



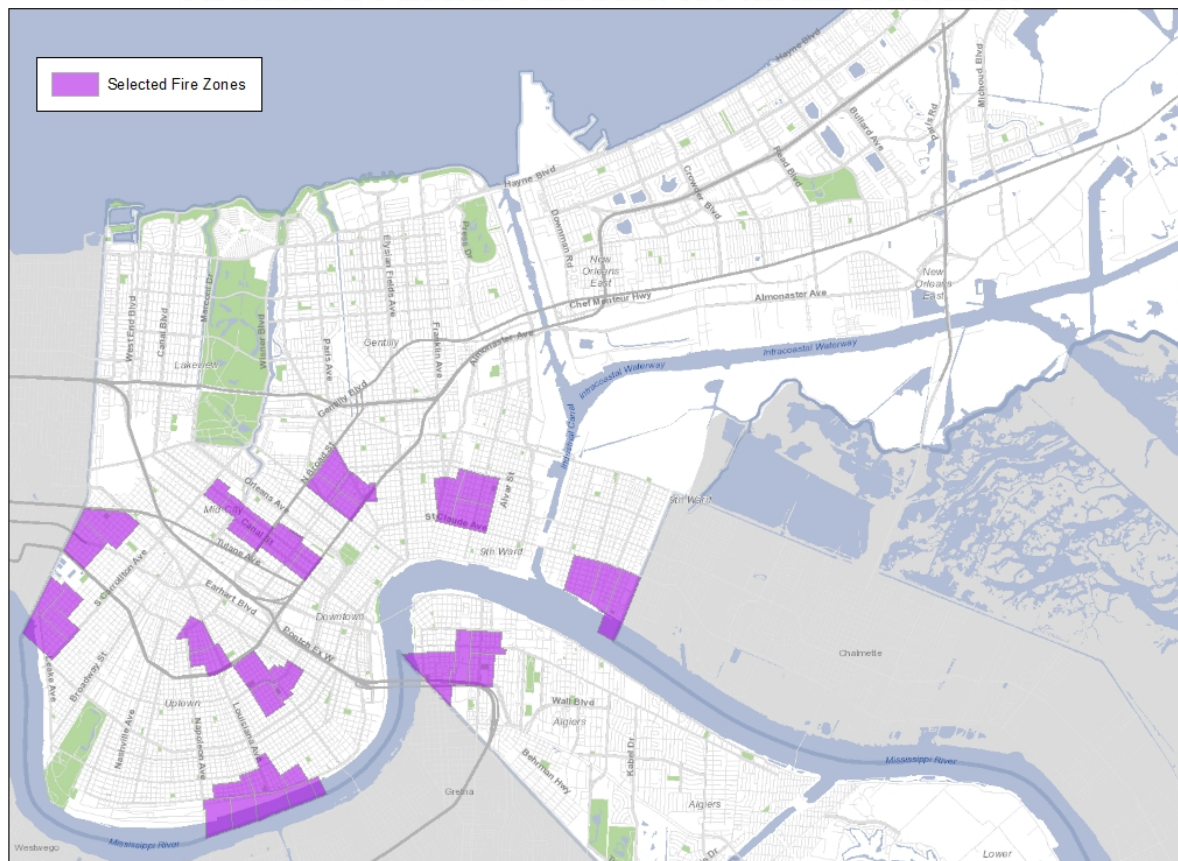
CITY OF NEW ORLEANS

Analytics-Informed Smoke Alarm Outreach Program

March 31, 2015

The New Orleans Fire Department is launching a door-to-door smoke alarm outreach campaign that leverages analytics to prioritize those neighborhoods that are least likely to have smoke alarms and most likely to experience fire fatalities

At-Risk Fire Zones Selected for Initial Outreach



Motivation

- In 2010-2014, there were 22 structure fire-related fatalities
- On November 11, 2014, five residents, including three children died in a house fire in Broadmoor. No smoke alarm was present
- In order to support fire fatality prevention, New Orleans Fire Department (NOFD) and the Office of Performance and Accountability (OPA) collaborated to create a predictive model that identifies those areas of the City most in need of a smoke alarm
- With this analysis, NOFD will conduct a targeted, risk-informed door-to-door smoke alarm outreach program
- This project is a component of the NOLAytics Initiative, which leverages the power of data science to improve City services

Approach

- OPA creates a map for NOFD that identifies those areas of City that are:
 - Least likely to have a smoke alarm in their house
 - Most likely to suffer structure fire fatalities
- Analysis conducted by Dylan Knaggs (OPA)
- Technical assistance and peer review provided by Mike Flowers and Raluca Dragusanu (Enigma.io)

Data sources

- American Housing Survey, 2011 (AHS)
 - Detailed survey regarding housing conditions
 - Data available at county/parish level
- American Community Survey, 2013 5-year estimate (ACS)
 - Data available at census block group level
- Census, 2010
- NOFD Administrative Data

What homes are least likely to have smoke alarms?

- American Housing Survey asks respondents whether or not they have a smoke alarm installed in their home
- Other variables asked in the survey correspond to questions in the ACS, which is available at more granular (census block group) level
- Approach: Use logistic regression where the presence of smoke alarm is the dependent variable and questions that are shared in the AHS and ACS are candidate independent variables

Results of regression analysis

Variable	Significance level as sole variable in regression
Year structure was built	***
Year resident moved into house	**
Household income compared to poverty level	*
House has replacements/additions	*
Age of householder	*
Cost of replacements/additions	ns
Occupant rents house	ns

Significance codes: *** – 99% | ** – 95% | * – 90% | ns – not significant at 90%

Notes: replacements/additions excluded due to data availability and directionality concerns. Age of householder excluded due to the variable already being accounted for by fatality risk.

Weights of Variables Chosen for Final Model

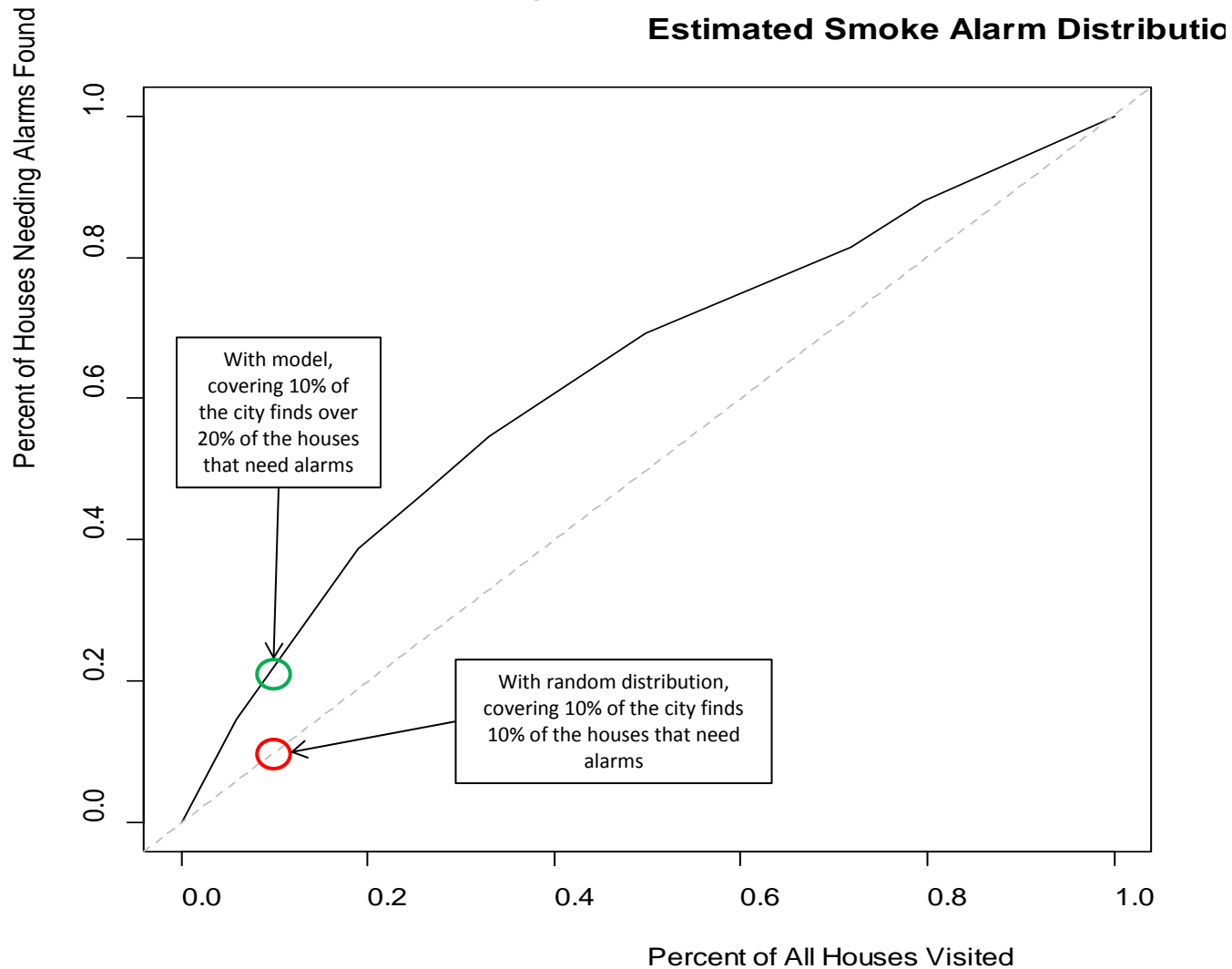
Weights chosen to correspond with regression coefficients

Structure Built Before 1950	Household Income <2x Poverty Level	Resident Moved Before 2000
1.00	.626	.546

Relevance of variables

Structure Built Before 1950	Household Income <2x Poverty Level	Moved Before 2000	Percent of AHS Respondents Missing Alarm
No	No	No	4.4%
No	No	Yes	6.5%
No	Yes	No	4.0%
No	Yes	Yes	8.1%
Yes	No	No	6.4%
Yes	No	Yes	8.8%
Yes	Yes	No	13.7%
Yes	Yes	Yes	18.6%
New Orleans Average			7.6%

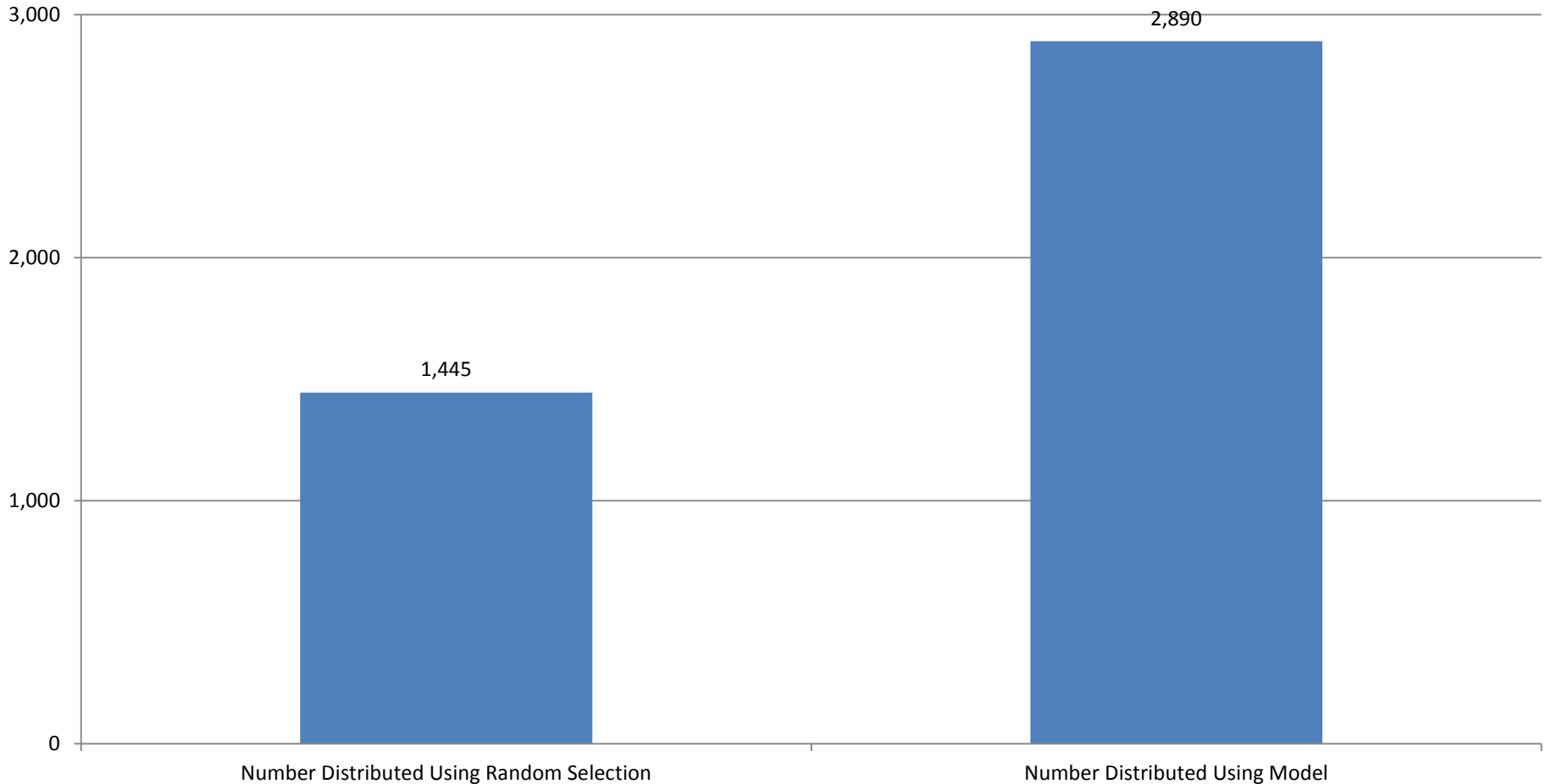
Predictive power of model



Note: Estimates on pages 8 and 9 are derived assuming data is at the structure level. In practice, data was used at the block group level, which could lead to less precise estimation. The final model also has a factor accounting for fatality risk, not included in these estimates.

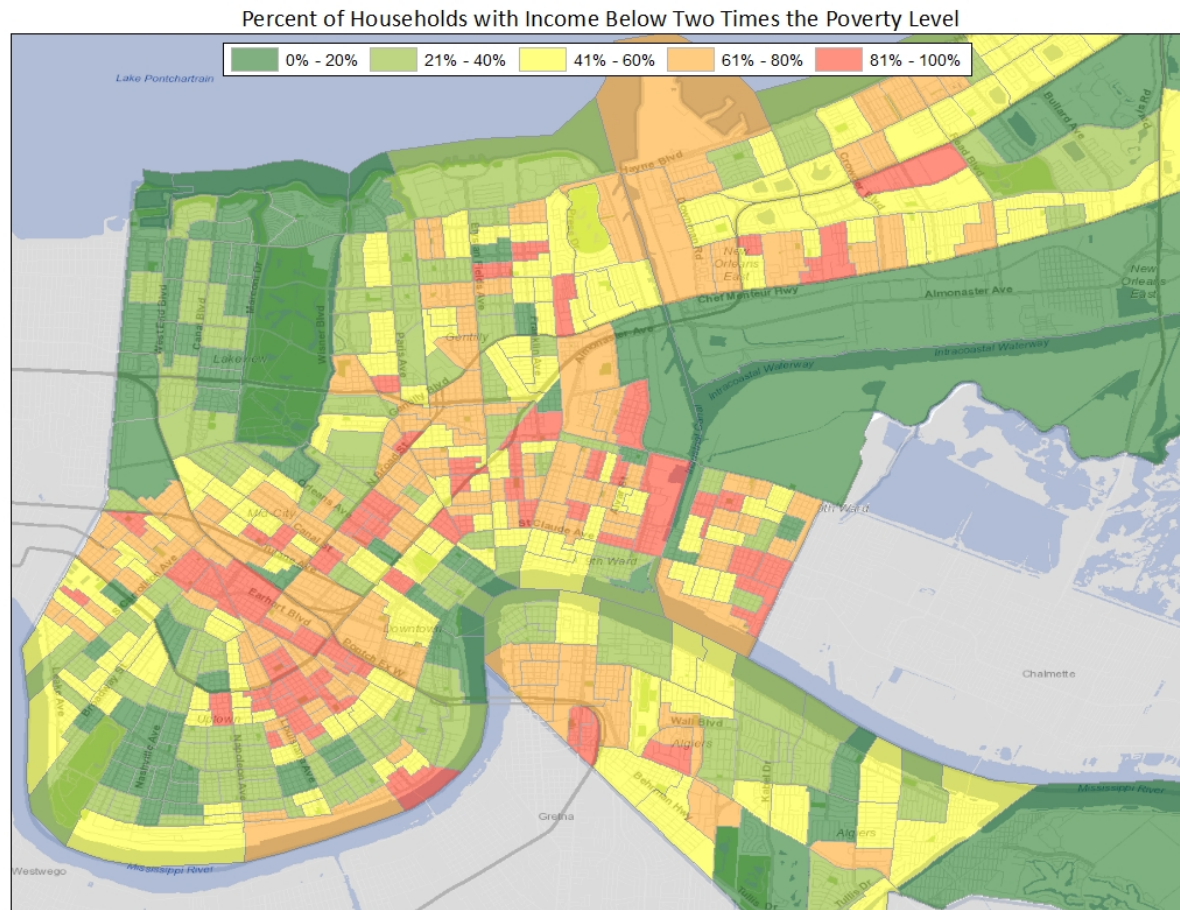
Predictive power of model

Estimated Number of Alarms Distributed After Canvassing 10% of City



Note: Estimates on pages 8 and 9 are derived assuming data is at the structure level. In practice, data was used at the block group level, which could lead to less precise estimation. The final model also has a factor accounting for fatality risk, not included in these estimates.

Poverty map

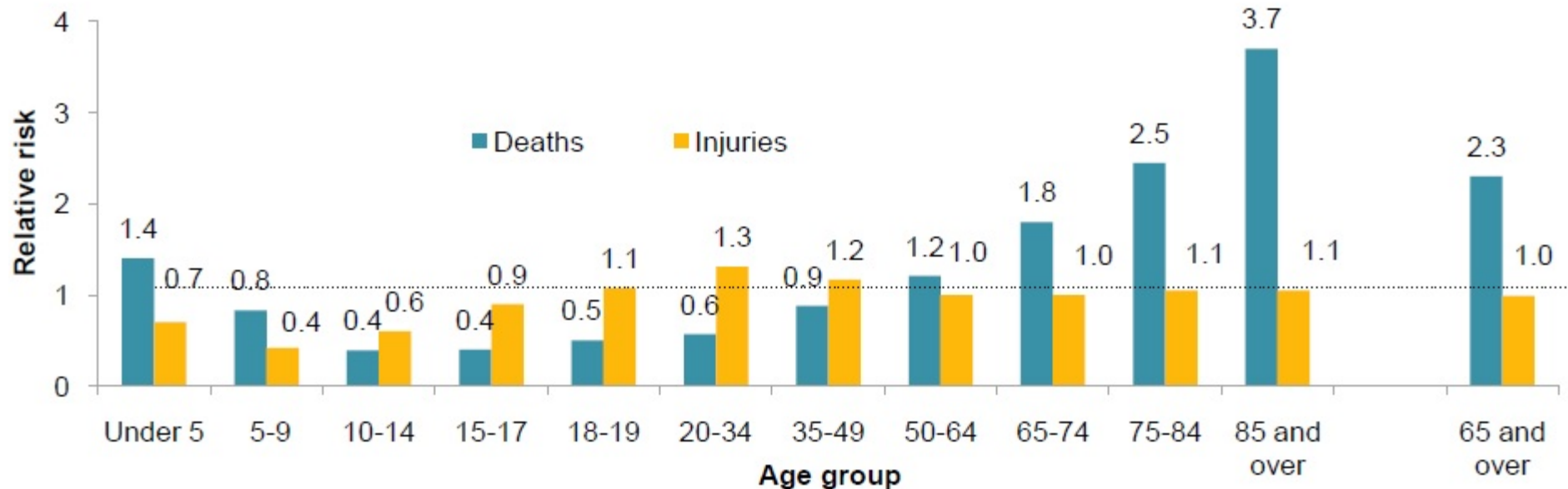


Source: American Community Survey, 2013 5-year estimate

What areas of the cities are most prone to fire fatalities?

- Research shows that the very young and very old are most susceptible to fire fatalities (National Fire Protection Agency 2010)

Figure 1. Relative Risk of Home Fire Death and Injury by Age: 2003-2007



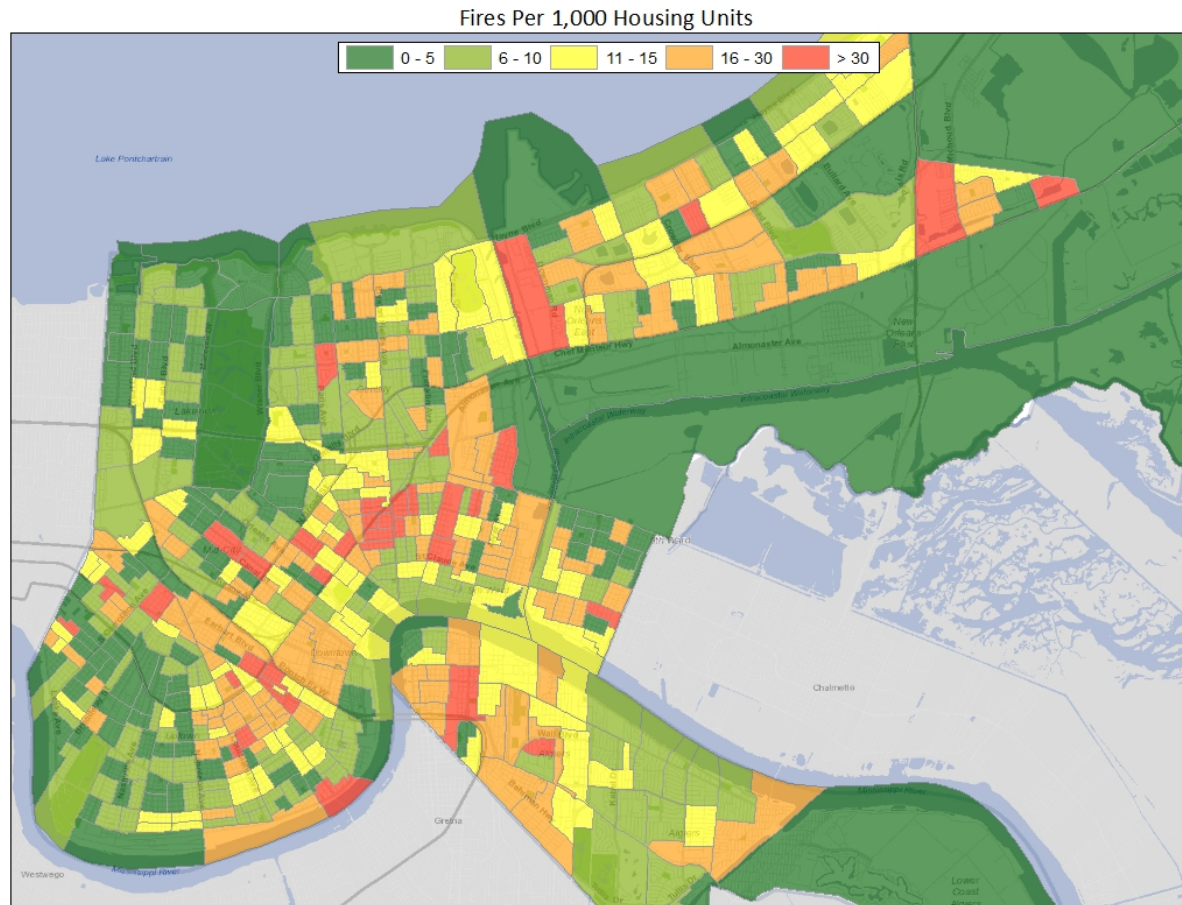
Overall fire fatality risk

- Create model that estimates the risk of fire fatalities by block group. The model accounts for the number of fires over the past 5 years, as well as the percent of population within age extremes.
- Fire Fatality Risk = 2 x (Fires/Housing Unit) + Age Adjustment
- Age Adjustment =
(% Population Over 65) + ((1.5/2.3)^{††} x % Population Under 5)

[†] Fires were weighted twice as strongly as the age adjustment

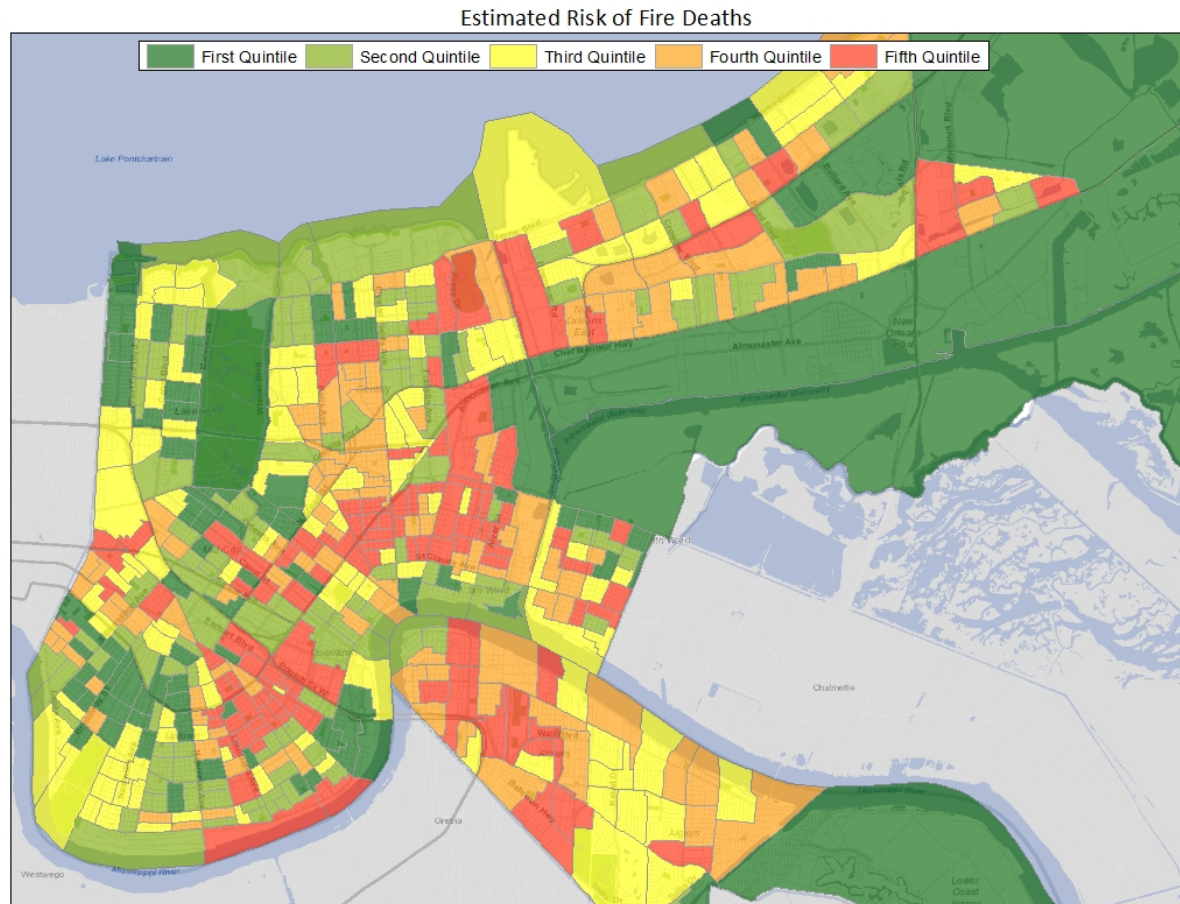
^{††} Relative risk of fatalities for population over 65 vs. fatalities for population under 5

Map of fires



Source: New Orleans Fire Department, Fires from March 2009 – March 2015

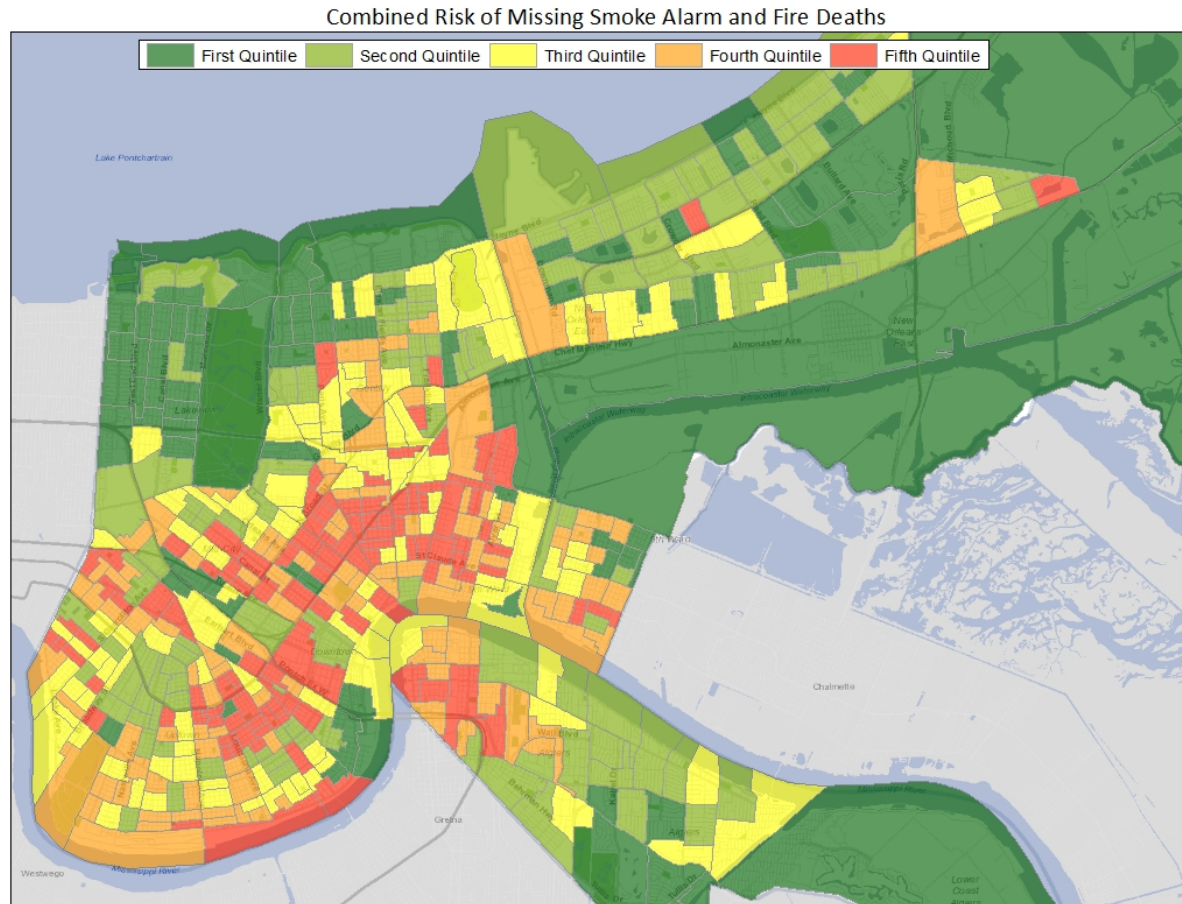
Fire fatality risk map



Source: OPA analysis

Overall Map

Created by averaging the standardized missing smoke alarm and fire fatality risk for each block group



Source: OPA analysis

Highest priority for smoke alarm outreach

At-Risk Fire Zones Selected for Initial Outreach

