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Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

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Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

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Table of Contents

Section I:
Introduction...........................................................................................................................................................................1
Purpose
Client Description
Outline

Section II: Background............................................................................................................................................................2
Plan Parameters
  Existing Conditions
  Geographic Area..............................................................................................................................................................................4
  Age..........................................................................................................................................................................................5
  Disability
  Race..........................................................................................................................................................................................6
  Education....................................................................................................................................................................................8
  Income.......................................................................................................................................................................................11
  Housing.....................................................................................................................................................................................12
  Historical Background
Existing Knowledge...........................................................................................................................................................................14
  Vulnerable Populations and Resilience
  Defining Vulnerability
  Vulnerable Populations Within This Study................................................................................................................................17
  Vulnerable Populations and Residential Fires.......................................................................................................................20
  Approaches to Address Fire Vulnerability............................................................................................................................21
Theoretical Approach to Plan......................................................................................................................................................22

Section III: Methodology.........................................................................................................................................................23
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

Research Questions

Methods

Sources of Information and Analytical Methods.................................................................25

Section IV: Findings.............................................................................................................26

Data Collection

Data Analysis.......................................................................................................................27

Percentile Rankings...........................................................................................................30

Correlation Coefficient.....................................................................................................31

Conclusion..........................................................................................................................34

Section V: Recommendations.............................................................................................35

Vision

Strengths, Weaknesses, Opportunities, and Threats.........................................................36

Goals, Objectives, and Actions.........................................................................................37

Section VI: Implementation.................................................................................................53

References..........................................................................................................................61

Appendix A Correlation coefficient with education as factor.............................................64

Appendix B Residential fires by individual vulnerability factor.........................................65

Appendix C Links to resources found in recommendations............................................71
List of Tables

Table
1. Populations by risk level..................................................................................................................................................15
2. Block group breakdown showing each vulnerability’s percentile ranking, total fires, and individual factors.................30
3. Correlation coefficient between vulnerability factors and residential fires (2015-2017)..................................................32

List of Figures

Figure
1. Map of Richmond, Virginia highlighting major features..................................................................................................4
2. Percentage of Richmond population showing vulnerable and non-vulnerable age cohorts.................................................5
3. Percentage of Richmond Population by Race..................................................................................................................6
4. Map of Primary Cities with Majority-Minority Populations, Large Metro Areas..................................................................7
5. Percentage of Richmond Residents 25 and Over Total Population by Educational Attainment...........................................8
6. Percentage of Richmond 25 and Over Total Population by Educational Attainment (By Race)..............................................10
7. Percentage of Richmond population below and above poverty line................................................................................11
8. 1930s Richmond redlining grades assigned by Home Owners’ Loan Corporation assessing neighborhood security........13
9. Vulnerable population framework.......................................................................................................................................17
10. Methodology flow chart...................................................................................................................................................24
11. Residential fires by block group vulnerability (Richmond, Va 2015-2017).......................................................................28
12. Social vulnerability by Richmond neighborhood (Richmond, Va 2015-2017).................................................................29
13. Scatterplot showing positive relationship between vulnerability and number of fires and trend line regression...........33
Plan Purpose

House fires accounted for 72 percent of all structural fires and 77 percent of civilian fire deaths in 2017 in the United States.\textsuperscript{1} According to the U.S. Fire Administration (USFA), fires cost the United States $23 billion in 2017 and statistics show residential fires annually cause more deaths, injuries, and dollar loss than any other type of fire.\textsuperscript{2} The physical, mental, emotional, and financial ramifications of structural fires on those who experience them constitute a necessity for municipalities to take preventative measures.

There were 1,079 residential fires in Richmond, Virginia between 2015 and 2017. “Residential” is defined as a single-family dwelling, multifamily dwelling, mobile home, boat, or Recreational Vehicle. Richmond, like many urban communities, is comprised of a diverse population. Within the diversity, however, exists vulnerabilities that could make a household more likely to experience a fire or present additional challenges in recovering from a fire. This study considers these vulnerabilities as they relate to both the frequency of fires within the susceptible community as well as the likelihood of a future fire. It is also the intent to provide a plan by which preparedness, response, and recovery agencies may increase their own understanding of where fires are likely to occur so they can target the identified pockets of vulnerability through additional education and response efforts.

Client Description

The primary client for this plan is the Richmond Regional Planning District Commission (RRPDC). RRPDC is a state-connected planning agency whose purpose is to serve as the regional forum of member local governments to address issues of regional significance. Additionally, the RRPDC provides technical assistance to localities and promotes and enhances the collective consensus
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

on demographic interests in the region. The commission has the capability to work with Richmond and other municipalities in addressing funding, education, and other fire prevention needs. The primary stakeholder for this plan is the Richmond Fire Department (RFD) as it has the primary responsibility of fire preparedness and response within the city. In addition, the American Red Cross (ARC) is also a stakeholder in the plan due to its Home Fire Campaign and its involvement in recovery efforts following a residential fire. On a local level, the RFD can use this plan to target pockets of susceptibility and employ education and tools (i.e. smoke alarms). Partnerships with the American Red Cross are encouraged as ARC has a current campaign to partner with local fire departments and provide smoke alarms to homes free of charge. The RRPDC can use this plan as a model for its other localities and distribute it accordingly to help determine where house fires are more likely to occur based on the vulnerabilities identified. They can also invest in education efforts.

Outline

This plan is divided into six sections: introduction, background, methodology, research findings, recommendations, and an implementation timeline. The introduction and background place the subject of house fires within the context of Richmond. The background also provides existing conditions within the city and sets the stage for eventual recommendations. Methodology explains how the data was compiled and analyzed using both quantitative and qualitative methods, and research findings synthesizes the data analysis. Based on the findings, recommendations and an implementation timeline were developed by establishing goals, objectives, and actions and determining reasonable times to execute each task.
Section II: Background

Plan Parameters

In order to understand the potential link which may exist in Richmond between community vulnerabilities and residential fire frequency, it is important to first understand Richmond from a socioeconomic perspective. Factors like age, race, education level, and income all play a vital role in determining whether someone is part of a vulnerable population. The seven vulnerable populations covered in the study are:

- children 14 and under
- adults 65 and over
- persons with a disability
- black and Hispanic populations combined into one minority category
- the under-educated
- families below the poverty line
- number of multifamily housing structures
The factors were determined using data from the public health sector as well as the U.S. Fire Administration (USFA). The one exception is multifamily housing, which is not necessarily considered a vulnerability but is included because multifamily housing is often correlated to low-income families and has links to poverty. Richmond’s existing conditions for the seven vulnerable factors are presented below.

**A Snapshot of Richmond**

**Geography and Basic Demographics**

Richmond, Virginia is 62.5 square miles and is divided into 161 census block groups. The James River serves as one of the most important defining geographical features and divides the city into a north and south side. Additionally, two major U.S. interstates run through the city, I-95 and I-64, as well as one regional interstate, I-195. As of 2018, Richmond has a population of 227,032.

**Figure 1** Map of Richmond, Virginia highlighting features. *Source. Created using ArcMap, 2018.*

Richmond, Virginia from the James River, 2018.
Age

Approximately 28 percent, or close to one-third, of the population are either 14 years and under or 65 years and over (Figure 2). According to USFA, these two age demographics represent two vulnerable groups because they are more likely to die in a fire than other age cohorts.

Disabilities

Richmond exceeds the national average in population with a disability. According to American Community Survey (ACS) 5-year estimates, 15.5 percent of Richmond’s population has some sort of disability. The types of disabilities included in this statistic vary and include hearing, vision, cognitive, ambulatory, self-care, and independent difficulties. By comparison, 12.5 percent of the United States experiences at least one of these difficulties. USFA lists persons with disabilities as a third vulnerability after children 14 and under and adults 65 and over.

Figure 2 Percentage of Richmond population showing vulnerable and non-vulnerable age cohorts. Source. American Community Survey (ACS) 1-year estimate 2017 data retrieved from American FactFinder, 2018.
Race

Richmond has a majority-minority population; 40.5 percent of the population is White, 47.1 percent is black, 6.7 percent is Hispanic or Latino, and the remaining 5.7 percent is comprised of Asian, some other race alone, or a mix of at least two races (Figure 3). In “Melting Pot Cities and Suburbs: Racial and Ethnic Change in Metro American in the 2000s,” William Frey provides data that show the majority-minority characteristic of Richmond is actually part of a larger trend across metropolitan areas in the United States. In fact, primary cities with a majority-minority population saw a growth from 25 in 1990 to 58 in 2010 and Richmond is one of dozens of cities with a majority-minority population as seen in Figure 4 on the next page.

Figure 3 Percentage of Richmond Population by Race.

1 Defined by the author as one to three large cities included in the name of the metropolitan area
Education

Educational attainment levels for residents 25 and over were considered for the total population as well as for White and minority populations individually. Regarding the total population, 15 percent have less than a high school diploma and 22 percent have either a diploma or the equivalent. 24 percent have some college or an associate degree and 39 percent possess a four-year degree or higher. Figure 5 provides a visualization of the total population’s educational attainment levels in the city.¹⁰

**Figure 5** Percentage of Richmond Residents 25 and Over Total Population by Educational Attainment. *Source. ACS 1-year estimate 2017 data retrieved from American FactFinder, 2018.*
Low education rates are considered a vulnerability because education directly impacts income and poverty. When educational attainment levels are broken down for Black, White, and Hispanic populations, there are some distinct disparities which favor the White population and should be noted. Figure 6 shows the largest disparities occur within the following categories: less than 9th grade, 9th to 12th grade, high school diploma, Bachelor’s degree, and Graduate or Professional degree. Over seven times as many Hispanics (38.6 percent) have less than a 9th grade education when compared to Whites (4.9 percent). Additionally, 72.1 percent of the Hispanic population has a high school degree or less while only 21.7 percent of the White population and 54.5 of the Black population fall into the same category.

As the education levels increase so do the percentage of Whites with a degree while the percentage of Blacks and Hispanics decreases (Figure 6). For example, 36 percent of the White population 25 and over has a bachelor’s degree while only 8.9 percent of the Black population and 6.9 percent of the Hispanic population have the same. Additionally, just 6.3 percent of the Black population and 5.2 percent of the Hispanic population have a graduate or professional degree compared to 23.7 percent of the White population. These trends are present at the national level as well.\(^\text{11}\) An article by Lindsey Cook entitled “U.S. Education: Still Separate and Unequal” pulls its data from the Civil Rights Project and discusses in detail the consequences of the inequalities seen in our education system. These include the school-to-prison pipeline, mental and physical trauma, and a perpetuation of low-income, food insecure, and low employment Black communities across the country.\(^\text{12}\) Moreover, the National Education Association attributes low education rates among Hispanics to a lack of English Language Learner (ELL) programs.\(^\text{13}\) Since 80 percent of ELLs in the United States are Hispanic, a gap in ELL programs causes a decline in the Hispanic community’s ability to attain education taught in English.
Figure 6 Percentage of Richmond 25 and Over Total Population by Educational Attainment (By Race). Source. ACS 1-year estimate 2017 data retrieved from American FactFinder, 2018.
Income

Within Richmond, 29 percent\textsuperscript{14} of the population lives at or below the poverty level established by the Department of Health and Human Services for a family of four, which is $24,600.\textsuperscript{2} 19.3 percent earn at least $100,000 per household. Virginia has a 17.8 percent population and the United States has a 22.3 percent population who live at or below the poverty level.\textsuperscript{15} This indicates Richmond’s poverty level exceeds that of both the state and the country.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{poverty.png}
\caption{Percentage of Richmond population below and above poverty line. \textit{Source. ACS 1-year estimate 2017 data retrieved from American FactFinder, 2018.}}
\end{figure}
Housing

Multifamily structures account for 43 percent of all housing units as there are 99,737 units in Richmond and 42,686 percent are multifamily.\(^1^6\) 50,668, or 51 percent, of occupied units are rental (ACS 2017 5-year) and national statistics estimate around 85 percent of rentals are multifamily with at least three dwellings.\(^1^7\) Census data which show the number of rented multifamily units in Richmond is unavailable but national statistics support the claim that the vast majority of Richmond’s multifamily structures are rented. This is important because homeownership is strongly correlated to building income and generational wealth, and non-ownership correlates to poverty.\(^1^8\) Moreover, since income directly affects the type of housing where a family resides, possible links exist in Richmond between the number of multifamily structures within a given block group and the overall vulnerability of that block group.

Though it was not included as an independent vulnerability factor, vacancies also play a role in susceptibility so statistics on current vacancy rate are important. Richmond has a 10.5 percent vacancy rate, just below the national average of 12.2 percent.\(^1^9\) The National Fire Protection Association released a report in April 2018 that stated half of the 30,200 vacant structure fires between 2011 and 2015 in the United States were intentionally set.\(^2^0\) In comparison, only 10 percent of occupied structure fires were set intentionally.\(^2^1\) Additionally, a study conducted on fire risk in Baltimore, Maryland found the risk of fire in an occupied dwelling increased 8 percent for every vacant structure within 10 meters.\(^2^2\)

Historical Background

It is important to note some of the preceding sociodemographic factors are a result of Richmond’s complicated past revolving around race. Many of Richmond’s poorest neighborhoods are primarily minority and were established in the early to mid-1900s with segregationist and racist motivations.\(^2^3\) Red lining, public housing developments, urban renewal, and the construction of Interstate 95, for example, were all systems and actions which led to the concentration of poverty still very much present in the city. This complicated past not only has current ramifications on the various populations’ chance at recovery, but it also impacts first responders’ ability to address safety issues within the communities. A certain level of mistrust continues to permeate in many poor neighborhoods so responders must consider these challenges when implementing fire prevention and education efforts.
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

Existing Knowledge

Vulnerable populations and resilience

The public health community agrees vulnerability impacts a person’s resiliency, the ability to recover quickly from difficulties. Alex Gitterman, a professor and author in the field of social work, believes certain social structures provide buffers which help populations cope with stressful life events. If those structures are not in place, as we see in vulnerable populations, then the stressors are intensified and communities lack both necessary coping skills as well as systems and infrastructure to assist.24 When considering vulnerable populations in conjunction with housing, Rolf Pendall, Brett Theodos, and Kaitlin Franks say,

“Vulnerability has intrinsic connections with resilience. Vulnerable people are, by definition, more likely than other people to suffer from a shock or strain in the first instance and will have trouble regaining or maintaining pre-shock levels thereafter. Regions composed of large numbers of vulnerable residents, by extension, face greater governance strains than those whose residents have fewer vulnerabilities.”25

If a vulnerable population experiences a house fire, and by virtue of being vulnerable has a lowered level of resiliency, it is appropriate to assume the ability to recover from the house fire is impacted. The different vulnerable populations are interrelated, so it is challenging to isolate one factor from another, but substandard housing tends to serve as a common thread through which all vulnerable populations are tied. Resiliency, while not directly responsible for propensity to experience a house fire, is certainly tied to a community’s chances to recover and is, therefore, included in the study as well.

Defining Vulnerability

This study considers the patterns that exist between residential fires and various vulnerable communities. As such, it is essential to define vulnerability in the context in which it is used throughout the research. For the purposes of this plan, a definition of vulnerability is used that merges the public health sector’s and USFA’s definitions. The public health sector’s definition of vulnerability is used because it is often the accepted standard across various fields beyond public health to include but not limited to urban planning, government, education, and social sciences. They include children fourteen and under, adults 65 and over, persons
with disabilities, racial minorities, the under-educated, and those who live below the poverty level. USFA's definition of vulnerability is used because the organization is the lead federal agency on firefighting and fire prevention. USFA chooses to define the most vulnerable populations according to those with the highest mortality rates and lists children 14 and under, adults 65 and over, and persons with a disability on its website. The number of multifamily housing units is also included since housing is strongly correlated to some of the socioeconomic factors like poverty and race.

Vulnerability, as defined by Aday (2001) is the capacity to possess an increased likelihood of susceptibility to harm or mistreatment. Table 1 is adapted from Aday’s breakdown of different demographics with high and low risk as it pertains to vulnerability within the public health sector. Of importance to this study are age, race, education, income, and housing. Aday does not include persons with disabilities in her definition of vulnerable populations but the category is included in the table since it is part of the broader study.

Table 1 Populations by risk level

<table>
<thead>
<tr>
<th>Community and Individual Resources</th>
<th>Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Risk</td>
<td>Lower Risk</td>
</tr>
<tr>
<td>The people: Social status</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Infants</td>
<td>Working-age adults</td>
</tr>
<tr>
<td>Children</td>
<td></td>
</tr>
<tr>
<td>Adolescents</td>
<td></td>
</tr>
<tr>
<td>Elderly</td>
<td></td>
</tr>
<tr>
<td>Race and ethnicity</td>
<td></td>
</tr>
<tr>
<td>African Americans</td>
<td>Whites</td>
</tr>
<tr>
<td>Hispanics</td>
<td></td>
</tr>
<tr>
<td>Disability 29</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Table 1 (continued)

<table>
<thead>
<tr>
<th>The neighborhood: Human capital</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Under-educated</td>
</tr>
<tr>
<td>Income</td>
<td>Low Income</td>
</tr>
<tr>
<td></td>
<td>Middle Income</td>
</tr>
<tr>
<td></td>
<td>High Income</td>
</tr>
<tr>
<td>Housing</td>
<td>Substandard</td>
</tr>
<tr>
<td></td>
<td>Adequate or better</td>
</tr>
</tbody>
</table>


Aday then takes each vulnerable population and shows the direct relationship between populations and individuals and the corresponding health needs and resources (Figure 9). With vulnerable populations and vulnerable individuals, or indicators, there exist increases in the likelihood of a direct relationship between those indicators and both community and individual health needs as well as individual risk. Moreover, as vulnerability increases in the individual or community, she notes a corresponding decrease in regards to individual and community resources.\(^{30}\) David Mechanic and Jennifer Tanner say, “Vulnerability results from developmental problems, personal incapacities, disadvantaged social status, inadequacy of interpersonal networks and supports, degraded neighborhoods and environments, and the complex interactions of these factors over the life course.”\(^{31}\) In other words, vulnerability is not caused by one issue or characteristic alone but is, instead, a conglomeration of physical, social, and economic factors compiled over short and long periods of time.
Vulnerable populations within this study

**Children 14 and Under:** USFA states children 14 and under have an increased likelihood of dying in a fire so it lists the demographic as one of two vulnerable populations based solely on age with no other factors present. While extensive literature is not available that show a heightened vulnerability to experiencing a residential fire, this demographic is included in the list of vulnerable populations on the USFA’s website, irrespective of socioeconomic status. From a public health perspective and in

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**Figure 9** Vulnerable population framework. Source. Lu Ann Aday, “At Risk in America: the health and health care needs of vulnerable populations in the United States,” 3.
explaining why children comprise a vulnerable population, Brenda Conway and Jordan Pike remind us that children have significant emotional, physical, and mental differences from adults. Children are not fully developed in any of those areas and this leads to a greater predisposition to injury and illness. It also means their resiliencies are not fully established and, thus, they experience and cope with stress much differently than adults. This could represent a case where the demographic is more susceptible to the impacts of fires than to the likelihood of a residential fire itself.

**Adults 65 and Over:** Elisabeth Schroder-Butterfill and Ruly Marianti discuss the variations which exist within the 65 and over demographic and refer to two key characteristics present at a higher rate within this population when compared to other populations: income shifts and poor health. Retirement age usually brings with it certain economic shifts. As one exits the workforce and enters into retirement, they are often met with decreased income to some degree. It is important to note that those who contributed to a pension while in the workforce are less likely to experience a dramatic decrease in income versus those who did not or could not participate in a pension program. Illness has the potential to exacerbate this shift in income. According to the American Journal of Managed Care, 87 percent of adults 65 and over have at least one chronic condition, and 67 percent have two or more chronic illnesses.

**Disability Status:** Disabilities in the form of chronic health conditions, cognitive restrictions, mental or emotional disorders, and physical limitations all impact a person’s vulnerability. Clearly a person with physical challenges or poor health is predisposed to susceptibility but conditions such as depression, schizophrenia, developmental delays, and learning disabilities can all negatively impact resiliency and, therefore, increase vulnerability. Moreover, the disabled community runs the risk of exploitation. In a Congressional hearing on worker exploitation in 2009, Senator Harkin discussed a scenario where 21 intellectually challenged men were taken advantage of by a turkey processing plant in Iowa. Not only were the men severely underpaid but they were provided with room and board in abhorrent housing conditions. In another scenario, an investigation by the U.S. Department of Labor found 250 workers were improperly paid by a company in Illinois. Exploitation has direct impacts on persons with disabilities in regards to this study because low wages often lead to substandard, and therefore, unsafe housing.

**Education:** Studies show higher education levels correspond to better overall health. Conversely, individuals with lower levels of education are more likely to have fewer resources to cope with illnesses and other economic and personal aversities. Moreover, communities with lower levels of human capital investment in its residents possess schools that underperform and a preponderance of unemployment and substandard housing. Education is unique from the other vulnerabilities in that it is not
biological like age or disability and it is directly linked, even potentially responsible for, additional vulnerabilities like poverty and housing conditions. Study after study report a correlative relationship between education and poverty. Mihaela Mihai et al.’s report on education and poverty concludes welfare levels decrease substantially as education levels increase on both a national and global scale. In fact, education is highly regarded as a solution to global poverty and sits at the core of many worldwide policies meant to address the poor. Therefore, lower levels of education certainly constitute an overall vulnerability.

Race: When presented with all of the challenges minorities face, it is unsurprising race plays a role in determining vulnerability. Minorities are disproportionately impacted by deficiencies in almost every aspect of society: substandard housing, lower education rates, lower income, poor health, and poverty, to name a few. Aday says, “Minorities often have poorer health and fewer material and nonmaterial resources to meet their needs, associated with historical and contemporary patterns of discrimination and related residential or occupational segregation, more limited economic or educational opportunities, and the disproportionate exposure to environmental risks in predominantly minority neighborhoods.”

Race is unique because it is the only vulnerability that never shifts. Alex Gitterman says, “The life event of being born Black in the United States creates a trajectory with profound impact on education, employment, housing, health, and family life.” Though research shows the poorer the person the more challenging it is for that person to experience upward mobility, it is not beyond the realm of possibility, meaning even poverty is a vulnerability someone has the potential to escape. It is conceivable that education and housing can improve as well, and people age out of the 14 and under population and live another 50 years before reaching the 65-and-over cohort. In a study that looked at 84 metropolitan areas around the United States and covered 198 million people, over one-third of African Americans had one other vulnerability and one-quarter had two others.

Poverty: If lack of or under-education is one of the largest driving forces in causing vulnerability then poverty is one of the, if not the, most predictable and devastating outcomes. Perhaps more than any other vulnerable population in this study, those who live in poverty experience challenges more frequently and feel the effects longer than those who do not. Damas Philip and Israt Rayhan say, “The poor are more vulnerable than any other group to health hazards, economic down-turns, natural catastrophes, and even man-made violence. Shocks such as illness, injury and loss of livelihood have dreadful impacts, and are significant causes of poverty.” Not only are these causes of poverty, but they are also key factors in exacerbating the effects of someone who already
lives in poverty. Income inequalities combined with long-term economic deficiencies between different socioeconomic groups create vast health disparities.\(^{49}\) Research shows those with higher-status occupations, and therefore larger incomes, have decreased rates of morbidity and mortality versus those with lower-status jobs.

**Housing**: Housing conditions play a role in determining vulnerability from both a public health and fire risk perspective. In fact, housing is the only vulnerability in this study with literature and research which show a direct relationship between varying characteristics of housing and the propensity for fire. USFA reports both housing vacancy and age of housing are positively correlated with fire rates, though it is important to note this data is 40 years old.\(^{50}\) Obvious factors such as age and vacancy can determine whether a house is more prone to catching fire. However, there are less obvious factors such as whether or not the house is a rental or the proximity of the house to vacant structures. Still, what remains unclear is if a direct correlation exists between rental houses and propensity for fire due to the fact that it is a rental or if the correlation exists because of the rental population, which tends to possess the vulnerabilities discussed in this study.\(^{51}\)

**Vulnerable populations and residential fires**

Limited recent research is available on vulnerable populations as variables with respect to residential fire occurrence. The USFA recognizes that, “...socioeconomic factors are among the best known predictors of fire rates at the neighborhood level.”\(^{52}\) One study conducted in 1977 and across five localities concluded that under-education, or fewer than eight years of schooling, was one of several variables most effective in explaining deviations in fire occurrences and good education, or at least a high school degree, was one variable somewhat effective in the same prediction.\(^{53}\) It is important to note the age of this study because education is perceived differently in 2018 than it was in 1977 so it is unlikely a high school degree would constitute a good education by today’s standards in the United States. Other variables found to explain some variation of fire occurrences were race (percentage Black), home ownership (percentage of year-round housing units that were owner-occupied), and adequate income (percentage of household incomes greater than $15,000).\(^{54}\) The age of the study certainly impacts the last variable as the current poverty level is set at $24,600.

USFA names two age cohorts as vulnerable populations: children 14 and under and adults 65 and over. However, vulnerability in this case refers to cohorts who are at a higher risk for mortality at the hands of a fire.\(^{55}\) USFA stops short of declaring these two age groups are more likely to experience a fire. Moreover, mortality rates due to fire decreased between 2007 and 2016
by 19 percent. Nevertheless, adults 65 and over account for 40 percent of all fire deaths but only comprise 15 percent of the population. It is essential to consider these statistics because, while a direct correlation may not exist between the age cohort and likelihood to experience a fire, the ramifications of a house fire clearly have devastating impacts on the 65 and over population.

Existing research appears to show the greatest connection between the other vulnerable populations in the study and susceptibility to residential fires. Still, it is feasible the common denominator is substandard housing as vulnerable populations are more likely to experience overcrowding and reside near vacant structures, as well as within housing that lacks modern upgrades and safety features. One study from the *Journal of the American Academy of Pediatrics* found strong correlations between fire and burn injuries to children and substandard housing. In this study, 99 percent of houses failed the quality measures and only one working smoke alarm was identified in 82 percent of the homes. Gielen et al. conclude substandard housing and lower rates of smoke alarms frequently involve poverty as a risk, but stop short of concluding housing quality as a definite effect since the variable cannot be isolated. Still, they do state it is likely there exists some association between poor housing and the ability to adequately implement safety measures. Therefore, the link between vulnerable populations, substandard housing, and house fire occurrences is paramount to consider.

**Approaches to address fire vulnerability**

Fire vulnerability is addressed in a variety of ways around the country, though most methods are utilized for all populations irrespective of vulnerability. The American Red Cross launched the Home Fire Campaign in 2014 to address residential fire injuries and death. The organization partners with fire departments across the country to install smoke alarms, including special alarms called bed shaker alarms that are equipped to shake a bed for those unable to hear a traditional alarm. The campaign also includes the Pillowcase Project, a fire safety series presented in elementary schools. The bed shaker alarms and Pillowcase Project represent two practices specifically aimed at vulnerable populations.

USFA provides outreach materials via their website. These materials include digital media libraries which target specific vulnerable communities, educational tools on types of fires and prevention methods, and fire escape plans. The organization also provides a fire safety program toolkit to help visitors develop population-specific training and presentations on a variety of topics that are available for download. Lastly, a large portion of literature recognizes a current gap and calls for more cooperation between public health, housing, and emergency response sectors to specifically address vulnerable populations’ susceptibility to fire.
Theoretical Approach to Plan

The theoretical framework is important to understand because it informs the methods and approaches of the plan. For this purpose, the study was divided into two parts: data collection and analysis; and recommendation formulation and implementation. A brief background provides foundational knowledge about Advocacy Planning, the Just City approach, and Communicative Action. Lastly, in-depth analysis shows how each theory or approach played a role in the research beginning with the overall purpose and leading to final recommendations.

Two planning theories provided the primary framework for this study and they are Advocacy Planning and the Just City. Advocacy Planning was developed by Paul Davidoff in the 1960s and seeks to establish representation for those who generally do not have a voice, often the very same vulnerable communities identified in this study. Actions which consider both facts and values are central to this planning theory. The Just City approach was developed by Susan Fainstein throughout the early 2000s and places emphasis on three separate values: diversity, equity, and democracy. The approach recognizes the importance for practitioners to weigh these values alongside pragmatic responses to planning challenges. Though not as prevalent as Advocacy Planning or the Just City approach, there are aspects of Communicative Action present in recommendation formation and implementation, which emphasizes public involvement above all else.
Research Questions

Once current existing conditions for Richmond were established then it was necessary to collect data on house fires from 2015 to 2017 and various vulnerable communities in the city. Next, the following questions were answered to determine if there exists a preponderance of fires in our vulnerable communities:

1. Which communities (block groups) in the city of Richmond are most impacted by residential fires?
2. Do residential fires in the city of Richmond disproportionately affect vulnerable communities? What consistencies or similarities exist throughout the Richmond neighborhoods with high residential fire occurrences?
3. How can these potential trends inform recommendations for emergency preparedness and response?

Methods

Methodology offers a guide for how data was compiled, research questions were answered, and recommendations were proposed. There were two distinct steps to the study, each requiring different methodology to accomplish, and they were data collection and analysis and recommendation formulation and implementation. During the first step, quantitative methods were used, and the Richmond Fire Department (RFD) provided the three-year fire data while the U.S. Census Bureau provided the population data. Quantitative research focuses on objective measurements and uses statistical, mathematical, or numerical analysis of data. It is then used to generalize data across clusters of people or to help explain a pattern. This study is descriptive in that fire and population data were measured once to establish potential associations between the variables. House fire data between 2015 and 2017 acted as the independent variable. Vulnerable population data acted as the dependent variables. A social vulnerability index (SVI) was created for each block group and the fires were plotted in ArcGIS to visualize pockets of susceptibility across the city and to subsequently determine trends. Furthermore, a correlation coefficient was run to establish the strengths of correlations between individual factors and number of fires.

The second step was to develop recommendations based on the information obtained in the first step. This step used both quantitative and qualitative methods and involved elements of the participatory process. Qualitative research concentrates on things which are not measured through quantity, but instead, on the human aspect of a study. Experiences and emotions are not necessarily quantifiable so interviews with stakeholders and experts rely heavily on the qualitative approach. The participatory process is defined as one that aspires to expand public input. Feedback from the RRPDC served to assist in the recommendation
development. While the participatory process was not executed in its purest form, the intent was to increase the voice of the impacted communities and this agency serves as an advocate for the community within emergency response and preparedness. It is important to recognize the majority of recommendations were strongly based on quantitative data; however, the feedback provided context around statistics and patterns identified in the first step. Additionally, it was a long-term goal of the study to provide a pathway to increase the inclusive process between residents, stakeholders, and the Richmond Regional Planning District Commission (RRPDC). The process aimed to increase the ability of the public to implement decisions.\textsuperscript{71}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{methodology_flow_chart.png}
\caption{Methodology flow chart}
\end{figure}
Sources of Information and Analytical Methods

Data and information for this plan were drawn from a variety of sources. Publicly available sources include the U.S. Census Bureau, academic journals, government agencies, and news reports, and were all used to provide background knowledge and existing conditions on the topic. RFD provided house fire data for 2015 through 2017 and ArcGIS was used to create visualizations. It should be noted house fire data from the RFD was not publicly available and required a request. The RRPDC District provided insight into the recommendations and implementation. Visualization with ArcGIS was the primary method used to analyze and evaluate the data. House fires between 2015 and 2017 were mapped and combined with a social vulnerability index overlay to determine if patterns existed between fires and certain communities.
Data Collection

The Richmond Fire Department (RFD) provided the data for residential fires that occurred between January 1, 2015 and December 31, 2017 within the city boundary. American Community Survey (ACS) 2017 5-year estimate census data on vulnerable populations was obtained from American FactFinder and, to reiterate, includes: 14 and under, 65 and over, households below the poverty line, minority (defined by the study as Black or Hispanic populations), persons with a disability, and multifamily residential structures. Six of the seven factors were collected at the block group level of which there are 161. Populations with a disability was collected at the census tract level because data was not available at the block group level.

Data Preparation

First, the total for each vulnerability factor was determined for each of the block groups. For example, the total number of children 14 and under or the total number of households living below the poverty line was calculated for every block group. In order to determine how frequently factors occurred in each block group when compared to the rest of the city, a percentile ranking was calculated for each vulnerability factor using the Excel formula

\[
\text{PERCENTRANK}(\text{range}, x, \text{[significance]})
\]

where range was all 161 factor totals, \(x\) was the vulnerability factor total for that one block group, and significance value was left as the default value of 3 significant digits. This equation produced a percentile rank for each factor within the block group. Next, the factor percentile rankings were added together to determine a total. The same percentile ranking calculation was used to rank every block group's vulnerability on a scale of 0 to 100 where

- 0%-20%: Low Vulnerability
- 20%-40%: Low to Moderate Vulnerability
- 40%-60%: Moderate Vulnerability
- 60%-80%: Moderate to High Vulnerability
- 80%-100%: High Vulnerability
In this calculation, range was all 161 block group totals, \( x \) was the individual block group total determined in the previous step, and significance remained 3. The calculation assigned each block group a percentile ranking that showed its vulnerability based on the vulnerable factors present within the geographical location and when compared to the other block groups. Furthermore, this system ensured optimal geographic integrity by determining the most vulnerable communities within Richmond when compared to other communities in the city. In addition to calculating percentile rankings, the correlation coefficient was calculated to determine how strong the relationship was between each vulnerability factor and residential fires. The study used the correlation function in Excel’s data analysis tool, an automated tool which relies on the Pearson Correlation Coefficient formula. The final value in this formula can range from -1.00 to 1.00 where negative values show a negative correlation and positive values show a positive correlation.

The Excel spreadsheet with the block group percentile rankings was added to ArcMap and joined to the Richmond block group layer’s attribute table using the geographic identification, or Geo ID. The layer was symbolized to create a choropleth map to show block group vulnerability and renamed “SVI” to indicate to the reader it is a social vulnerability index. Then, the street address included in each line of residential fire data was used to geocode the location within ArcMap. The spatial join function was used to join the fire occurrences to their appropriate block groups and total occurrences in each block group was obtained for the three-year period.

**Data Analysis**

Richmond Fire Department recorded 1,079 fires from 2015 to 2017. The five census block groups with the most fires experienced 28, 25, and 20 fires from 2015 to 2017 (Figure 11). These five block groups account for 3 percent of the total number of block groups but 11 percent of the total number of fires that occurred in the city.

Data Sources: Richmond Fire Department; American FactFinder.
Figure 12 Social vulnerability by Richmond neighborhood (Richmond, Va 2015-2017). Source. Created using ArcMap, 2018.
Percentile Rankings

The five block groups with the most fires over the three-year period have at least a moderate level of vulnerability and three groups have a high level of vulnerability. Table 4 provides a by-vulnerability breakdown for each block group. Block group 710.02, 2 has the highest vulnerability ranking at 99% and had the highest number of fires with 28 occurrences. Three of the five vulnerable groups have at least an 80\textsuperscript{th} percentile ranking. This means the total number of vulnerable persons as defined by this study ranks in at least the 80\textsuperscript{th} percentile across all of Richmond. In all but one block group, the total number of households who live below the poverty line exceeds the 65\textsuperscript{th} percentile and three block groups are in at least the 89\textsuperscript{th} percentile. Poverty is linked to poor housing conditions which, in turn, can affect both the likelihood of a fire as well as the ability to recover from a fire. The single outlier is 610, 2 where the poverty factor ranks in the 43\textsuperscript{rd} percentile; however, three other factors within that block group rank in at least the 90\textsuperscript{th} percentile, effectively increasing its overall vulnerability ranking.

Table 2 Block group breakdown for each vulnerability’s percentile ranking, total fires, and individual factors

<table>
<thead>
<tr>
<th>Block Group/Percentile Ranking</th>
<th>Total Fires (2015-2017)</th>
<th>Vulnerability Level</th>
<th>Vulnerability Factor</th>
<th>Percentile Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>710.02, 2/99\textsuperscript{th}</td>
<td>28</td>
<td>High</td>
<td>14 and Under</td>
<td>92%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>65 and Over</td>
<td>94%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Below Poverty Line</td>
<td>94%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minority</td>
<td>96%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disability</td>
<td>71%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Multifamily Structures</td>
<td>91%</td>
</tr>
<tr>
<td>610, 2/97\textsuperscript{th}</td>
<td>25</td>
<td>High</td>
<td>14 and Under</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>65 and Over</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Below Poverty Line</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minority</td>
<td>94%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disability</td>
<td>69%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Multifamily Structures</td>
<td>99%</td>
</tr>
</tbody>
</table>
Correlation Coefficient

Table 3 provides the correlation coefficient for the final variables. After running the formula, education was dropped to avoid over-contribution of similar factors because it was closely correlated to the minority vulnerability at .84 (refer to Appendix A). Poverty had the strongest positive correlation to fires at .68 immediately followed by minorities at .61. The moderate to strong positive correlation between poverty and fires displays a possible link between unsafe housing conditions and fires since households living below the poverty line are more likely to live in substandard housing. Substantial correlations also exist between poverty, minorities and the overall social vulnerability index (SVI). This supports data that show minorities are more likely to live below the poverty line and larger minority populations increase the overall vulnerability of a block group. Therefore, if poverty is correlated to
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

Fire occurrences and minorities are more likely to live in poverty than it is reasonable to suggest minorities have the potential to experience fires at a higher rate. The social vulnerability (SVI) of each block group had a moderate positive correlation to the number of fires at .61 and Figure 10 highlights the relationship. As the vulnerability of a block group increases, there is a moderate increase in the potential for fires.

The three weakest population correlations to fires were the two age groups and populations with a disability where the 65 and over population had a .23 correlation, 14 and under and populations had a correlation of .24, and populations with a disability had a .16 correlation. The weaker correlation between the two age cohorts, populations with a disability, and fires suggests age and functional ability do not play a large role in the likelihood of a fire; however, both age and disability could impact the overall likelihood of an injury or death and can also impact recovery.

Table 3 Correlation coefficient between vulnerability factors and residential fires (2015-2017)

<table>
<thead>
<tr>
<th></th>
<th>65</th>
<th>14</th>
<th>Poverty</th>
<th>Minority</th>
<th>Multifamily</th>
<th>Disability</th>
<th>SVI</th>
<th>Total Fires</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0.241</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poverty</td>
<td>0.235</td>
<td>0.267</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority</td>
<td>0.075</td>
<td>0.386</td>
<td>0.628</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multifamily</td>
<td>0.11</td>
<td>0.11</td>
<td>0.672</td>
<td>0.269</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability</td>
<td>0.053</td>
<td>0.267</td>
<td>0.26</td>
<td>0.561</td>
<td>0.018</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SVI</td>
<td>0.429</td>
<td>0.57</td>
<td>0.812</td>
<td>0.774</td>
<td>0.584</td>
<td>0.562</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total Fires</td>
<td>0.23</td>
<td>0.246</td>
<td>0.686</td>
<td>0.617</td>
<td>0.436</td>
<td>0.168</td>
<td>0.611</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 13 Scatterplot showing positive relationship between vulnerability and number of fires and trend line regression.
**Conclusion**

The findings demonstrate socioeconomic and minority status play the largest role in the likelihood of a fire. The strongest correlation exists between households who live in poverty followed closely by minority populations. Data show minorities as defined by this study make up 48 percent of the population in the five block groups with the highest numbers of fires. Additionally, minorities and poverty have a strong correlative relationship at .68. It should be noted data for poverty levels by race are not available at the block group level. Housing type (multifamily) and household composition appear to play a much smaller role in the likelihood of a residential fire, but they certainly factor into consequences and recovery. These findings, as well as existing conditions, played a considerable role in determining acceptable recommendations for the Richmond Regional Planning District Commission and the Richmond Fire Department.

Additionally, the human aspect of a residential fire is of utmost importance. There is currently very little research on the short and long-term ramifications on peoples’ mental health following a fire. Most research focuses on the aggregate numbers of injuries, deaths, and total dollar loss. Given the purpose of this plan, which was to determine if fires disproportionately impact the city’s vulnerable communities, mental health following a fire or after displacement was not studied as it was beyond the scope. However, if a recovery organization is to succeed in helping an individual truly recover, the organization must address any potential emotional and mental pain that results from a residential fire. Therefore, it is recommended that additional research be conducted in the form of long-term tracking of persons who have experienced a fire to better understand patterns and possible solutions.
Section V: Recommendations

Vision

The neighborhoods and communities of Richmond, Virginia utilize local resources to include the Richmond Fire Department (RFD) and American Red Cross (ARC) for fire prevention methods and education. A strong relationship exists between the Richmond Fire Department, local and regional supporting agencies, and the citizens to whom they respond in order to maximize awareness and safety across the city, specifically in the most vulnerable neighborhoods. Lastly, the number of residential fires continues to decrease as a result of targeted approaches meant to address fire safety and prevention.
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

Strengths, Weaknesses, Opportunities, and Threats Analysis

Richmond’s strengths, weaknesses, opportunities, and threats were determined in order to drive recommendations and are based on the findings from the research. Due to its small geographical area, Richmond’s population is easily accessible to the fire departments dispersed throughout the city. However, 20 percent of Richmond’s block groups have a high vulnerability and the city has a 19 percent poverty rate. Still, weaknesses provide opportunities for improvement like strengthened relationships and partnerships, better education, and safer homes. Lastly, some important threats include a potential increase in poverty or failure of the appropriate agencies to engage residents. Recommendations take advantage of the strengths and opportunities while simultaneously targeting the weaknesses and threats.

**Strengths**
- Small geographical area
- Large concentration of fire stations (20 within city limits according to City of Richmond website)

**Weaknesses**
- 20 percent high vulnerability rate (33 block groups >=81% SVI)
- 19 percent poverty rate (ACS 2017 5-year estimate)

**Opportunities**
- Existing and new community education programs
- Strengthened relationship between RFD and community
- Increased partnership between American Red Cross, RFD, and community
- American Red Cross Home Fire Campaign

**Threats**
- Lack of proper fire prevention education
- Aging housing stock (historical homes versus new construction)
- Increase in poverty and/or overall vulnerability
- Failure to engage citizens in a meaningful way
While some of the proceeding recommendations were developed using best practices from other localities, a number of them are already in place. Regarding the latter, the goal is to build upon these practices to increase prevention and recovery efforts.

**Relationships**

### Goal 1: Enhance relationships between residents and responders

**Objective 1.1** Develop strong partnerships with Richmond-focused community organizations

<table>
<thead>
<tr>
<th>Action 1.1.1</th>
<th>Volunteer with EnRichmond to clean up Evergreen Cemetery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 1.1.2</td>
<td>Partner with Tricycle Gardens to provide volunteers for manual labor or events</td>
</tr>
<tr>
<td>Action 1.1.3</td>
<td>Volunteer with Friends of Chimborazo Playground to help maintain the space</td>
</tr>
<tr>
<td>Action 1.1.4</td>
<td>Connect with service-based organizations like Community Foundation, Hands on Greater Richmond, Rotary, Kiwanis, or Moose and help them with local charity events</td>
</tr>
</tbody>
</table>

**Objective 1.2** Develop a positive image of fire responders

<table>
<thead>
<tr>
<th>Action 1.2.1</th>
<th>Work closely with fire department public affairs officials to publicize &quot;good news&quot; stories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 1.2.2</td>
<td>Publish a community newsletter highlighting the most recent updates and activities within the fire department</td>
</tr>
</tbody>
</table>

**Objective 1.3** Increase visibility of fire responders throughout neighborhoods

<table>
<thead>
<tr>
<th>Action 1.3.1</th>
<th>Partner with ARC to install free smoke alarms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 1.3.2</td>
<td>Use October (Fire Prevention Month) to open the doors to the fire station</td>
</tr>
<tr>
<td>Action 1.3.3</td>
<td>Offer short fire prevention education sessions at Richmond Public School PTA meetings</td>
</tr>
</tbody>
</table>

**Education**

### Goal 2: Increase fire prevention education in Richmond

**Objective 2.1** Prioritize most vulnerable neighborhoods and block groups

<table>
<thead>
<tr>
<th>Action 2.1.1</th>
<th>Host fire safety classes at fire stations located in the most vulnerable areas of Richmond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 2.1.2</td>
<td>Collaborate with ARC to establish rally events that include education sessions and free smoke alarm installations</td>
</tr>
<tr>
<td>Objective 2.2</td>
<td>Build capacity for robust fire education program through use of external resources</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Action 2.2.1</strong></td>
<td>Develop a social media platform using the social media toolkits available in the Fire Prevention and Safety Digital Media Library on USFA's website</td>
</tr>
<tr>
<td><strong>Action 2.2.2</strong></td>
<td>Make use of the USFA's Fire Protection Technology link to train the trainer and ensure firefighters are up to date on the latest products and technologies within the industry</td>
</tr>
<tr>
<td><strong>Action 2.2.3</strong></td>
<td>Closely monitor new grant and funding opportunities for community education and protection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 2.3</th>
<th>Increase accessibility of educational materials for the Hispanic population</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action 2.3.1</strong></td>
<td>Disseminate fire prevention, preparedness, and escape plans translated into Spanish and available on the Richmond Fire Department website</td>
</tr>
<tr>
<td><strong>Action 2.3.2</strong></td>
<td>Create a local fire education program led by Spanish-speaking firefighters and present it to Hispanic communities</td>
</tr>
<tr>
<td><strong>Action 2.3.3</strong></td>
<td>Use pictographs, when necessary, available in the Fire Prevention and Safety Digital Media Library on USFA's website</td>
</tr>
<tr>
<td><strong>Action 2.3.4</strong></td>
<td>Develop Public Service Announcements in Spanish focused on fire safety to be aired on Spanish-speaking radio and television stations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 2.4</th>
<th>Target age-specific vulnerable populations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action 2.4.1</strong></td>
<td>Work with local American Red Cross chapter to present Pillowcase Project in Richmond City elementary schools</td>
</tr>
<tr>
<td><strong>Action 2.4.2</strong></td>
<td>Partner with Greater Richmond AgeWave to present a fire prevention class aimed at older adults</td>
</tr>
<tr>
<td><strong>Action 2.4.3</strong></td>
<td>Continue to present Richmond's Fifth Grade Fire Safety Education Program throughout city schools</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 2.5</th>
<th>Involve trusted organizations in the delivery of educational content and materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action 2.5.1</strong></td>
<td>Work with pastors to schedule a time for firefighters to address congregations</td>
</tr>
<tr>
<td><strong>Action 2.5.2</strong></td>
<td>Solicit assistance from pastors to identify hard-to-reach individuals who may be at a higher risk due to housing conditions or other factors</td>
</tr>
</tbody>
</table>
**Infrastructure**

<table>
<thead>
<tr>
<th><strong>Goal 3: Develop sustainable and reliable information infrastructure</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 3.1</strong></td>
</tr>
<tr>
<td><strong>Action 3.1.1</strong></td>
</tr>
<tr>
<td><strong>Action 3.1.2</strong></td>
</tr>
<tr>
<td><strong>Objective 3.2</strong></td>
</tr>
<tr>
<td><strong>Action 3.2.1</strong></td>
</tr>
<tr>
<td><strong>Action 3.2.2</strong></td>
</tr>
<tr>
<td><strong>Action 3.2.3</strong></td>
</tr>
<tr>
<td><strong>Objective 3.3</strong></td>
</tr>
<tr>
<td><strong>Action 3.3.1</strong></td>
</tr>
<tr>
<td><strong>Action 3.3.2</strong></td>
</tr>
<tr>
<td><strong>Action 3.3.3</strong></td>
</tr>
<tr>
<td><strong>Objective 3.4</strong></td>
</tr>
<tr>
<td><strong>Action 3.4.1</strong></td>
</tr>
<tr>
<td><strong>Action 3.4.2</strong></td>
</tr>
<tr>
<td><strong>Objective 3.5</strong></td>
</tr>
<tr>
<td><strong>Action 3.5.1</strong></td>
</tr>
<tr>
<td><strong>Action 3.5.2</strong></td>
</tr>
</tbody>
</table>
Relationships

Goal 1: Enhance relationships between residents and responders

Objective 1.1 Develop strong partnerships with Richmond-focused community organizations

WHO: RFD; Local non-profits; Service-based organizations

WHY: Partnering with non-profits and other organizations focused on improving various aspects of the city show RFD’s commitment to fostering a better environment for all its residents. Additionally, it is important to select organizations concerned with problems which affect the vulnerable populations impacted most by fires. Issues like preservation of minority history, Richmond’s food desert, and the lack of green space available to many minority communities are targeted and addressed by myriad organizations within the city and the RFD has the opportunity to assist these establishments in their mission.

HOW:

Action 1.1.1 Volunteer with EnRichmond to clean up Evergreen Cemetery. RFD should coordinate with EnRichmond to schedule a day where firefighters and their families provide crews to assist in the clean-up of Evergreen Cemetery, a minority cemetery of great historical significance.

Action 1.1.2 Partner with Tricycle Gardens to provide volunteers for manual labor or events. RFD should coordinate with Tricycle Gardens, a non-profit formed to address Richmond’s food desert and lack of healthy options in poor communities. RFD could provide volunteers for the urban gardens and orchard dispersed throughout the city. Volunteer opportunities include providing manpower to one of the many gardens around the city or working one of the events hosted by Tricycle Gardens.
**Objective 1.2**  Develop a positive image of fire responders

**WHO:** RFD; RRPDC; Local news affiliates

**WHY:** First responders have a unique position within our society because they are often the difference between life or death during an emergency. The general public must be able to trust first responders due to this relationship. Furthermore, firefighters are responsible for educating residents on preventative measures, so it is essential citizens trust the responders. Therefore, residents must have a positive image of their local firefighters.

**HOW:**

**Action 1.2.1**  *Work closely with fire department public affairs officials to publicize "good news" stories.* Public Affairs officials within the fire department should reach out to and build a relationship with NBC 12, CBS 6, and other local news affiliates. When the RFD is involved in a newsworthy story, RFD PAOs can reach out to their contacts at the news stations and ensure positive stories are reported to the general public.

**Action 1.2.2**  *Publish a community newsletter highlighting the most recent updates and activities within the fire department.* The fire department should produce a quarterly newsletter to be distributed to the city via social media. The newsletter should include photos and stories of local firefighters and how they are bettering Richmond through firefighting and beyond. The RRPDC should work with local emergency management to help distribute the newsletter as well. Additionally, one of the Central Virginia
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

Emergency Management Association’s (CVEMA) goals is to promote the region’s emergency management and first responders through stories and photos so CVEMA could serve as another outlet through which to disseminate the newsletter.

Objective 1.3 Increase visibility of fire responders throughout neighborhoods

WHO: RFD; RRPDC; ARC; Richmond Public Schools

WHY: Increasing visibility of fire responders helps to tear down barriers that naturally exist when people do not know each other. As communities engage with and interact with their local firefighters, they build relationships and trust builds because the community knows the firefighters are there to serve and protect.

HOW:

Action 1.3.1 Partner with ARC to install free smoke alarms. American Red Cross’s Home Fire Campaign provides up to three free smoke alarms per household. The Richmond Chapter and RFD should build a strong relationship where RFD schedules installation appointments throughout the city and ARC provides the alarms at no cost to the fire department or resident. Moreover, ARC can provide volunteers to install the smoke alarm(s) if the RFD is limited on manpower. Rally events are also an option where the RFD and ARC team up and host day-long events centered on fire prevention education and alarm installation.

Action 1.3.2 Use October (Fire Prevention Month) to open the doors to the fire station. RFD should host their residents at the fire station so communities have the chance to interact with their local responders and equipment, as well as host student tours through a partnership with Richmond Public Schools. Fire stations are staples in communities and allowing residents the chance to meet the firefighters and interact with fire engines in a great way to build trust as well as interest in fire prevention. These events can be used to further educate the public on ways to prevent fires as well as set up appointments to install free smoke alarms.

Action 1.3.3 Offer short fire prevention education sessions at Richmond Public School PTA meetings. This action targets two populations at once: children and young to middle-aged adults. Firefighters can provide short educational sessions at PTA meetings, teaching parents about fire prevention and how to educate their children at home. Additionally, face time with parents allows relationship building with the 25-50-year-old demographic. Lastly, firefighters can build close working relationships with Richmond Public Schools which could result in additional training time offered to the firefighters. This action could best be accomplished by establishing a dedicated liaison between RFD and the school system.
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

Education

Goal 2: Increase fire prevention education in the Richmond region

Objective 2.1  Prioritize most vulnerable neighborhoods and block groups

WHO: RFD; RRPDC; ARC

WHY: The study shows some of Richmond’s most vulnerable neighborhoods experienced the highest rates of fire over the three-year period. The southwest portion of the city to include Westover, Midlothian, and Jahnke, as well as Manchester, Blackwell, and Swansboro just south of the James River and Ginter Park, Brookland Park, and Barton Heights in the north side all had the highest numbers of fires combined with the highest social vulnerability indices. Educators should prioritize these areas of the city in an effort to immediately decrease the number of fires.

HOW:

Action 2.1.1  Host fire safety classes at fire stations located in the most vulnerable areas of Richmond. Engines 13 (411 East Commerce Road), 23 (495 LaBrook Concourse), and 14 (2932 Hawthorne Avenue) all reside within neighborhood boundaries identified as vulnerable and with the highest numbers of fires. Additionally, Engine 17 (2211 Semmes Avenue) falls just outside one of the neighborhood boundaries. These four fire engines should take the lead in hosting classes at their respective engines in order to educate their residents and simultaneously build relationships with those they serve.

Action 2.1.2  Collaborate with ARC to establish rally events that include education sessions and free smoke alarm installations. RRPDC, RFD, and ARC should coordinate for events to be held throughout the affected communities which serve to educate residents and take advantage of ARC’s Home Fire Campaign. “National Night Out,” held each August, is one opportunity for a rally event. Events could be held at fire stations, schools, religious organizations, or community centers. The primary intent of these events should be fire prevention education with a secondary goal of alarm installations.

Objective 2.2  Build capacity for robust fire education program through use of external resources

WHO: RFD; RRPDC; CVEMA; Richmond Office of Emergency Management (OEM)
WHY: Ample resources exist within the national fire community to support local fire safety and education programs. USFA lists public fire education in its mission and the organization is meant to support fire response across the nation. Richmond fire should establish an education program with existing research, tools, and media as its foundation, when possible. This allows for a more cost-efficient program formulated around methods of proven success. They should also take advantage of the available grant requests through USFA because there are millions of dollars awarded each year across the country to be used for fire education.

HOW:

**Action 2.2.1** Develop a social media platform using the social media toolkits available in the Fire Prevention and Safety Digital Media Library on USFA’s website. RFD should identify one or two individuals within the department to create the toolkit based on guidelines and materials readily available on USFA’s website. The available toolkits should serve as the primary resource in order to maximize consistency, with variations to accommodate for regional differences which may exist in Richmond when compared to other locations. RRPDC and CVEMA could serve as a distributor of the media in addition to RFD’s distribution methods.

**Action 2.2.2** Make use of the USFA’s Fire Protection Technology link to train the trainer and ensure firefighters are up to date on the latest products and technologies within the industry. RFD’s leaders on training should monitor this site on a regular basis and disseminate any new information to the firefighters in the field. Moreover, new technologies identified to be useful to RFD could be added to resourcing requests.

**Action 2.2.3** Closely monitor new grant and funding opportunities for community education and protection. RRPDC, RFD, and Richmond’s OEM should monitor USFA’s available grants listing and the RRPDC should work with RFD to assist in resourcing the fire department. These grants can be used to establish a robust, community-wide education program at no cost to the taxpayer. RFD should also take advantage of OEM’s State Homeland Security Program grants which can be applied to community outreach.

**Objective 2.3** Increase accessibility of educational materials for the Hispanic population

WHO: RFD; RRPDC; Office of Multicultural Affairs (OMA); Sacred Heart Center; Local news and radio affiliates

WHY: Two of the top five block groups with the most fires over the three-year timeframe fall within at least the 81st percentile for the number of Hispanic residents and two others fall within at least the 61st percentile. Given this data and combined with the statistic that 80 percent of all English Language Learners are Hispanic, it is reasonable to assume many of our Hispanic residents may
not speak English fluently. It is crucial fire education is available and presented in a way that affords 100 percent of the community to receive, interpret, and understand the data.

HOW:

**Action 2.3.1** Disseminate fire prevention, preparedness, and escape plans translated into Spanish and available on the Richmond Fire Department website. RRPDC and OMA should work in conjunction with the RFD to ensure the fire department is fully stocked with education materials translated into Spanish. The materials should be made available online as well as at schools, libraries, and any other community establishments where the Hispanic population has access.

**Action 2.3.2** Create local fire education program led by Spanish-speaking firefighters and present it to Hispanic communities. The Richmond Ambulance Authority and Richmond Police Department both have a Latino Youth Academy in which they host Hispanic students for education and training. RFD, in conjunction with the OMA, should create a similar program and present it to Spanish-speaking communities, irrespective of age. Presentations could take place at the Sacred Heart Center, a local non-profit geared towards improving Hispanic adult and child education, local fire stations, or Hispanic Heritage festivals throughout the city. RRPDC could act as the primary oversight and coordinating agency.

**Action 2.3.3** Use pictographs, when necessary, available in the Fire Prevention and Safety Digital Media Library on USFA’s website. Pictographs are a cost-efficient and effective method of communicating when there are language barriers present. RFD and RRPDC should locate the pictographs on USFA’s website and print them off to include in fire education materials. The pictographs should be made available during Spanish-speaking classes as well as at locations around the city where Hispanic populations visit such as religious facilities, schools, Latino grocery stores, and community centers.

**Action 2.3.4** Develop Public Service Announcements in Spanish focused on fire safety to be aired on Spanish-speaking radio and television stations. RRPDC should coordinate with Richmond’s OMA and the RFD to produce and air the PSAs. Additionally, the RRPDC should locate available grants for fire education to help pay for the PSAs.

**Objective 2.4** Target age-specific vulnerable populations

WHO: RFD; RRPDC
WHY: Children 14 and under and adults 65 and over comprise 28 percent of Richmond’s population. Four of the top five block groups with the highest numbers of fires are in at least the 65th percentile for number of children 14 and under and the 53rd percentile for number of adults 65 and over. Two of those block groups are in at least the 90th percentile for both age cohorts. Due to their vulnerabilities, these two age cohorts should be targeted through education meant specifically to address the challenges faced by children and aging adults with regards to fire safety and prevention.

HOW:

Action 2.4.1 Work with local American Red Cross chapter to present Pillowcase Project in Richmond City elementary schools. The RRPDC should contact Richmond Public Schools and the local ARC chapter to request initiation of this free program in the RPS system. The program itself would be taught by ARC but oversight by the RRPDC and RFD (as the overall responsible organization for fire safety in Richmond) should occur to ensure the program is meeting established benchmarks for success.

Action 2.4.2 Partner with Greater Richmond AgeWave to present a fire prevention class aimed at older adults. RFD should develop an age-specific program dedicated to educating adults 65 and over and using videos and data from the Fire Prevention and Safety Digital Media Library on USFA’s website. The courses could be taught at facilities who collaborate with AgeWave, as well as willing independent living facilities, retirement communities, and religious organizations.

Action 2.4.3 Continue to present Richmond’s Fifth Grade Fire Safety Education Program throughout city schools. This program was established and introduced in 1980 and has educated approximately 70,000 Richmond students. It also recognizes students who alerted their families of a house fire, proof of the program’s success. RFD should continue to implement the program, using the most up-to-date methods and materials made available through USFA’s website. The program should be updated annually to include any new information since the previous update.

Objective 2.5 Involve trusted organizations in the delivery of educational content and materials

WHO: RFD

WHY: Due to previously mentioned challenges involving some of the vulnerable populations and trust of government agencies, it may be necessary to enlist the help of trusted organizations within these communities. Religious organizations and service-based organizations are often beacons within majority-minority neighborhoods and, if leadership within these organizations endorse an
initiative, residents within the neighborhood are more likely to respond in a positive manner. Furthermore, this action provides RFD with an additional facility in which to present the materials.

HOW:

**Action 2.5.1 Work with pastors or other religious leadership to schedule a time for firefighters to address congregations.** RFD’s training leadership should outreach to religious leadership within these neighborhoods. RFD should explain the goals and objectives behind presenting fire education to congregations, which is to present important information with the support of a trusted individual from within the neighborhood. RFD could offer to address the congregation either during a Saturday or Sunday morning service, or during a mid-week gathering, which often occurs at may religious establishments. This action also allows for a mixed audience as religious congregations span multiple generations.

**Action 2.5.2 Solicit assistance from pastors to identify hard-to-reach individuals who may be at a higher risk due to housing conditions or other factors.** Pastors often have insight into their congregations that others may not have so RFD could work with community pastors to identify these high-risk individuals. Then, a plan could be developed to outreach to them whether it is through additional education materials, smoke alarm installations, or in-home visits should the individual have accessibility challenges.
**Infrastructure**

**Goal 3:** Develop sustainable and reliable information infrastructure

**Objective 3.1** Identify vulnerable populations within the city of Richmond

**WHO:** RFD; CURA

**WHY:** RFD must understand the socioeconomic characteristics of its area of operation if it hopes to preemptively address the house fire problem in the city. Research shows a potential correlation between highly vulnerable populations and the number of house fires within those populations’ communities so RFD should identify those areas of the city and concentrate their efforts accordingly.

**HOW:**

**Action 3.1.1** *Pull U.S. Census data on an annual basis to track the movement of vulnerable populations across the city.* RFD should identify someone within the department who can oversee the compilation of this data on a yearly basis. The individual should understand which data to collect and from where to collect it. Data on poverty rates, income, age, race, and housing are all essential to understand the makeup of the community as it pertains to vulnerability. Websites like American FactFinder provide the data in multiple forms.

**Action 3.1.2** *Reach out to CURA to provide any updates on population trends around the city.* CURA is an invaluable resource as the organization tracks the city’s demographic makeup and movement. The organization can also provide analysis and insight which could be used to not only understand the current picture, but also to predict future areas of vulnerability.

**Objective 3.2** Build and maintain an accurate and up-to-date database of residential fire occurrences around the city

**WHO:** RFD

**WHY:** Richmond Fire’s Records Management System (RMS) serves to provide local, regional, and nationwide organizations with an accurate picture of the city’s fire landscape. This data could be used to understand patterns and direct education and prevention efforts. However, data input must be accurate, consistent, and thorough to achieve effectiveness.
HOW:

**Action 3.2.1** *Enter residential fire data in its entirety into RMS.* Complete information should be entered as opposed to entering only the required information. Optional information currently includes fire origin, heat source, number of units within the structure, and smoke alarm effectiveness, to name a few, and this information is useful in the study of house fires as it pertains to pattern development. Therefore, it should be department policy that this information is included in every RMS entry.

**Action 3.2.2** *Implement robust department-wide training program on RMS.* Every station should have firefighters with the required knowledge base to input accurate data into RMS. This not only limits the number of errors present across the city’s system but also lends to a more robust data collection system. Ensure firefighters know how to access the system, manipulate data, and who to contact should they experience problems with the system. Lastly, create buy-in with the stations so they understand the importance of accurate data.

**Action 3.2.3** *Designate two individuals responsible for oversight of the database, a primary and a secondary.* The primary would maintain day-to-day responsibilities to include RMS training for the stations, as well as data collection, compilation, and clean-up. The secondary would maintain oversight and serve as a substitute in the event the primary is unavailable.

**Objective 3.3** Develop a mapping system which shows residential fire occurrences across the city based on vulnerable population locations.

WHO: RFD; RRPDC; CVEMA; OEM; CURA

WHY: Using population and fire data to create a visualization is a powerful way to both understand and communicate patterns across the city. Patterns create pathways to educate the targeted areas and education can lead to fewer fires. Maps are also a tool which can be distributed to stakeholders, used for educational purposes, and included in funding requests.

HOW:

**Action 3.3.1** *Map residential fires with most up to date demographics to determine patterns.* On an annual basis, RFD should take the census data acquired in Action 3.1.1 and the residential fire data acquired in Action 3.2.1 and combine it into a visual representation to show fire frequency in vulnerable neighborhoods. The information should be shared with the RRPDC and Richmond’s OEM for situational awareness.
**Action 3.3.2**  *Designate one individual to assume responsibility for oversight of the mapping system.* Since this action should only be completed once a year, it is recommended RFD designate one responsible party to assume oversight of the system. They should collect the necessary data, create the map(s), and ensure the results are shared across the department. RFD could consult with CURA for assistance in analyzing the data. Each fire station should be updated with the results; however, the fire stations located in the discovered pockets of susceptibility should receive prioritization.

**Action 3.3.3**  *Use mapping system to determine necessary changes to fire prevention and education program.* RFD’s mapping lead should provide clear feedback to RFD’s training and education lead regarding patterns between residential fires and vulnerable communities so the education program could be updated accordingly. This would ensure the education program targets specific areas which should be addressed. This could include a certain location, a certain vulnerable population, or a certain fire source.

**Objective 3.4**  *Establish a close partnership between RRPDC, RFD, and OEM*

**WHO:** RFD; RRPDC; OEM; CVEMA

**WHY:** As the primary regional planning agency, the RRPDC has the capability to assist RFD in various capacities to include technical expertise, plan construction and implementation, regional best practices, and potential partnerships with other stakeholder agencies as it pertains to fire preparedness and response. RFD has the primary responsibility of fire education, prevention, and response within the capital city, the most densely populated locality within RRPDC’s geographical scope. It is, therefore, imperative for RFD and RRPDC to maintain a close working relationship that is mutually beneficial.

**HOW:**

**Action 3.4.1**  *Hold quarterly meetings to ensure agencies have most up-to-date information.* RFD, RRPDC, and OEM should meet once a quarter to engage with one another on topics pertaining to fire preparedness and response within the city. This face-to-face time not only serves to enhance working relationships but affords the agencies the chance to provide pertinent updates. Updates from the RFD could include best practices that RRPDC and OEM could share with other fire response agencies around the region. Additionally, RFD representatives should regularly attend CVEMA meetings as a way to continue building relationships with other emergency response organizations around central Virginia.
Action 3.4.2  Work together to develop and implement fire prevention education plan for Richmond. While the RFD is the subject matter expert in fire prevention, the RRPDC has access to other response agencies within the region and this could be useful in plan development. Best practices from around the region, technical expertise, and assistance in securing funding are all areas in which the RRPDC can assist. For example, Action 1.2.3 discusses grants which are used to develop education programs for fire response and non-profit agencies, and the RRPDC could assist in obtaining these grants.

Objective 3.5  Develop ongoing collaboration between response and support organizations

WHO: RFD; RRPDC; CVEMA; CURA; ARC; Emergency management

WHY: While RFD maintains primary responsibility for fire preparedness and response, various agencies around the city have a vested interest in public safety. For this reason, it is imperative RFD collaborate with the different agencies to streamline communication, develop and implement best practices, and provide the most effective fire preparedness and response possible. Additionally, the RRPDC should conduct cross-agency coordination in order to maximize resources across the region.

HOW:

Action 3.5.1  Create a fire safety program within the Central Virginia Emergency Management Association (CVEMA) built on teamwork between fire departments, government agencies, and non-profits. The RRPDC should use the RFD to implement a pilot program built on heavy collaboration between CVEMA agencies and using resources available to the RFD through USFA’s website. RFD could take the lead on developing the plan in response to research provided to them through this study but should consider input from other fire departments as well as agencies within the preparedness and recovery communities like the American Red Cross.

Action 3.5.2  Enlist assistance from CURA. As part of their services, CURA analyzes social impacts of a program. RRPDC and RFD could work with CURA to provide feedback on the impacts of a fire safety program and/or any fire education provided to the vulnerable communities addressed in this study. This feedback could be used to improve the program. Furthermore, CURA could provide existing census data in the form of usable shapefiles to assist with the mapping of vulnerable populations.

Action 3.5.3  Include Richmond emergency management department in fire prevention initiatives. Emergency managers possess leverage within their communities and have a vested interest in public safety. The RRPDC and RFD should provide
Richmond’s emergency manager with updates to the construction and implementation of any fire safety initiative. This action allows the emergency manager a chance to provide feedback as well as assist with any implementation challenges (i.e. the manager can help RFD secure locations and times for fire safety presentations).

**Action 3.5.4  Replicate the methods used in this study throughout RRPDC’s footprint.** The RRPDC should work with the localities within its jurisdiction and collect the necessary data to understand each locality’s vulnerabilities. While the data in this plan pertains specifically to the city of Richmond, the methods used are applicable in any given location. The data can then be synthesized and specific plans can be tailored based on the findings in each location.
## Section VI: Implementation

### Goal 1: Enhance relationships between residents and responders

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<thead>
<tr>
<th>WHAT</th>
<th>WHO</th>
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<tbody>
<tr>
<td>Volunteer with EnRichmond to clean up Evergreen Cemetery</td>
<td>RFD; EnRichmond</td>
<td><img src="#" alt="Red cells for all quarters" /></td>
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<tr>
<td>Partner with Tricycle Gardens to provide volunteers for manual labor or events</td>
<td>RFD; Tricycle Gardens</td>
<td><img src="#" alt="Red cells for all quarters" /></td>
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<tr>
<td>Volunteer with Friends of Chimborazo Playground to help maintain the space</td>
<td>RFD; Friends of Chimborazo Playground</td>
<td><img src="#" alt="Red cells for all quarters" /></td>
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<tr>
<td>Connect with service-based organizations like Rotary, Kiwanis, or Moose and help them with local charity events</td>
<td>RFD; Service-based organizations</td>
<td><img src="#" alt="Red cells for all quarters" /></td>
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<tr>
<td>Work closely with fire department public affairs officials to publicize &quot;good news&quot; stories</td>
<td>RFD; RRPDC; Local news affiliates</td>
<td><img src="#" alt="Red cells for all quarters" /> <strong>Ongoing task; execute as necessary</strong></td>
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<tr>
<td>Publish a community newsletter highlighting the most recent updates and activities within the fire department</td>
<td>RFD; RRPDC</td>
<td><img src="#" alt="Red cells for all quarters" /> <strong>Ongoing task; execute quarterly</strong></td>
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<tr>
<td>Partner with ARC to install free smoke alarms</td>
<td>RFD; American Red Cross</td>
<td><img src="#" alt="Red cells for all quarters" /> <strong>Ongoing task; execute as necessary</strong></td>
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<td>Use October (Fire Prevention Month) to open the doors to the fire station</td>
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### Goal 2: Increase fire prevention education in Richmond

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<tr>
<th>WHAT</th>
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<tr>
<td>Host fire safety classes at fire stations located in the most</td>
<td>RFD</td>
<td>Q1</td>
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<td>vulnerable areas of Richmond</td>
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<td>Collaborate with ARC to establish rally events that include</td>
<td>RFD; RRPDC; American Red Cross (ARC)</td>
<td>Ongoing task; execute as</td>
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<td>education sessions and free smoke alarm installations</td>
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<td>Develop a social media platform using the social media toolkits</td>
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<td>Ongoing task; execute as</td>
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<td>available in the Fire Prevention and Safety Digital Media Library</td>
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<td>on USFA's website</td>
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<td>Make use of the USFA's Fire Protection Technology link to</td>
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<td>latest products and technologies within the industry</td>
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<td>Ongoing task; execute as</td>
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<td>community education and protection</td>
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<tr>
<td>Disseminate fire prevention, preparedness, and escape plans</td>
<td>RFD; RRPDC; Office of Multicultural</td>
<td>Ongoing task; execute as</td>
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<tr>
<td>translated into Spanish and available on the Richmond Fire</td>
<td>Affairs (OMA)</td>
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<td>Department website</td>
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# Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

## Goal 2: Increase fire prevention education in Richmond

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<tr>
<th>WHAT</th>
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<tr>
<td>Create a local fire education program led by Spanish-speaking</td>
<td>RFD; RRPDC; OMA; Sacred Heart Center</td>
<td>Year 1: Q1 Q2 Q3 Q4 Year 2: Q1 Q2 Q3 Q4 Year 3: Q1 Q2 Q3 Q4</td>
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<tr>
<td>firefighters and present it to Hispanic communities</td>
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<td>Ongoing task; execute as necessary</td>
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<td>Use pictographs, when necessary, available in the Fire Prevention</td>
<td>RFD; RRPDC</td>
<td>Year 1: Q1 Year 2: Q2 Year 3: Q3 Q4</td>
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<td>and Safety Digital Media Library on USFA’s website</td>
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<td>stations</td>
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<td>Work with local American Red Cross chapter to present Pillowcase</td>
<td>RFD; RRPDC; Richmond Public Schools</td>
<td>Year 1: Q1 Year 2: Q2 Year 3: Q3</td>
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<td>Project in Richmond City elementary schools</td>
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<td>Partner with Greater Richmond AgeWave to present a fire prevention</td>
<td>RFD</td>
<td>Year 1: Q1 Year 2: Q2 Year 3: Q3</td>
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<td>class aimed at older adults</td>
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<td>Continue to present Richmond’s Fifth Grade Fire Safety Education</td>
<td>RFD</td>
<td>Year 1: Q1 Year 2: Q2 Year 3: Q3</td>
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<td>Program throughout city schools</td>
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**Goal 3: Develop sustainable and reliable information infrastructure**

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<td>RFD</td>
<td>Year 1: Q1, Year 2: Q2, Year 3: Q3</td>
</tr>
<tr>
<td>Reach out to CURA to provide any updates on population trends around the city</td>
<td>RFD; CURA</td>
<td>Year 1: Q2, Year 2: Q3, Year 3: Q4</td>
</tr>
<tr>
<td>Enter residential fire data in its entirety into RMS</td>
<td>RFD</td>
<td>Year 1: Q1, Year 2: Q2, Year 3: Ongoing task; execute as necessary</td>
</tr>
<tr>
<td>Implement robust department-wide training program on RMS</td>
<td>RFD</td>
<td>Year 1: Q3, Year 2: Q4, Year 3: Q1</td>
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<td>Designate two individuals responsible for oversight of the database, a primary and a secondary</td>
<td>RFD</td>
<td>Year 1: Q4, Year 2: Q1, Year 3: Q2</td>
</tr>
<tr>
<td>Map residential fire occurrences with most up to date demographics to determine patterns</td>
<td>RFD; RRPDC; CVEMA; OEM</td>
<td>Year 1: Q2, Year 2: Q3, Year 3: Q4</td>
</tr>
<tr>
<td>Designate one individual to assume responsibility for oversight of the mapping system</td>
<td>RFD; RRPDC; CURA</td>
<td>Year 1: Q3, Year 2: Q4, Year 3: Q1</td>
</tr>
<tr>
<td>Use mapping system to determine necessary changes to fire prevention and education program</td>
<td>RFD; RRPDC; OEM</td>
<td>Year 1: Q4, Year 2: Q1, Year 3: Q2</td>
</tr>
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</table>
### Goal 3: Develop sustainable and reliable information infrastructure

<table>
<thead>
<tr>
<th>WHAT</th>
<th>WHO</th>
<th>WHEN</th>
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<tr>
<td>Hold quarterly meetings to ensure agencies have most up-to-date information</td>
<td>RFD; RRPDC; OEM; CVEMA</td>
<td>Q1 Q2 Q3 Q4; Q1 Q2 Q3 Q4; Q1 Q2 Q3 Q4; Ongoing task; execute quarterly</td>
</tr>
<tr>
<td>Work together to develop and implement fire prevention education plan for Richmond</td>
<td>RFD; RRPDC</td>
<td>Year 2; Year 3; Ongoing task; execute as necessary</td>
</tr>
<tr>
<td>Create fire safety program within the Central Virginia Emergency Management Association (CVEMA) built on teamwork between fire departments, government agencies, and non-profits</td>
<td>RFD; RRPDC; OEM; CVEMA</td>
<td>Year 3; Plan Dev.</td>
</tr>
<tr>
<td>Enlist assistance from CURA</td>
<td>RFD; RRPDC; CURA</td>
<td>Year 3; Ongoing task; execute as necessary</td>
</tr>
<tr>
<td>Include Richmond emergency management department in fire prevention initiatives</td>
<td>RFD; RRPDC; OEM</td>
<td>Year 3; Ongoing task; execute as necessary</td>
</tr>
<tr>
<td>Replicate the methods used in this study throughout RRPDC’s footprint</td>
<td>RRPDC</td>
<td>Ongoing task; execute as necessary</td>
</tr>
</tbody>
</table>

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3. Richmond Regional Planning District Commission Mission Statement accessed on October 2, 2018 on RRPDC’s website.
Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities

5 U.S. Fire Administration, 2018.
6 U.S. Census Bureau American Community Survey 5-year estimate 2016 data retrieved from American FactFinder, 2018.
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10 U.S. Census Bureau, ACS 1-year estimate 2017 data, 2018.
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16 U.S. Census Bureau, ACS 5-year estimate 2017 data, 2018.
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21 Ibid.
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26 U.S. Fire Administration, 2018.
28 Ibid.
29 U.S. Fire Administration, 2018.
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31 David Mechanic and Jennifer Tanner, “Vulnerable People, Groups, and Populations: Societal View.”
32 U.S. Fire Administration, 2018.
33 Brenda Conway and Jordan Pike, “Hospital Response for Children as a vulnerable population in radiological/nuclear incidents,” 58.
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35 Ibid.
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41 Aday, “At Risk in America,” 6.
43 Aina Tarabini, “Education and poverty in the global development agenda: Emergence, evolution and consolidation,” 205.
44 Aday, “At Risk in America,” 6.
48 Damas Philip and Israt Rayhan, “Vulnerability and poverty: What are the causes and how are they related?,” ii.
49 Aday, “At Risk in America,” 6-7.
53 Aday, “At Risk in America,” 3.
54 Ibid.
56 Ibid.
57 Ibid.
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59 Ibid.
60 Ibid., 1,056.
63 Marcia Marker Feld and Patricia Baron Pollak, “Advocacy Planning.”
64 Michael McQuarrie, “The Just City by Susan Fainstein,” 338.
65 Leonie Sandercock, “The Democratization of Planning: Elusive or Illusory?,” 437.
67 Ibid.
68 Ibid.
70 Kathryn Quick and Martha Feldman, “Distinguishing Participation and Inclusion,” 274.
71 Ibid.
References


Residential Fire Impacts on Richmond, Virginia: A plan for identifying and educating our most vulnerable communities


### APPENDIX A: Correlation coefficient with education as factor

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<th></th>
<th>65</th>
<th>14</th>
<th>Poverty</th>
<th>Minority</th>
<th>Multifamily</th>
<th>Education</th>
<th>Disability</th>
<th>SVI</th>
<th>Total Fires</th>
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<td>65</td>
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<td>Multifamily</td>
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<td>SVI</td>
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<td>0.774</td>
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<td>0.563</td>
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<tr>
<td>Total Fires</td>
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<td>0.618</td>
<td>0.437</td>
<td>0.566</td>
<td>0.168</td>
<td>0.612</td>
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</tbody>
</table>

APPENDIX C: Links to resources found in recommendations

https://enrichmond.org/everygreen-cemetery/


https://enrichmond.org/partners/friends-of-chimborazo-playground/

https://www.handsonrva.org/


https://www.usfa.fema.gov/prevention/outreach/media/

https://www.usfa.fema.gov/training/

https://www.usfa.fema.gov/grants/

http://www.agewellva.com/

https://cura.vcu.edu/

https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

http://www.richmondregional.org/CVEMA/CVEMA-Home.htm