Heat Awareness and Response among Montreal Residents with Chronic Cardiac and Pulmonary Disease

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ABSTRACT

Objectives: Persons affected by chronic heart and lung disease risk illness and death through exposure to extreme ambient heat. Here we describe their knowledge and awareness of the risks, and the degree to which they practice the protective behaviours recommended by public health and meteorological authorities.

Methods: Over the course of a hot Montreal summer, chronic cardiac and/or pulmonary insufficiency patients were recruited sequentially on site or by telephone from among attendees at five Montreal university hospital clinics. A one-hour face-to-face structured interview was completed by 238 patients, of whom 78% were at least 60 years of age.

Results: Participants were well informed about extreme heat and its impact on health. Most see themselves as vulnerable to heat, recall extreme heat advisories, and all adopt at least one recommended protective measure. Of the participants, 68% spend time in an air-conditioned space during extreme heat episodes, and more than 75% reduce their physical activity and drink extra fluids. A small minority resists recourse to air conditioning: of those without, 32% have "little confidence in buying an air conditioner" even if so advised by their caregivers, and 25% would refuse to overnight in an air-conditioned shelter during a prolonged heat wave.

Conclusions: These chronically ill respondents perceive themselves as susceptible to extreme heat, have confidence in prevention, and almost all adopt recommended protective behaviours. A minority resists protective messaging.

Key words: Heat; health risks; knowledge; COPD; heart failure

La traduction du rsum se trouve la fin de l'article.

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Sustained heat waves have struck both North America and Europe in the recent past. Impacts on human health have been dramatic: in August 2003, an estimated 1,067 Parisians died prematurely during the course of 9 uncharacteristically hot days;¹ an estimated 739 Chicago residents died as a consequence of a 7-day heat wave in 1995.²

The ill and elderly are among those most vulnerable to the ravages of extreme heat.³ On very hot days, older individuals⁴ and persons with cardiac insufficiency, obstructive pulmonary disease and other chronic health conditions die in above-expected numbers.^{5,6}

Mortality may be preventable by measures taken before and by interventions taken during episodes of extreme heat. Health authorities recommend pre-event measures such as acquiring an air conditioner, learning the signs of heat-related illness, and identifying a friend or family member ready to monitor and assist when it is hot.⁷ During heat episodes, news media join health authorities in advising the public to find cool spaces, to stay hydrated and to avoid strenuous activity.⁸ Many cities now have programs to inform, assist and even shelter residents during prolonged heat episodes.⁹

Despite the existence of advisories and interventions designed to protect vulnerable persons from the effects of extreme heat, we know little about how those targeted respond. Our objective was to fill this gap.

METHODS

Participants and procedures

The study was conducted in Montreal between May 30 and October 6, 2005, when daily mean temperatures were 2.4C above the long-term average.¹⁰

Patients attending two specialized clinics for heart failure (CHF) and three for chronic obstructive pulmonary disease (COPD), all located at Montreal university hospitals, and who were resident in metropolitan Montreal (population 3,000,000), spoke French and/or English, and had a home telephone, were eligible. Contact was made with all patients waiting at the clinics, and by telephone drawing from lists of all clinic patients treated at home. At the participant's choice, face-to-face interviews were conducted either at the hospital clinic or the participant's home.

Measures

A preliminary version of the questionnaire (available from the corresponding author) was developed in collaboration with health professionals from two participating CHF and COPD clinics. Composed in French, the hour-long questionnaire was translated into English.

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The questionnaire measured:

A. Respondents and their lodgings – besides socio-demographic variables, the interview queried social contacts and the presence of air conditioning and fans.

B. Knowledge of heat impacts – general understanding of ambient heat and its impact on health were queried through open-ended, “true or false”, and multiple choice questions.

C. Awareness of and attitudes to heat advisories – how often participants listen to general weather reports and the credibility they attach to them; whether, when and where participants had heard extreme heat advisories, the trust they accord them, and whether they see them as useful for preventing negative impacts on their health. We also asked if a health professional had ever advised that they were vulnerable to extreme heat.

D. Protective behaviours adopted – how often (“always, frequently, seldom, never”) participants used specific protective measures including recourse to an air-conditioned environment, activity reduction, dietary change, hydration, and social support during extremely hot days.

Research ethics

Research ethics boards of McGill University (Montreal), and the three hospitals approved the protocol.

Statistics

Descriptive statistics and Pearson chi-square, calculated to assess differences in the adoption of protective behaviours comparing participants with and those without a home air conditioner, were calculated with SPSS 11.0.¹¹

RESULTS

Respondents and their lodgings

Of 343 outpatients approached, 101 (29%) declined to participate because of either lack of interest or precarious health. Age and sex distribution of those who declined are similar to those of participants. Four interviewees not meeting inclusion criteria were excluded, leaving a final sample of 238. Of these, 86 (36%) were recruited at the two CHF clinics, and 152 (64%) at the three COPD clinics. One hundred and ninety-seven (83%) persons responded in French and 41 in English.

Of the 238 participants, 78% were 60 years of age or older, and 24% were 75 years of age or older ($M=67.8$ years, $SD=9.6$, Table 1). The excess of male participants likely reflects the clientele of clinics for chronic heart and lung disease. Of the participants, 42% fall below Canada's low-income threshold.¹² As for social relations, 94% are in telephone contact with friends or family members and 78% receive personal visits. An isolated subgroup includes 13% who receive less than one telephone call per week, and 44% who receive less than one visit per week.

Co-morbidity was evaluated by self-report: of participants with COPD, 22% also reported having CHF, and 12% of CHF participants also had COPD. Other conditions mentioned include arthritis/rheumatism (45%), diabetes (26%), depression (17%), and kidney conditions (15%). Thirty-eight percent follow therapeutic fluid restriction.

Some participants report personal experience with heat-related illness: 13% mention having been hospitalized due to extreme heat, most often for respiratory problems.

Only 4 participants (2%) possess neither a fan nor an air conditioner; 174 (73%) participants have an air conditioner, of whom 102 (59%) have window units. Those without air conditioners have

Table 1. Demographic Characteristics and Residential Arrangements of the 238 Participants, and of Those with and without Residential Air Conditioning

Socio-demographics	TOTAL % (n=238)	Have AC % (n=174)	No AC % (n=64)
Gender			
Male	61	62	58
Age (years)			
41-59	22	19	28
60-64	18	17	20
65-69	15	17	9
70-79	35	34	38
80-88	10	12	3
Unknown	1	1	2
Main occupation			
Worker	13	13	17
Disability pension/retired	79	82	75
Other	7	5	8
Level of education			
None to 6 th grade	12	10	14
Grade 7 to 12	51	50	55
College or trade school	16	17	14
University	21	23	17
Household income			
<\$15,000	24	23	28
\$15,000-24,999	21	20	25
\$25,000-39,999	20	20	19
\$40,000+	24	26	19
Declined to provide	11	11	9
Residence			
Live alone	39	36	47
Owner or renter			
Owner	42	44	34
Renter	58	56	66
Type of dwelling			
Single family	21	23	14
Duplex or triplex	23	23	22
Multiplex or apartment building	49	48	53
Subsidized housing	4	3	6
Nursing home/autonomous or semi-autonomous housing (private/public)	3	3	5
Have an air conditioner	73	–	–
If yes (n=174), type of air conditioner			
Central air conditioner	25	–	–
Wall unit/Split type air	15	–	–
Window unit/portable	16	–	–
Have a portable and/or ceiling fans	79	74	94

Table 2. Knowledge about Extreme Heat (n=238)

If after a hot day, temperature remains high at night, it has a worse effect on health (should answer “true”)	86%
People suffering from lung or heart diseases are hospitalized more often when there are heat waves (“true”)	94%
Heat can affect your health even before you feel any of the warning signs (“true”)	93%
The “Humidex” is based on two factors. Which? (“temperature and humidity”)	44%
Heat waves have a greater effect on people's health when they occur (offered “beginning”, “end”, “all summer”: should answer “at the beginning of summer”)	12%

less education, lower incomes, and are more likely to rent and to live alone (Table 1). Participants with air conditioning were asked how often their machines run by day and by night: of the 174, 2% claim never to use air conditioning during the day, and 17% never at night; 38% say their air conditioning “always” runs both day and night. As for what motivated their having air conditioning, 49% said comfort/relief from heat and 34% said it was to mitigate symptoms related to their medical condition.

Knowledge of heat impacts

Questions reflecting knowledge of extreme heat and its effects on health were answered correctly by most participants (Table 2).

Table 3. Proportion Reporting that They “Always” or “Often” Employ the Following Measures during Extreme Heat

Protective Measure	174 with A/C (%)	64 without A/C (%)	p values
Spend time in an air-conditioned environment at home or elsewhere	88	14	p<0.001
Use a fan	49	84	p<0.001
Take the temperature inside their home	25	23	NS
Open windows at night	21	89	p<0.001
Go outdoors	18	33	p<0.05
Do fewer activities that require physical effort	87	89	NS
Cool off with a wet towel, a bath or a cool shower	37	56	p<0.01
Drink at least 1 litre of water per day	74	83	NS
Limit their consumption of hot meals or hot drinks	45	66	p<0.01
Avoid beverages with caffeine such as tea or coffee	25	39	p<0.01
Avoid alcoholic beverages (including beer)	70	72	NS
Make sure there is someone they can contact rapidly in case of a problem	86	83	NS
Ask for help with their daily activities	20	27	NS
Reduce dose of diuretic (n=107)	3	3	NS

Notably, 88% were unaware that heat waves have a greater effect on health when they occur at the beginning of summer. There was confusion evident with regard to distinguishing between heat and smog: 46% answered that air pollution is one of the two elements of the Canadian apparent temperature index (“Humidex”, based on humidity and temperature).

Among the 215 participants (90%) who recall ever hearing a heat advisory, 183 (85%) related at least one measure recommended by the Meteorological Service of Canada:¹³ 42%-55% mentioned “cool down” by showering, bathing or swimming, “drink lots of fluids”, “stay indoors at home”, “use air conditioning”, and/or “reduce physical activities”. Only 5% offered inappropriate measures, such as “wear a mask” or “avoid polluted areas”.

Awareness of and attitudes to heat advisories

Weather forecasts are either read or listened to daily by 80% of participants: in all, 75% say they have confidence in weather reports which call for extremely hot weather.

During 2005, extreme heat advisories were issued for 13 days (M. Pétrou, Meteorological Service of Canada: written communication, 2005). Asked about their recall of heat advisories, 84% recalled at least one heat advisory during the current year (the proportion rose to 93% for those interviewed in mid-summer). The media through which they receive extreme heat advisories is predominantly television (94%, especially the weather channel), and to a lesser extent, radio (44%). Among participants who recalled ever hearing an extreme heat advisory, 194/215 (90%) believe it is “somewhat” to “very important” for their health to take heed of the warning.

Some participants have been advised about heat by their caregivers: 58% have been counselled by their physician or nurse that their medical condition makes them vulnerable to the effects of heat; 20% have been told by their physician or pharmacist that medications may increase their vulnerability.

Protective behaviours adopted

All respondents report that they “always” or “often” employ at least one measure to protect themselves from extreme heat (Table 3). When it is very hot, 68% “always” or “often” spend time in an air-conditioned environment at home or elsewhere, 71% use a fan, 87% engage in fewer activities that require physical effort, and 76% drink at least 1 litre of water daily.

Not surprisingly, compared to participants who do not have home air conditioning, those who do were much more likely to pass time in an air-conditioned environment. In contrast, participants without air conditioning more often adopt other protective

behaviours including using a fan, opening windows, going outdoors, cooling off with shower/bath/wet towel, limiting their consumption of hot meals or hot drinks and avoiding caffeinated beverages (Table 3).

We examined the readiness of persons without home air conditioning to acquire it. Of 62 respondents without, 41 (66%) had no intention of acquiring an air conditioner during the subsequent 12 months. Even were their physician/nurse to recommend that they acquire air conditioning, 20/63 (32%) were “not really” or “not at all” confident they would.

Finally, participants without air conditioning were asked if they would agree to be sheltered in the event of a prolonged heat wave: 15/61 (25%) stated that they would refuse even if a municipal state of emergency were declared. Among reasons given were the difficulty of sleeping in a dormitory, the availability of air conditioning nearby, not being ill enough to need it, and being too fragile to leave home.

DISCUSSION

While our survey does not represent the range of heat-vulnerable persons, respondents do demonstrate many known risk factors for heat-related illness and death. Specifically, persons with CHF and COPD are at risk based on their underlying pathology^{3,5,6} as well as on the basis of therapies including diuretic medications and fluid restriction. Advanced age,^{3,14-16} poverty,^{3,6,14} being home-bound,¹⁷ living alone^{6,17} and in a general sense, social isolation^{18,19} are also recognized as important heat-related risk factors. Note that the extremely ill may have been under-represented: while our protocol provided for contacting all eligible clinic patients able to tolerate a one-hour interview, clinic staff tended not to solicit the most frail.

Knowledge, attitudes, awareness

Participants have a good grasp of popular knowledge about extreme heat. Of concern, however, is that few are aware that hot days in late spring and early summer are greater threats to health than hot mid-summer days (related to lack of physiologic acclimatisation and to not yet adopting protective behaviours³). It should not be surprising that there is confusion between extreme heat and smog, given that extreme heat and poor air quality often co-exist.²⁰

As with seniors interviewed by Sheridan²¹ in several North American cities, and in Britain by Morgan,²² our participants are attentive to weather bulletins and tend to believe forecasts of coming hot weather. Of those who recall hearing advisories, 85% can name at least one recommended protective measure; most judge these recommendations useful.

Practices

Air conditioning diminishes the risk of heat-related mortality.^{5,6,15,17,23,24} Of participants, 73% have home air conditioning; of those who do not, 14% say they “always” or “often” spend time in an air-conditioned environment during hot weather. This level of air conditioner use is somewhat higher than has been calculated for Montreal seniors overall: recent surveys indicate that 50% of all Montreal households with residents 65 and older are air conditioned (F. Jacquemin; Hydro Quebec; written communication, 2006).

Persons with air conditioning report the adoption of many additional protective measures (Table 3): 70% avoid alcohol, 74% drink at least 1 litre of water daily, and 87% perform fewer activities which require physical effort. We speculate that this heat-vulnerable group conscientiously follows advice aimed at reducing their risk.

While 85% of respondents say there is someone they can contact if they need help, only 22% ask for assistance with strenuous activity, cooling and hydration.

The widespread use of diuretics, medications which may interfere with physiologic adaptation to heat, is of concern:²⁴ only 3/107 who take diuretics (including 1/28 without air conditioning) say they reduce their dose on hot days. Health caregivers should take note of this.

Although summer 2005 was particularly hot, two thirds of respondents without air conditioners had no plans to buy one. Even if their doctor or nurse advised them to do so, one third say they have little confidence that they would. Finally, faced with a prolonged heat wave, 25% stated they would refuse to spend the night in an air-conditioned shelter even if a state of emergency were declared. Although this group represents only 15 of 238 respondents, they should be considered particularly vulnerable to extreme heat.

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RÉSUMÉ

Objectifs : Les personnes souffrant de maladies cardiaques et pulmonaires chroniques sont à risque de maladies et de mortalité lors de l'exposition à la chaleur accablante. Cette étude décrit leur connaissance et leur perception des risques et du degré auquel elles appliquent les moyens de protection recommandés par les instances de santé publique et de météorologie.

Méthode : Durant un été particulièrement chaud à Montréal, des patients atteints d'insuffisance cardiaque et/ou pulmonaire ont été recrutés parmi la clientèle inscrite dans cinq cliniques d'hôpitaux universitaires, sur place ou par téléphone. 238 participants, desquels 78 % avaient au moins 60 ans, ont complété une entrevue structurée face-à-face d'une durée d'une heure.

Résultats : Les participants étaient bien informés à propos de la chaleur accablante et de son impact sur la santé. La plupart reconnaissent leur vulnérabilité à la chaleur, se rappellent avoir entendu les avertissements de chaleur accablante et tous adoptent au moins un des moyens de protection recommandés. 68 % des participants passent du temps dans un endroit climatisé durant les épisodes de chaleur accablante. Plus de 75 % des participants réduisent leurs activités physiques et boivent plus de liquide. Une minorité de participants résistent au recours à l'air climatisé. Parmi ceux qui ne possèdent pas de climatiseur, 32 % sont « peu confiant à l'idée de se procurer un climatiseur » même lorsque suggéré par leur équipe soignante et 25 % refuseraient de passer une nuit dans un refuge climatisé lors d'une période de chaleur accablante qui se prolonge.

Conclusions : Ces participants ayant une maladie chronique se perçoivent susceptibles à la chaleur accablante, ont confiance en la prévention et pratiquement tous adoptent des moyens de protection recommandés. Une minorité résiste au message de prévention.

Mots clés : chaleur ; risques sanitaires ; connaissances ; MPOC ; arrêt du coeur