

Characteristics of the neighbourhood and dwelling most strongly associated with the harmful health effects of heat in low-income areas

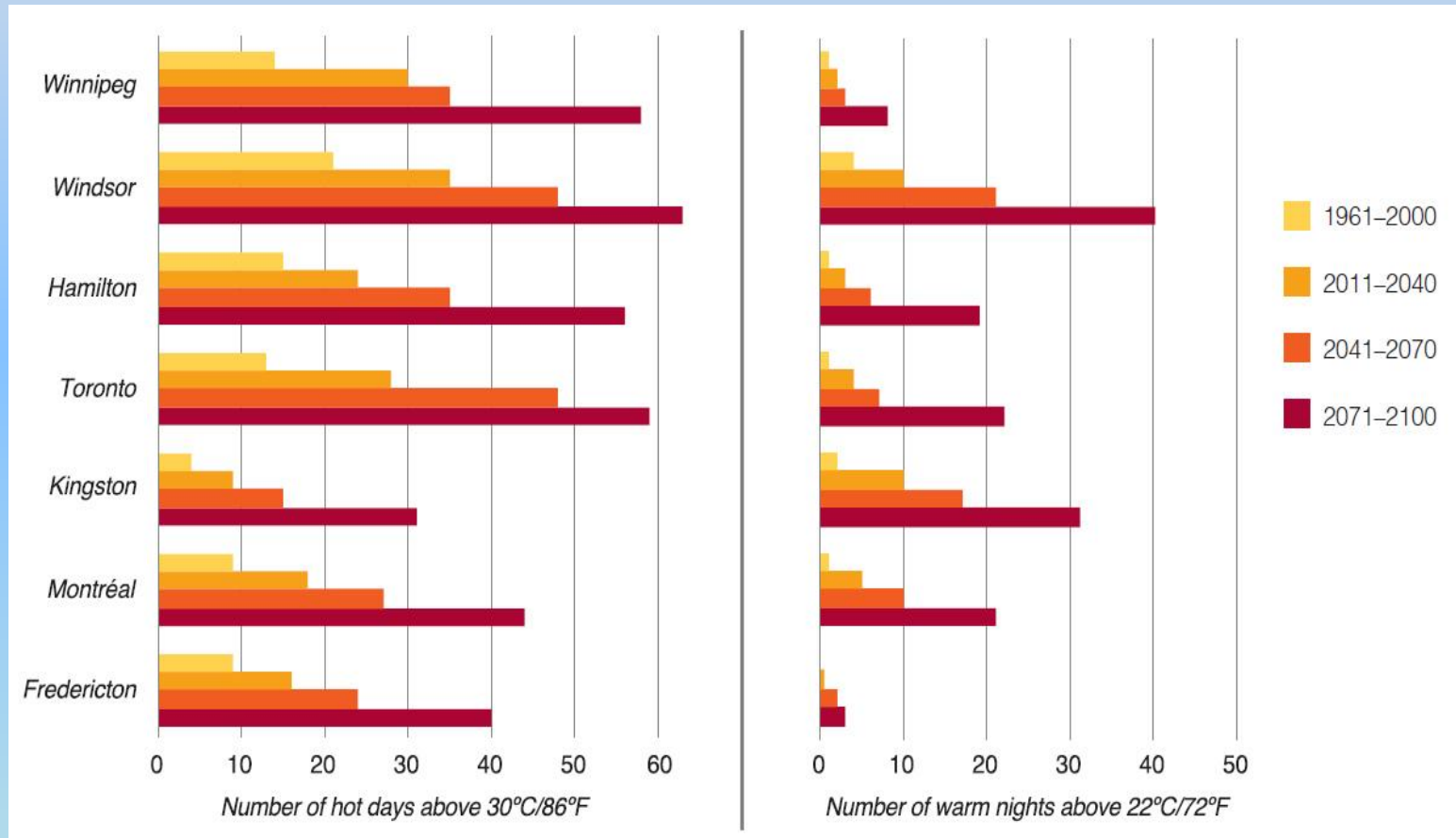
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Introduction

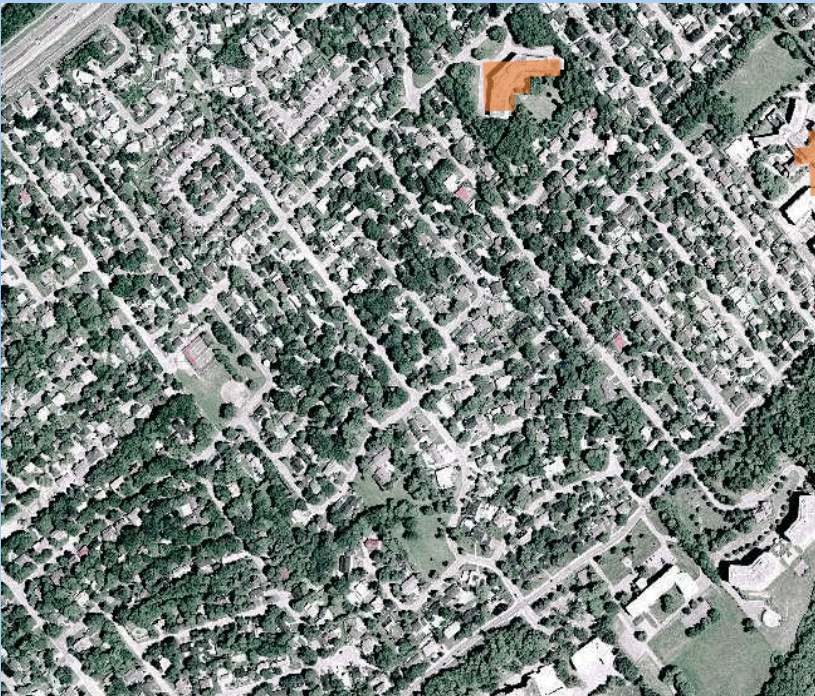
The number of hot days above 30°C (or 86°F) in Canadian cities will double or triple in the next 30 years or so (Casati, Yagouti & Chaumont, 2013)



Most very low-income neighbourhoods are located in deprived census tracts, called dissemination areas (DA) in Canada.

Urban heat islands differ greatly between those areas.

Least deprived (1st quintile)



Most deprived (5th quintile)



Rationale

Much is known about the impacts of heat on mortality, hospital admissions and visits to emergency rooms, yet much remains unknown about their variability.

And almost nothing exists in the scientific literature about the other health impacts suffered at home or seen in outpatient clinics

Recent literature shows that UHI and poor dwelling conditions add 1-3°C to indoor air temperature, on average

Objective of the study

To identify the characteristics of the dwelling and neighborhood of residence, adjusted for health characteristics, of the people who feel more the harmful impacts of heat on their health, during summer, in the most disadvantaged neighborhoods of the 9 largest cities in the province of Québec (Canada).

Methodology

The study is cross-sectional by stratified sample. For each of the cities studied, the 2-step selection procedure produced representative samples of the most deprived DAs.

A total of 3,485 people were interviewed in 2011 in their residences, by means of a closed questions survey. 50% in subsidized public housing, and 50% in normal housing.

The data were weighted to ensure calibration of the survey frequencies on the theoretical frequencies (population). The analyses take into account these weights and the sampling plan.

Methodology

Dependent variable:

PERCEIVED ADVERSE PHYSICAL AND MENTAL HEALTH IMPACTS DURING VERY HOT AND HUMID SUMMER CONDITIONS

- Similar to perceived overall health status (commonly used in national surveys) but in a heat context; overall health status is considered an excellent predictor of future health problems/consumption of medical services/risk of death.
- Risk group consisted of participants who reported their physical and/or mental health as moderately or greatly adversely affected by very hot and humid weather conditions (vs. slightly or not at all)

Methodology

Independent variables:

- Dwelling characteristics affecting ***heat exposure***, including air conditioning, common spaces and management;
- Perceptions on neighbourhood characteristics affecting heat exposure (ex. shade, highways);
- Demographic, cultural, economic, and lifestyle variables, self-reported diagnoses of chronic diseases, disabilities, social support, access to services, all affecting either ***heat sensitivity*** or ***access to treatment***.

Methodology

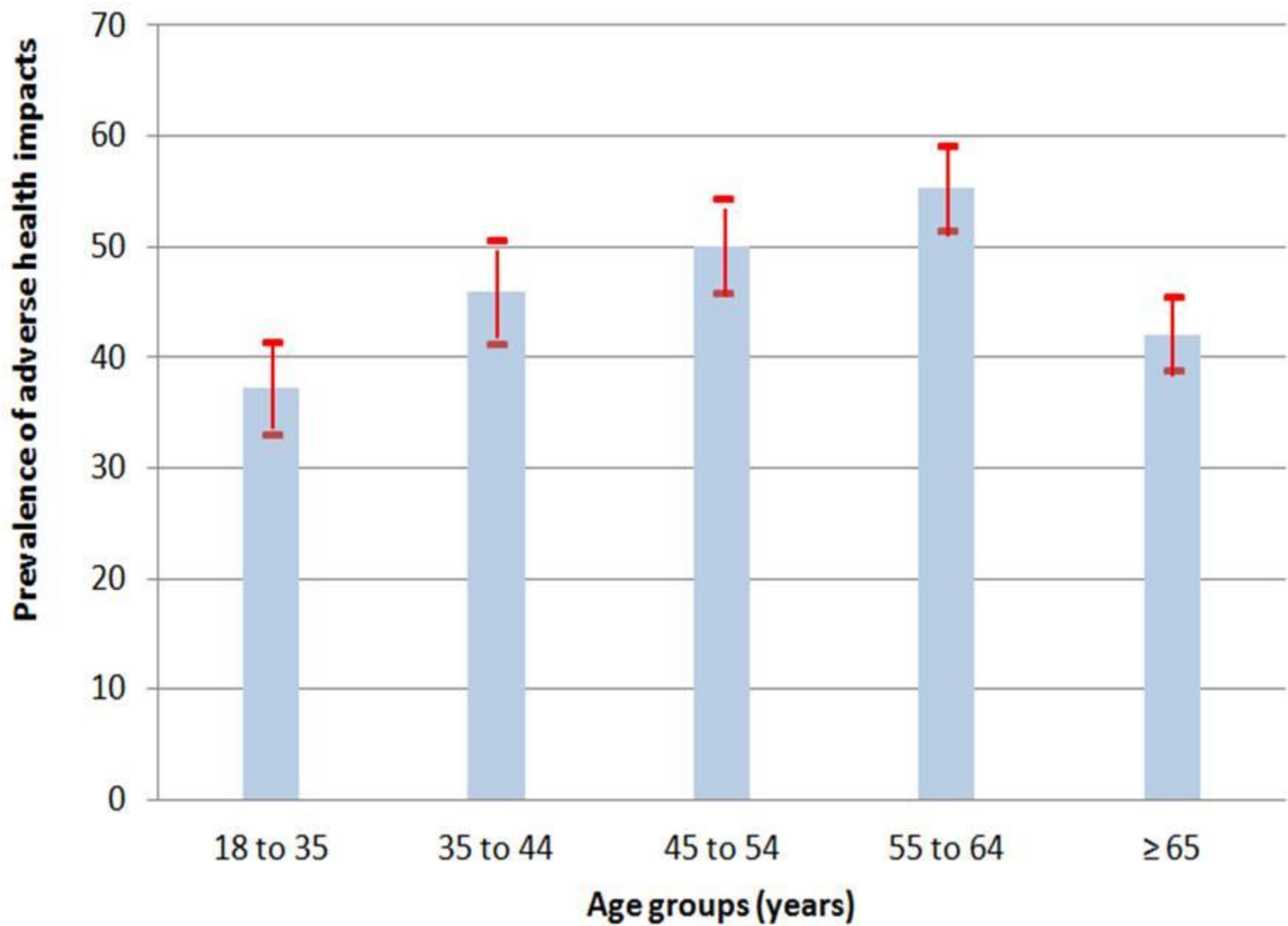
Data analysis

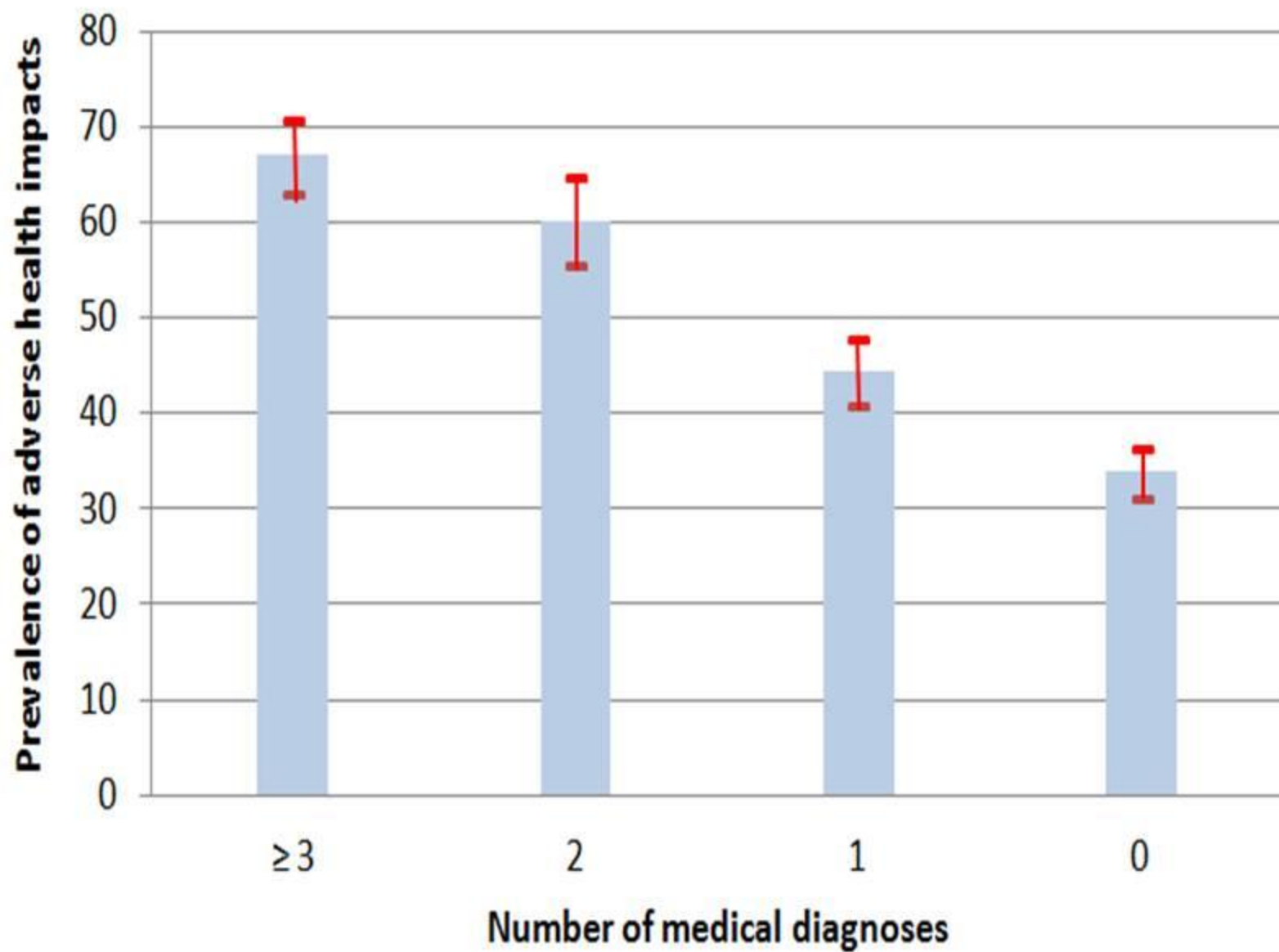
- Sampling design enabled weighting of data sequentially according to the weights of DAs and households (age, gender).
- Multivariate logistic regression model (proc surveylogistic)
- Generalized estimating equations methods (proc genmod) takes into account spatial autocorrelation (DA/communities)
- Influence of the season in which the interview took place evaluated
- Statistical rejection threshold retained is $\alpha \leq 0.01$, given the high number of participants and comparisons made.

Results

Prevalence of adverse health impacts when it's very hot and humid in summer

- Overall prevalence: **46.0 %** (IC:44.2-47.8), mostly physical (44.0% (CI:42.2-45.7) . Some 17.8% (16.4-19.1) also experienced adverse mental health problems.
- Health impacts leading to a medical consultation, most often the family doctor: **11.9 %** (CI:10.7-13.0);





Results

In multivariate analysis, 10 risk Indicators remained:

- 1. Presence of air conditioning (vs no, OR: 1.4; CI: 1.2-1.7)**
- 2. Strong dissatisfaction with temperature inside dwelling in summer (OR=3.5, CI:2.8-4.4)**
- 3. Important air pollution problem due to traffic in neighbourhood (OR=1.4, CI:1.2-1.7)**

Results

4. Female gender (OR=1.5, CI:1.3-1.8);
5. Under 65 years old (OR=1.5, CI:1.3-1.8);
6. Perceived health status fair or poor (OR=1.8, CI=1.4-2.5);
7. Multimorbidity (OR=1.7, CI:1.3-2.2), and especially having ≥ 2 diagnoses of chronic diseases, particularly for people self-describing as in poor health (OR <65 =5.6; OR ≥ 65 =4.2),

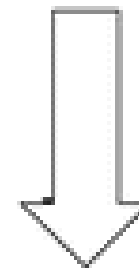
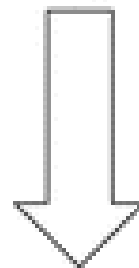
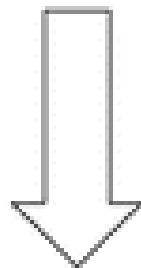
Results

- 8. Being on long term medical leave or handicapped (OR =2.0, CI:1.6-2.7);**
- 9. Health problems perceived as related to indoor air quality (OR=2.1, CI:1.5-3.0);**
- 10.High stress levels almost all the time (OR=1.5, CI:1.2-1.8);**

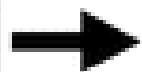
Factors
affecting
exposure

Factors
affecting
sensitivity to
a given heat
exposure

Factors
affecting
access to
treatment



Heat



Heat stress



Heat illness
(clinical signs)



Heat death



Kovats RS, Hajat S. 2008.

Annu. Rev. Public Health. 29:41–55

[View larger version\(122K\)](#) [Download as a PowerPoint slide \(66K\)](#)

Figure 2 Points along the causal chain from heat exposure to heat death.

Results

For the 12 % going to see their physician or attending nurse, 6 risk indicators were identified:

2 indicators of heat exposure:

- Insatisfaction with indoor dwelling temperature in summer
- Air pollution due to trafic in neighbourhood

Results

And 4 indicators of higher sensitivity to heat due to existing health status:

- having ≥ 2 diagnoses of chronic diseases
- people self-describing as in poor health
- high stress levels almost everyday
- long-term medical leave

Results

Based on the C index (around .8, which indicates that the model's discriminant capacity is good), it appears that the scope of the indicators associated with the prevalence of health impacts should be broadened to other categories of variables, such as the characteristics of the dwelling and lifestyle.

And they all live in urban heat islands...



Conclusion

- The prevalence of reported impacts was high at 46%, mostly physical health.
- Female gender and long-term medical leave are two impact risk indicators in people <65 years of age.
- Low income and air conditioning at home are risk indicators at all ages in deprived DAs.
- Results for having ≥ 2 diagnoses of chronic diseases, particularly for people self-describing as in poor health (odds ratio, $OR_{<65}=5.6$; $OR_{\geq 65}=4.2$), and perceiving daily stress, are independent of age.

Conclusion

- The prevalence of reported heat-related health impacts is thus very high in those inner cities, with notable differences according to age, stress levels and long-term medical leave, and overall health status and pre-existing chronic diseases.
- In line with the only other study from 5 other Canadian cities, from all socio-economic status that found similar but much lower perceived negative health impacts at all ages (Alberini et al. 2011)
- Will allow public health authorities to improve preparedness plans for heat waves.

References

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