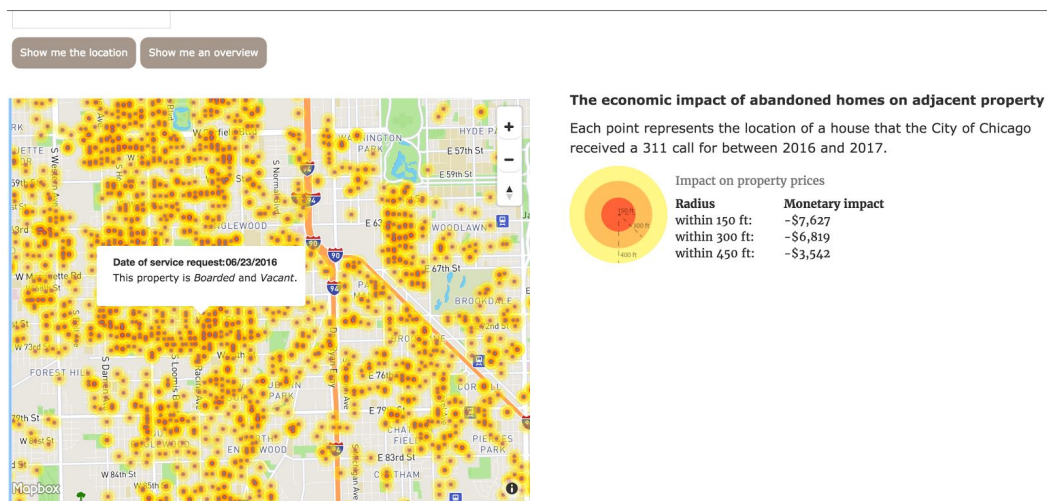
Call to Action

Finally, we end our visualization with some recommendations to readers on what they can do when they see an abandoned property nearby. Now that they have been informed about the dangers of these properties and the potential negative impacts they impose on their communities, we wanted to provide some actionable items for any audience reading our website, not just for professional development workers or policy workers. We present each of the actions with a simple icon and bigger text to represent the title for quick reads and to imply simple call to action for anyone.

What you can do

In order to prevent undesirable outcomes, residents should be proactive and look for ways to help the neighborhood's well-being. Here are some actions community members can take when there is an abandoned property in the neighborhood:

Call 311	Rally the neighborhood	Identify the property owners	Stay safe
Report abandoned homes so that city officials can inspect them.	Collaborate with your community to find new solutions to this old problem.	Often, the owners are banks. Ask them to take care of the property.	Do not enter abandoned homes and inform others of the risks.

Data Source and Description

There are several datasets we used to accomplish our goals. First, we used records collected from 311 calls where residents reported on abandoned properties in Chicago.[1] This dataset contains information obtained from phone calls since January 1, 2010 and continues to be updated with previous day's calls. Available in .csv format, it has about 60,000 rows of data and 20 columns. For our project's purpose and relevancy to the audience, we focused on calls from 2016 and 2017 and deleted any duplicates based on address, and the transformed version was used mainly to plot and find locations on our interactive map. The following table describes the specific variables -

Name of Variable	Type of Information	Description
Date Service Request was Received	Date	Date that 311 call was received (formatted in MM/DD/YYYY)
Is Building Open or Boarded?	State of building	Determines if the building is open and unsecure (e.g. backdoor is missing) or if it has been boarded up (e.g. locked doors, chained gates)
Is the Building Currently Vacant or Occupied?	State of building	Describes if the property currently currently has people living inside. Options are vacant, occupied, or unknown
Location	Address	Formatted with latitude and longitude numerical values (e.g. 41.871720, -87.628635)

Other main sources we obtained several types of data from were government and other official websites. The following table lists their websites and description of their data we used in our visualizations, either for specific cities or to show national trends -

Website Title with Link	Description of Dataset	Variables Used from Dataset
Bureau of Labor Statistics (Link)	Unemployment statistics by metropolitan area in the U.S.	Unemployment rate in 2015
Crime Statistics (Link)	Crime statistics for each metropolitan area in the U.S. split by crime categories (e.g. murder, thefts) and by year since 2001	Comprehensive crime index value in 2015

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[1]https://data.cityofchicago.org/Service-Requests/311-Service-Requests-Vacant-and-Abandoned-Building/7nii-7srd

United States Cities by Population ([Link](#))	List of 300 cities in the U.S. with population over 100,000, and details on 2010 census, 2015 estimate, area, and density of each city	Rate of population change from 2010 to 2015
Trulia's Local Scoop ([Link](#))	Real estate market overview by city	Median house price
Vacant and Abandoned Buildings - Violations ([Link](#))	Vacant and abandoned building violations issued on properties owned by financial institutions in Chicago since January 1, 2011	Aggregate number of unique violation numbers by year from beginning of 2011 to the end of 2015
Home Foreclosure Statistics. STATISTIC BRAIN. ([Link](#))	Foreclosures filing data from 2007-15	Number of foreclosure filings per year in US
Housing Vacancies and Homeownership (CPS/HVS). U.S. Census Bureau datasets. ([Link](#))	Vacancy rates in US by Metropolitan Statistical Areas	Vacancy rates for key cities showing increase
Median and Average Sales Prices of New Homes Sold in United States. U.S. Census Bureau datasets. ([Link](#))	Annual data of Median and Average Sales Prices of New Homes Sold in United States from 1963 - 2016	Median home sale values
Historical Poverty Tables: People and Families - 1959 to 2015. U.S. Census Bureau datasets. ([Link](#))	US Census data on poverty thresholds and proportion of poor in different categories	Percent of people living below poverty threshold

Tools used

We utilized a range of tools and languages to accomplish the intended project goal, as we found appropriate for different components of the final product. These are listed below with brief description of how they were used.

Languages: HTML, CSS and JavaScript

Our final product is a website, for which we used HTML and CSS for styling, and JavaScript for interactive components. The figure below shows Github's description for our project code. We also used **Bootstrap** as a starting point but ended up doing extensive customization and styling of the page ourselves. We used **Github** to store our code online and collaborate asynchronously.
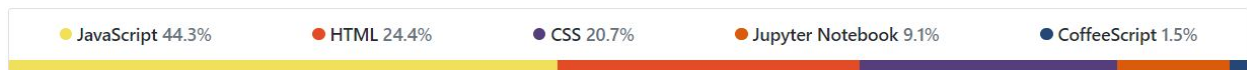
Tableau

We used Tableau for two purposes. *First*, exploratory data analysis of the 311 call dataset for chicago (shown below).
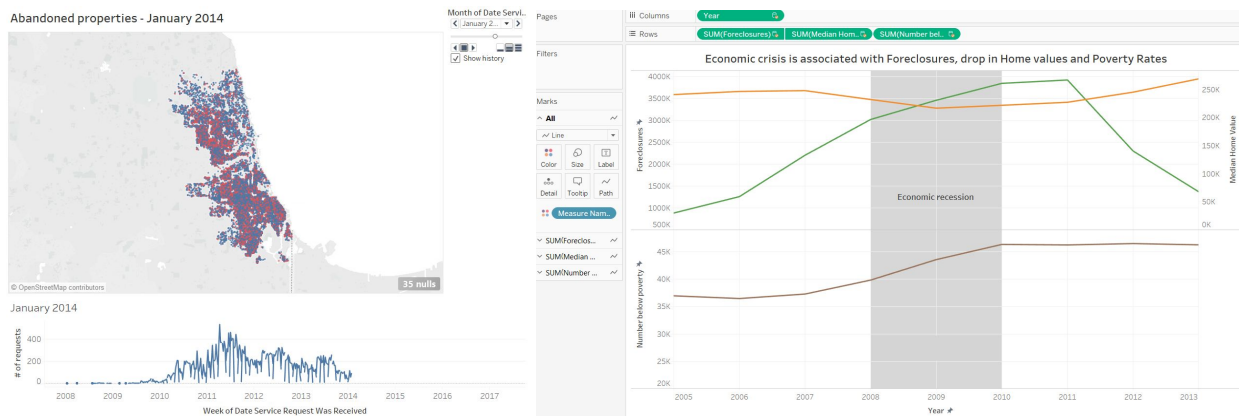

Second, we used it for creating a scatter plot with isotypes showing association of vacancy rate with various city characteristics such as unemployment and house prices. This was embedded in the webpage later. (See below)

Data Driven Documents - D3

We used D3 as a key tool to create two visualizations in the project. The *first* one is an interactive SVG illustration depicting the vicious cycle of abandonment (shown below).
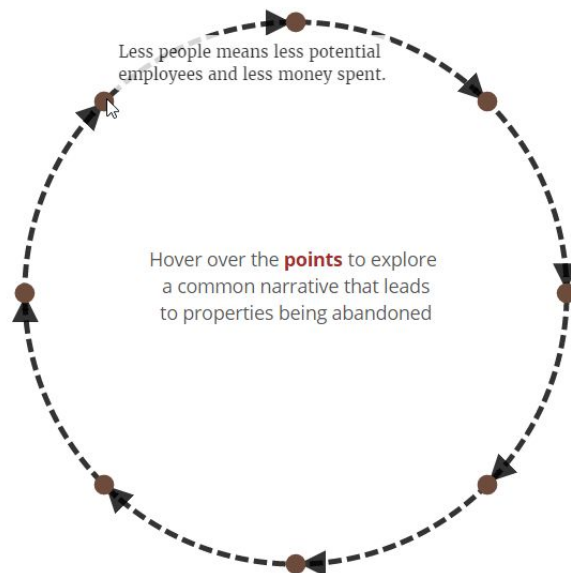
The *second* is an interactive bar graph, using animation to show dropping population of relevant cities between 1950 and 2010. The data for this chart is dynamically loaded from a CSV file (See below).
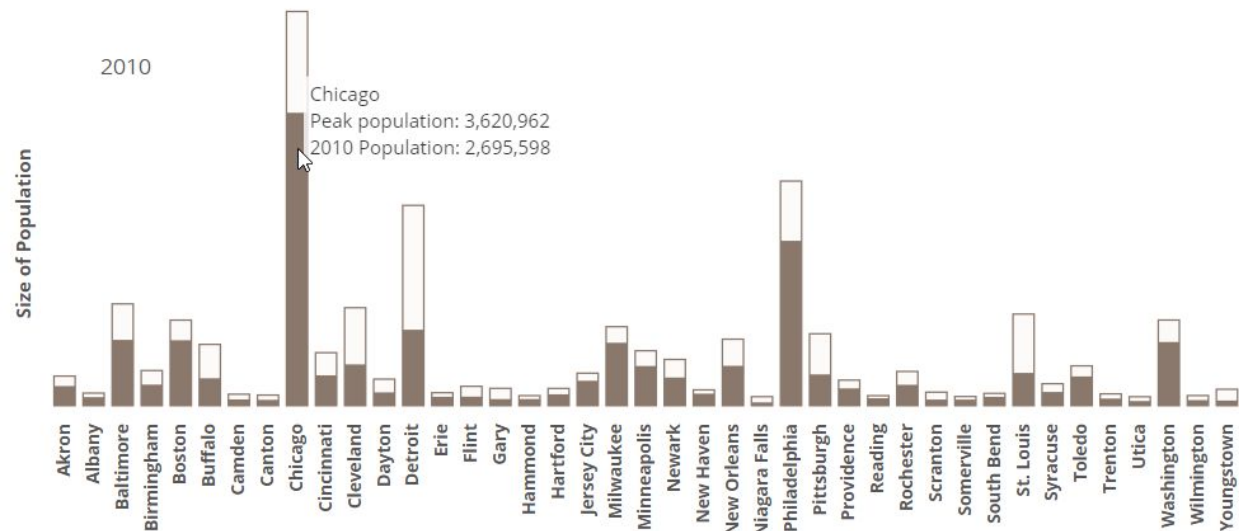

Mapbox GL

We used the Mapbox GL library to create an interactive map of abandoned properties in Chicago, identifying their locations as well as impact on value of nearby houses, using concentric circular zones (See below). We also added the ability for users to input a specific address and find abandoned sites in proximity, leveraging the Google Geocoding API in the background.
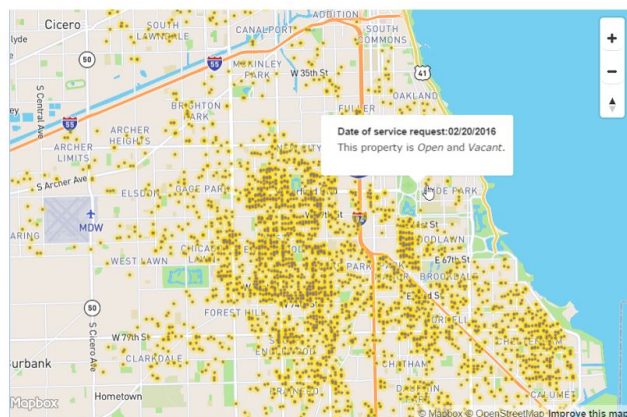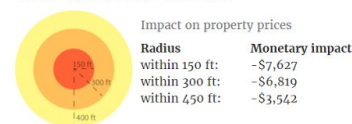
Highcharts

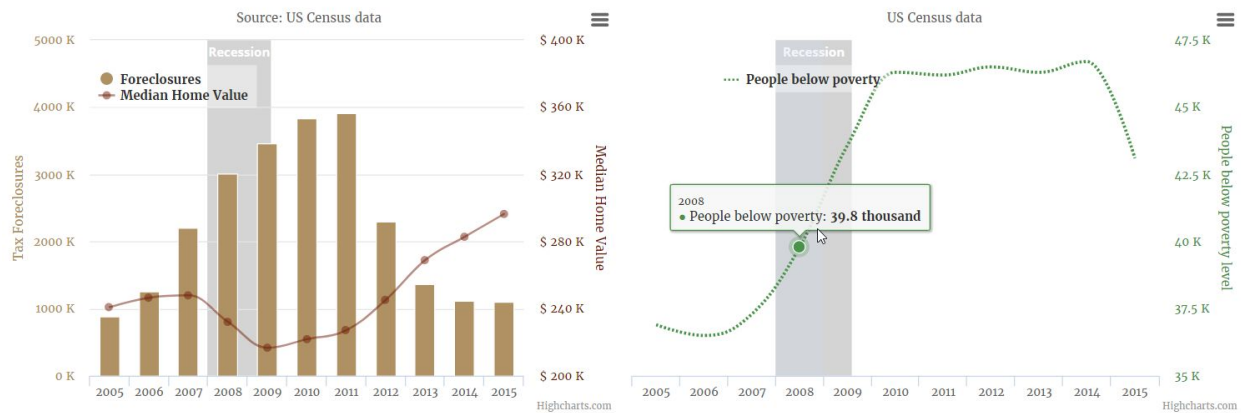To depict association of home foreclosures, poverty and home values, we used multiple axis templates from Highcharts library (see below). Although dual axes can be harder to read, we reinforced the differentiation in multiple ways (color, shape) to achieve clarity.

We also used the Highcharts Library to create a simple line graph showing increasing crime rate in Chicago over the years (see below).
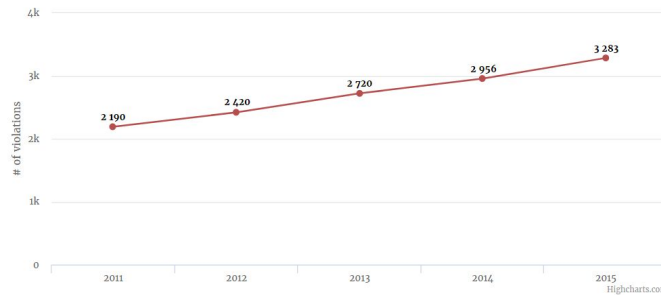
Adobe Illustrator, Photoshop and InDesign

For static visualizations in our project that required drawing or modification of images and icons, we used Adobe Illustrator. One of these (a timeline) is shown below. We also used Adobe's other graphic-editing tools including Photoshop and InDesign for certain components.
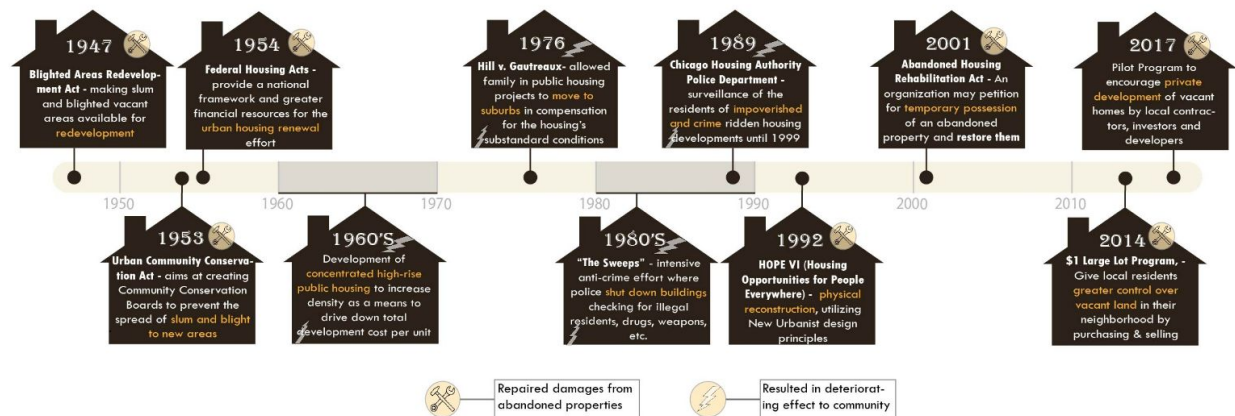
Steps taken to accomplish goals

1. **Search literature and other visualizations** on property abandonment, in order to understand the scope of problem, its related factors and what interesting visualizations have been created by others.
2. **Identify and collect a suitable data set** for a specific location (Chicago in this case), and other supporting data for the problem in general.
3. **Cleaning data set** and transfer it onto either Excel or csv format so that the information can be easily integrated and imported to different tools. During this process, we choose the variables that were relevant for our purpose.
4. **Exploratory Data Analysis** using Tableau and Excel to explore and identify possible relationships between the abandonment and environmental factors. This process helped us determine the best graphic form to display the insights of the data set and how users could most effectively interact with it.
5. **Paper prototyping** to represent how we wanted the website structured in general and what kind of visualizations could be placed. (See Appendix A for prototypes)
6. **Early feedback** on paper prototype allowed us to identify certain gaps in the narrative that were corrected later.
7. **Setting up the website template and Github** repository to begin constructing the actual content and front end.
8. **Building visualizations and linked descriptions**. Each team member took responsibility for some of the visualizations and related descriptions. We first started working individually on our agreed visualizations and shared with each other for **continuous feedback**.
9. After the basic visualizations were created, **integrated** all of them into a single web page and spent considerable time in **styling and placement** of various components, choosing a consistent color, theme, typefaces, and etc. to be applied on the website and in our charts.
10. **First round of usability testing** was done with this draft version of the website and further tweaks were made based on feedback received.
11. During the **project showcase**, we received more feedback from peers as well as outside visitors regarding the visualizations. We were also able to observe how easy or difficult it was for people to understand the intended message.
12. **Second round of usability testing** was conducted after the showcase with potential audience of the website, and the feedback was collected in qualitative manner.
13. Given the time constraint, only the **less time consuming changes were incorporated** from the feedback, while bigger changes were noted for future iteration.
14. **Report writing** was done jointly by all team members.

Usability Testing

We conducted formal and informal usability testing at various points in this project, and the design evolved all along.

Informal Feedback on Paper Prototype

The initial feedback from two I School students was obtained for the paper sketch of the website. The topic was explained to them in order to give context and a better understanding of what the objective was. This initial feedback suggested that the overall narrative of the visualization had gaps in it, especially when transitioning from national context to Chicago's interactive map. Based on this feedback, we introduced additional components in the design, providing more context to Chicago's situation that links well with the national problem described earlier in the website.

Round 1

After the first draft version of the website was ready, we conducted a usability test with two GSIs working in EECS department. They were given a short description of what the website is about, and then asked to explore it while being observed. Following is a summary of the feedback received and the corrections made before showcase based on this feedback.

Feedback received	*Corrections made*
In general they liked the color and theme but suggested that Section Headings were a bit harder to read, and needed more white in the containing box.	Background of section headings was made lighter.
The panel with types of properties: colors were considered too dark by users and suggested lighter shade of brown.	Colors changed to light grey with dark grey icons
White space between types of properties panel and next separator image seems disruptive.	White space removed
The circle of causation: the users didn't know to hover over it for quite a while	A text prompt was placed in the center of the circle, inviting the user to explore
Play button and bar chart on population: too pale looking	Play button was given a slightly darker shade
Economy charts: swipe charts left/right instead of top/bottom	The charts were placed side-by-side instead of top/bottom arrangement

Tableau chart: they couldn't figure out what vacancy rate meant	No change was implemented at that time; it was noted for further testing

Feedback from project showcase

While most of the showcase time was spent presenting the website to visitors, we received some feedback from I School community as well as outside visitors, one of whom had worked with Trulia.com and was interested in utilizing the ideas for his next startup. We also received specific feedback from Prof. Marti Hearst on certain charts, which we later implemented.

Round 2

After the showcase presentation, we were able to further test the website with two more users. These were I School students who were given the below scenario:

> *"While searching for property lease and looking for better places to live, you have come across this website on property abandonment."*

For testing, they were first asked to generally explore the website and speak aloud what they thought or felt, and voice any questions that come to their mind as they explore it. After they had explored most of the website, they were asked the following two questions:

1. What is the association between home foreclosures and home values during recession?
2. Are there very few abandoned properties close to Douglas Park in Chicago?

Finally, general feedback was elicited.
Throughout the process, the following types of observations were made:
- Task completion / ability to answer question correctly
- Critical errors
- Non-critical errors and corrective feedback
- Overall feedback on website

A summary of these usability tests is given below.

- **Task completion**: Both users were able to correctly answer questions or complete the task, although one user did not notice the search box for location search initially.
- **Why abandoned section**: isotypes are too small to read and both users pointed out the need to have a starting point in the vicious circle figure.
- **City characteristics Tableau chart**: X-axis usually is out of view since the chart has large height. Also, it was unclear to both users what the size of the isotypes in this chart relates to. One was confused why isotype size is increasing when population is going down. The fixed tooltip in the Tableau chart confused both users, as they expected it to go away once clicked elsewhere.
- **Population shrinkage chart**: It may be helpful to show percentages as well and also highlight the worst case with a different color.
- **Chicago efforts timeline**: The periods shown as a tab on the timeline were confusing; it might be better to use a curly bracket to indicate a period. The clickable down arrow was not needed according to one user.
- **Interactive map of Chicago**: One user was unsure what it would mean when the impact circles overlapped.
- **Navigation bar**: None of the users noticed or used the navigation bar at the top.
- **Economic crises charts**: One user was surprised to see combined tooltips showing data from both series at the same time. Also, the second chart on poverty is inaccurately shown as a continuous line while the data is at discrete points.

Lessons Learned

Overall, we found the experience of completing this project to be highly educative. Some key lessons learned in the process are mentioned below.

- **Type of data influences the type of visualizations possible or feasible**. In our project, several aspects of property abandonment were qualitative in nature, which forced us to use isotypes, iconography and non-quantitative graphical depictions of facts.
- **Iterative process of design**. We went through several major and many minor iterations of our visualization, both using our own critique and user feedback.
- **Right tool for the right visualization**. By the time we completed the final version of our visualization, we ended up using almost all the tools introduced in this course. Although, the task was possible with fewer tools, we found it best to use the appropriate tool for each component. The tradeoff is of course building a minimum proficiency in each tool, which is time consuming.

Links to demos, code and documents

Here is our project website:
http://people.ischool.berkeley.edu/~carinasauter/Sp17/Info_final_project/

Here is a video guiding through our final project:
http://people.ischool.berkeley.edu/~carinasauter/Sp17/Info_final_project/website_tour.mp4

Here is the link to our github repository, including data files used:
https://github.com/carinasauter/InfoVizfinal

Summary of contributions by team members

Task	Carina	Liz	Usman
Content literature search	20%	40%	40%
Search for data and statistics	33.3%	33.3%	33.3%
Defining exploratory questions	33.3%	33.3%	33.3%
Data cleaning and preparation	33.3%	33.3%	33.3%
Exploratory Data Analysis	20%	40%	40%
Creating charts in Tableau	0%	100%	0%
Creating visualizations in D3	50%	0%	50%
Creating charts in Highcharts	0%	0%	100%
Creating interactive map	100%	0%	0%
Descriptive content creation	33.3%	33.3%	33.3%
Prototyping	33.3%	33.3%	33.3%
Website design (incl. CSS styling)	60%	20%	20%
User research design and usability testing	0%	0%	100%
Revisions in response to feedback	33.3%	33.3%	33.3%
Final report write up	20%	40%	40%
Final report video	100%	0%	0%

References

Top Background Photo

Huize Vanneste / House of Vanneste (Be) by Martino Zegwaard
Available at: flickr.com/photos/martino

Abandoned property definition

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Historical Poverty Tables: People and Families - 1959 to 2015. U.S. Census Bureau datasets. Available at: https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-people. html
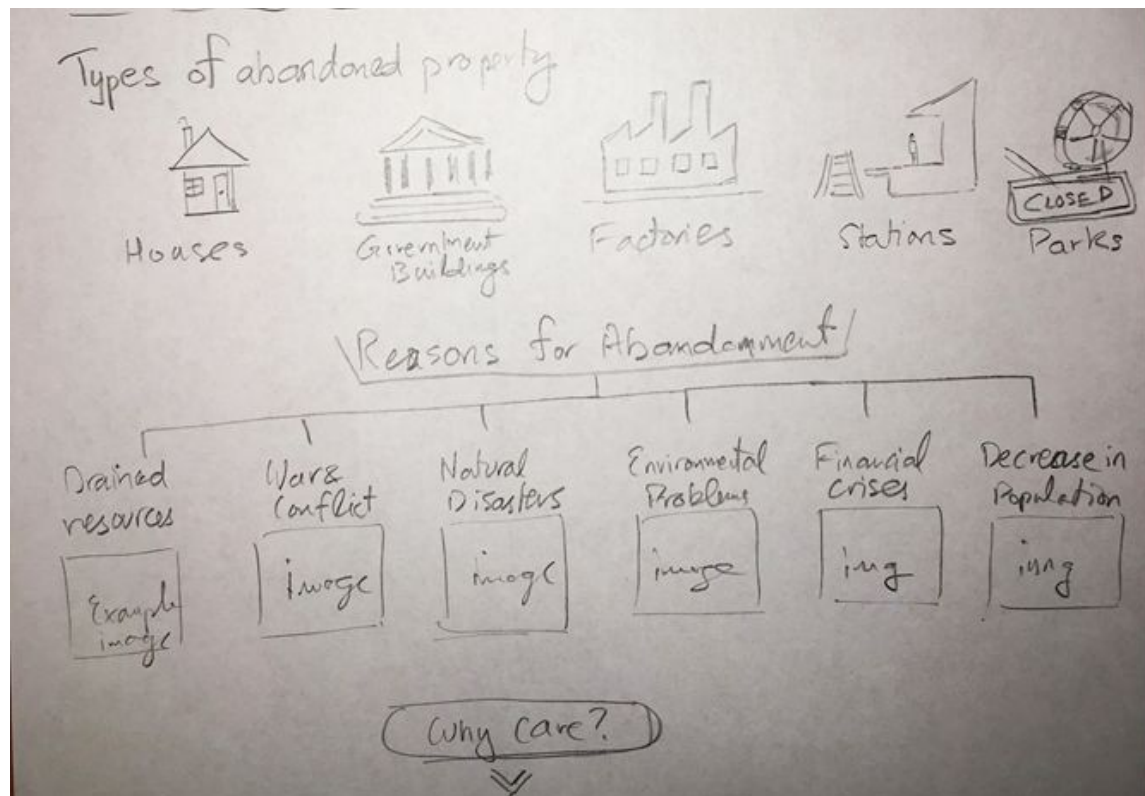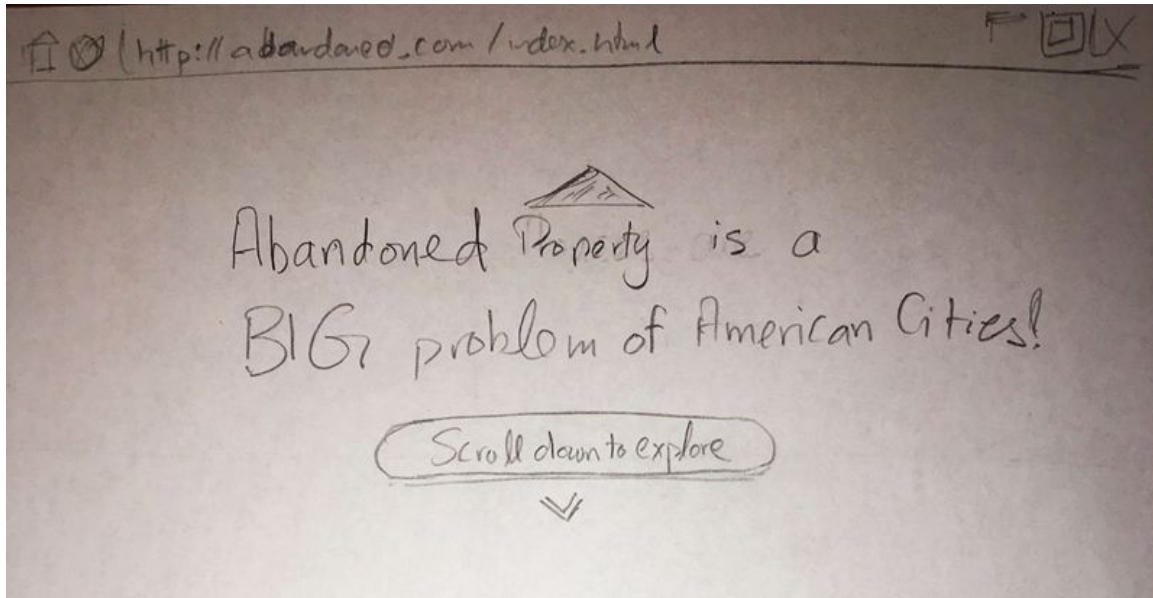

Data Sources

See section above on Data Sources and Description

Code sources

Mike Foster's tutorial on Interaction and Animation: D3 Transitions, Behaviors, and Brushing. Available at: http://duspviz.mit.edu/d3-workshop/transitions-animation/

Appendix A - Prototypes of website

Paper Prototype / Sketches

Why abandoned properties are a problem?

| CRIME | FIRE | PROPERTY VALUE | PUBLIC HEALTH |

83% of accessible abandoned property in Tx show evidence of illegal use by prostitutes, drug dealers, etc
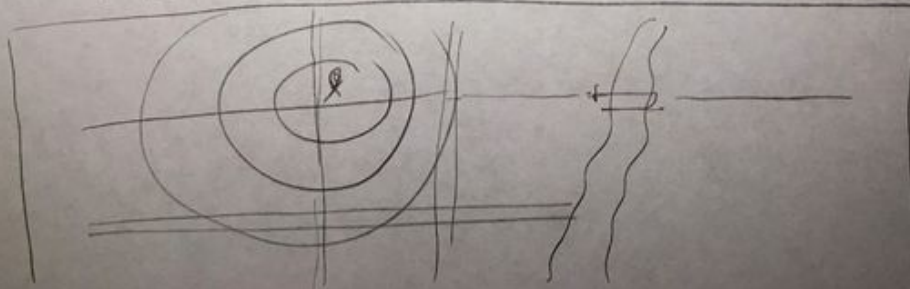

Explore abandoned places in Chicago

Abandoned places map

Facts about Chicago

Zoom

Type

Find an abandoned place by address

Address: [22 XYZ St.]   Search Radius: [5 ↕] miles

First draft High Fidelity Prototype