

VANCOUVER'S Indoor HEAT Study 2021-2023

Household Exposure to
Ambient Temperatures



image source
Taylor Legere





Vancouver's *Indoor HEAT Study* was conducted on the unceded and ancestral territory of the x^wməθk^wə́y əm (Musqueam), Sḵw̓x̓wú7mesh (Squamish Nation), and səliłwətał (Tsleil-Waututh Nation) between 2021 and 2023.

We are grateful to all the First Nations who have cared for and nurtured the lands and waters around us for all time.

In 2021, Western Canada experienced an extreme heat event caused by a heat dome that resulted in 619 heat-related deaths across BC. This was BC's deadliest environmental disaster to date, with 98% of deaths occurring indoors.

In the weeks following, a team of health and climate professionals at Vancouver Coastal Health, BC Centre for Disease Control, and the City of Vancouver identified indoor temperature as a data gap in the region. To address this gap, these organizations designed a multi-year study – the Indoor Household Exposure to Ambient Temperatures (HEAT) Study – to collect temperature, building, and household data from residents living in Vancouver, BC.

Over the three-year study period, we received 4,574 valid temperature measurements across all housing tenures, residential building typologies, and 22 neighbourhoods in Vancouver.



Study Objectives & Questions

Collect indoor temperatures in Vancouver homes with and without mechanical cooling

- Temperature in a room with and/or without mechanical cooling
- Type of thermometer
- Location, date, and time
- Type of mechanical cooling
- Cooling techniques and behaviours
- Health symptoms (2023 only)

Collect building and household characteristics

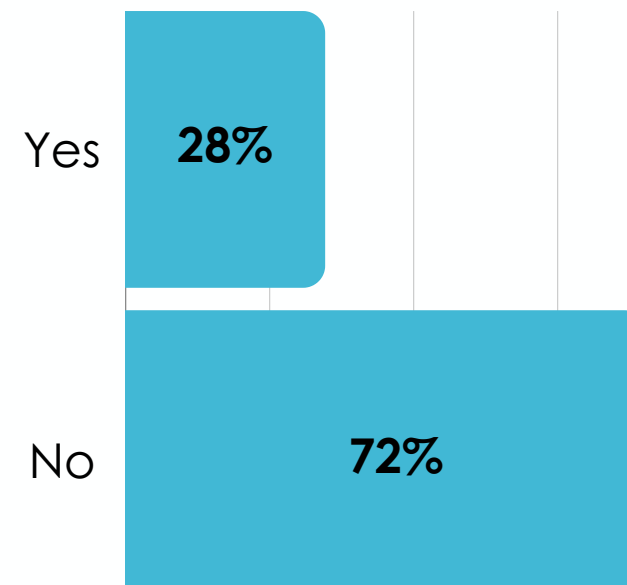
- Housing tenure
- Building type, age, material
- Floor, top floor
- Proportion walls covered by windows
- Unit/room orientation
- Households with greater susceptibility to heat-related illness

Hear directly from households about experiences living in hot indoor environments

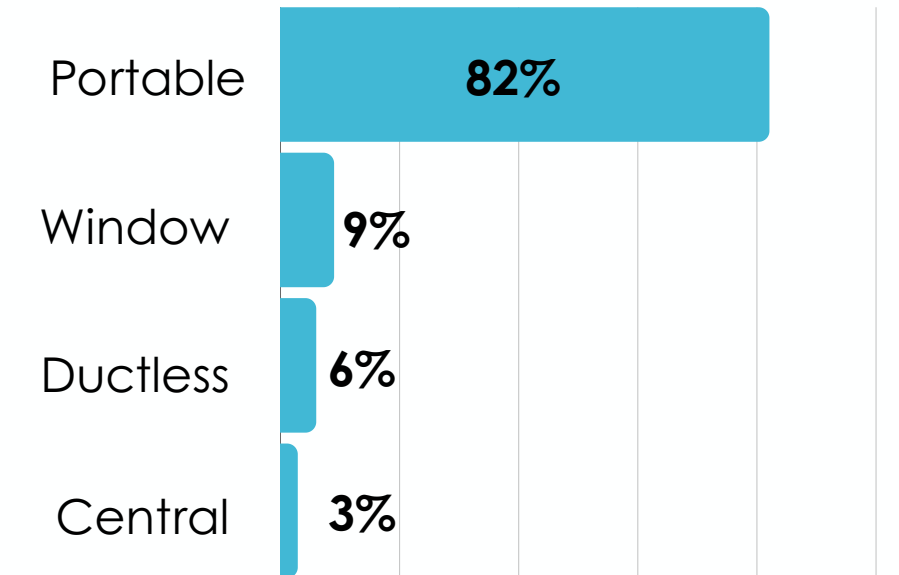
- Perception of climate change and extreme heat events (2021)
- Barriers to purchasing or installing mechanical cooling
- Barriers to accessing cool spaces outside of their homes

Who participated? 4,574 reported temperatures

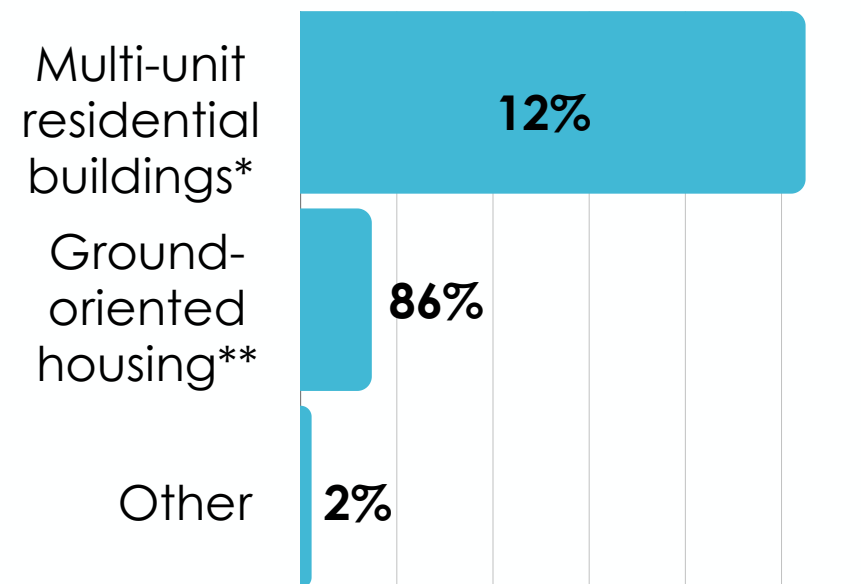
presence of mechanical cooling



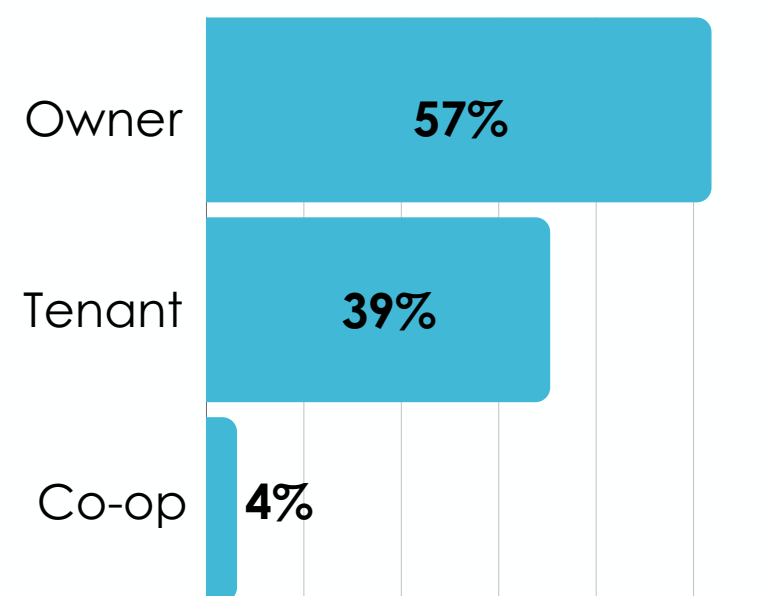
type of mechanical cooling



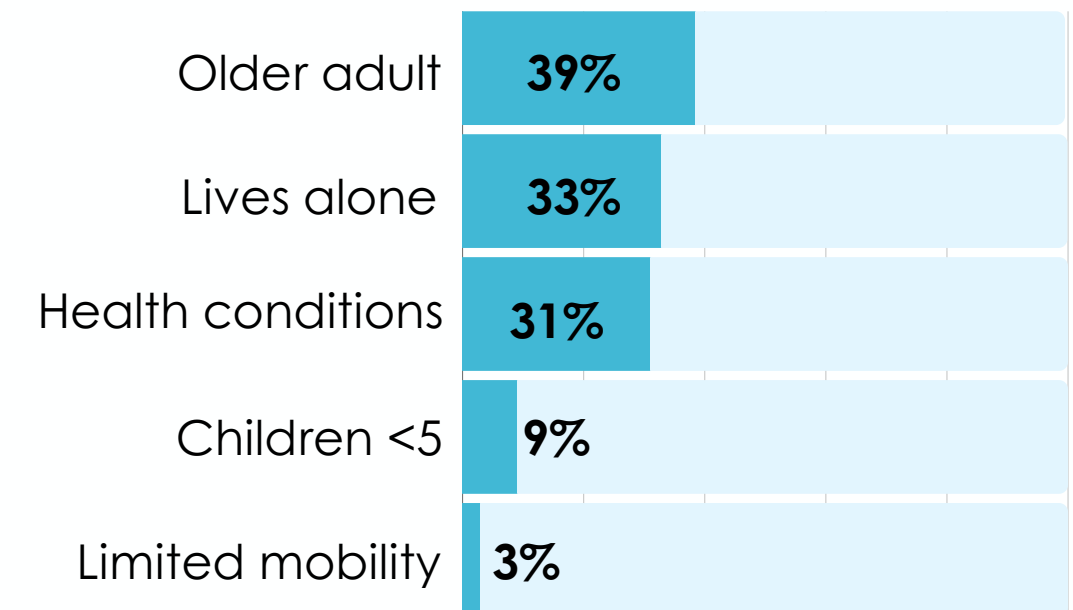
housing type



housing tenure



households with individuals at higher risk to impacts of heat



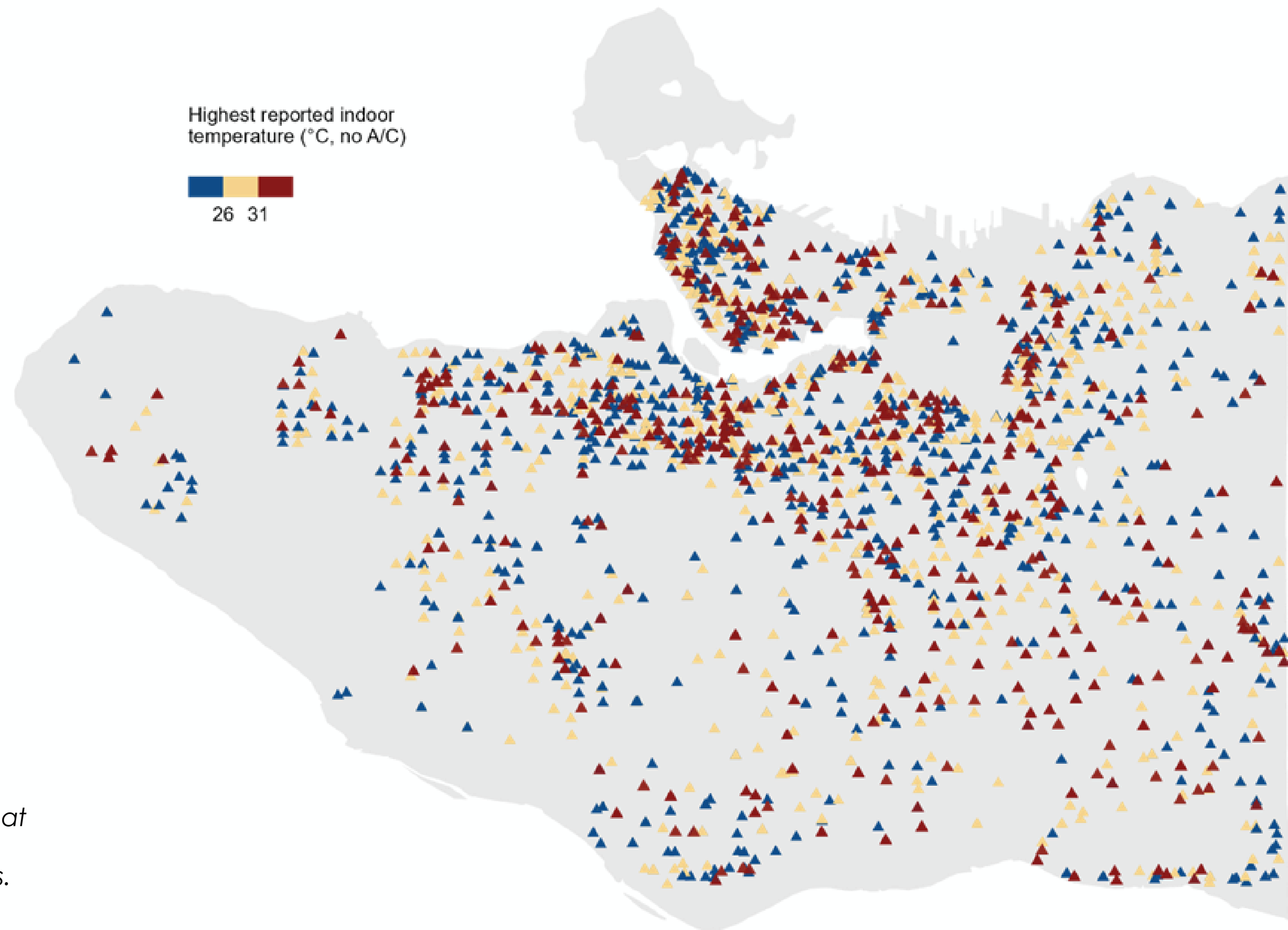
*low-, mid-, or high-rise building

**detached house, duplex, laneway house, townhouse, rowhouse

High temperatures were reported across the city

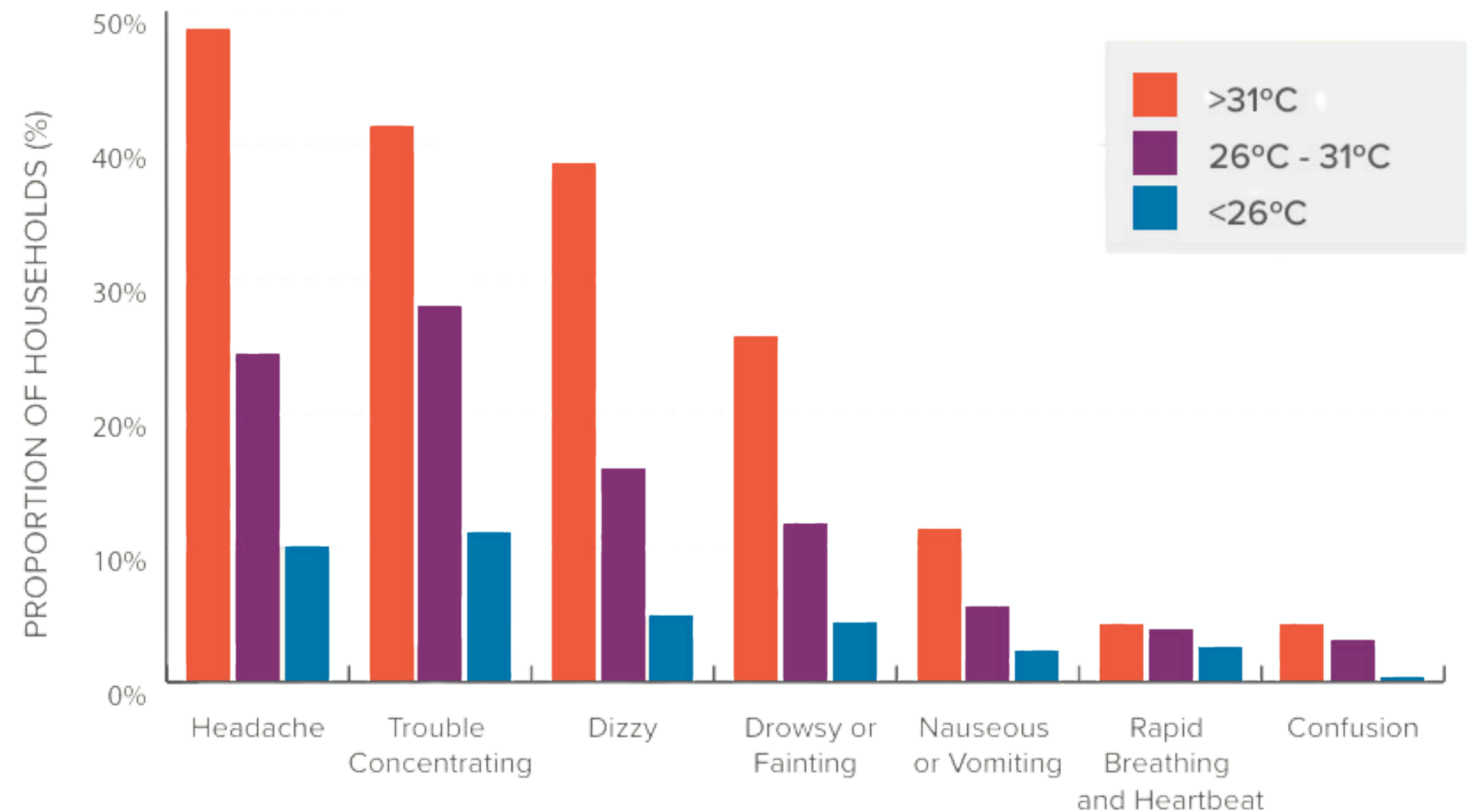
61% of participants experienced maximum indoor temperatures over 26°C and 13% over 31°C*.

**For people susceptible to heat, the risk increases at indoor temperatures higher than 26°C, and temperatures higher than 31°C can be dangerous.*



Participants reported heat-related impacts to health and well-being

Nearly half (47%) of households reported experiencing at least one symptom of heat-related illness in the summer of 2023 and described impacts to daily lives.





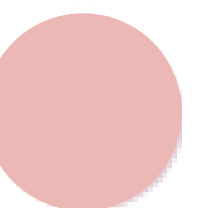
“The heat has really taken such a toll on me. I’m a healthy 22 year old and still often feel lethargic+ other heat exhaustion symptoms when I’m home in a heat wave. It really negatively impacts my mental and physical health.”



“I am on medication that decreases my heat tolerance, living somewhere without adequate cooling has made it difficult to function on very hot days. During the heatwave last year there are large chunks of time that are completely blank in my memory. Dealing with intense [heat] isn’t just uncomfortable, sometimes it feels like a survival situation.”



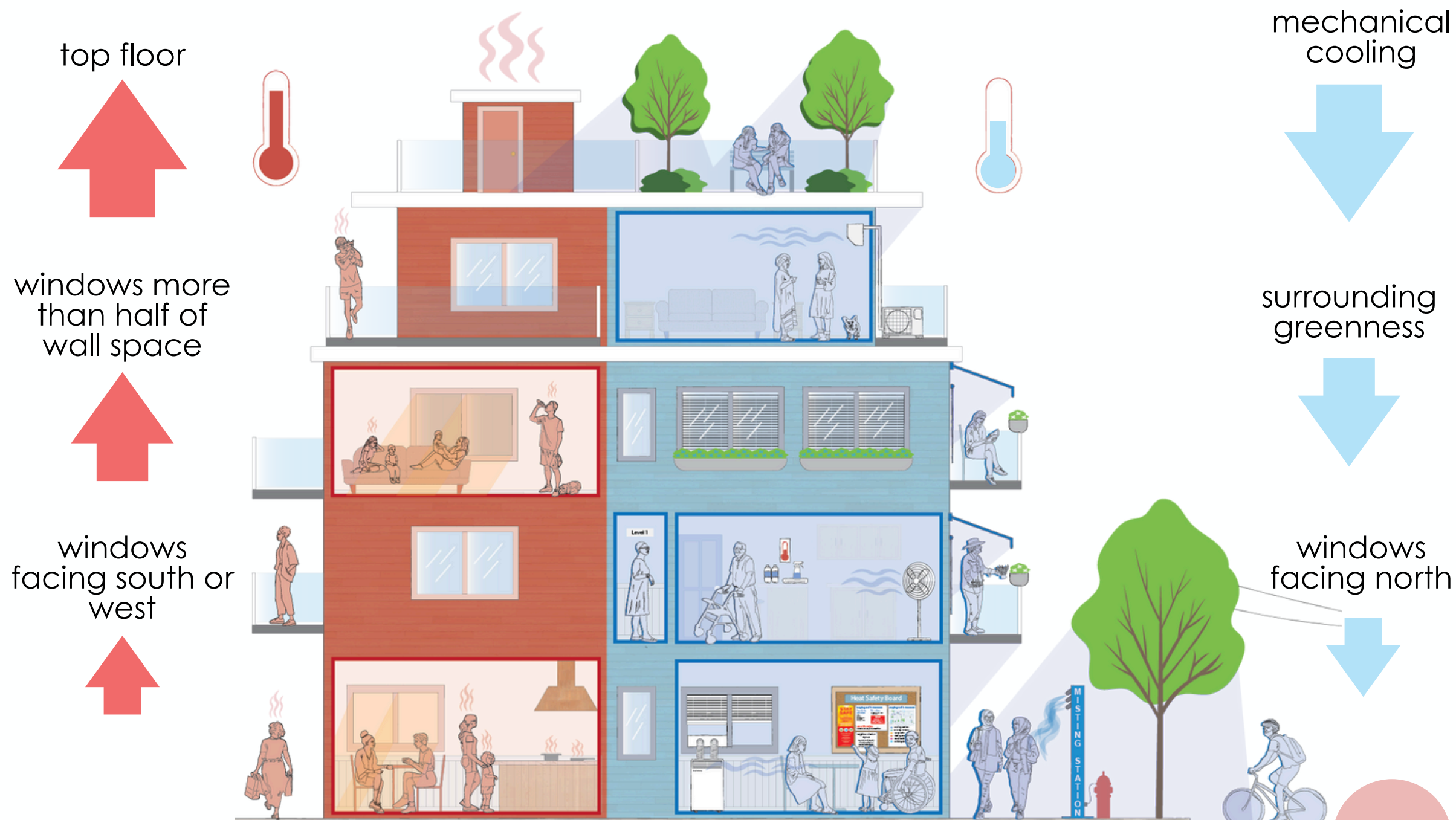
“In the severe heat I develop a bad headache even though I drink lots of water. Life is a struggle in the heat. Severe heat causes me to become dizzy, nauseated and disoriented when I can’t get my core temperature to cool down.”



Built environment factors that influence indoor temperatures

Units with windows facing south or west, with large windows, and located on the top floor reported higher indoor temperatures.

On the contrary, units with mechanical cooling, surrounding greenness, and those facing north reported lower indoor temperatures.





“As a top-floor corner unit, facing S and W with lots of windows, plus the reflection of the opposite building from the E sunlight, this is a whole day sunlight, curtain doesn't help, and the roof and wall materials are designed to trap heat, and this cause some of the summer days, must turn on 2 portable A/C to balance the temperature, lower for 3 degree celcius, far from a normal room tempature with A/C.”



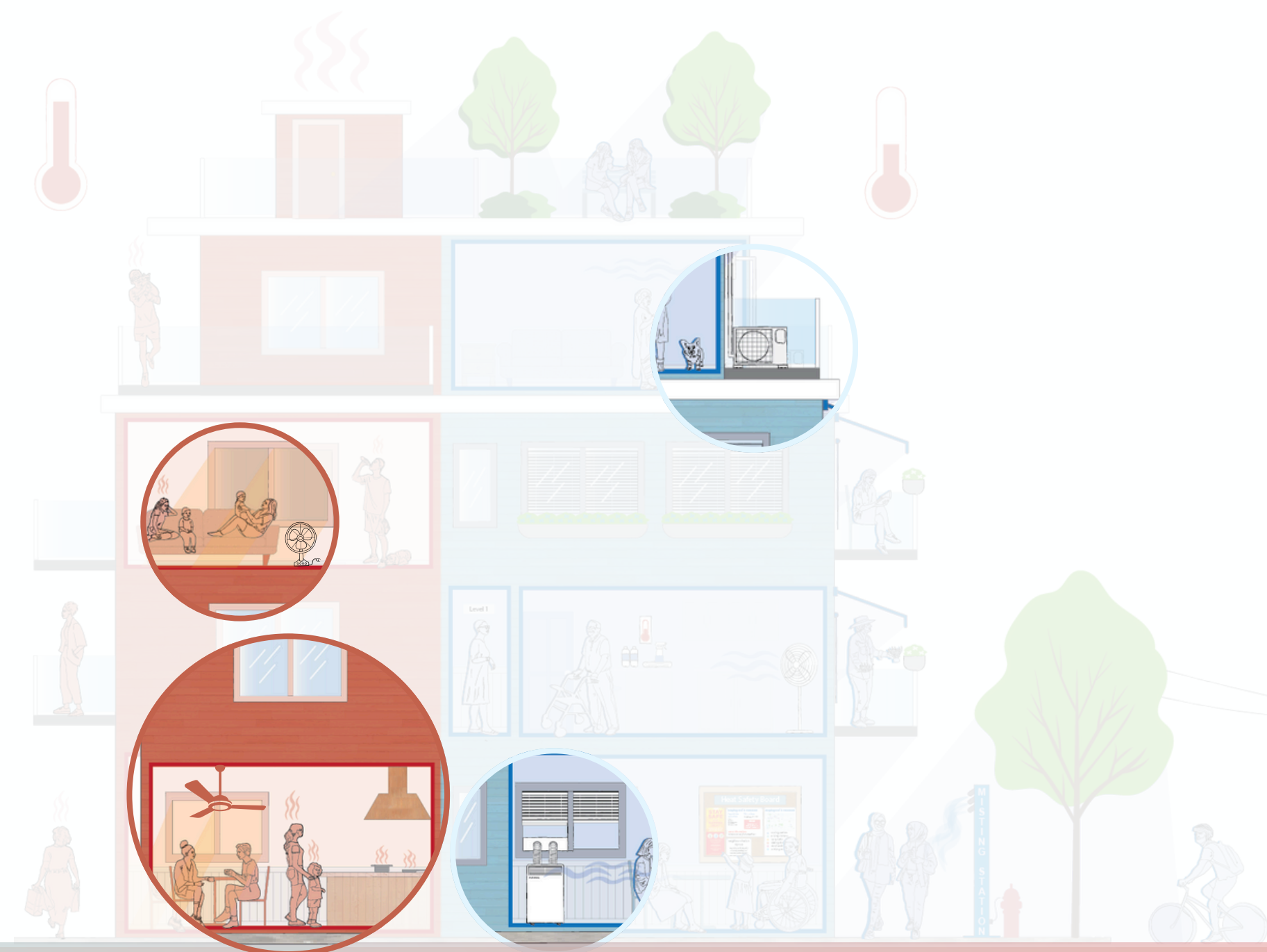
“We have triple glazing which has also really helps keep heat out. We also sealed up the house as best we could and we have done 2 energy assessments and did as much insulation as we could do. We also have a covered deck which keeps the sun off hottest part of the house, which also has blinds to keep sun off the deck. Before we made changes (heat pump, new windows etc), we found the summer completely unlivable in our house and would have had to move.”

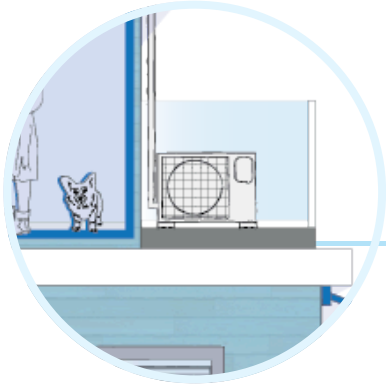


Mechanical cooling helped reduce temperatures but barriers remain

40% of participants reported barriers to accessing, installing, and/or operating mechanical cooling equipment.

The top barriers mentioned were high cost of purchasing and operating, restrictive tenancy agreements or strata bylaws, and building characteristics that make cooling less effective.





“The heat pump keeps all the rooms in my apartment at 24.5 even during the hottest periods of the day.”

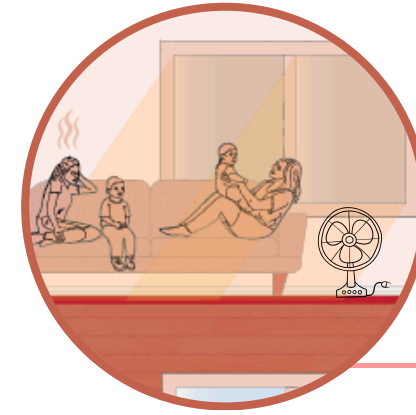
“Without AC I wouldn’t be able to go about my day to day indoors.”



“Even with portable AC it’s a struggle to get indoor temperatures lower than 26 degrees on hot days.”

“Portable air conditioners are inefficient and barely cool.”

“I have multiple fans going all summer and I get tired of the noise but it’s nothing compared to the roar of the a/c. I long for the quiet.”



“I am [now] able to manage temperature in my home using air conditioning, but this was something I struggled to purchase as I have a low income [...and] I had to save for a couple of years to purchase an AC unit.”

“I am low income senior who can’t afford the cost of air conditioners and the higher electrical bills.”



Outdoor greenness is an important protective factor to mitigate high indoor temperatures

Homes surrounded with greenness (within 100 metres) reported cooler indoor temperatures. Fewer of those homes reported temperatures over 26°C.





“My bedroom is a little more protected from the sun because of a tree next to it and it definitely feels cooler.”

“I have never been excessively uncomfortable with the heat my apartment. There are lots of big old trees around the building.”



“I feel a major factor is that our street does not have any large trees. None are more than 6 inches in diameter and there is no shade at all. In contrast the street behind us has large, older growth trees and walking down the street is considerably cooler and the homes are as well.”

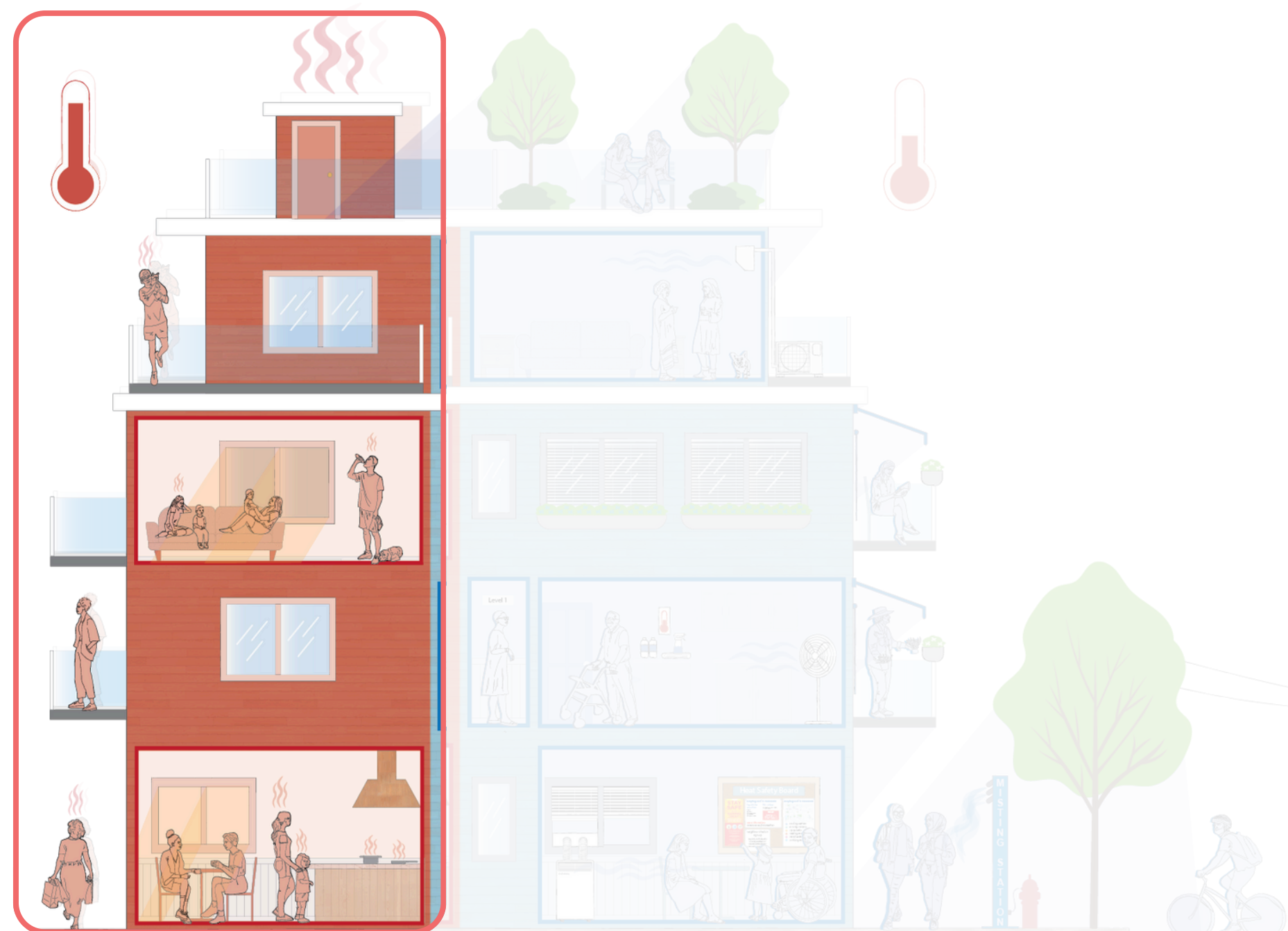


“I live in International Village/Tinseltown area. There’s very limited canopy/tree cover around here which makes it difficult to walk my dog. There’s only one small corridor near Andy Livingstone and walking along the seawall on this side of False Creek is unbearable on summer afternoons.”



Residents living in apartments and condos experienced unique barriers to cooling

Residents reported legislative barriers (e.g. tenancy agreements and strata bylaws) that make it difficult to implement temporary, semi-permanent, and permanent changes to their units that would mitigate overheating.





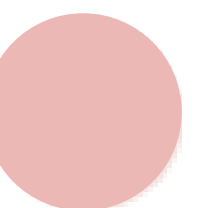
“There are many improvements that could be made by strata to the building itself (outdoor shades, more landscaping, installation of heat pumps, etc.), however as renters we have very little to no influence over.”



“My strata doesn't like air conditioner hoses coming out the windows so some of us have made wooden inserts for our windows. We have to put a white backing on the wood as strata will complain if not white in the windows. I have been told to take down chrome bubblewrap covering I had on the outside of my windows (terrace). They refuse to put up overhangs to block the sun.”



“There are trees immediately outside my apartment which help to reduce heat, but my building owner has removed trees and shrubbery from other parts of the property resulting in higher temperatures for the affected suites.”



Community spaces were identified as important places to cool off

Participants reported visiting both official and unofficial indoor and outdoor cooling spaces such as cooling centres, spray parks, parklets, grocery stores, etc; however, many participants also reported barriers to accessing these spaces.





“I have realized how important community resources are — parks and outdoor common areas with shade and water, cooling centres at libraries and community centres.”

“When the heat becomes unbearable we leave and go to the local nearby park which is shaded.”

“We go to community center, shaded parks, library, cooling place or spend my days at the mall or community center to get away from the heat.”

“In order to access cool buildings, I have to leave the house and take transit, which is not always air conditioned. The walk to transit has no shade and is extremely hot. Even though I am close to transit, even a 10-15 min walk can cause overheating.”



Most cited public calls to action*

**These five calls to action were identified in participant responses that used verbs like 'need,' 'should,' 'must,' and 'would' to emphasize need for action.*

- Introduce or expand programs that facilitate passive and active cooling options in existing buildings, through information and financial support.
- Expand and maintain greenness (e.g. tree canopy coverage and park space) near homes across Vancouver neighbourhoods.
- Remove legislative barriers to cooling that exist within the Strata Property Act and Residential Tenancy Act
- Improve and expand access to public cooling facilities and outdoor spaces.
- Encourage or require passive building design features that reduce overheating in new buildings



“It would be great if smaller grants could also be provided to make retrofits to housing like adding window tints, reflective blinds, white paint for roof tiles, attic fans etc.”

“Need government incentives to install proper cooling.”



“We urgently need to update our aging infrastructure and housing policies to reflect [our warming climate] and prevent thousands more dying heat-related deaths.”

“Please amend the building code to require developers to build functional, livable homes that take climate into consideration.”



“City trees should be protected at all cost.”

“City needs more small, treed parks in local neighborhoods.”

“More water/pool/spray parks within a short walk would greatly improve quality of life.”





Emily Peterson
Senior Environmental Health Scientist

Iris Chan
Environmental Health Scientist

Dr. Michael Schwandt
Medical Health Officer

 healthy.environments@vch.ca



Shirley Chen
Environmental Health and
Knowledge Translation Scientist

Katherine White
PhD Candidate at the School of
Population and Public Health

Dr. Sarah Henderson
Scientific Director

 environmentalhealth@bccdc.ca



Sarah Labahn
Sustainability Policy Analyst

Tamsin Mills
Senior Sustainability Specialist

Micah Hilt
Lead Seismic Policy Planner

 greenestcity@vancouver.ca