

---

# Mobility Impairment, Elevators, and Climate Change in New York Public Housing A Case Study of Harlem Developments

JUNE 2023

**YALE CENTER ON  
CLIMATE CHANGE  
AND HEALTH**

---

---

#### **AUTHORS**

**Chiara Agnello**, Yale School of the Environment  
**Ryan Anderson**, Yale School of the Environment  
**Mitchell Manware**, Yale School of Public Health  
**Anna Stouffer**, Yale School of Public Health  
**Khang Tran**, Yale School of Public Health  
**T. Dorje Wu**, Yale School of the Environment  
**Melody Yang**, Yale School of the Environment  
**Emma Zehner**, Yale School of the Environment

#### **FACULTY ADVISOR**

**Daniel Carrión**, PhD, MPH

#### **COMMUNITY PARTNER: COMMUNITY VOICES HEARD**

Established in 1994, Community Voices Heard (CVH) is a member-led organization that serves and is comprised of people of color and low-income families in New York State. CVH's mission to impel a truly just future is rooted in grassroots organizing, leadership development, and policy change. In order to realize this goal, CVH addresses current inequities in four primary issue areas: housing justice, investment in public housing, equitable development and economic justice, and support for Black female leadership.<sup>1</sup> This report specifically responds to NYCHA residents' concerns about frequent elevator outages and poor elevator conditions. This report aims to quantify and outline the public health impacts of the challenge – both in everyday life and in increasingly common disaster scenarios. The student team worked in partnership with CVH as part of a course, EPH 555/ENV 959 Clinic in Climate Justice, Law, and Public Health, to document residents' experiences with NYCHA elevators and analyze relevant secondary data.

---

## EXECUTIVE SUMMARY / 5

## BACKGROUND / 7

- A The Scale of the Elevator Problem / 7
- B Mobility Impairments in NYCHA Developments / 7
- C Elevator Outages and Disaster Evacuation / 10
- D Recent Efforts to Address Elevator Outages / 12
- E Importance of Study / 14

## HARLEM CASE STUDY / 15

- A Secondary Data on Elevators and Mobility Impairments / 15
- B Survey Data Results / 16
  - 1. Key Findings: Mobility Impairment and Elevator Usage Analysis / 17
  - 2. Key Findings: Disaster Preparedness Analysis and Findings / 21
  - 3. Impacts of Climate Change in Harlem / 22

## DISCUSSION / 27

- A Areas of Opportunity / 29

## CONCLUSION / 31

## ACKNOWLEDGEMENTS / 32

## REFERENCES / 33

## APPENDIX / 39

---

---

This page was intentionally left blank.

---

# EXECUTIVE SUMMARY

The New York City Housing Authority (NYCHA)—the largest public housing authority in North America—is home to 1 in 16<sup>i,2</sup> New York City residents. Established in 1935 to provide affordable housing to low- and moderate- income New Yorkers, NYCHA currently manages 277 public<sup>3</sup> developments. These buildings are home to about 340,000 people, who predominantly identify as Black or Hispanic.<sup>ii,4</sup> In recent decades, while housing has increasingly been recognized as a key determinant of health, some NYCHA residents have continued to live with lead, asbestos, mold, and maintenance breakdowns like leaks and power outages.<sup>5</sup> A 2018 survey of NYCHA residents in Far Rockaway found that one quarter of respondents believe housing conditions directly negatively affect their physical health. One third believe that housing conditions negatively affect their mental health.<sup>6</sup>

Among a long list of maintenance issues, broken elevators are cited by residents as a key concern.<sup>7</sup> In 2018, NYCHA recorded 44,000 elevator outages.<sup>8</sup> Reported outages have gradually declined in recent years under a contract with the U.S. Department of Housing and Urban Development (HUD), but outages are still an everyday reality.<sup>9</sup> Elevator outages in buildings that are often 15 to 30 stories high<sup>10</sup> pose various challenges for the 31,000 NYCHA residents with mobility impairments, the 76,000 residents who are over the age of 62,<sup>iii</sup> and the many residents with chronic conditions like asthma and cardiovascular disease, all of whom may find it challenging or impossible to climb the stairs.<sup>11</sup> Outages have the potential to exacerbate or introduce new health challenges: without consistent elevator service, residents may face isolation, fail to refill important medications, or fall when attempting to use the stairs.

Elevators also play a critical role in helping residents with mobility impairments evacuate during disasters. In 2012, for example, Hurricane Sandy shut down 700 elevators, trapping residents in their homes for days to weeks.<sup>12</sup> While NYCHA's climate resiliency planning and emergency preparedness strategies have evolved since Hurricane Sandy, mobility impairments and other health conditions are not thoroughly addressed in disaster preparedness and emergency response plans.<sup>13</sup> For example, a 2015 audit of NYCHA's processes found that NYCHA had incomplete or inaccurate contact information for residents with disabilities.<sup>14</sup>

While elevator outages are a widespread issue across NYCHA developments, this study focuses on Harlem developments as a case study because of its high proportion of residents with mobility impairments and high proportion of developments located in flood-prone areas. The proportion of residents with mobility impairments is higher in Harlem (9.20%) compared to NYCHA

**i**  
This figure includes NYCHA's public housing developments (the focus of this project) as well as residents in NYCHA's Section 8 and PACT/RAD programs. This project focuses specifically on public housing funded through Section 9 (as opposed to Section 8 vouchers that can be used in eligible apartments across the city outside of public housing developments) and PACT/RAD programs where NYCHA has converted its units to private management. When we make compare NYCHA developments in specific neighborhoods throughout the report, we are only referring to the 277 Section 9 developments.

**ii**  
The 2022 NYCHA Development Data Book reports residents' race in the following categories: Black, White, Hispanic, Asian, Other. The Book does not further specify the source of the data or whether or not some residents identify with multiple of the five categories listed. The percentages are presented as mutually exclusive.

**iii**  
There is significant overlap between number of reported residents with mobility impairments (31,000) and residents over 62 years of age (76,000).

developments overall (8.80%).<sup>15</sup> Harlem developments also experience more monthly elevator outages and longer elevator outages.<sup>16</sup> While about 19% of all NYCHA developments are located in Hurricane Evacuation Zones 1 and 2 (the most at risk), almost 27% of Harlem NYCHA developments are located within Hurricane Evacuation Zones 1 and 2. Harlem, like the rest of New York City, is also expected to see a growing number of extreme heat days each year.<sup>17</sup>

This report summarizes the results of this study, which involved 1) analyzing publicly available data on NYCHA service requests, climate risk, and public health metrics and 2) conducting a survey of NYCHA residents in Harlem developments.

Ninety-four residents representing at least eight NYCHA developments completed our survey online or in person. We selected developments in Harlem that, based on previous analysis, have poor elevator condition ratings and a high proportion of residents with reported mobility impairments. About one-third of survey respondents reported that they or someone in their household had a mobility impairment. Respondents on average rated elevators a 3.46 out of 10 for reliability. 88% of residents surveyed with mobility impairments were unable to leave or enter their apartment due to elevator outages at least once, compared with 55% of residents without mobility impairments. Residents reported having received varying levels of disaster preparation education and having taken individual actions to prepare (e.g., flashlights, emergency kit).

NYCHA serves 6% of New York City's population<sup>iv</sup>, and therefore plays a key role in dictating quality of life for city residents and providing residents with the tools to live with growing climate threats.<sup>18</sup> This report builds on previous surveys and research quantifying the impacts of elevator outages, with a specific focus on how outages impact residents with mobility impairments and other conditions, and how climate risks threaten to amplify these impacts.

**iv**

This figure again refers to all residents served by NYCHA (Section 8, Section 9, and PACT/RAD). If we just consider Section 9 apartments, NYCHA serves about 4% of New York City's population.

---

# BACKGROUND

## A. The Scale of the Elevator Problem

*“There are no words to describe them. If they’re broken, you better have bought your food the day before. Can’t count on housing to fix it.”*

— NYCHA resident referring to frequent elevator outages

Across its 277 developments, NYCHA is responsible for 3,224 elevators that collectively average 3 million trips each day.<sup>19</sup> While NYCHA has a \$74 million annual budget for elevator maintenance,<sup>20</sup> it would require an estimated \$1.5 billion over a five-year period to properly repair elevators.<sup>21</sup> About half of all NYCHA buildings, many of which are 15 to 30 stories,<sup>22</sup> have a single elevator configuration.<sup>23</sup> Elevator upkeep is staffed by a team of 400, including 193 mechanics.<sup>24</sup> Despite their importance in everyday building functions, elevators are frequently out of service in NYCHA developments.

Advocates, journalists, and the City of New York have made several efforts to quantify power outages, including elevator outages, and other service requests, through analysis of publicly available data and surveys. NY1 News found that from 2012 to 2018, the number of elevator outages per year increased by 16% from 38,000 to 44,000 and that elevators took, on average, 12 hours to repair.<sup>25</sup> A December 2022 NYCHA survey of almost 800 residents found that, after sanitation concerns, residents were most concerned about safety and repair tickets being inappropriately closed before repairs were completed.<sup>26</sup> Further, as of 2020, almost one-third of elevators were “beyond their useful life of 20 years” and an additional 1,237 were within five years of reaching the end of their useful lives.<sup>27</sup> Of the 3,163 passenger elevators (61 are freight elevators), 1,560 (49%) are “single-elevator configurations,” meaning that residents rely on the sole elevator and residents have no alternative in the case of a breakdown.<sup>28</sup> Elevator outages can prevent residents from leaving their apartments and can trap people in broken elevators.<sup>29</sup>

## B. Mobility Impairments in NYCHA Developments

NYCHA’s housing conditions, including frequent elevator outages, prevent residents with mobility impairments from leaving their apartments and, therefore, accessing key lifelines like medical care. Fully functioning elevators are also a necessary component of emergency evacuation planning for residents with mobility impairments – if elevators break down, residents may be stranded. NYCHA and the

---

City of New York broadly encourage households to develop their own evacuation plans and prepare emergency kits, though a 2014 survey by NYCHA found that only 56% of residents reported having a plan.<sup>30</sup> NYCHA encourages residents with mobility impairments to sign up to receive NYCHA alerts on service outages, restorations, and emergency management and to inform NYCHA, through the online Emergency Assistance Registration Form, if they have a mobility or vision impairment and require daily medication or “life-sustaining equipment.”<sup>31</sup> With this information, NYCHA can better coordinate with other City agencies and partners to deliver important services,” according to a 2013 City of New York press release.<sup>32</sup>

In the case that the mayor orders evacuation as a result of a coastal storm or hurricane, “people with disabilities or other access or functional needs, who have no other options to evacuate safely, can request transportation assistance [from the city].”<sup>33</sup> One resident, who is a member of NYCHA’s Network for Climate Action (a series of resident workshops on climate and environmental issues led by NYCHA), said that residents in her development developed an evacuation plan for the entire development: “We distributed the booklets and informed our residents.”<sup>34</sup> While there are options for residents facing mobility impairments and broken elevators, there isn’t one consistent strategy for the scale that may be required in the event of a storm or other emergency.

According to the University of Washington, a mobility impairment is broadly defined as any “disability that affects movement ranging from gross motor skills, such as walking, to fine motor movement, involving manipulation of objects by hand.”<sup>35</sup> Elevator outages can also impact residents with health problems not traditionally considered “mobility impairments.” Based on our conversations with stakeholders and the project’s focus on elevator access, we expanded our study to consider additional health conditions, such as vertigo and asthma, that may inhibit or prevent people from using the stairs.

Under this definition, elevator malfunction is not merely an inconvenience to residents living in multi-story buildings, but can entirely preclude people with mobility impairments from entering or leaving their apartments. Notably, elevators are the primary means by which many people, including the 31,000 NYCHA residents with mobility impairments, travel to and from their homes.<sup>36</sup> Compared to the 6.9% of New Yorkers with a disability,<sup>37</sup> nearly 20% of NYCHA residents report having a disability.<sup>38</sup>

Older adults are particularly likely to report mobility challenges. On average, 20% of residents in a given NYCHA development are 62 and over.<sup>39</sup> However, there are 52 NYCHA developments that are either partially or completely designated for senior residents.<sup>40</sup> A 2009 survey of NYCHA residents found that nearly 30% of tenants 65 years and older reported at least one basic activities of daily living (BADL) limitation

and nearly 93% reported at least one diagnosed chronic condition.<sup>41</sup> The researchers also found a strong correlation between income and prevalence of BADL limitations. Residents living below the federal poverty line were 2.5 times more likely to have BADL limitations than their moderate income (>200% of FPL) counterparts.<sup>42</sup>

Therefore, when elevators break down, residents facing mobility impairments and other health conditions lose a key lifeline to a range of support services, including medical care. Most residents have health insurance,<sup>43</sup> but there are still barriers to accessing related care. More than 10% of older residents surveyed said they did not have a personal physician and 13% said they forwent medication due to costs in the past year.<sup>44</sup> One resident of an Upper West Side development told NY1 News that an elevator outage in his building lasting two weeks caused him to miss surgery: “I really couldn’t survive now if it wasn’t for [my] home health aide.”<sup>45</sup> Furthermore, door-to-door transportation services are relatively underutilized among the older NYCHA resident population, who may be unable to leave their buildings; 68% of older residents with a BADL limitation or mobility-limiting arthritis did not use transportation services such as the Metropolitan Transit Authority’s (MTA) Access-A-Ride.<sup>46</sup> Access-A-Ride is designed to provide transportation services (as an alternative to subways and buses) for residents with mobility impairments or other health conditions,<sup>47</sup> but has faced criticism in recent years for not responding to residents’ ride requests or for sending late drivers.<sup>48</sup>

In addition to mobility impairments, a range of other health conditions impact residents’ ability to use the stairs. Further, many health conditions common among NYCHA residents are in part a result of NYCHA’s poor housing conditions (e.g. poor ventilation triggers asthma): “The line between housing conditions and chronic disease is fairly straight,” a reporter wrote in *Politico*.<sup>49</sup> Asthma offers one example of a condition that is both common in NYCHA developments and may prevent residents from climbing up or down multiple flights of stairs in the case of an elevator outage. Data from the New York City Department of Health and Mental Hygiene suggests that residents in public housing may have higher rates of asthma than other New Yorkers:<sup>50</sup> higher rates of asthma hospitalizations are correlated with a higher concentration of public housing developments and asthma has been named the number one health concern for children living in NYCHA housing.<sup>51</sup> Poor ventilation and exposure to allergens can trigger asthma attacks. For example, the Bronx has the highest percentage of tenant complaints of mice and rats, the most reported cockroach infestations, and the highest rate of asthma of the boroughs.<sup>52</sup>

Older NYCHA residents also face a range of other health challenges: almost 80% of older NYCHA residents reported that they had been diagnosed with two or more chronic conditions, such as diabetes, hypertension, high cholesterol, arthritis, or osteoporosis.<sup>53</sup> The prevalence of BADL limitations among older NYCHA tenants coincides with some of these other ailments.<sup>54</sup> The prevalence of mobility

impairments and other health conditions among NYCHA residents is greater than both the national average and New York City average, but is relatively consistent with similar low-income populations.<sup>55</sup>

### C. Elevator Outages and Disaster Evacuation

The issue of elevator maintenance within NYCHA housing may be indicative of broader problems of poor housing conditions in NYCHA developments. Poor housing conditions can manifest in numerous ways, including in fire safety concerns. Safe heating is a right in most cities in the United States, including New York City,<sup>56</sup> but when this right is not met during cold weather conditions, residents may resort to unsafe heating methods. According to the National Fire Protection Association, heating equipment is the second most common cause of fires.<sup>57</sup> Previous research has shown a high correlation between heat complaints and structural fires.<sup>58</sup> Further, these fires tended to occur in districts with high populations of Black and Latino residents.<sup>59</sup>

Regardless of the cause of a fire, in the event of a fire emergency, evacuation is sometimes required to ensure the safety of building occupants. Although NYCHA advises against using elevators in disaster situations, there is a growing body of literature about the utility of elevators in fire evacuation. For those with mobility impairments, using elevators for evacuation offers several benefits including speed of evacuation, familiarity and ease of use, and the ability to retain one's mobility device.<sup>60</sup> Evacuation with elevators allows people with mobility impairments to self-evacuate and using elevators in emergency situations reduces fatigue and exhaustion.<sup>61</sup> Self-agency in emergency situations can be important for removing the fear of being left behind or being isolated.

Climate change impacts, including more frequent and intense flooding from hurricanes and an increased frequency of extreme heat days, will likely increase the prevalence of power outages and broken elevators and amplify the challenges faced by residents who are reliant on functioning elevators. A growing body of research focuses on the health impacts of climate change, including the consequences of power outages and elevator failures, on residents' short- and long-term health. Nationally, advocates are also highlighting the failure of many emergency-response plans to include strategies accessible to residents with disabilities. Agencies like the Federal Administration for Community Living have put together best practice recommendations and resources for local emergency planners to better include people with disabilities and older adults.<sup>62</sup>

Coastal flooding, resulting from hurricanes or other extreme weather events, is increasingly seen as a public health threat. Power outages in high-rise buildings

have caused cardiac arrest in residents attempting to climb the stairs.<sup>63</sup> Sheltering in housing without elevator service prevents residents from accessing medical care, medications, or home-based services.<sup>64</sup> Although researchers would expect that households with older populations or residents with more mobility impairments would be more likely to evacuate, one study found that “there is a propensity of elderly populations to shelter in place,” which may lead to worse health outcomes.<sup>65</sup> Other studies have found that socially isolated older people with mobility impairments are less likely to have completed disaster mitigation actions prior to an event.<sup>66</sup>

Hurricane Sandy, which struck New York City in 2012 and whose impacts have been partially tied to human-caused climate change,<sup>67</sup> illustrated how extreme weather can further aggravate the problems of elevator outages. The storm was the most “costly and destructive” disaster to impact NYCHA developments and knocked out about 700 elevators at NYCHA properties, trapping many elderly and disabled residents in their buildings for days to weeks.<sup>68</sup> Hurricane Sandy impacted almost 10% of all housing units in the city, but impacted 20% of all NYCHA public housing units.<sup>69</sup>

Researchers have studied the physical and mental health impacts of the storm from many angles. Hernández et al. found that public housing residents who did not evacuate from homes felt unsafe (as a result of fewer residents and staff) and described symptoms commonly associated with post-traumatic stress.<sup>70</sup> Older residents were disproportionately impacted; residents 65 years and older comprised about half of deaths in New York City during Hurricane Sandy. After Hurricane Katrina, a similar pattern emerged: residents over 60 years old made up 71% of deaths in Louisiana.<sup>71</sup>

Extreme heat days, which are expected to increase in frequency due to climate change, can also disrupt elevator service. Increased demand on air conditioners may increase the frequency of power outages.<sup>72</sup> One study found that most of the neighborhoods with the highest heat vulnerability in the city have a higher density of 311 calls related to power outages.<sup>73</sup> In the summers between 2014 and 2020, 22% of total power outage 311 calls came from hotspots in the Bronx and Harlem.<sup>74</sup> Half of NYCHA’s residents live in city neighborhoods that are highly vulnerable to heat.<sup>75</sup> Heat vulnerability is a function of temperature, access to air conditioning, poverty, and proximity to green spaces, among other factors.<sup>76</sup> More people in New York City die from extreme heat than from other natural disasters combined,<sup>77</sup> and Black residents are disproportionately likely to die from heat-related illnesses.<sup>78</sup> A 2019 study found that while 90% of New York City residents have access to air conditioners, the reported number for NYCHA residents is only about 50%.<sup>79, v</sup> Elevator outages that trap people on high floors without proper cooling systems can have life-threatening implications.<sup>80</sup>

v Residents are required to register their air conditioners and pay a fixed fee for the energy. Reports state that some residents have unregistered air conditioners because of the fee, so this percentage may be higher in reality.

One of the City's key strategies for addressing the impacts of extreme heat is its operation of cooling centers, community spaces where anyone can gather in air conditioning during extreme heat.<sup>81</sup> However, this strategy still relies on residents leaving their buildings through elevators and then accessing reliable public transportation if needed: "Availability and awareness of affordable, reliable and convenient transportation that integrate accommodation for people with disabilities play key roles in cooling center utilization and can thereby significantly reduce the impact of heat on health in the state."<sup>82</sup> Elevators can also be part of "transportation" considerations.

#### D. Recent Efforts to Address Elevator Outages

The pressing need to address broken elevators, and prepare for the impacts of climate change, has received growing attention. Efforts to address elevators have included legal action, increased funding, and community-based organizing.

- **Legal Action:** Under the American with Disabilities Act,<sup>83</sup> NYCHA is legally obligated to maintain a fully functioning passenger elevator. Despite this legal obligation, NYCHA has not met these responsibilities.<sup>84</sup> Although courts have ordered settlements requiring NYCHA to improve its requests for accommodations, these measures only seem to be temporary solutions as issues continue to surface.<sup>85</sup>
- **Additional Funding:** In early January 2023, Mayor Eric Adams and Governor Kathy Hochul announced \$300 million in funding to replace 335 elevators at 20 NYCHA developments.<sup>86</sup> These upgrades will theoretically impact 34,000 residents.<sup>87</sup> Six of the 20 developments are senior-designated.<sup>88</sup> Upgrades are projected to finish by December 2028.<sup>89</sup> The federal government has allocated an additional \$55 million to replace 78 elevators at six developments, prioritized by conditions assessments. The state has allocated another \$81 million for elevator replacements.<sup>90</sup>
- **Privatization:** Federal funding for public housing has decreased in recent decades, leading to deferred maintenance. HUD has responded, in part, with the Permanent Affordability Commitment Together (PACT) Program/Rental Assistance Demonstration Program (RAD), which allows private companies to take over management and maintenance fixes. From 2016 to 2021, private developers had privatized almost 10,000 units through PACT/RAD.<sup>91</sup> RAD converts traditional public housing into Section 8 project-based public housing units. Residents have expressed concern that privatization may lead to displacement pressures, and a 2021 report by the Human Rights Watch found, that "PACT has negatively impacted the right to housing of low-income residents

by leading to a reduction in oversight and crucial protections for tenants' rights..."<sup>92</sup> NYCHA requires PACT developments to meet certain resiliency and green building standards.<sup>93</sup>

- **Advocacy:** Tenants and community-based organizations have organized around poor living conditions, including elevators, for decades. For example, in its 2022 *Extreme Heat Policy Agenda*, WE ACT for Environmental Justice recommended additional NYCHA funding, including funding for the explicit purpose of ensuring elevators are functioning.<sup>94</sup>
- **Federal Action:** In 2019, NYCHA entered into an agreement with the U.S. Office of Housing and Urban Development and the City of New York, committing to 14 actions related to the conditions of NYCHA elevators.<sup>95</sup> Requirements ranged from providing at least quarterly data on elevator service interruptions, replacement of certain elevators, and targets for an upper limit of outages per elevator annually. (See Appendix 1 for the full list of agreements).<sup>96</sup>
- **State Action:** In 2022, New York Governor Kathy Hochul enacted two state laws related to NYCHA transparency.<sup>97</sup> The first requires NYCHA to create a searchable database of work tickets and the second requires the city to make information about public housing code violations publicly accessible.<sup>98</sup>
- **NYCHA Climate Adaptation Planning:** After Hurricane Sandy in 2012, NYCHA created an Office of Recovery and Resilience within its Capital Projects Division.<sup>99</sup> Several efforts since resulted in the 2021 NYCHA Climate Adaptation Plan, which details NYCHA's efforts to address extreme heat, extreme rain, and coastal flooding threats. The plan outlines NYCHA's air conditioning demonstration program in one development, provision of free air conditioners to residents over 65 years of age during COVID-19, installation of generators at 200 buildings, and elevation and floodproofing of certain mechanical equipment.<sup>100</sup> The plan briefly mentions the need to prioritize populations with mobility challenges in its extreme heat planning: "programs that seek to protect NYCHA residents from extreme heat should pay special attention to residents with underlying health conditions and with limited mobility. Department of Health and Mental Hygiene recommends that when NYCHA determines which developments are most in need of interventions aimed at improving thermal safety, it looks first at building residents' rate of access to cooling and the proportion of residents with registered mobility impairments or dependence on life-sustaining medical equipment."<sup>101</sup> The report also reflected on the implications of power outages during Hurricane Sandy: "The interruption of essential building utilities created serious public health and safety concerns for NYCHA residents limiting their mobility and access to health care due to egress issues, as well as the ability to engage in necessary daily activities."<sup>102</sup>

- **NYCHA Emergency Management Planning:** After a 2015 audit by the city’s comptroller office highlighted significant deficiencies with the authority’s emergency preparedness planning, NYCHA has coordinated several of its disparate emergency management planning efforts into the Operations Support Services Department and is developing the Comprehensive Emergency Management Plan (NYCHA’s first master emergency plan).<sup>103</sup>

## E. Importance of Study

Elevators play a critical role in both every day and emergency situations. In a rapidly changing climate, evacuation has been identified as an important adaptation strategy. Many areas of New York City, including Harlem, have been identified as flood prone and vulnerable to heat. As large-scale flooding and heat events become more common in the future, it is crucial that all residents have access to the infrastructure for safe and timely evacuations. For older residents and residents with mobility impairments in NYCHA housing, this means ensuring elevators are in working order and ready to meet any potential emergency response needs.

# HARLEM CASE STUDY

## A. Secondary Data on Elevators and Mobility Impairments

Residents in NYCHA developments across the city have high rates of mobility impairments and face routine elevator outages.<sup>104</sup> Harlem developments in particular face challenging conditions: 9.20% of residents have mobility impairments compared to the 8.80% in NYCHA developments in the rest of New York City (TABLE 1).<sup>105</sup> NYCHA's 2019 *Elevator Action Plan* offered insights into the conditions of elevators by development.<sup>106</sup> While elevators in Harlem developments received a better average condition rating than those in the rest of New York City (2.55 versus 2.93 on a scale of 1 to 5 with 5 being the worst), Harlem developments consistently experienced more outages per month and longer outage durations (10.94 hours compared to 8.36 hours) than the rest of the city (TABLE 2).<sup>107</sup> NYCHA rated elevators based on the elevators' "remaining useful life and deficiencies" and "number of outages, work order tickets, and availability of parts."<sup>108</sup>

TABLE 1 RESIDENT DEMOGRAPHICS IN HARLEM VERSUS NEW YORK CITY (EXCLUDING HARLEM)

	Harlem	NYC excluding Harlem
Percentage of residents with mobility impairments <sup>vi</sup>	9.20%	8.80%
Percentage of residents over the age of 62	22.60%	22.66%

Data Source: 2019 Elevator Action Plan.

TABLE 2 ELEVATOR STATISTICS IN HARLEM VERSUS NEW YORK CITY (EXCLUDING HARLEM)

	Harlem	NYC excluding Harlem
Condition rating (1 = good; 5 = poor)	2.55	2.93
Outages per month 2019 (year-to-date)	1.34	1.03
Average outage duration 2019 (year-to-date; hours)	10.94	8.36
Percentage of elevators 20 years and older	0.024%	0.030%

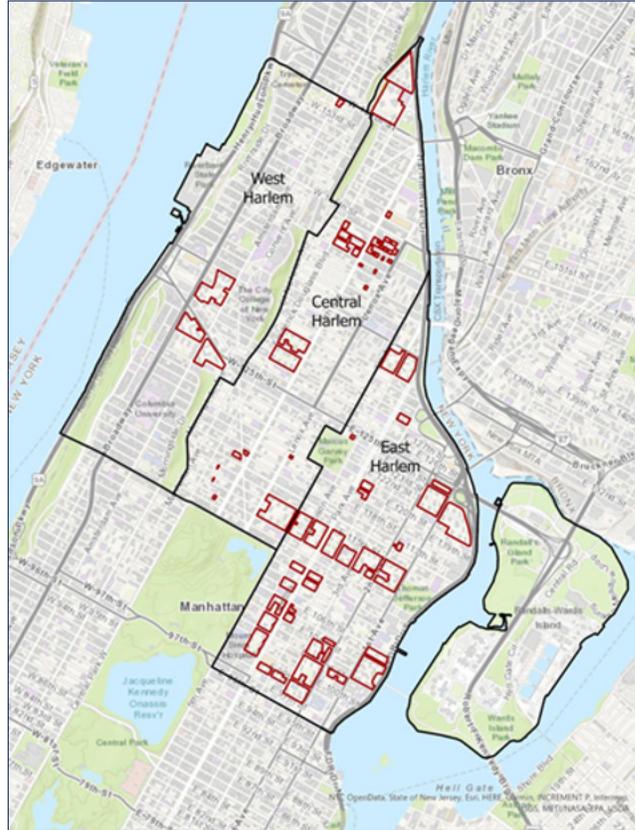
Data Source: 2019 Elevator Action Plan.

Note: P-value for t-test evaluating the differences between the means in each category is < 0.05.

<sup>vi</sup>

Residents self-reported their mobility impairments based on ability to navigate and use stairs.

Harlem is divided into community districts 9, 10, 11, or West, Central, and East Harlem, respectively. There are 30 NYCHA developments in Harlem (FIGURE 1), which together are made up of 474 buildings and house 53,618 residents.<sup>109</sup>



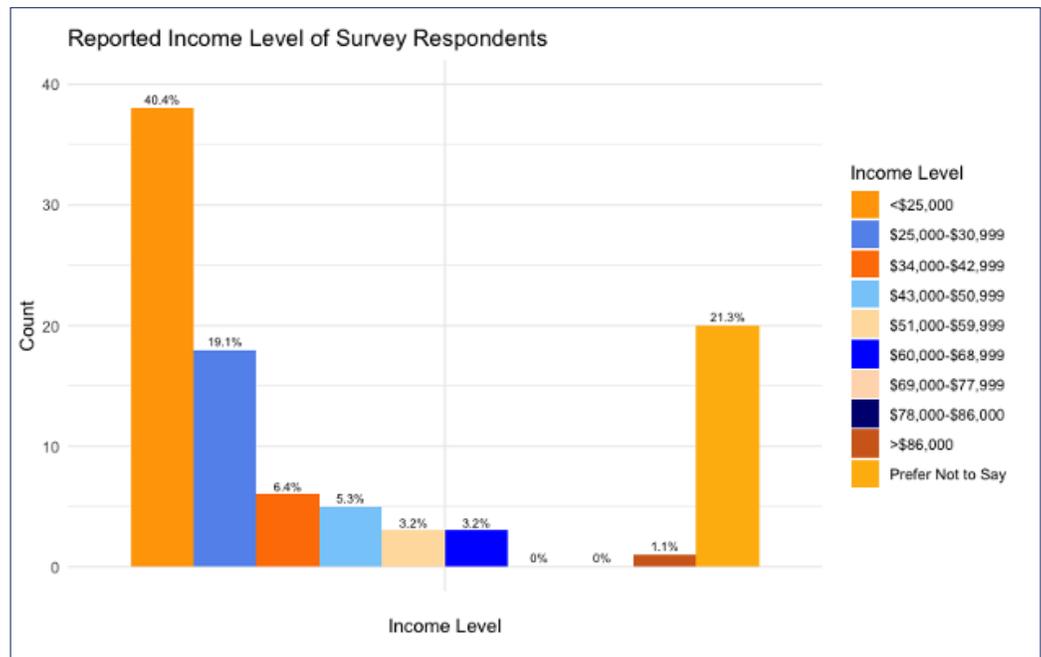
**FIGURE 1:** NYCHA Developments in Harlem

## B. Survey Data Results

To complement existing secondary data, this project deployed a survey to residents of NYCHA developments in Harlem. The survey gathered information on residents' perception and utilization of the elevators, familiarity with evacuation procedures, and preparation for extreme weather events. The survey also included questions to assess residents' mobility performance and to collect demographic information.

Researchers visited five developments, which were selected based on their high rates of mobility impairments and elevator service outages (See the Appendix for a detailed description of the survey methodology), and Community Voices Heard distributed online surveys through email and text banking. NYCHA residents at various developments in Harlem completed 94 surveys in March and April 2023 (TABLE 3). The race/ethnicity, age, gender identity, and annual income of survey respondents are reported in TABLES 4, 5, 6, and 7, and FIGURE 2, respectively.

As shown in **FIGURE 2**, more than 50% of respondents reported annual household incomes under \$33,999. Based on reported household size and household income, we found that 60.6% of people surveyed have an annual household income below the NY poverty line. The average household size for the survey population was 3 people.

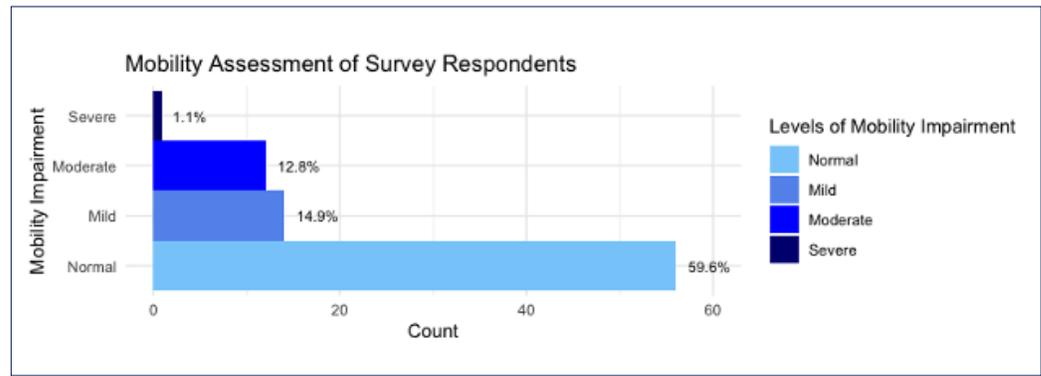


**FIGURE 2:** Reported Annual Income of Respondents

## 1. KEY FINDINGS: MOBILITY IMPAIRMENT AND ELEVATOR USAGE ANALYSIS

### Frequency of Households Containing at Least One Person with a Mobility Impairment

We found that 32.5% of all respondents who completed the mobility assessment section of the survey themselves have or live with someone who has a mobility impairment. As shown in **FIGURE 3**, of this group of people, 14 had mild mobility impairment, 12 had moderate mobility impairment, and 1 person had severe mobility impairment. It is important to note that 22 people answered the mobility assessment questions on behalf of a member of their household. Of these answers, responses revealed that nine respondents had household members with a mobility impairment according to the Neuro-QoL scoring system.



**FIGURE 3:** Results of Mobility Assessment of Survey Respondents

### Average Elevator Rating

On average, residents rated elevator reliability a 3.46 on a scale ranging from 1 to 10, where 1 meant “not reliable at all” and 10 meant “incredibly reliable.” There were no significant differences in the rating assigned to elevator reliability between residents with and without mobility impairments.

**TABLE 3** NUMBER OF SURVEY RESPONDENTS BY DEVELOPMENT

Development	Number of Responses
Carver	1
Clinton	1
East River	3
Grant	18
Lincoln	2
Manhattanville	8
Polo Grounds	32
Robinson	1
St. Nicholas	21
Other	4
Unknown	3
<b>Total</b>	<b>94</b>

**TABLE 4** ETHNICITY OF SURVEY RESPONDENTS

Ethnicity	Number of Responses
Hispanic/Latine	43 (45.7%)
Not Hispanic/Latine	49 (52.1%)

Note: Percentages may not add up to 100% due to missing values

**TABLE 5** RACE OF SURVEY RESPONDENTS

Race/Ethnicity	Number of Responses
White	3 (3.2%)
Black or African American	45 (47.9%)
Asian or Asian American	5 (5.3%)
Mixed race or multiracial	3 (3.2%)
Other	13 (13.8%)
Prefer not to say	9 (9.6%)

Note: Percentages may not add up to 100% due to missing values.

TABLE 6 AGE OF SURVEY RESPONDENTS

Age Groups (years)	Number of Responses
18–24	3 (3.2%)
25–34	11 (11.7%)
35–44	20 (21.3%)
45–54	14 (14.9%)
55–64	18 (19.1%)
65–74	18 (19.1%)
≥ 75	9 (9.6%)

Note: Percentages may not add up to 100% due to missing values.

TABLE 7 GENDER IDENTITY OF SURVEY RESPONDENTS

Gender Identity	Number of Responses
Male	25 (26.6%)
Female	67 (71.3%)
Prefer not to say	1 (1.1%)

Note: Percentages may not add up to 100% due to missing values.

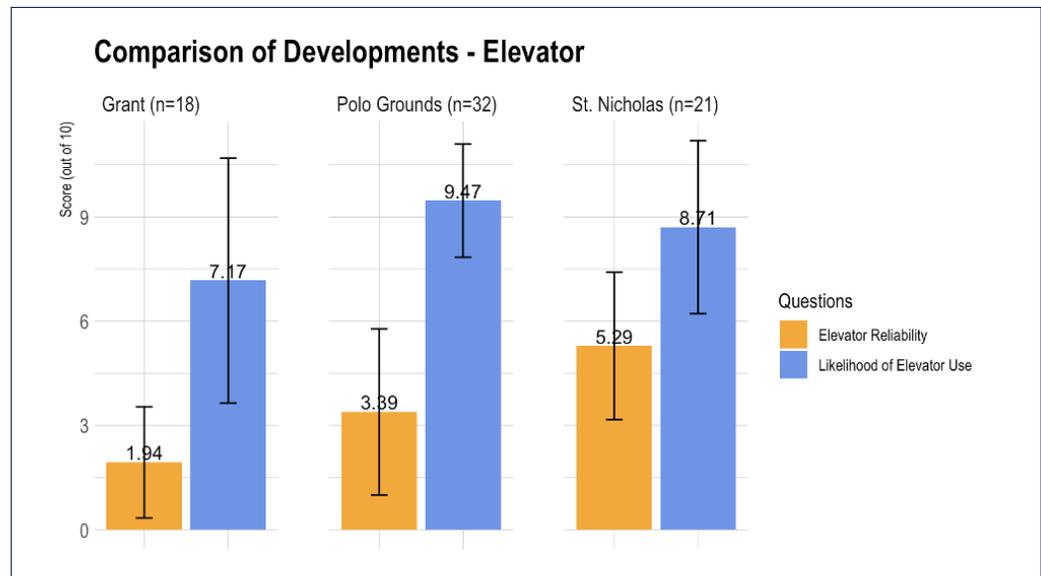
### Likelihood of Elevator Use

Similarly, there is no significant difference in the self-reported likelihood of elevator use between residents with and without mobility impairments. On a scale of 1 to 10, where 1 was “not at all likely” and 10 was “incredibly likely”, the average rate for likelihood of elevator use among surveyed residents was 8.59, indicating that residents surveyed rely on the smooth operation of the elevators, regardless of mobility capacity. One reason for this high dependence on elevators is that some NYCHA developments can have twenty or more stories. In fact, some buildings in Grant Houses and Manhattanville have 21 stories, and all towers in Polo Grounds have 30 stories.<sup>110</sup> Additionally, some residents report feeling unsafe when using the stairwells and prefer the elevators.

### Differences between Developments

FIGURE 4 shows the differences in reported elevator reliability and likelihood of elevator use of the three NYCHA developments with the most survey responses (Polo Grounds, St. Nicholas, and Grant). Grant received the worst score for elevator reliability (1.94 out of 10), but also the lowest score for likelihood of elevator use (7.17 out of 10). At least half of the Grant residents surveyed mentioned having been unable to leave or access their apartment at one point due to an elevator outage.

Polo Grounds presented an extremely high average score for likelihood of elevator use (9.47 out of 10) and 81.3% of respondents reported they have been unable, at least once, to enter or leave their apartments due to elevator outages. Out of 26 people affected by this issue, 17 had to wait for the elevators to be repaired before leaving. In some cases, this meant staying home, canceling appointments, or waiting in the lobby.



**FIGURE 4:** Elevator Reliability and Likelihood of Elevator use by Development (n = 71)

#### Frequency of Inability to Exit Home Due to an Elevator Outage

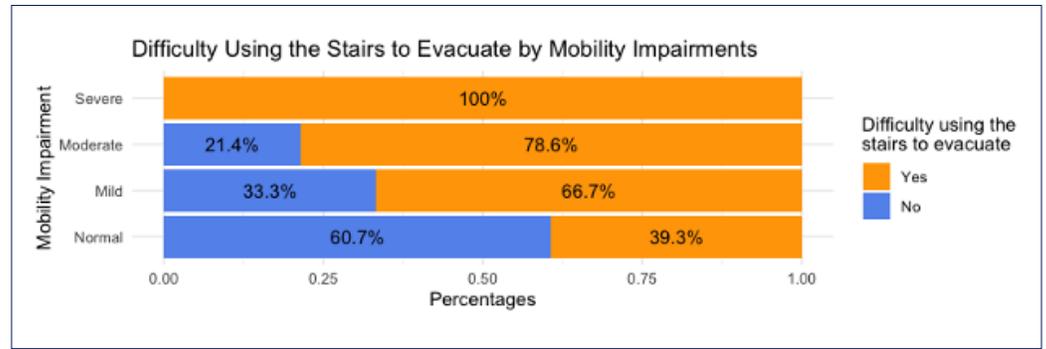
More than 65% of all respondents reported that they have been unable to enter or leave their apartment as a result of elevator outages at least once. The results show residents with mobility impairments are disproportionately affected by the situation (p-value = 0.001)<sup>vii</sup>. 88% of these residents (vs. 55% without mobility impairments) reported having been unable to access or leave their apartments due to an elevator outage. Residents responded in different ways when faced with this challenge. Those without mobility impairments or with mild mobility impairments reported using the stairs to exit the building or to reach their apartments. On the other hand, residents with more severe mobility impairments reported that they waited inside their apartments or in the lobby until the elevators were serviced.

We also identified a significant difference (p-value = 0.024) in the answers of people with and without mobility impairments related to the use of the stairs to evacuate the building. **FIGURE 5** shows that residents with mild, moderate, and severe mobility impairments have significantly higher difficulty trying to use the stairs to leave (and access) the building than residents with no mobility impairments. Waiting times for repairs, as reported on the survey, can range from ten minutes to four hours. For residents with severe mobility impairments and little to no assistance, this means cancelling plans, like medical appointments, and staying home.

#### vii

The P-value for the chi-square test evaluating the difference in ability to use the stairs for evacuation between residents with mobility impairments and residents without is <0.05, meaning that there is a significant difference between the groups.

It is also important to explore whether other groups, beyond people with mobility impairments, are disproportionately affected by elevator outages. **FIGURE 6** shows residents' reported capacity to use stairs to evacuate their building by number of chronic conditions. Arthritis, diabetes, and heart conditions were the most reported chronic conditions among surveyed residents.

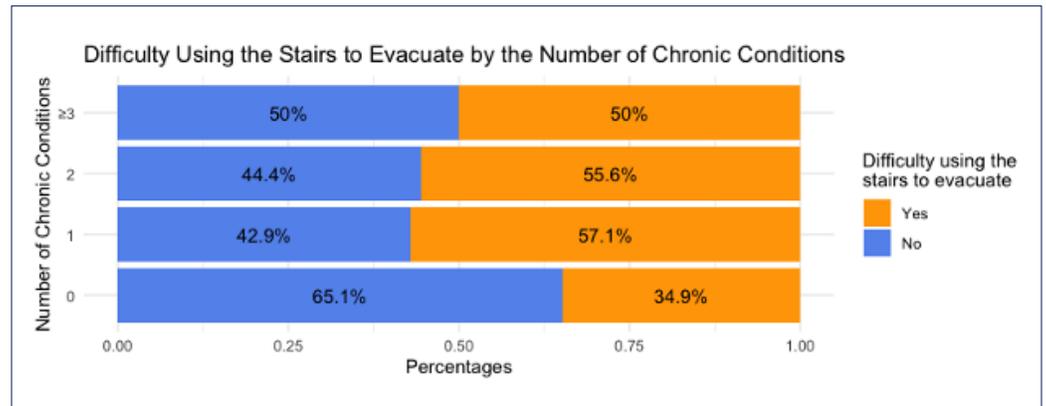


**FIGURE 5:** Difficulty Using the Stairs by Mobility Impairment

## 2. KEY FINDINGS: DISASTER PREPAREDNESS ANALYSIS AND FINDINGS

### Frequency of Apartment Evacuation

Around 18% of all surveyed residents have had to evacuate their building at one point. Of the 17 people who evacuated, 7 reported that it was due to a fire. Two more people mentioned that they had to leave their apartments due to steam or gas leakage.



**FIGURE 6:** Difficulty Using the Stairs by Chronic Conditions

NYCHA also evacuated some residents (non-emergency) to conduct lead and asbestos abatement procedures in their apartments.

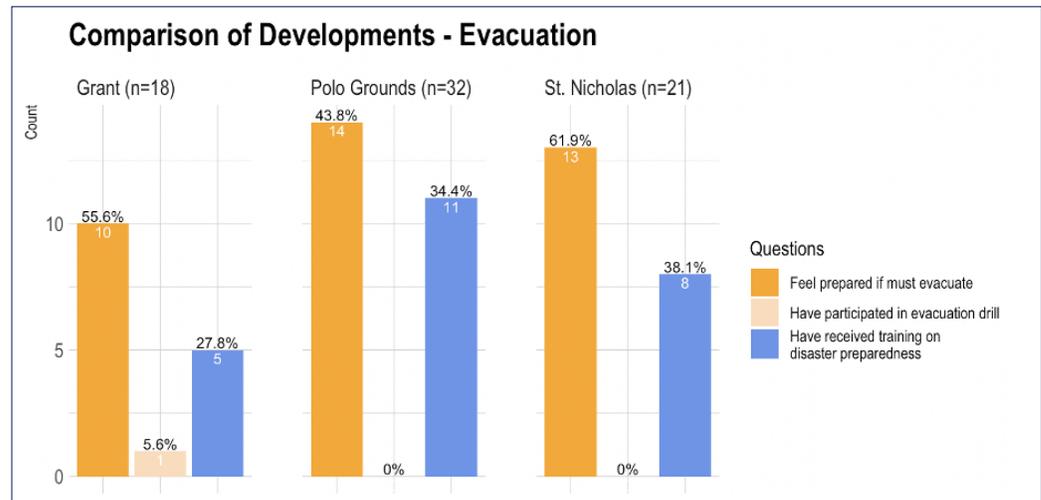
### Frequency of Reported Disaster Preparedness Information and Strategies

Only 33% of all respondents reported receiving training on disaster preparedness, with no differences between developments. Some of them mentioned having received information on disaster preparedness directly from NYCHA through brochures, mail, and e-mail. Others commented that they received the information from television news channels and YouTube videos. One resident mentioned they contacted WE ACT for Environmental Justice to get more information on preparation strategies during extreme weather and climate-related events.

In terms of personal preparedness in the event of disaster or extreme weather event, only 43.6% of respondents have an emergency kit at home that includes food and bottled water. 61.7% of them have A/C units in their apartments, but only 2.1% have some kind of backup power device to help them deal with power outages. Only a few residents, 8 out of 94, mentioned having items such as battery flashlights and candles to help them momentarily through power outages. Additionally, only 2.1% reported having participated in an evacuation drill. Nevertheless, 50% of respondents feel prepared to evacuate in an emergency.

**Differences between Developments**

Survey participants were asked about their experience with evacuation procedures and disaster preparedness. Out of the three developments with the most responses (Grant, Polo Grounds, and St. Nicholas), as can be seen in FIGURE 7, St. Nicholas had the highest proportion of participants (61.9%) who reported feeling prepared and knowledgeable to evacuate in the case of emergency. Only residents from Grant (5.6%) recalled participating in evacuation drills. Polo Grounds had the highest proportion of residents surveyed (38.1%) who had received information or training on how to prepare for or respond to an extreme weather event/natural disaster.

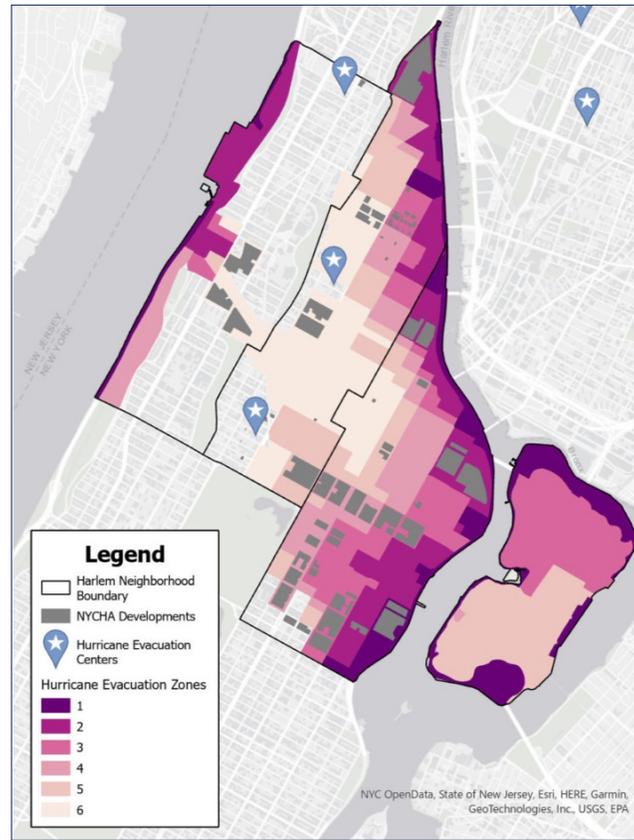


**FIGURE 7:** Responses to Emergency Evacuation and Disaster Preparedness Questions by Development (n = 71)

**3. IMPACTS OF CLIMATE CHANGE IN HARLEM**

**Flooding and Hurricanes**

Harlem is located between the Hudson and East Rivers. East Harlem, one of the lowest-lying areas of Manhattan, is particularly prone to flooding. During Hurricane Sandy, as a result of lucky timing of the tides, the neighborhood did not experience significant flooding damage. However, The City notes that this has resulted in no flood mitigation funding for the neighborhood, which would have seen catastrophic damages under different tide conditions.<sup>111</sup> The area routinely experiences flooding



**FIGURE 8:** Hurricane Evacuation Zones and Centers at NYCHA Developments in Harlem  
Data Sources: Hurricane Evacuation Centers, 2022; Hurricane Evacuation Zones, 2023

issues due to outdated infrastructure and disinvestment.<sup>112</sup> While New York City undertook a \$1 million East Harlem resiliency planning process, the finalized document has not been made public.

New York City’s Hurricane Evacuation Zones indicate the areas of the city that are most at risk of storm surges during hurricane, and help communicate evacuation orders to residents in each zone.<sup>113</sup> The zones are ranked from 1 to 6, with areas in Zone 1 holding the greatest risk.<sup>114</sup> Much of Harlem is located within a hurricane zone, with 94% of East Harlem’s area and 64.3% of the land area of Central Harlem-Morningside Heights falling within one of the evacuation zones.<sup>115</sup>

Seven of the NYCHA developments in Harlem, home to 17,895 residents, are located within Hurricane Evacuation Zones 1 and 2, making them highly vulnerable to damage caused by storm surges (FIGURE 8; TABLE 8). Although Manhattan’s power lines are underground and more resilient than their above-ground counterparts, underground transmission wires can still flood and break down. In fact, fixing underground lines may take longer in hurricane events such as Sandy because of the inaccessibility of manholes.<sup>116</sup> Despite this high risk, only three Hurricane Evacuation Centers serve the entire population of Harlem (FIGURE 9) and are located far from NYCHA developments. A Harlem NYCHA resident’s closest Hurricane

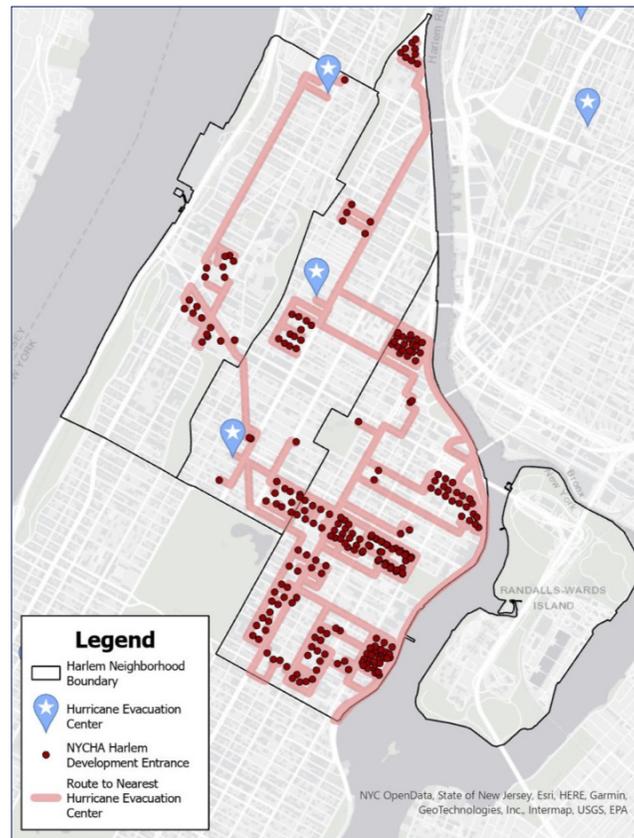
Evacuation Center is, on average, 1.19 miles from their development. The East River development, which is located in the most hazardous hurricane evacuation zone, is 3.54 miles from the nearest Hurricane Evacuation Center.

TABLE 8 NYCHA HARLEM DEVELOPMENTS BY HURRICANE EVACUATION ZONE

Hurricane Evacuation Zone	Developments
1	East River; Wilson
2	Lincoln; Metro North Plaza; Wagner; Polo Grounds Towers; Rangel
3	Clinton; Corsi Houses; Jefferson; Washington; White; Samuel (City)
4	Carver; Johnson; Lehman Village; Robinson; Taft
5	UPACA (Site 5); UPACA (Site 6); King Towers
6	Grant; Manhattanville; Morris Park Senior Citizens Home; Drew-Hamilton; Rehab Program (Taft Rehabs); Saint Nicholas
Outside Evacuation Zones	Audubon; Lexington; 131 Saint Nicholas Avenue

Finally, while New York City's Evacuation Centers are set up to be accessible for people across disability status and functional needs, some of the city's and NYCHA's communication and emergency risk strategies require an opt-in approach (e.g. registering in the Emergency Assistance Registration Form system), which residents may or may not be aware of.<sup>117</sup> For the most part, residents are asked to prepare their own evacuation plans and arrange for assistance from family, friends, building staff, and service providers.<sup>118</sup> Our survey found that only 49.5% of respondents felt prepared to evacuate, and less than 33% reported receiving information regarding evacuation protocols from NYCHA. It appears that NYCHA residents with mobility impairments in Harlem are underprepared to respond to a hurricane event.

NYC Emergency Management has a dedicated staff and group of volunteers ready to host educational events to prepare communities for evacuation and emergency preparedness. They also have a program dedicated to increasing awareness of evacuation zones by encouraging building owners to post visible signage indicating their zone. Beyond regular maintenance of elevators for daily health and safety of residents, NYCHA should also provide education to residents through the use of existing municipal programs and resources designed to prevent devastation before it occurs. Education and awareness will become even more critical as flood and hurricane impacts are projected to increase significantly with climate change and sea level rise.



**FIGURE 9:** Routes to Nearest Hurricane Evacuation Centers from NYCHA Developments in Harlem  
Data Source: Hurricane Evacuation Centers, 2022

### Extreme Heat

New York City is projected to become warmer over the course of the century. By the 2090s, temperatures may be up to 8.0° F, 9.2° F, and 10.5° F warmer in the spring, fall, and summer seasons, respectively.<sup>119</sup> In addition to higher average temperatures, extreme heat days are projected to occur more frequently.<sup>120</sup> The number of days when the temperature exceeds 90° F, 95° F, or 100° F is expected to increase under both the high and low emissions scenarios (FIGURE 10).<sup>121</sup> These projections encompass New York County as a whole, and therefore do not reflect warming trends specific to Harlem or individual NYCHA developments. Given that air temperature measurements are based on weather monitors, this temperature forecasting also may underestimate the personal heat exposure to individuals living in high rise buildings.

---

This page was intentionally left blank.

---

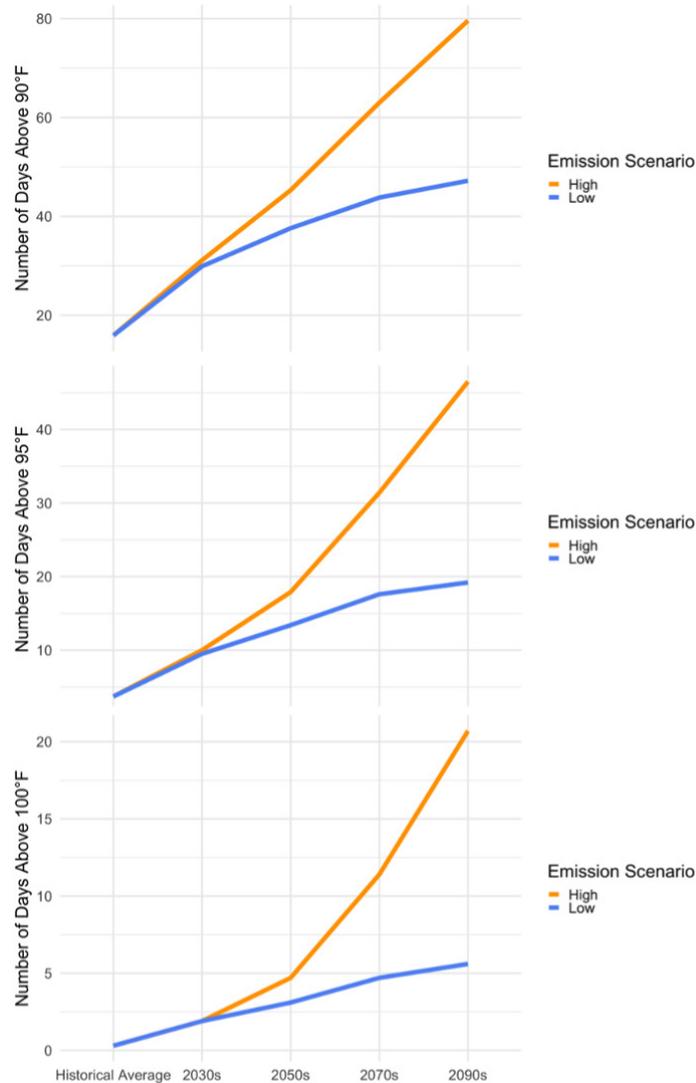
---

# DISCUSSION

This report builds on previous findings on mobility impairments, elevator conditions in public housing, and the experiences of residents with mobility impairments navigating maintenance concerns. Importantly, it brings together city-wide administrative data on elevator conditions with surveys to query residents' lived experience, and considering these within the context of disaster preparedness and climate change impacts.

Similar to findings from previous studies, our secondary data analysis and primary survey data collection suggest that the unreliable nature of the elevators in NYCHA buildings poses barriers to residents during daily activities, and these barriers would likely be exacerbated in disaster scenarios. In our survey, residents rated elevators a 3.5 out of 10 for reliability with over 70% reporting that they have been unable to leave or enter their home due to an elevator outage. Residents also emphasized in their comments that there is an urgent need to install new elevators. However, according to recent coverage on NYCHA's Elevator Replacement Plan, only 18 out of the 325 elevators up for replacement in the next four years are in Harlem, and all of them are in one development, the Taft Houses.<sup>122</sup> Secondary data analysis found that elevator outages have steadily increased in the past decade<sup>123</sup> and that many NYCHA buildings only have one elevator available to residents of a given part of a building.<sup>124</sup> If this elevator fails, these residents may be stranded.<sup>125</sup>

---



**FIGURE 10:** Projected Change in Annual Number of 90° F, 95°vF, and 100° F Days in New York County, New York City

Data Source: Statistically downscaled CMIP5 daily Climate Observations using Localized Constructed Analogs (LOCA; Pierce et al., 2014)

The results of this survey underscore the importance of reliable and functioning elevators in NYCHA developments, which are often 15 to 30 stories. There is not a statistically significant difference in the self-reported use of elevators between residents with and without mobility impairments, which is intuitive given the height of most buildings. Residents also reported safety concerns about using stairwells during elevator outages. Many residents also reported that mobility impairments made it impossible to climb or descend stairs.

In addition to concerns over elevator outages, residents discussed dissatisfaction with the condition of the elevators and the buildings, highlighting generalized safety concerns, low capacity and high demand, and persistent mechanical problems. Concerning capacity or elevator demand, residents pointed out that the ratio of elevators to residents appeared low, leading to people to hold elevators on their floors to avoid waiting for them to return. With regard to mechanical issues, residents reported situations where elevators had faulty doors that remained open while traveling, contributing to unsafe conditions for everyone. Other reported mechanical issues included skipping floors and uncharacteristic noises that frightened riders.

Residents communicated that they feel neglected by NYCHA with regard to elevator issues and other maintenance concerns. Some expressed that they did not have the resources to move elsewhere and felt that NYCHA was taking advantage of this reality by not addressing building deficiencies. Additionally, numerous residents declined to participate in the survey altogether and conveyed similar reasoning, making statements like, “nothing ever changes so this is not worth my time.”

Given the size of NYCHA developments and frequency of elevator utilization, it is obvious that elevators would experience substantial wear and tear over time. The point of our report is not to identify whether or not breakdowns, maintenance, and repairs are sufficient, but instead to elucidate residents’ perceptions and consider elevator outages within the context of disaster preparedness.

## A. Areas of opportunity

The following areas of opportunity do not constitute formal policy recommendations for NYCHA and partners, but rather highlight three potential areas for change based on survey responses, secondary analyses, and informal conversations with NYCHA residents.

### 1. **Communicate with residents about short-term and long-term plans to replace and maintain elevators:**

NYCHA is currently in an agreement with HUD to improve elevator conditions and at the beginning of 2023, received funding for replacement elevators at several developments. However, residents interviewed did not mention these efforts and were perhaps unaware (although this was not an explicit survey question). We believe residents of NYCHA buildings would benefit from knowing about these capital investments.

**2. Regularly communicate with residents about potential climate risks as well as the authority’s plans and the plans of specific developments to build climate adaptation and resilience:**

Climate resiliency measures will play a necessary role in coping with warmer temperatures and more frequent extreme weather events. Very few survey participants reported having an emergency kit with food and water, and even fewer had received any disaster preparedness training. Providing information about evacuation processes, as well as what to include in an emergency kit, can help build resilience among NYCHA residents in the face of mechanical or climate-influenced elevator outages. NYCHA’s Climate Adaptation Plan offers an important roadmap on many of these issues, including the importance of building social resilience and strategies for doing so.

**3. Center the voices and lived experiences of residents with mobility impairments or other health conditions (e.g. asthma, vertigo, etc.) in disaster evacuation planning:**

An audit of NYCHA emergency preparedness plans in 2015 found serious gaps, including missing contact information for residents with mobility impairments. It is unclear if these gaps have been addressed, but our survey revealed a stark reality: 70% of respondents have been unable to leave their homes at least once due to elevator outages. While we may not have sampled a representative group, the survey nonetheless speaks to a potentially large group of individuals who may be homebound by elevator outages. Having the contact information for residents with mobility impairments could serve two purposes, the most obvious of which is around disaster preparedness and emergency planning for extreme weather events. Additionally, having this contact information may serve residents with mobility impairments in the case of planned elevator outages. Outreach to these residents prior to these outages would allow residents to make alternative plans.

NYCHA’s 2021 plan for climate adaptation notes the need to target extreme heat protections to buildings with high proportions of residents with registered mobility impairments or dependence on life-sustaining medical equipment. NYCHA could engage residents to understand what other health conditions (that may not be registered) put residents in danger during extreme heat events. Finally, beyond building-level evacuation, NYCHA could continue to plan for accessibility to cooling centers and hurricane evacuation centers such as providing appropriate transportation plans and information for residents with mobility impairments.

---

# CONCLUSION

The survey conducted for this report shows residents' dissatisfaction with the quality, cleanliness, and reliability of elevators across NYCHA buildings in Harlem. These findings are consistent with secondary data sources reporting elevator outages in NYCHA developments.

The problems associated with the elevators pose safety concerns and barriers to residents with mobility impairments who may be unable to enter or leave their homes during elevator outages. Outages may therefore result in missed medical appointments or days of work. For residents who receive in-home care, elevator outages can prevent medical employees and caretakers from transporting equipment and supplies. Further, elevator problems are a safety hazard for residents in the event of an emergency. There are residents who are unable to use the stairs, and in the event of an evacuation, there is no way for these residents to leave the building.

As New York City's climate warms and extreme weather events become more common, reliable elevators in NYCHA buildings will become even more critical infrastructure. Evacuation orders for heavy rains, hurricanes, and floods will necessitate the mobility of all NYCHA residents. Extreme heat may also instigate evacuation as conditions can become unsafe, especially for the elderly and small children. In these instances, elevator function will be integral to facilitating the safe evacuation of residents.

The findings highlighted align with advocacy efforts around elevator improvements and replacements across NYCHA developments in Harlem and throughout the city, elevating residents' voices, and building resilience to changing climate conditions.

---

---

# ACKNOWLEDGEMENTS

First and foremost, it is with profound appreciation that we acknowledge the key contribution of NYCHA residents who shared their experiences and participated in our survey, making the findings from this study a catalyst for change.

We extend our sincere gratitude to our esteemed faculty advisor, Dr. Daniel Carrión, for providing us with steadfast support and invaluable guidance throughout the semester. We would also like to express our deepest appreciation to Travis Carter, Georgina Pierre-Louis, Kelly Viselman, Ms. Barbara, and other members of Community Voices Heard, whose extensive expertise and unwavering assistance proved instrumental in orienting us to the survey deployment process and steering this project towards success.

Finally, we would like to acknowledge Dr. Laura Bozzi and our classmates, whose valuable insights and feedback have been an essential source of inspiration and motivation throughout the semester, and the Stavros Niarchos Foundation for funding this course.

---

# REFERENCES

- 1 Community Voices Heard. <https://www.cvhaction.org/who-we-are>
- 2 “NYCHA 2022 Fact Sheet.” New York City Housing Authority, April 2022. [https://www.nyc.gov/assets/nycha/downloads/pdf/NYCHA\\_Fact\\_Sheet\\_2022.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/NYCHA_Fact_Sheet_2022.pdf).
- 3 “NYCHA 2022 Fact Sheet.” New York City Housing Authority, April 2022. [https://www.nyc.gov/assets/nycha/downloads/pdf/NYCHA\\_Fact\\_Sheet\\_2022.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/NYCHA_Fact_Sheet_2022.pdf).
- 4 “Resident Data Book — 2022.” New York City Housing Authority, March 2022. <https://www.nyc.gov/assets/nycha/downloads/pdf/Resident-Data-Book-Summary-2022.pdf>.
- 5 Gates, Moses. “The Impacts of Living in NYCHA.” Regional Plan Association, July 2020. [https://s3.us-east-1.amazonaws.com/rpa-org/pdfs/RPA\\_The\\_Effects\\_of\\_Living\\_at\\_NYCHA.pdf](https://s3.us-east-1.amazonaws.com/rpa-org/pdfs/RPA_The_Effects_of_Living_at_NYCHA.pdf).
- 6 Gates, Moses. “The Impacts of Living in NYCHA.” Regional Plan Association, July 2020. [https://s3.us-east-1.amazonaws.com/rpa-org/pdfs/RPA\\_The\\_Effects\\_of\\_Living\\_at\\_NYCHA.pdf](https://s3.us-east-1.amazonaws.com/rpa-org/pdfs/RPA_The_Effects_of_Living_at_NYCHA.pdf).
- 7 Davenport, Emily. “NYC Comptroller’s NYCHA Committee Gets to Work after First Resident Survey.” *AMNY*, December 12, 2022. <https://www.amny.com/news/nyc-comptroller-nycha-committee-gets-to-work/>.
- 8 Gross, Courtney. “Out of Service: NY1 Investigation Finds Chronic Elevator Outages Plague NYCHA.” *Spectrum News NY1*, September 3, 2019. <https://www.ny1.com/nyc/all-boroughs/politics/2019/09/03/out-of-service--ny1-investigation-finds-chronic-elevator-outages-plague-nycha>.
- 9 Schwartz, Bart. “Monitor Report Measuring NYCHA’s Compliance With The HUD Agreement.” NYCHA Federal Monitor, November 2022. <https://nychamonitor.com/wp-content/uploads/2022/11/Monitor-Metrics-Report-11.29.22.pdf>.
- 10 “NYCHA Development Data Book 2020.” New York City Housing Authority, n.d. <https://www.nyc.gov/assets/nycha/downloads/pdf/pdb2020.pdf>.
- 11 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 12 Hernández, Diana, David Chang, Carole Hutchinson, Evanah Hill, and Amenda Almonte. “Public Housing on the Periphery: Vulnerable Residents and Depleted Resilience Reserves Post-Hurricane Sandy.” *Journal of Urban Health: Bulletin of the New York Academy of Medicine* 95, no. 5 (October 2018): 703–15. <https://doi.org/10.1007/s11524-018-0280-4>.
- 13 Rooney, Catherine, and Glen White. “Consumer Perspective: Narrative Analysis of a Disaster Preparedness and Emergency Response Survey From Persons With Mobility Impairments.” *Journal of Disability Policy Studies* 17, no. 4 (2007): 206–15. <https://doi.org/10.1177/10442073070170040301>.
- 14 Stringer, Scott. “Re: NYC Emergency Preparedness Planning,” September 6, 2019. <https://comptroller.nyc.gov/wp-content/uploads/2019/09/Mayor-de-Blasio-re-NYC-Emergency-Preparedness-Planning.pdf>.
- 15 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 16 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 17 Environmental Protection Agency. “New York City Assesses Extreme Heat Climate Risk,” 2023. <https://www.epa.gov/arc-x/new-york-city-assesses-extreme-heat-climate-risk>.
- 18 “NYCHA 2022 Fact Sheet.” New York City Housing Authority, April 2022. [https://www.nyc.gov/assets/nycha/downloads/pdf/NYCHA\\_Fact\\_Sheet\\_2022.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/NYCHA_Fact_Sheet_2022.pdf).
- 19 McGlaughlin, Kelly. “New York City Has a Massive Elevator Problem.” *Insider*, September 5, 2019. <https://www.insider.com/new-york-public-housing-elevator-breakdowns-people-with-disabilities-2019-9>.
- 20 Spivack, Caroline. “NYCHA Fighting a ‘losing Battle’ against Elevator Upkeep.” *Curbed New York*, September 4, 2019. <https://ny.curbed.com/2019/9/4/20849423/nycha-elevators-public-housing-city-council>.
- 21 “Report on the Fiscal 2023 Preliminary Plan and the Fiscal 2022 Mayor’s Management Report for the New York City Housing.” New York City Council Finance Division, March 2022. <https://council.nyc.gov/budget/wp-content/uploads/sites/54/2022/03/NYCHA.pdf>.

- 22 “NYCHA Development Data Book 2020.” New York City Housing Authority, n.d. <https://www.nyc.gov/assets/nycha/downloads/pdf/pdb2020.pdf>.
- 23 Schwartz, Bart. “Monitor Report Measuring NYCHA’s Compliance With The HUD Agreement.” NYCHA Federal Monitor, November 2022. <https://nychamonitor.com/wp-content/uploads/2022/11/Monitor-Metrics-Report-11.29.22.pdf>.
- 24 Spivack, Caroline. “NYCHA Fighting a ‘losing Battle’ against Elevator Upkeep.” *Curbed New York*, September 4, 2019. <https://ny.curbed.com/2019/9/4/20849423/nycha-elevators-public-housing-city-council>.
- 25 Gross, Courtney. “Out of Service: NY1 Investigation Finds Chronic Elevator Outages Plague NYCHA.” *Spectrum News NY1*, September 3, 2019. <https://www.ny1.com/nyc/all-boroughs/politics/2019/09/03/out-of-service--ny1-investigation-finds-chronic-elevator-outages-plague-nycha>.
- 26 Long, Ariama. “NYCHA Audit Reports Are in, Budget Gap Holds up Repairs.” *New York Amsterdam News*, n.d. <https://amsterdamnews.com/news/2022/12/15/nycha-audit-reports-are-in-budget-gap-holds-up-repairs/>.
- 27 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 28 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 29 Brenzel, Kathryn, and David Jeans. “Elevated Risk: Malfunction at NYCHA.” *The Real Deal*, n.d. <https://therealdeal.com/magazine/new-york-february-2019/nycha-elevators/>.
- 30 NYCHA Journal. “Special Issue: Emergency Preparedness.” Fall 2014. <https://www.nyc.gov/assets/nycha/downloads/pdf/j14oct.pdf>.
- 31 “NYCHA Prepares for Future Weather-Related Emergencies,” October 29, 2013. <https://www.nyc.gov/site/nycha/about/press/pr-2013/nycha-one-year-after-sandy.page>.
- 32 “NYCHA Prepares for Future Weather-Related Emergencies,” October 29, 2013. <https://www.nyc.gov/site/nycha/about/press/pr-2013/nycha-one-year-after-sandy.page>.
- 33 NYCHA. “Information about Evacuations,” n.d. <https://www.nyc.gov/site/nycha/residents/evacuations.page>.
- 34 NYCHA Journal. “Network for Climate Action Selected 15 NYCHA Residents to Engage in Climate Solutions.” n.d. <https://nychajournal.nyc/network-for-climate-action-selected-15-nycha-residents-to-engage-in-climate-solutions/>.
- 35 AccessCSforAll. “What Is a Mobility Impairment?,” n.d. <https://www.washington.edu/accesscomputing/what-mobility-impairment>.
- 36 Spivack, Caroline. “NYCHA Fighting a ‘losing Battle’ against Elevator Upkeep.” *Curbed New York*, September 4, 2019. <https://ny.curbed.com/2019/9/4/20849423/nycha-elevators-public-housing-city-council>.
- 37 U.S. Census Bureau. “Quick Facts: New York City, New York,” n.d. <https://www.census.gov/quickfacts/newyorkcitynewyork>.
- 38 NYU Furman Center. “How NYCHA Preserves Diversity in New York’s Changing Neighborhoods.” Furman Center on Urban Policy, April 2019. [https://furmancenter.org/files/NYCHA\\_Diversity\\_Brief\\_Final-04-30-2019.pdf](https://furmancenter.org/files/NYCHA_Diversity_Brief_Final-04-30-2019.pdf).
- 39 “Climate Change at NYCHA: A Plan to Adapt.” New York City Housing Authority, 2021. [https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA\\_lores\\_single-pages.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA_lores_single-pages.pdf).
- 40 “Climate Change at NYCHA: A Plan to Adapt.” New York City Housing Authority, 2021. [https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA\\_lores\\_single-pages.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA_lores_single-pages.pdf).
- 41 Ralph, Nancy, Thelma Mielenz, Hilary Parton, Anne-Marie Flatley, and Lorna Thorpe. “Multiple Chronic Conditions and Limitations in Activities of Daily Living in a Community-Based Sample of Older Adults in New York City, 2009.” *Preventing Chronic Disease* 10, no. E199 (November 27, 2013). <https://doi.org/10.5888/pcd10.130159>.
- 42 Ralph, Nancy, Thelma Mielenz, Hilary Parton, Anne-Marie Flatley, and Lorna Thorpe. “Multiple Chronic Conditions and Limitations in Activities of Daily Living in a Community-Based Sample of Older Adults in New York City, 2009.” *Preventing Chronic Disease* 10, no. E199 (November 27, 2013). <https://doi.org/10.5888/pcd10.130159>.
- 43 Parton, HB, Richard Greene, AM Flatley, N Viswanathan, L Wilensky, J Berman, N Ralph, et al. “Health of Older Adults in New York City Public Housing.” New York City Housing Authority, the New York City Departments of Health and Mental Hygiene and for the Aging, and the City University of New York School of Public Health at Hunter College, May 2011. [https://www1.nyc.gov/assets/doh/downloads/pdf/episrv/nycha\\_senior\\_report.pdf](https://www1.nyc.gov/assets/doh/downloads/pdf/episrv/nycha_senior_report.pdf).

- 44 Parton, HB, Richard Greene, AM Flatley, N Viswanathan, L Wilensky, J Berman, N Ralph, et al. "Health of Older Adults in New York City Public Housing." New York City Housing Authority, the New York City Departments of Health and Mental Hygiene and for the Aging, and the City University of New York School of Public Health at Hunter College, May 2011. [https://www1.nyc.gov/assets/doh/downloads/pdf/episrv/nycha\\_senior\\_report.pdf](https://www1.nyc.gov/assets/doh/downloads/pdf/episrv/nycha_senior_report.pdf).
- 45 Herzenberg, Michael. "Public Housing Building Without Elevator Service For Two Weeks." *Spectrum News NY1*, July 19, 2019. <https://www.ny1.com/nyc/all-boroughs/news/2019/07/19/public-housing-building-without-elevator-service-for-two-weeks>.
- 46 Greene, A.M., H.B. Flatley, N. Viswanathan, L. Wilensky, J. Berman, A.E. Schneider, A. Uribe, E.C. Olson, E.N. Waddell, and L.E. Thorpe. "Health of Older Adults in New York City Public Housing: Part 1, Findings From the New York City Housing Authority Senior Survey." *Care Management Journals* 13, no. 3 (September 1, 2012): 134–47. <https://doi.org/10.1891/1521-0987.13.3.134>.
- 47 Access NYC. "Public Transportation for People with Disabilities," April 1, 2023. [https://access.nyc.gov/programs/access-a-ride/#:~:text=Access-A-Ride%20\(AAR,available%20within%20NYC's%20five%20boroughs](https://access.nyc.gov/programs/access-a-ride/#:~:text=Access-A-Ride%20(AAR,available%20within%20NYC's%20five%20boroughs).
- 48 Martinez, Jose. "'Access-A-Ride Is Failing': MTA Board Gets Earful as Paratransit Service Plummets." *The City*, November 17, 2021. <https://www.thecity.nyc/2021/11/17/22788573/access-a-ride-failing-mta-paratransit-service-drops>.
- 49 Goldberg, Dan. "The Long-Term Health Consequences of Living at NYCHA." *Politico*, April 9, 2018. <https://www.politico.com/states/new-york/albany/story/2018/04/09/the-long-term-health-consequences-of-living-at-nycha-352931>.
- 50 Lewis, Kristen, Sarah Burd-Sharps, and Bruce Cory. "Public Housing and Asthma: Another Winter of Discontent, or Relief at Last?" *Center for New York City Affairs* (blog), January 16, 2019. <https://www.centrernyc.org/public-housing-and-asthma>.
- 51 Goldberg, Dan. "The Long-Term Health Consequences of Living at NYCHA." *Politico*, April 9, 2018. <https://www.politico.com/states/new-york/albany/story/2018/04/09/the-long-term-health-consequences-of-living-at-nycha-352931>.
- 52 Goldberg, Dan. "The Long-Term Health Consequences of Living at NYCHA." *Politico*, April 9, 2018. <https://www.politico.com/states/new-york/albany/story/2018/04/09/the-long-term-health-consequences-of-living-at-nycha-352931>.
- 53 Parton, HB, Richard Greene, AM Flatley, N Viswanathan, L Wilensky, J Berman, N Ralph, et al. "Health of Older Adults in New York City Public Housing." New York City Housing Authority, the New York City Departments of Health and Mental Hygiene and for the Aging, and the City University of New York School of Public Health at Hunter College, May 2011. [https://www1.nyc.gov/assets/doh/downloads/pdf/episrv/nycha\\_senior\\_report.pdf](https://www1.nyc.gov/assets/doh/downloads/pdf/episrv/nycha_senior_report.pdf).
- 54 Greene, A.M., H.B. Flatley, N. Viswanathan, L. Wilensky, J. Berman, A.E. Schneider, A. Uribe, E.C. Olson, E.N. Waddell, and L.E. Thorpe. "Health of Older Adults in New York City Public Housing: Part 1, Findings From the New York City Housing Authority Senior Survey." *Care Management Journals* 13, no. 3 (September 1, 2012): 134–47. <https://doi.org/10.1891/1521-0987.13.3.134>.
- 55 Greene, A.M., H.B. Flatley, N. Viswanathan, L. Wilensky, J. Berman, A.E. Schneider, A. Uribe, E.C. Olson, E.N. Waddell, and L.E. Thorpe. "Health of Older Adults in New York City Public Housing: Part 1, Findings From the New York City Housing Authority Senior Survey." *Care Management Journals* 13, no. 3 (September 1, 2012): 134–47. <https://doi.org/10.1891/1521-0987.13.3.134>.
- 56 "ABCs of Housing." NYC Department of Housing Preservation and Development, 2021. <https://www.nyc.gov/assets/hpd/downloads/pdfs/services/abcs-of-housing.pdf>.
- 57 National Fire Protection Association. "Home Structure Fires," October 2021. <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Building-and-Life-Safety/Home-Structure-Fires>.
- 58 Stanton, Eloise, Julia Biedry, and Danielle Rochlin. "Association of Structural Fires in New York City With Inequities in Safe Heating for Immigrant Communities." *JAMA Medical News*, 2023. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2801942?cmp=1>.
- 59 Stanton, Eloise, Julia Biedry, and Danielle Rochlin. "Association of Structural Fires in New York City With Inequities in Safe Heating for Immigrant Communities." *JAMA Medical News*, 2023. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2801942?cmp=1>.
- 60 Butler, Kathryn, Erica Kuligowski, Susanne Furman, and Richard Peacock. "Perspectives of Occupants with Mobility Impairments on Evacuation Methods for Use during Fire Emergencies." *Fire Safety Journal* 91 (July 2017). <https://www.sciencedirect.com/science/article/abs/pii/S0379711217301789>.
- 61 Hostetter, Haley, and M.Z. Naser. "Characterizing Disability in Fire Evacuation: A Progressive Review." *Journal of Building Engineering* 53, no. 1 (2022). <https://www.sciencedirect.com/science/article/abs/pii/S2352710222005861>.

- 62  
Otte, Kathleen. "No One Left Behind: Including Older Adults and People with Disabilities in Emergency Planning." *Administration for Community Living* (blog), September 4, 2015. <https://acl.gov/news-and-events/acl-blog/no-one-left-behind-including-older-adults-and-people-disabilities>.
- 63  
Donelson Wright, Lynn, Christopher D'Elia, and C. Reid Nichols. "Impacts of Coastal Waters and Flooding on Human Health." *Tomorrow's Coasts: Complex and Impermanent* 27 (2019). <https://www.sciencedirect.com/science/article/pii/S2214140519300787>.
- 64  
Lane, Kathryn, Kizzy Charles-Guzman, Katherine Wheeler, Zaynah Abid, Nathan Graber, and Thomas Matte. "Health Effects of Coastal Storms and Flooding in Urban Areas: A Review and Vulnerability Assessment." *Journal of Environmental and Public Health* 2013 (May 30, 2013): e913064. <https://doi.org/10.1155/2013/913064>.
- 65  
Behr, Joshua G., and Rafael Diaz. "Disparate Health Implications Stemming from the Propensity of Elderly and Medically Fragile Populations to Shelter in Place during Severe Storm Events." *Journal of Public Health Management Practice*, 2013. <https://pubmed.ncbi.nlm.nih.gov/23903396/>.
- 66  
Al-rousan, Tala, Linda Rubenstein, and Robert Wallace. "Preparedness for Natural Disasters Among Older US Adults: A Nationwide Survey." *American Journal of Public Health* 104, no. 3 (n.d.). <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3953784/>.
- 67  
Tandon, Ayesha. "Hurricane Sandy Caused an 'Extra \$8bn' Damage Due to Human-Caused Sea Level Rise." *Carbon Brief* (blog), May 18, 2021. <https://www.carbonbrief.org/hurricane-sandy-caused-an-extra-8bn-damage-due-to-human-caused-sea-level-rise/>.
- 68  
Hernández, Diana, David Chang, Carole Hutchinson, Evanah Hill, and Amenda Almonte. "Public Housing on the Periphery: Vulnerable Residents and Depleted Resilience Reserves Post-Hurricane Sandy." *Journal of Urban Health : Bulletin of the New York Academy of Medicine* 95, no. 5 (October 2018): 703–15. <https://doi.org/10.1007/s11524-018-0280-4>.
- 69  
McNamara, David. "Managed Retreat in New York City: An Avenue for Climate Justice?" Masters of Science, Columbia University, 2022. <https://academiccommons.columbia.edu/doi/10.7916/ppvj-6x41/download>.
- 70  
Hernández, Diana, David Chang, Carole Hutchinson, Evanah Hill, and Amenda Almonte. "Public Housing on the Periphery: Vulnerable Residents and Depleted Resilience Reserves Post-Hurricane Sandy." *Journal of Urban Health : Bulletin of the New York Academy of Medicine* 95, no. 5 (October 2018): 703–15. <https://doi.org/10.1007/s11524-018-0280-4>.
- 71  
Otte, Kathleen. "No One Left Behind: Including Older Adults and People with Disabilities in Emergency Planning." *Administration for Community Living* (blog), September 4, 2015. <https://acl.gov/news-and-events/acl-blog/no-one-left-behind-including-older-adults-and-people-disabilities>.
- 72  
McCourt, Clara. "Here's What Mass. Power Companies Are Doing to Protect against Blackouts as Summers Get Hotter." *Boston.Com*, August 3, 2022. <https://www.boston.com/news/local-news/2022/08/03/heat-wave-power-outage-prevention-eversource-nationalgrid/>.
- 73  
Alper, Gabrielle. "Do Heat Vulnerable Neighborhoods in New York City Experience Disproportionate Power Outages?" Master of Science, City University of New York, 2021. [https://academicworks.cuny.edu/hc\\_sas\\_etds/727/](https://academicworks.cuny.edu/hc_sas_etds/727/).
- 74  
Alper, Gabrielle. "Do Heat Vulnerable Neighborhoods in New York City Experience Disproportionate Power Outages?" Master of Science, City University of New York, 2021. [https://academicworks.cuny.edu/hc\\_sas\\_etds/727/](https://academicworks.cuny.edu/hc_sas_etds/727/).
- 75  
"Extreme Heat Policy Agenda 2022." WE ACT for Environmental Justice, June 2022. <https://www.weact.org/wp-content/uploads/2022/06/WE-ACT-2022-Extreme-Heat-Policy-Agenda.pdf>.
- 76  
Gronlund, Carina. "Racial and Socioeconomic Disparities in Heat-Related Health Effects and Their Mechanisms: A Review," n.d. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4264980/>.
- 77  
Environmental and Health Data Portal. "Interactive Vulnerability Index," n.d. <https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/key-topics/climatehealth/hvi/>.
- 78  
Chavez, Nicole. "Black People Are More Likely to Die from Heat Stress than White People in New York City, Report Says." CNN, June 17, 2022. <https://www.cnn.com/2022/06/17/us/new-york-heat-related-deaths-report/index.html>.
- 79  
Schuerman, Matthew. "One Small Step to Keep Public Housing Cool." WNYC, June 17, 2019. <https://www.wnyc.org/story/small-step-keep-elderly-cool-public-housing-seniors/>.
- 80  
Environmental and Health Data Portal. "Interactive Vulnerability Index," n.d. <https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/key-topics/climatehealth/hvi/>.
- 81  
"Find a Cooling Center," n.d. <https://maps.nyc.gov/cooling-center/inactive.html?1682880900000>.
- 82  
Nayak, Seema. "Accessibility of Cooling Centers to Heat-Vulnerable Populations in New York State." *Journal of Transport & Health* 14 (September 2019). <https://www.sciencedirect.com/science/article/pii/S2214140519300787>.

- 83 Oshan & Associates. “Are Disability Rights Being Violated in NYCHA Buildings?” n.d. <https://oshanandassociates.com/blogs/fire-law-blog/are-disability-rights-being-violated-in-nycha-buildings>.
- 84 Fernandez, Manny. “Suit Says Faulty Elevators in Public Housing Violate Rights of Tenants.” *The New York Times*, April 20, 2009. <https://www.nytimes.com/2009/04/21/nyregion/21elevators.html>.
- 85 Bierer, Liliانا. “Tireless Accountability: Legal Justice for NYCHA Residents Suffering from Asthma in Unsafe Homes.” *Environmental Justice* (blog), May 19, 2016. <https://sites.williams.edu/envi-322-s16/mold-in-new-york-city-public-housing-by-lili-bierer/tireless-accountability-legal-justice-for-nycha-residents-suffering-from-asthma-in-unsafe-homes/>.
- 86 City of New York. “Mayor Adams, Governor Hochul, NYCHA Undertake Effort to Replace Elevators in Developments Serving Nearly 34,000 Residents,” January 6, 2023. <https://www.nyc.gov/office-of-the-mayor/news/011-23/mayor-adams-governor-hochul-nycha-undertake-effort-replace-elevators-developments-serving>.
- 87 City of New York. “Mayor Adams, Governor Hochul, NYCHA Undertake Effort to Replace Elevators in Developments Serving Nearly 34,000 Residents,” January 6, 2023. <https://www.nyc.gov/office-of-the-mayor/news/011-23/mayor-adams-governor-hochul-nycha-undertake-effort-replace-elevators-developments-serving>.
- 88 City of New York. “Mayor Adams, Governor Hochul, NYCHA Undertake Effort to Replace Elevators in Developments Serving Nearly 34,000 Residents,” January 6, 2023. <https://www.nyc.gov/office-of-the-mayor/news/011-23/mayor-adams-governor-hochul-nycha-undertake-effort-replace-elevators-developments-serving>.
- 89 City of New York. “Mayor Adams, Governor Hochul, NYCHA Undertake Effort to Replace Elevators in Developments Serving Nearly 34,000 Residents,” January 6, 2023. <https://www.nyc.gov/office-of-the-mayor/news/011-23/mayor-adams-governor-hochul-nycha-undertake-effort-replace-elevators-developments-serving>.
- 90 “Capital Plan Years 2022-2026.” New York City Housing Authority, 2021. <https://www.nyc.gov/assets/nycha/downloads/pdf/capital-plan-2226.pdf>.
- 91 Gandour, Jackson. “‘The Tenant Never Wins’: Private Takeover of Public Housing Puts Rights at Risk in New York City.” Human Rights Watch, January 27, 2022. <https://www.hrw.org/report/2022/01/27/tenant-never-wins/private-takeover-public-housing-puts-rights-risk-new-york-city>.
- 92 Gandour, Jackson. “‘The Tenant Never Wins’: Private Takeover of Public Housing Puts Rights at Risk in New York City.” Human Rights Watch, January 27, 2022. <https://www.hrw.org/report/2022/01/27/tenant-never-wins/private-takeover-public-housing-puts-rights-risk-new-york-city>.
- 93 “Climate Change at NYCHA: A Plan to Adapt.” New York City Housing Authority, 2021. [https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA\\_lores\\_single-pages.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA_lores_single-pages.pdf).
- 94 “Extreme Heat Policy Agenda 2022.” WE ACT for Environmental Justice, June 2022. <https://www.weact.org/wp-content/uploads/2022/06/WE-ACT-2022-Extreme-Heat-Policy-Agenda.pdf>.
- 95 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 96 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 97 Brand, David. “New York’s New NYCHA Laws Aim to Hold Agency Accountable.” *CityLimits*, July 21, 2022. <https://citylimits.org/2022/07/21/new-yorks-new-nycha-laws-aim-to-hold-agency-accountable/>.
- 98 Brand, David. “New York’s New NYCHA Laws Aim to Hold Agency Accountable.” *CityLimits*, July 21, 2022. <https://citylimits.org/2022/07/21/new-yorks-new-nycha-laws-aim-to-hold-agency-accountable/>.
- 99 “Climate Change at NYCHA: A Plan to Adapt.” New York City Housing Authority, 2021. [https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA\\_lores\\_single-pages.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA_lores_single-pages.pdf).
- 100 “Climate Change at NYCHA: A Plan to Adapt.” New York City Housing Authority, 2021. [https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA\\_lores\\_single-pages.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA_lores_single-pages.pdf).
- 101 “Climate Change at NYCHA: A Plan to Adapt.” New York City Housing Authority, 2021. [https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA\\_lores\\_single-pages.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA_lores_single-pages.pdf).
- 102 “Climate Change at NYCHA: A Plan to Adapt.” New York City Housing Authority, 2021. [https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA\\_lores\\_single-pages.pdf](https://www.nyc.gov/assets/nycha/downloads/pdf/Climate-Change-at-NYCHA_lores_single-pages.pdf).
- 103 Stringer, Scott. “Re: NYC Emergency Preparedness Planning,” September 6, 2019. <https://comptroller.nyc.gov/wp-content/uploads/2019/09/Mayor-de-Blasio-re-NYC-Emergency-Preparedness-Planning.pdf>.
- 104 Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.

- 105 Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 106 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 107 Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 108 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 109 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 110 “NYCHA Development Data Book 2020.” New York City Housing Authority, n.d. <https://www.nyc.gov/assets/nycha/downloads/pdf/pdb2020.pdf>.
- 111 Holliday Smith, Rachel. “De Blasio’s \$1 Million Flood Plan Shelved and Hidden From High-Risk East Harlem.” *The City*, January 26, 2021. <https://www.thecity.nyc/2021/1/25/22245050/de-blasio-hides-flood-climate-plan-from-east-harlem-resiliency>.
- 112 Holliday Smith, Rachel. “De Blasio’s \$1 Million Flood Plan Shelved and Hidden From High-Risk East Harlem.” *The City*, January 26, 2021. <https://www.thecity.nyc/2021/1/25/22245050/de-blasio-hides-flood-climate-plan-from-east-harlem-resiliency>.
- 113 NYC Emergency Management. “Know Your Zone,” n.d. <https://www.nyc.gov/assets/em/html/know-your-zone/knowyourzone.html>
- 114 NYC Emergency Management. “Know Your Zone,” n.d. <https://www.nyc.gov/assets/em/html/know-your-zone/knowyourzone.html>
- 115 NYC Environment and Health Data Portal. “Climate and Health in Central Harlem - Morningside Heights,” n.d. [https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/neighborhood-reports/central\\_harlem\\_morningside\\_heights/climate\\_and\\_health/](https://a816-dohbesp.nyc.gov/IndicatorPublic/beta/neighborhood-reports/central_harlem_morningside_heights/climate_and_health/)
- 116 CBS News. “NYC Utility Cuts Power to More Households in Sandy’s Aftermath.” November 1, 2012. <https://www.cbsnews.com/news/nyc-utility-cuts-power-to-more-households-in-sandys-aftermath/>.
- 117 “NYCHA Prepares for Future Weather-Related Emergencies,” October 29, 2013. <https://www.nyc.gov/site/nycha/about/press/pr-2013/nycha-one-year-after-sandy.page>.
- 118 NYC Emergency Management. “Coastal Storms & Hurricanes,” n.d. <https://www.nyc.gov/site/em/ready/coastal-storms-hurricanes.page>.
- 119 University of California San Diego. New York Climate Change Science Clearinghouse, n.d. <https://www.nyclimatescience.org/map>.
- 120 University of California San Diego. New York Climate Change Science Clearinghouse, n.d. <https://www.nyclimatescience.org/map>.
- 121 University of California San Diego. New York Climate Change Science Clearinghouse, n.d. <https://www.nyclimatescience.org/map>.
- 122 NYC. “Mayor Adams, Governor Hochul, NYCHA Undertake Effort to Replace Elevators in Developments Serving Nearly 34,000 Residents,” January 6, 2023. <https://www.nyc.gov/office-of-the-mayor/news/011-23/mayor-adams-governor-hochul-nycha-undertake-effort-replace-elevators-developments-serving>.
- 123 Gross, Courtney. “Out of Service: NY1 Investigation Finds Chronic Elevator Outages Plague NYCHA.” *Spectrum News NY1*, September 3, 2019. <https://www.ny1.com/nyc/all-boroughs/politics/2019/09/03/out-of-service--ny1-investigation-finds-chronic-elevator-outages-plague-nycha>.
- 124 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.
- 125 “Elevator Response Action Plan.” New York City Housing Authority, January 31, 2020. <https://www.nyc.gov/assets/nycha/downloads/pdf/Elevator-Action-Plan-FINAL-20200130.pdf>.

# APPENDIX

## A1. Detailed Methodology

### A. RESEARCH DESIGN

The research project aimed to explore the experiences of NYCHA residents in Harlem with mobility impairments with elevator outages, extreme weather events, and disaster preparedness. The research methodology has a mixed qualitative and quantitative approach. We first conducted a literature review and collected secondary data from a wide range of sources. From NYCHA records, we gathered information on frequency of elevator outages, maintenance protocols, and the demographic breakdown of their resident population for each development. We also looked at peer-reviewed articles on the perspectives of individuals with mobility impairments with evacuation procedures, as well as the health effects of climate change on urban communities. From news and opinion articles, we collected further information on the challenges NYCHA residents face, their relationship with the corporation, and the actions taken so far to address frequent elevator outages. To better understand the situation of NYCHA residents in Harlem, we also deployed a survey to collect primary data on their experiences with elevator outages and evacuation procedures. Primary data collection procedures and instruments were submitted to, and approved by, Yale University's Institutional Review Board (IRB) and qualified as an exempt protocol.

### B. SURVEY DEVELOPMENT

We developed an anonymous survey questionnaire using Qualtrics and collected information from 94 NYCHA residents in Harlem. The survey was developed in consultation with CVH and members of the organization who live in NYCHA developments. We followed the IRB's guidelines on the development of the consent form.

We gathered information on residents' perception and utilization of their building's elevators, familiarity with evacuation procedures, and preparation against extreme weather events. The survey also included questions to assess residents' mobility performance and to collect demographic information. Conscious that the likelihood of encountering residents with severe mobility impairments outside their building was low, the questionnaire format allowed residents to respond on behalf of household members with mobility impairments. The survey consisted of sixteen multiple-choice questions, three Likert scale questions, and four open-ended questions. A contracted translator translated the questionnaire into Spanish. (See Appendix 3 for the survey questions).

### C. PARTICIPANT SELECTION – SAMPLE

Our target group for the survey consisted of NYCHA residents in Harlem over the age of 18. Study participants were recruited through purposive sampling. For the in-person survey implementation, we identified NYCHA developments in Harlem with either a high percentage of residents with mobility impairments, or a poor elevator condition rating (4 and 5), or both, as demonstrated in [FIGURE 13](#) and [FIGURE 14](#). These developments included Grant, Manhattanville, St. Nicholas, East River, Metro North, Gaylord White Houses, and Morris Park Senior Citizens. We also honored a request from CVH to include the Polo Grounds development based on their organizing work there. For virtual deployment, CVH reached out to 500 individuals regarding the survey via email and text-banking.

### D. DATA COLLECTION

The survey was deployed in person in Harlem by the team of researchers over five days and virtually shared with NYCHA residents in Harlem through email and text banking.

#### **In-person deployment**

The team of researchers visited seven NYCHA developments in Harlem. The first part of the in-person implementation was carried out over four weekdays (Tuesday to Friday). The team deployed the survey from 3 pm to 6 pm or 4 pm to 7 pm to collect responses from residents returning home during commuting hours. Research team members then returned to Harlem during a weekend day to collect additional responses. We approached participants in the outdoor common areas around the selected development, such as playgrounds, parks, and sidewalks. Consent was obtained orally at the start of each survey. The researchers, working either in pairs or alone, asked the survey questions orally and collected the responses on their mobile phones. Surveys were administered in English and in Spanish, depending on the participants' language preference and the availability of Spanish-speaking researchers.

#### **Virtual deployment**

CVH sent the Qualtrics survey through an email blast and text-banking to a list of NYCHA residents in Harlem whose contacts they had from previous canvassing efforts. The online survey, available in English and Spanish, was self-administered by participants. Consent was obtained electronically.

## E. DATA PROCESSING AND ANALYSIS

Continuous data were summarized using means and standard deviations. Categorical data were displayed as frequency counts and percentages. Survey responses were analyzed if  $\geq 70\%$  of questions were completed. The first step of analysis involved stratifying the participants to two subgroups by whether or not they had difficulties using stairs to evacuate in the case of emergency. Variables including demographics and disaster preparedness related questions were compared between the two stratified groups. To show if the differences were statistically significant at an alpha level of 0.05, we performed 2-sample t-tests for numeric variables and chi-squared tests of independence for categorical variables. For chi-squared tests of categorical variables, in order to generate valid p-values we omitted categories if no participants belonged to them.

We supplemented the stratifying factor with the Neuro-QoL lower extremity function - mobility 8-item short form to assess the mobility function of participants. The short form consists of 8 questions asking about the participant's capability to perform daily mobility-related actions. Participants were asked to answer each question on a scale of 1 to 5 to generate a mobility score. A mobility score was approximated if a participant skipped one or more questions but completed more than 50% of the 8-item mobility assessment questions. We converted the mobility assessment scores to levels of mobility impairment (mild to severe) based on the Neuro-QoL score cut points, which were defined using the US population as reference. Since the ability to use stairs to evacuate is closely related to not only one's mobility function but also other factors such as one's chronic health conditions, the Neuro-QoL-defined mobility impairment categories served to illustrate the distribution of different levels of mobility impairments among the two stratified groups.

In the second step of analysis, we identified some housing developments with the highest numbers of respondents, then compared the resident's experiences with elevators and their disaster preparedness among these developments.

## F. LIMITATIONS

There were several limitations in this study. First, the research team had strict time constraints. This study was conducted as part of a practicum class that spanned a four-month semester. Data collection occurred over two months, which limited the scope of our study primarily in that the number of developments we could visit in this time period was restricted.

The feasible sample size for this study was limited due to time constraints. P-values, which are generally used to assess the difference between two distributions, are more reliable for large sample sizes. This is important to consider when reviewing the p-values from the collected data. The study may also be impacted by self-selection bias, i.e., individuals who are willing to take the survey may not be representative of the whole population of interest. There was also an oversampling of individuals who identify as female - 71.4% of survey respondents. It's important to note that, given time constraints, we were unable to sample at many different times of day, and therefore we likely oversampled for people with 9-to-5 jobs or those with children. This may not be representative of residents with more severe mobility impairments who may be fully unable to travel outside.

Due to time constraints, only one area of New York City was included in the study: Harlem. Harlem was prioritized by CVH given our limited time. We do not advise extrapolating information collected from this area to all NYCHA development. Demographics in NYCHA developments in Harlem may differ from NYCHA developments in Brooklyn or the Bronx. The context of elevators is also likely to be different based on age, density, height, and other relevant factors. Further, the views of residents interviewed may not be fully captured due to the limited survey length. The survey was administered to people as they were entering and leaving their buildings, which required that the survey be brief. This limited the breadth of questions that could potentially be asked. The budget for this study was also limited and it is possible that self-selection bias would have been less pronounced if incentives were offered for completion of the survey (e.g., gift cards).

Finally, the target populations and developments were chosen based on publicly available data on elevator conditions and mobility impairments. It's possible that more granular data that may only be available internally at NYCHA may have allowed for further targeting of developments with particularly concerning elevator service issues.

## A2. HUD Agreements

In 2019, NYCHA entered into an agreement with the Office of Housing and Urban Development and the City of New York. NYCHA made the following commitments.

### **Effective now, as of May 2023**

- Develop an action plan for each elevator for what to do in the case of elevator outages
- Provide HUD and NYCHA Monitor with data about elevator service interruptions at least on a quarterly basis
- 70% of all elevators will have no more than 8 outages per year, with no elevator having more than 15
- 70% of buildings with more than one elevator will never have total elevator outage, planned or not. No such building will have more than 3 instances of total outage.
- No planned outages between 6–10am and 3–8pm
- Response rates will improve each year and 75% must be resolved within 18 hours
- Create a system to identify, monitor, and record elevator outages and work orders
- Notify residents at least 24 hours before a planned outage, 2 hours after unplanned outage

### **Effective in 2024**

- NYCHA will have replaced 475 elevators since February 2019

### **Effective on January 31, 2025**

- 85% of all elevators will have no more than 8 outages per year, with no elevator having more than 15
- 85% of buildings with more than one elevator will never have total elevator outage, planned or not. No such building will have more than 3 instances of total outage.
- 85% of all outages that result in total lack of service must be resolved in 4 hours or less.
- No-service outages will last no more than 12, unless under special conditions
- 85% of all outages must be resolved in 10 hours or less.
- No outages will last no more than 18, unless under special conditions

### A3. Additional Survey Results

#### DEMOGRAPHICS

	DIFFICULTY USING THE STAIRS TO EVACUATE			P-value
	Total	Yes	No	
<b>Gender Identity</b>				0.292
Male	25 (26.6%)	9 (20.9%)	16 (31.4%)	
Female	67 (71.3%)	33 (76.7%)	34 (66.7%)	
Prefer not to say	1 (1.1%)	1 (2.3%)	0 (0%)	
Missing	1 (1.1%)	0 (0%)	1 (2.0%)	
<b>Age</b>				0.332
Mean (SD)	52.4 (± 16.2)	54.1 (± 15.9)	50.9 (± 16.5)	
Missing	1 (1.1%)	0 (0%)	1 (2.0%)	
<b>Age Groups (years)</b>				0.457
18-24	3 (3.2%)	0 (0%)	3 (5.9%)	
25-34	11 (11.7%)	6 (14.0%)	5 (9.8%)	
35-44	20 (21.3%)	9 (20.9%)	11 (21.6%)	
45-54	14 (14.9%)	4 (9.3%)	10 (19.6%)	
55-64	18 (19.1%)	10 (23.3%)	8 (15.7%)	
65-74	18 (19.1%)	9 (20.9%)	9 (17.6%)	
≥75	9 (9.6%)	5 (11.6%)	4 (7.8%)	
Missing	1 (1.1%)	0 (0%)	1 (2.0%)	
<b>Hispanic/Latino</b>				0.0542
Yes	43 (45.7%)	15 (34.9%)	28 (54.9%)	
No	49 (52.1%)	28 (65.1%)	21 (41.2%)	
Missing	2 (2.1%)	0 (0%)	2 (3.9%)	
<b>Race/Ethnicity</b>				0.551
White	3 (3.2%)	1 (2.3%)	2 (3.9%)	
Black or African American	45 (47.9%)	23 (53.5%)	22 (43.1%)	
Asian or Asian American	5 (5.3%)	3 (7.0%)	2 (3.9%)	
Mixed race or multiracial	3 (3.2%)	1 (2.3%)	2 (3.9%)	
Other	13 (13.8%)	3 (7.0%)	10 (19.6%)	
Prefer not to say	9 (9.6%)	4 (9.3%)	5 (9.8%)	
Missing	16 (17.0%)	8 (18.6%)	8 (15.7%)	
<b>Chronic Conditions</b>				0.272
0	43 (45.7%)	15 (34.9%)	28 (54.9%)	
1	28 (29.8%)	16 (37.2%)	12 (23.5%)	
2	9 (9.6%)	5 (11.6%)	4 (7.8%)	
≥3	6 (6.4%)	3 (7.0%)	3 (5.9%)	
Missing	8 (8.5%)	4 (9.3%)	4 (7.8%)	
<b>Mobility Impairment</b>				0.0237
Normal	56 (59.6%)	22 (51.2%)	34 (66.7%)	
Mild	14 (14.9%)	11 (25.6%)	3 (5.9%)	
Moderate	12 (12.8%)	8 (18.6%)	4 (7.8%)	
Severe	1 (1.1%)	1 (2.3%)	0 (0%)	
Missing	11 (11.7%)	1 (2.3%)	10 (19.6%)	

continued on next page

	DIFFICULTY USING THE STAIRS TO EVACUATE			P-value
	Total	Yes	No	
<b>Annual Household Income</b>				NA
<\$25,000	38 (40.4%)	20 (46.5%)	18 (35.3%)	
\$25,000-\$33,999	18 (19.1%)	6 (14.0%)	12 (23.5%)	
\$34,000-\$42,999	6 (6.4%)	2 (4.7%)	4 (7.8%)	
\$43,000-\$50,999	5 (5.3%)	2 (4.7%)	3 (5.9%)	
\$51,000-\$59,999	3 (3.2%)	1 (2.3%)	2 (3.9%)	
\$60,000-\$68,999	3 (3.2%)	3 (7.0%)	0 (0%)	
\$69,000-\$77,999	0 (0%)	0 (0%)	0 (0%)	
\$78,000-\$86,000	0 (0%)	0 (0%)	0 (0%)	
>\$86,000	1 (1.1%)	0 (0%)	1 (2.0%)	
Missing	20 (21.3%)	9 (20.9%)	11 (21.6%)	
<b>Household</b>				0.711
Mean (SD)	2.98 (± 1.76)	2.90 (± 1.56)	3.04 (± 1.93)	
Missing	2 (2.1%)	1 (2.3%)	1 (2.0%)	
<b>Under NY Poverty Line</b>				1
Yes	57 (60.6%)	26 (60.5%)	31 (60.8%)	
No	37 (39.4%)	17 (39.5%)	20 (39.2%)	

## EXPERIENCES WITH ELEVATOR & DISASTER PREPAREDNESS

	DIFFICULTY USING THE STAIRS TO EVACUATE			P-value
	Total (N=94)	Yes (N=43)	No (N=51)	
<b>Elevator Reliability (_/10)</b>				
Mean (SD)	3.46 (± 2.38)	3.19 (± 2.31)	3.71 (± 2.43)	0.297
Missing	3 (3.2%)	0 (0%)	3 (5.9%)	
<b>Likelihood of Elevator Use (_/10)</b>				
Mean (SD)	8.59 (± 2.65)	8.84 (± 2.43)	8.38 (± 2.83)	0.404
Missing	1 (1.1%)	0 (0%)	1 (2.0%)	
<b>Have been unable to leave or return home due to elevator outage</b>				
Yes	66 (70.2%)	38 (88.4%)	28 (54.9%)	0.00137
No	27 (28.7%)	5 (11.6%)	22 (43.1%)	
Missing	1 (1.1%)	0 (0%)	1 (2.0%)	
<b>Have had to evacuate</b>				
Yes	17 (18.1%)	10 (23.3%)	7 (13.7%)	0.403
No	75 (79.8%)	33 (76.7%)	42 (82.4%)	
Missing	2 (2.1%)	0 (0%)	2 (3.9%)	
<b>Have received training on disaster preparedness</b>				
Yes	31 (33.0%)	13 (30.2%)	18 (35.3%)	0.662
No	61 (64.9%)	30 (69.8%)	31 (60.8%)	
Missing	2 (2.1%)	0 (0%)	2 (3.9%)	

continued on next page

## DIFFICULTY USING THE STAIRS TO EVACUATE

	<b>Total (N=94)</b>	<b>Yes (N=43)</b>	<b>No (N=51)</b>	<b>P-value</b>
<b>Have participated in evacuation drill</b>				
Yes	2 (2.1%)	1 (2.3%)	1 (2.0%)	1
No	90 (95.7%)	42 (97.7%)	48 (94.1%)	
Missing	2 (2.1%)	0 (0%)	2 (3.9%)	
<b>Feel prepared if must evacuate</b>				
Yes	47 (50.0%)	19 (44.2%)	28 (54.9%)	0.354
No	20 (21.3%)	5 (11.6%)	15 (29.4%)	
Missing	27 (28.7%)	19 (44.2%)	8 (15.7%)	
<b>Emergency Kit</b>				
Yes	41 (43.6%)	19 (44.2%)	22 (43.1%)	1
No	53 (56.4%)	24 (55.8%)	29 (56.9%)	
<b>Air Conditioning</b>				
Yes	58 (61.7%)	27 (62.8%)	31 (60.8%)	1
No	36 (38.3%)	16 (37.2%)	20 (39.2%)	
<b>Backup Power Device</b>				
Yes	2 (2.1%)	2 (4.7%)	0 (0%)	0.401
No	92 (97.9%)	41 (95.3%)	51 (100%)	

## COMPARISON OF DEVELOPMENTS – DEMOGRAPHICS

	<b>Total (N=71)</b>	<b>Grant (N=18)</b>	<b>Polo Grounds (N=32)</b>	<b>St. Nicholas (N=21)</b>
<b>Gender Identity</b>				
Male	17 (23.9%)	3 (16.7%)	6 (18.8%)	8 (38.1%)
Female	53 (74.6%)	15 (83.3%)	25 (78.1%)	13 (61.9%)
Prefer not to say	1 (1.4%)	0 (0%)	1 (3.1%)	0 (0%)
<b>Age (years)</b>				
Mean (SD)	51.9 (± 15.5)	54.8 (± 15.0)	52.8 (± 16.7)	48.1 (± 13.9)
<b>Age Groups (years)</b>				
18-24	2 (2.8%)	0 (0%)	2 (6.3%)	0 (0%)
25-34	9 (12.7%)	1 (5.6%)	4 (12.5%)	4 (19.0%)
35-44	16 (22.5%)	6 (33.3%)	4 (12.5%)	6 (28.6%)
45-54	10 (14.1%)	2 (11.1%)	5 (15.6%)	3 (14.3%)
55-64	15 (21.1%)	4 (22.2%)	7 (21.9%)	4 (19.0%)
65-74	13 (18.3%)	3 (16.7%)	6 (18.8%)	4 (19.0%)
≥75	6 (8.5%)	2 (11.1%)	4 (12.5%)	0 (0%)
<b>Hispanic/Latino</b>				
Yes	34 (47.9%)	10 (55.6%)	13 (40.6%)	11 (52.4%)
No	36 (50.7%)	8 (44.4%)	19 (59.4%)	9 (42.9%)
Missing	1 (1.4%)	0 (0%)	0 (0%)	1 (4.8%)

continued on next page

	<b>Total</b> <b>(N=71)</b>	<b>Grant</b> <b>(N=18)</b>	<b>Polo</b> <b>Grounds</b> <b>(N=32)</b>	<b>St.</b> <b>Nicholas</b> <b>(N=21)</b>
<b>Race/Ethnicity</b>				
White	3 (4.2%)	0 (0%)	2 (6.3%)	1 (4.8%)
Black or African American	35 (49.3%)	10 (55.6%)	15 (46.9%)	10 (47.6%)
Asian or Asian American	3 (4.2%)	0 (0%)	3 (9.4%)	0 (0%)
Mixed race or multiracial	1 (1.4%)	0 (0%)	1 (3.1%)	0 (0%)
Other	10 (14.1%)	3 (16.7%)	4 (12.5%)	3 (14.3%)
Prefer not to say	6 (8.5%)	2 (11.1%)	3 (9.4%)	1 (4.8%)
Missing	13 (18.3%)	3 (16.7%)	4 (12.5%)	6 (28.6%)
<b>Chronic Conditions</b>				
0	31 (43.7%)	6 (33.3%)	14 (43.8%)	11 (52.4%)
1	24 (33.8%)	9 (50.0%)	8 (25.0%)	7 (33.3%)
2	7 (9.9%)	0 (0%)	6 (18.8%)	1 (4.8%)
≥3	6 (8.5%)	3 (16.7%)	2 (6.3%)	1 (4.8%)
Missing	3 (4.2%)	0 (0%)	2 (6.3%)	1 (4.8%)
<b>Difficulty using the stairs to evacuate</b>				
Yes	33 (46.5%)	6 (33.3%)	19 (59.4%)	8 (38.1%)
No	38 (53.5%)	12 (66.7%)	13 (40.6%)	13 (61.9%)
<b>Mobility Impairment</b>				
Normal	44 (62.0%)	10 (55.6%)	19 (59.4%)	15 (71.4%)
Mild	10 (14.1%)	1 (5.6%)	6 (18.8%)	3 (14.3%)
Moderate	9 (12.7%)	3 (16.7%)	3 (9.4%)	3 (14.3%)
Severe	1 (1.4%)	1 (5.6%)	0 (0%)	0 (0%)
Missing	7 (9.9%)	3 (16.7%)	4 (12.5%)	0 (0%)
<b>Annual Household Income</b>				
<\$25,000	27 (38.0%)	6 (33.3%)	15 (46.9%)	6 (28.6%)
\$25,000-\$33,999	15 (21.1%)	6 (33.3%)	5 (15.6%)	4 (19.0%)
\$34,000-\$42,999	5 (7.0%)	0 (0%)	4 (12.5%)	1 (4.8%)
\$43,000-\$50,999	4 (5.6%)	2 (11.1%)	1 (3.1%)	1 (4.8%)
\$51,000-\$59,999	3 (4.2%)	1 (5.6%)	1 (3.1%)	1 (4.8%)
\$60,000-\$68,999	2 (2.8%)	0 (0%)	1 (3.1%)	1 (4.8%)
\$69,000-\$77,999	0 (0%)	0 (0%)	0 (0%)	0 (0%)
\$78,000-\$86,000	0 (0%)	0 (0%)	0 (0%)	0 (0%)
>\$86,000	1 (1.4%)	1 (5.6%)	0 (0%)	0 (0%)
Missing	14 (19.7%)	2 (11.1%)	5 (15.6%)	7 (33.3%)
<b>Household Size</b>				
Mean (SD)	3.17 (± 1.84)	3.17 (± 1.42)	3.23 (± 2.12)	3.10 (± 1.77)
Missing	2 (2.8%)	0 (0%)	1 (3.1%)	1 (4.8%)
<b>Under NY Poverty Line</b>				
Yes	44 (62.0%)	12 (66.7%)	22 (68.8%)	10 (47.6%)
No	27 (38.0%)	6 (33.3%)	10 (31.3%)	11 (52.4%)

continued on next page

## COMPARISON OF DEVELOPMENTS – EXPERIENCES WITH ELEVATOR & DISASTER PREPAREDNESS

	<b>Total (N=71)</b>	<b>Grant (N=18)</b>	<b>Polo Grounds (N=32)</b>	<b>St. Nicholas (N=21)</b>
<b>Elevator Reliability ( _/10)</b>				
Mean (SD)	3.61 (± 2.46)	1.94 (± 1.60)	3.39 (± 2.39)	5.29 (± 2.12)
Missing	2 (2.8%)	1 (5.6%)	1 (3.1%)	0 (0%)
<b>Likelihood of Elevator Use ( _/10)</b>				
Mean (SD)	8.66 (± 2.61)	7.17 (± 3.52)	9.47 (± 1.63)	8.71 (± 2.49)
<b>Have been unable to leave or return home due to elevator outage</b>				
Yes	47 (66.2%)	9 (50.0%)	26 (81.3%)	12 (57.1%)
No	24 (33.8%)	9 (50.0%)	6 (18.8%)	9 (42.9%)
<b>Have had to evacuate</b>				
Yes	13 (18.3%)	3 (16.7%)	7 (21.9%)	3 (14.3%)
No	57 (80.3%)	14 (77.8%)	25 (78.1%)	18 (85.7%)
Missing	1 (1.4%)	1 (5.6%)	0 (0%)	0 (0%)
<b>Have received training on disaster preparedness</b>				
Yes	24 (33.8%)	5 (27.8%)	11 (34.4%)	8 (38.1%)
No	46 (64.8%)	12 (66.7%)	21 (65.6%)	13 (61.9%)
Missing	1 (1.4%)	1 (5.6%)	0 (0%)	0 (0%)
<b>Have participated in evacuation drill</b>				
Yes	1 (1.4%)	1 (5.6%)	0 (0%)	0 (0%)
No	69 (97.2%)	16 (88.9%)	32 (100%)	21 (100%)
Missing	1 (1.4%)	1 (5.6%)	0 (0%)	0 (0%)
<b>Feel prepared if must evacuate</b>				
Yes	37 (52.1%)	10 (55.6%)	14 (43.8%)	13 (61.9%)
No	12 (16.9%)	4 (22.2%)	5 (15.6%)	3 (14.3%)
Missing	22 (31.0%)	4 (22.2%)	13 (40.6%)	5 (23.8%)
<b>Emergency Kit</b>				
Yes	34 (47.9%)	9 (50.0%)	15 (46.9%)	10 (47.6%)
No	37 (52.1%)	9 (50.0%)	17 (53.1%)	11 (52.4%)
<b>Air Conditioning</b>				
Yes	43 (60.6%)	12 (66.7%)	15 (46.9%)	16 (76.2%)
No	28 (39.4%)	6 (33.3%)	17 (53.1%)	5 (23.8%)
<b>Backup Power Device</b>				
Yes	2 (2.8%)	1 (5.6%)	1 (3.1%)	0 (0%)
No	69 (97.2%)	17 (94.4%)	31 (96.9%)	21 (100%)

## A4. Survey Questionnaire

Q1 Please download and review the [online consent form](#).

Do you consent to participating?

- Yes
- No

1. Which NYCHA development do you live in?
2. How reliable are the elevators in your building?  
(1:Not at all reliable; 5: Somewhat reliable; 10: Incredibly reliable)
3. How likely are you to use the elevators in your building?  
(1:Not likely, 5: Somewhat likely, 10: Incredibly likely)
4. Have you ever been unable to leave or enter your home as a result of an elevator outage?
  - Yes
  - No
5. If yes, what did you do? \_\_\_\_\_
6. Have you ever had to evacuate your apartment?
  - Yes
  - No
7. If yes, what was the reason for evacuating? \_\_\_\_\_
8. Have you ever received any information or training on how to prepare for or respond to an extreme weather event/natural disaster?
  - Yes
  - No
9. Have you ever participated in an evacuation drill while living here?
  - Yes
  - No
10. Do you feel knowledgeable and prepared to evacuate your building in the case of an emergency?
  - Yes
  - Maybe
  - No

11. What have you done to prepare in the case of a weather or climate-related emergency (heat wave, fire, flooding, hurricane, power outage, etc.)?  
(select all that apply)
    - I have a home emergency kit including food and water (1)
    - I have an A/C (2)
    - I have a generator or other backup power device (3)
    - Other (fill in) (5)
    - None of the above (6)
  
  12. In the case of an emergency, would you (or anyone in your household) be unable to walk down the stairs to evacuate the building?
    - Yes
    - No
    - No, but would need help from another person
  
  13. Is it you (the respondent) who has the mobility impairment?
    - Yes
    - No
  
  14. Please answer this question on behalf of the person with the mobility impairment. Please answer the following questions according to this scale: 1, Without any difficulty; 3, With some difficulty; 5, Unable to do.
    - a. Are you able to step up and down curbs?
    - b. Are you able to get in and out of a car?
    - c. Are you able to get out of bed?
    - d. Are you able to get on and off the toilet?
    - e. Are you able to push open a heavy door?
    - f. Are you able to run errands and shop?
    - g. Are you able to get up off the floor from lying on your back without help?
    - h. Are you able to go for a walk of at least 15 minutes?
  
  15. What is your age? \_\_\_\_\_
  
  16. What is your gender identity?
    - Male
    - Female
    - Non-binary/Third gender
    - Prefer not to say
    - Not listed (fill in) \_\_\_\_\_
-

- 
17. Do you identify as Hispanic or Latino/a/e?
- Yes
  - No
18. What would best describe you? You can choose multiple options.
- White
  - Black or African American
  - American Indian or Alaska Native
  - Asian
  - Native Hawaiian or Pacific Islander
  - Prefer not to say
  - Not listed (fill in) \_\_\_\_\_
19. Do you have any chronic health conditions, such as heart disease, diabetes, or cancer?
- Yes
  - No
20. If yes, how many? \_\_\_\_\_
21. What was your total household income for the last 12 months?
- Less than \$25,000
  - \$25,000 - \$33,999
  - \$34,000 - \$42,999
  - \$43,000 - \$50,999
  - \$51,000 - \$59,999
  - \$60,000 - \$68,999
  - \$69,000 - \$77,999
  - \$78,000 - \$86,000
  - More than \$86,000
22. How many people live in your household? \_\_\_\_\_
23. Is there anything else that you'd like to tell me?  
\_\_\_\_\_
-