Social vulnerability to extreme heat and wildfire smoke in the VCH region

Briefing note for Medical Health Officers and local government planners

Emma Branch (independent analysis, not a Vancouver Coastal Health product)

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Purpose

To identify which communities in the Vancouver Coastal Health (VCH) region are most socially vulnerable to extreme heat and wildfire smoke, and whether those communities also have less green cover, so that adaptation efforts can be prioritised. Full methods and the interactive map are available online.

Key findings

- **Vulnerability is concentrated in a small number of communities.** Across 1,773 neighbourhoods (dissemination areas) in 45 Community Health Service Areas (CHSAs), the highest average vulnerability was in Downtown Eastside, Richmond City Centre, and West End.
- **The most vulnerable neighbourhoods have the least green cover.** In the large urban area, vegetation covered an average of 25.0% of land in the most vulnerable fifth of neighbourhoods, compared with 35.2% in the least vulnerable fifth (Spearman's rho = −0.36).
- **166 neighbourhoods, home to about 137,967 people, face both risks:** they are in the most vulnerable fifth *and* the lowest third for vegetation cover. The largest shares of residents in these priority areas are in Downtown Eastside, Downtown Vancouver, Richmond City Centre, West End, and North Vancouver City - West.
- **The drivers of vulnerability differ between communities** (see table). Some rank highly mainly because of older adults and people living alone, and others because of low income, renting, or language barriers. A single intervention will not fit every community.
- **The index is consistent with national measures.** It agrees closely with Statistics Canada's Canadian Index of Social Vulnerability (rho = 0.74).

Communities with the highest social vulnerability

Rank	CHSA	Population	Residents in most vulnerable fifth (%)	Vegetation cover (%)	Main drivers (times VCH average)
1	Downtown Eastside	20,168	87	17	low income (2.2x); living alone (2.0x)
2	Richmond City Centre	63,946	75	24	no English or French (2.4x); low income (1.7x)
3	West End	46,891	64	24	renting (2.0x); living alone (1.9x)
4	Oakridge/Marpole	42,794	47	27	low income (1.3x); no English or French (1.3x)
5	Downtown Vancouver	44,523	50	18	living alone (1.6x); renting (1.4x)
6	West Vancouver - Lower	20,132	50	34	aged 65+ (1.9x); low income (1.2x)
7	University of British Columbia	18,296	40	35	low income (2.2x); renting (1.4x)
8	Victoria-Fraserview	30,433	31	23	no English or French (2.5x); aged 65+ (1.2x)

Recommended next steps (for consideration)

These options draw on VCH's CLEAR engagement with priority populations (VCH Public Health, 2025), which complements this analysis: CLEAR describes lived experience, and this index shows where the people most likely to share those experiences are concentrated.

1. **Focus outreach on priority areas through trusted community partners.** CLEAR participants valued in-person, multilingual communication from trusted messengers, and some were wary of being placed on a "vulnerable people" list. Area-level results can direct pre-season outreach and check-in support to neighbourhood houses, seniors' centres, and community organizations in priority areas without identifying individuals.
2. **Match the response to each community's main drivers.** Where many older adults live alone, strengthen informal check-in networks. Where language barriers are common, prioritise translated, offline materials (CLEAR identified gaps, for example in Farsi).
3. **Prioritise cooling and cleaner air at home, not only cooling centres.** In the 2021 heat dome, 98% of heat-related deaths occurred indoors at home (BC Coroners Service, 2022), and CLEAR found that transportation barriers and a preference to stay home limit cooling centre use. Options include air conditioner and air cleaner programs, and work with rental and social housing providers on cooling policies, as renters reported fearing eviction if they asked for cooling.
4. **Use the priority areas to guide urban greening with municipalities.** Tree planting and shade are structural levers for local government; as CLEAR participants noted, advice to "plant trees" is impractical for low-income renters.
5. **Fill the evidence gaps.** Add modelled heat and smoke exposure and health service use to move from vulnerability to risk. Rural and remote communities need other approaches, as neither the vegetation data nor the CLEAR engagement covered them, and First Nations communities should be engaged in partnership.

Limitations

- **Area-level data:** results describe neighbourhoods, not individuals, and may hide variation within areas.
- **Data currency:** census data are from 2021, collected during the COVID-19 pandemic.
- **Missing risk factors:** chronic health conditions and disability, key heat risk factors identified by the BC Coroners Service, are not available in the census at the neighbourhood level.
- **Index design:** equal weights are a transparent default, not an evidence-based weighting. Quintiles are relative to the VCH region.
- **Green cover:** the vegetation measure includes grass and shrubs as well as trees, and is only available for the large urban area. Rural and remote communities are not assessed for green cover.
- **Missing data:** low income is not published for First Nations reserves, so these areas are scored on four indicators instead of five.
- **No outcome validation:** the index has not been tested against heat- or smoke-related health outcomes.

Data: Statistics Canada 2021 Census Profile, Canadian Index of Social Vulnerability (2021), Canadian Index of Multiple Deprivation (2021), and vegetation cover in large urban areas (Table 38-10-0187-01); BC Ministry of Health CHSA boundaries. Code: github.com/emmabranch/vch-climate-equity-profile

References: Vancouver Coastal Health Public Health (2025). Climate, Lived Experience and Resilience (the CLEAR project). BC Coroners Service (2022). Extreme heat and human mortality: A review of heat-related deaths in B.C. in summer 2021.