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by Kathryn Wilkins, Marianne Gee and Norm Campbell

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..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E}	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

The difference in hypertension control between older men and women

by Kathryn Wilkins, Marianne Gee and Norm Campbell

Released online October 17, 2012

Abstract

Background
In Canada, as elsewhere, control of hypertension in older persons who are using antihypertensive medication is more likely in men than in women. The reasons for the observed difference are not known.

Data and methods
Data are from cycle 1 of the 2007 to 2009 Canadian Health Measures Survey (CHMS). The CHMS includes a comprehensive questionnaire, automated blood pressure (BP) measures, and a variety of biological and anthropometric assessments. Frequencies, means, cross-tabulations and multivariate models were produced to study differences between the sexes in hypertension control in a weighted sample representative of the household population aged 60 to 79.

Results
The prevalence of hypertension was nearly equal among older men (60%) and women (59%), and the percentage of those with hypertension who were receiving pharmaceutical treatment was not statistically different (84% and 89%, respectively). However, despite current treatment, hypertension was uncontrolled in a substantially higher percentage of women (30%) than men (17%). The difference persisted when age, socio-economic status, co-morbidity, category of medication, anthropometry, and other correlates of hypertension were taken into account.

Interpretation
The factors considered in the analysis do not account for the advantage to older men in hypertension control. The findings underscore the importance of efforts to control blood pressure in older women.

Keywords
Antihypertensive agents, high blood pressure, population surveillance, prevalence, sex factors

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Hypertension is a major health risk factor, and its control is an important clinical concern. In Canada, among people younger than 60 who are using medication for hypertension, control is nearly equal between the sexes, at well over 90%.[1] At older ages, however, control is more likely in men than in women—consistent with observations elsewhere.[2-8]

To date, investigation of the underlying causes of the male-female difference in hypertension control has been limited. Differences in cardiovascular co-morbidity and risk factors, hormonal influences, arterial stiffness and treatment regimens may contribute to the discrepancy,[7,9,10] but no conclusive explanations have emerged.

Using data from the Canadian Health Measures Survey (CHMS), which includes measures of blood pressure (BP), anthropometry and biochemical parameters, and information on diagnosed chronic diseases, health-related behaviours and risk conditions and medication use, this study explores the disparity in hypertension control between men and women aged 60 to 79.

Methods

The analysis is based on CHMS data collected from March 2007 through February 2009 at 15 sites across Canada.[11] The CHMS is representative of approximately 96% of the Canadian household population aged 6 to 79.[11] It does not include residents of Indian Reserves, Crown lands, institutions and certain remote regions, or full-time members of the regular Canadian Forces. The response rate for the 2007 to 2009 cycle—calculated as the product of response fractions for the household (69.6%), the household questionnaire (88.3%), the mobile examination centre component (84.9%), with an adjustment for the sampling strategy—was 51.7%.[11] Ethics approval for the CHMS was obtained from Health Canada's Research Ethics Board. Written consent was requested from respondents before participation.[11-16] This analysis focuses on the sub-population (n=658) of respondents aged 60 to 79 who met at least one of the criteria for hypertension (see *Definitions*).

During an in-home interview, respondents completed a questionnaire covering socio-demographic characteristics, medical history, current

health status, prevalent conditions and health-related behaviours. Information on use in the past month of "medicine for high blood pressure" was collected in the home, and also during a subsequent appointment at the mobile examination centre. From each medication container, the name and Drug Identification Number (DIN) were recorded. About 1% (n=14) of respondents in the study sample reported using antihypertensive medication, but either the DIN was not available, or the reported DIN did not correspond to any of the codes used to define antihypertensive medications. These respondents were not classified as users of antihypertensive medication.

At the mobile examination centre, height, weight and BP were measured. Blood samples were collected using a standardized venipuncture technique; specimens were processed and shipped to a reference laboratory according to a quality-assurance protocol.[11] Respondents unwilling or unable to go to the mobile examination centre (n=16 in the 60 to 79 age group) were offered and accepted the option of a home visit; the BP measurement protocol was the same as in the mobile examination centre.[17] BP was measured with the BpTRU™ BP-300 device (BpTRU Medical Devices Ltd., Coquitlam, British Columbia) at the mobile examination centre, and with the BpTRU™ BP-100 device during home visits. The BpTRU™ is an automated electronic monitor.[18,19]

Definitions

Measures of BP were calculated as the average of the first set (last five of six measures taken one minute apart) of valid measurements.[17] Consistent with recommendations of the Canadian Hypertension Education Program,[20] *hypertension* was defined as mean systolic BP (SBP) of ≥140 mm Hg, or mean diastolic BP (DBP) of ≥90 mm Hg, or antihypertensive medication use in the past month, as verified by the name and DIN on the medication container. Among respondents with diabetes, a more stringent definition of hypertension was applied: mean SBP of ≥130 mm Hg, or mean DBP of ≥80 mm Hg, or antihypertensive medication use in the past month.[20] *Pulse pressure* (PP) is the difference (in mm Hg) between SBP and DBP. *Uncontrolled hypertension* was defined as DIN-verified BP medication use in the past month together with measured mean BP value(s) in the hypertensive range.

During data processing, medications reported in current use by respondents were assigned codes from the Anatomical Therapeutic Chemical (ATC) Classification System.[11] The following categories of antihypertensive medications were specified: *beta blockers* (ATC codes C07, excluding C07AA07, C07AA12 and C07AG02), *agents acting on the renin-angiotensin system* (ATC codes C09), *thiazide diuretics* (ATC codes C03, excluding C03BA08 and C03CA01), *calcium channel antagonists* (ATC codes C08), and *miscellaneous antihypertensives* (ATC codes C02, excluding C02KX01). Only 13 respondents reported use of medications classified as miscellaneous antihypertensives, so this category was not retained in the analysis; however, these respondents were classified as antihypertensive medication users.

Age was defined as years of age at the time of the visit to the mobile examination centre.

Variables for *marital status, income, secondary school graduation, having a regular doctor, co-morbidity (diabetes and heart disease)* and *current daily smoking* were based on information reported by the respondent during the household interview.

Household income adjusted for household size was defined as total household income, divided by the number of people in the household. When income was reported as a range, the midpoint of the range was used. In linear regression analysis, adjusted household income was divided by 10,000.

Level of *leisure-time physical activity* was defined as inactive or moderate/active, based on total daily energy (kcal/kg/day) expended in specific activities reported by the respondent.[21]

Body mass index (BMI) is calculated as weight in kilograms divided by height in metres squared (kg/m^2). BMI was based on measured data; respondents with a BMI of 30.0 kg/m^2 or more were classified as *obese*.

"High-risk" *waist circumference* was defined as ≥102 cm for men, and ≥88 cm for women.[22]

Values of *blood glucose* (mmol/L) and *blood lipids* (ratio of total cholesterol to high-density lipoprotein (HDL) cholesterol) were available as derived variables.

Prevalent *heart disease* and *diabetes* were determined by asking respondents to report conditions that "are expected to last or have already lasted six months or more and that have been diagnosed by a health professional."

Analytical techniques

Based on weighted data, frequencies, means and cross-tabulations were produced for sex-specific descriptive analysis of people aged 60 through 79 with hypertension. Distributions of SBP, DBP and PP were plotted and smoothed using a three-year moving average. Multivariate linear regression models were fitted to examine associations of selected variables with SBP. Logistic regression modeling was used to study the association between female sex and uncontrolled hypertension, while adjusting for possible confounders.

Variance was calculated using the bootstrap technique[23,24]; in multivariate analysis, the number of degrees of freedom was restricted to 11 to account for the number of CHMS collection sites and sampling stratification.[11]

Results

The estimated prevalence of hypertension at ages 60 to 79 did not differ significantly between the sexes: 60% of men and 59% of women met at least one of the criteria for this condition (data not shown).

Moreover, the average age of these men and women with hypertension was not statistically different: 68.4 and 68.6 years, respectively (Table 1). Men with

hypertension were significantly more likely than their female counterparts to be married or in a common-law relationship. The average household income (adjusted for household size) of men with hypertension significantly exceeded that of women: $44,500 versus $35,900.

The prevalence of smoking among men and women with hypertension was similar (9% and 10%, respectively). A significantly higher percentage of women than men reported a level of leisure-time physical activity classified as inactive (62% and 51%, respectively). Although average BMI and the percentages classified as obese did not differ significantly between the sexes, the data suggest that a higher percentage of women (66%) than men (55%) with hypertension were in the high-risk range for waist circumference (p=0.08).

A large majority of men (94%) and women (97%) with hypertension reported having a regular doctor. Heart disease was reported by a significantly higher percentage of men (25%) than women (16%). The mean ratio of total to HDL cholesterol was also higher in men (4.2) than women (3.7). No statistically significant differences emerged for blood glucose level or diabetes.

Table 1
Selected characteristics of people with hypertension, by sex, household population aged 60 to 79, Canada, 2007 to 2009

	Men			Women		
		95% confidence interval			95% confidence interval	
Characteristics	% or mean	from	to	% or mean	from	to
Demographic/Socio-economic						
Mean age (years)	68.4	67.6	69.1	68.6	67.6	69.6
Married/Common-law (%)	81.9*	76.8	86.1	62.3	54.0	69.9
Mean household income ($, adjusted for household size)	44,520*	38,507	50,533	35,868	31,069	40,667
Secondary school graduation (%)	61.1	54.2	67.5	60.8	51.8	69.1
Has regular doctor (%)	94.2	87.6	97.4	97.0	94.0	98.5
Health behaviours						
Current daily smoker (%)	8.7[E]	5.6	13.3	10.1[E]	6.4	15.7
Inactive level of leisure-time physical activity (%)	50.6*	43.3	57.9	62.4	54.8	69.5
Physical measures						
Mean body mass index	29.3	28.4	30.1	29.6	28.5	30.6
Obese (%)	37.8	30.9	45.2	37.1	30.0	44.9
Waist circumference in high-risk range (%)	55.3	47.9	62.6	65.5	55.5	74.3
Mean blood glucose level (mmol/L)	5.7	5.5	5.9	5.6	5.0	6.2
Mean ratio of total to HDL cholesterol	4.2*	4.0	4.4	3.7	3.5	3.8
Co-morbidity (%)						
Diabetes	21.0	15.3	28.1	20.4	16.0	25.7
Heart disease	25.4*	19.8	32.0	15.5[E]	10.5	22.2
Blood pressure (mm Hg)						
Systolic	125.3*	123.4	127.2	132.5	129.6	135.4
Diastolic	73.7	72.7	74.7	72.4	70.7	74.0
Pulse pressure	51.6*	53.3	49.9	60.1	61.9	58.3
Antihypertensive medication use (%)						
Any	84.4	79.7	88.3	89.3	84.7	92.7
Diuretic	18.5*	13.6	24.8	33.4	24.5	43.7
Calcium channel antagonist	22.3[E]	14.7	32.5	21.7[E]	14.3	31.5
Agent acting on renin-angiotension system	64.3	57.9	70.2	56.9	47.5	65.9
Beta-blocker	25.9	18.8	34.5	25.1[E]	16.9	35.6
Number of antihypertensive types used (%)						
None	15.6	11.7	20.3	10.7	7.4	15.2
One	48.0	41.2	54.9	48.9	40.3	57.5
Two	26.8	20.1	34.8	31.8	24.3	40.4
Three or more	9.6[E]	6.3	14.3	8.6[E]	5.3	13.6

* significantly different from women (p<0.05)
[E] use with caution
Note: Hypertension is measured systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg (≥130 mm Hg or ≥80 mm Hg for those with diagnosis of diabetes), or use of antihypertensive medication in the month before the CHMS interview.
Source: 2007 to 2009 Canadian Health Measures Survey.

Systolic blood pressure, diastolic blood pressure and pulse pressure

SBP in women with hypertension (including those using antihypertensive medication and those with diabetes) averaged 132.5 mm Hg, significantly above the corresponding average in men: 125.3 mm Hg. Average DBP did not differ significantly between women and men (72.4 and 73.7 mm Hg, respectively).

Supplementary analysis showed that in people with hypertension, SBP and PP were higher in women than in men whether or not they were using antihypertensive medication. The respective SBP values in women and men using medication were 129.9 and 121.3 mm Hg, and in those who were not, 153.6 and 146.9 mm Hg (data not shown). PP averaged 58.8 and 49.7, respectively, in women and men using antihypertensive medication, and 71.5 and 61.6 in those who were not.

In regression models controlling for age, household income, education, marital status, BMI, co-morbid conditions and cholesterol ratio, SBP was lower in men than in women by an average of 6.4 mm Hg (Table 2). Among men, heart disease was negatively related to SBP, but blood glucose level showed a positive association with SBP. The pattern was similar in women, although the associations did not attain statistical significance.

Among people with hypertension, SBP was lower by an average of 4 mm Hg in those with at least secondary school graduation, compared with those who had not graduated from secondary school. Heart disease was also negatively related to SBP; the SBP of people with

Table 2
Regression coefficients relating selected characteristics to systolic blood pressure in people using antihypertensive medication, household population aged 60 to 79, Canada, 2007 to 2009

	Both sexes				Men				Women			
	Regression coefficient	95% confidence interval		Standardized regression coefficient	Regression coefficient	95% confidence interval		Standardized regression coefficient	Regression coefficient	95% confidence interval		Standardized regression coefficient
Characteristics	(B)	from	to	(beta)	(B)	from	to	(beta)	(B)	from	to	(beta)
Demographic/Socio-economic												
Men†	-6.43*	-10.33	-2.52	-0.18	...	...	...	...	...	...	...	...
Age (years)‡	0.34*	0.01	0.67	0.11	0.26	-0.06	0.58	0.11	0.35	-0.16	0.86	0.11
Secondary school graduation§	-3.98*	-6.40	-1.57	-0.11	-0.84	-4.86	3.18	-0.03	-3.80*	-7.52	-0.07	-0.09
Household income ($10,000)‡	-0.49	-1.02	0.03	-0.08	-0.06	-0.51	0.40	-0.01	-1.03	-2.15	0.09	-0.12
Married/Living with partner††	-0.23	-5.03	4.58	-0.01	-0.99	-6.70	4.72	-0.03	1.28	-5.94	8.49	0.03
Leisure-time physical activity level												
Inactive†	2.27	-2.25	6.78	0.06	1.35	-5.08	7.79	0.05	1.43	-4.88	7.74	0.03
Physical measures												
Height (cm)‡					-0.30	-0.61	0.02	-0.14	-0.54*	-1.00	-0.07	-0.18
Waist circumference (cm)‡	-0.08	-0.32	0.16	-0.07	-0.06	-0.17	0.04	-0.06	-0.03	-0.43	0.37	-0.02
Blood glucose level (mmol/L)‡	2.17*	0.01	4.34	0.27	1.34*	0.26	2.42	0.17	2.58	-2.23	7.39	0.33
Ratio of total to HDL cholesterol‡	0.98	-0.59	2.55	0.06	1.25	-0.39	2.88	0.10	0.68	-2.32	3.68	0.03
Co-morbidity												
Heart disease†	-6.39*	-10.97	-1.81	-0.15	-6.99*	-12.38	-1.61	-0.23	-5.70	-15.66	4.26	-0.10
Intercept	101.33				151.60				181.61			
R^2	0.18				0.12				0.19			

† reference category is absence of characteristic
‡ used as continuous variable
§ reference category is less than secondary school graduation
†† reference category is single/divorced
* significantly different from reference category (p<0.05)
... not applicable
Source: 2007 to 2009 Canadian Health Measures Survey.

heart disease was, on average, 6.4 mm Hg lower than that of people without heart disease. Blood glucose level was positively related to SBP.

Medication use

Similar percentages of men (84%) and women (89%) with hypertension were using at least one type of antihypertensive medication. Women were more likely than men to be using thiazide diuretics (33% and 19%, respectively). Use of agents acting on the renin-angiotensin system, calcium channel antagonists and beta-blockers did not differ significantly by sex. About 10% of men and women were taking three or more types of antihypertensive medication concurrently.

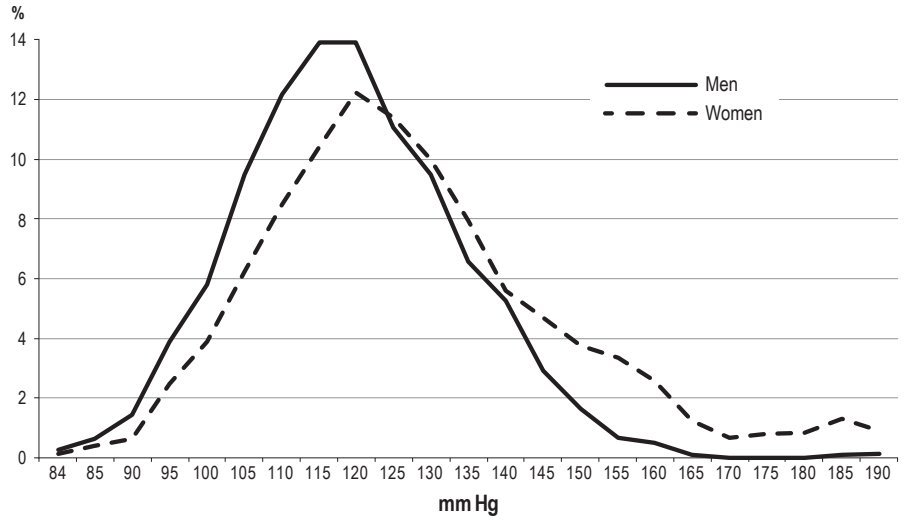
Among those who were using antihypertensive medication, the condition remained uncontrolled—that is, BP was in the hypertensive range—in a significantly higher percentage of women (30%) than men (17%) (p=0.03; data not shown). The difference between the sexes in hypertension control was reflected in SBP values. Mean SBP was significantly higher in women than in men (129.9 versus 121.3 mm Hg) (data not shown), and a higher percentage of women had SBP values of 140 mm Hg or more (Figure 1). The distribution of DBP did not differ between the sexes (Figure 2). Average PP was significantly higher in women (60.1 mm Hg) than in men (51.6 mm Hg); the distribution plot indicates a larger area under the curve for women at values of 45 mm Hg or more (Figure 3).

When the effects of age were taken into account, the odds of uncontrolled hypertension were twice as high in women as in men (Table 3). Adjustments for education, BMI, co-morbidity, cholesterol ratio, level of leisure-time physical activity and category of antihypertensive medication did not attenuate the odds ratio. A supplementary model that considered waist circumference rather than BMI did not change the results (data not shown). Each antihypertensive category was included in a separate multivariate model, with similar results.

Discussion

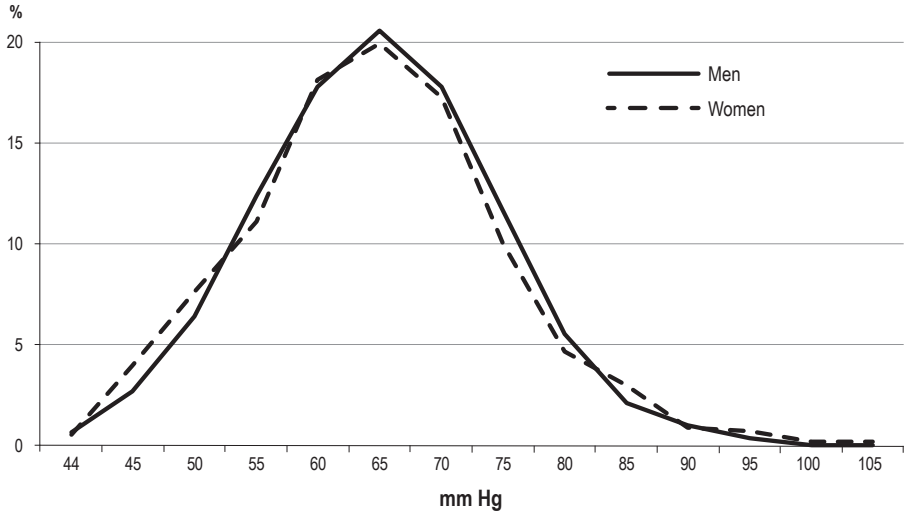
An estimated 60% of Canadians aged 60 to 79 have hypertension, and most of them are receiving pharmaceutical treatment for the condition. Although the likelihood of treatment does not differ significantly between men and women, among those receiving treatment, hypertension—due to higher SBP—is uncontrolled in almost one-third of women compared with one-sixth of men. Even when differences in category of

Figure 1
Percentage distribution of systolic blood pressure (mm Hg) in people with hypertension who are using antihypertensive medication, household population aged 60 to 79, Canada, 2007 to 2009



Source: 2007 to 2009 Canadian Health Measures Survey.

Figure 2
Percentage distribution of diastolic blood pressure (mm Hg) in people with hypertension who are using antihypertensive medication, by sex, household population aged 60 to 79, Canada, 2007 to 2009



Source: 2007 to 2009 Canadian Health Measures Survey.

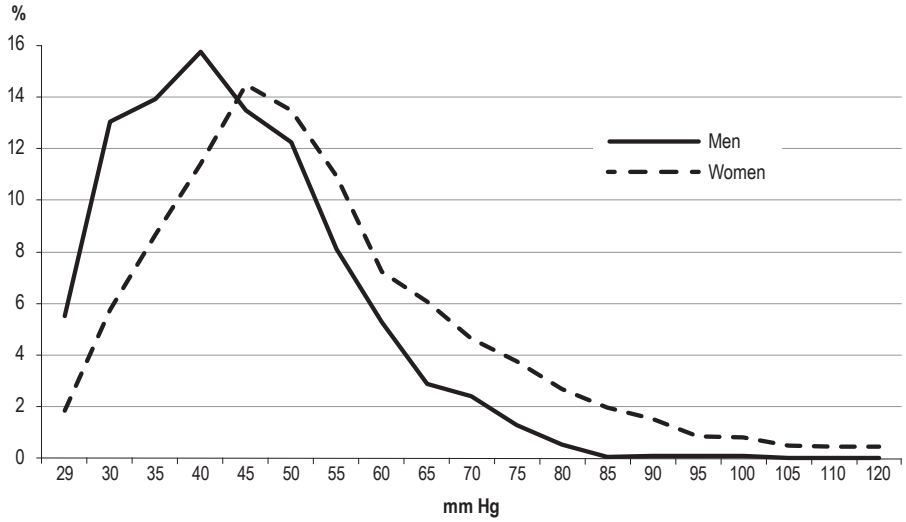
What is already known on this subject?

- Hypertension is a major risk factor for heart and vascular disease and is an important cause of death around the world.
- Hypertension is more common at older ages, and affects 6 in 10 people aged 60 to 79.
- In a number of countries, including Canada, hypertension control is more successful in older men than in older women.

What does this study add?

- Among people aged 60 to 79 who were using antihypertensive medication, the condition was controlled in a significantly higher percentage of men (83%) than women (70%).
- In people with hypertension aged 60 to 79, antihypertensive use was similar in men (84%) and women (89%).
- The number of medications used did not differ by sex, although women were more likely than men to be using thiazide diuretics (33% versus 19%).
- Even when age, co-morbidity, type of medication used, body mass index and socio-demographic characteristics were taken into account, women aged 60 to 79 using antihypertensive medication had higher measured systolic blood pressure and pulse pressure than did men.

Figure 3
Percentage distribution of pulse pressure (mm Hg) in people with hypertension who are using antihypertensive medication, by sex, household population aged 60 to 79, Canada, 2007 to 2009



Source: 2007 to 2009 Canadian Health Measures Survey.

antihypertensive medication used, age, co-morbidity and other risk factors for hypertension are taken into account, the odds of uncontrolled hypertension are nearly twice as high in women. The finding of higher SBP and PP in older women with hypertension than in their male counterparts is consistent with other observations.[3,25]

Previous research has revealed higher levels of low density lipids (LDL) and blood glucose in hypertensive women than in men, factors that were also related to poor hypertension control.[25,26] By contrast, analysis of the CHMS data indicated nearly equal average levels of blood glucose in women and men with hypertension, and a lower average ratio of total to HDL cholesterol (and thus a lower LDL level) in women with hypertension. Furthermore, multivariate analysis revealed no association between hypertension control and cholesterol,

Table 3
Odds ratios relating female sex and other characteristics to uncontrolled hypertension, household population aged 60 to 79, Canada, 2007 to 2009

	Model 1			Model 2			Model 3			Model 4			Model 5		
		95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval			95% confidence interval	
Characteristics	Odds ratio	from	to	Odds ratio	from	to	Odds ratio	from	to	Odds ratio	from	to	Odds ratio	from	to
Demographic/Socio-economic															
Men†	1.0	…	…	1.0	…	…	1.0	…	…	1.0	…	…	1.0	…	…
Women	2.1*	1.2	3.9	1.9*	1.0	3.7	2.0*	1.1	3.7	2.0*	1.1	3.7	2.1*	1.1	3.8
Age (years)‡	1.1*	1.0	1.1	1.1*	1.0	1.1	1.1*	1.0	1.1	1.1*	1.0	1.1	1.1*	1.0	1.1
Secondary school graduation§	…	…	…	0.8	0.4	1.3	0.8	0.5	1.3	0.8	0.5	1.3	0.8	0.5	1.3
Leisure-time physical activity level															
Inactive††	…	…	…	1.4	0.6	3.3	1.4	0.6	3.4	1.4	0.6	3.3	1.4	0.6	3.3
Physical measures															
Body mass index‡	…	…	…	1.0	0.9	1.1	1.0	0.9	1.1	1.0	0.9	1.1	1.0	0.9	1.1
Ratio of total to HDL cholesterol‡	…	…	…	1.0	0.8	1.3	1.0	0.8	1.3	1.0	0.8	1.3	1.0	0.8	1.3
Co-morbidity															
Diabetes††	…	…	…	2.6*	1.5	4.7	2.7*	1.5	4.8	2.6*	1.5	4.6	2.7*	1.5	4.6
Heart disease††	…	…	…	0.6	0.3	1.2	0.6	0.3	1.1	0.6	0.3	1.2	0.6	0.3	1.2
Type of antihypertensive medication used															
Thiazide diuretics††	…	…	…	1.5	0.7	3.0	…	…	…	…	…	…	…	…	…
Calcium channel antagonists††	…	…	…	…	…	…	…	…	…	…	…	…	0.9	0.5	1.5
Agents acting on renin-angiotensin system††	…	…	…	…	…	…	0.8	0.3	2.3	…	…	…	…	…	…
Beta blockers††	…	…	…	…	…	…	…	…	…	1.2	0.4	3.4	…	…	…

† reference category
‡ used as continuous variable
§ reference category is less than secondary school graduation
†† reference category is absence of characteristic
* significantly different from reference category (p<0.05)
... not applicable
Note: Hypertension is measured systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg (≥130 or ≥80 mm Hg for people with diabetes).
Source: 2007 to 2009 Canadian Health Measures Survey.

although small sample size limited the analysis.

The negative association between SBP and heart disease is somewhat paradoxical, as it would be expected that people with heart disease would be more likely to have higher BP. The finding may reflect more careful medical management of persons with heart disease.

Patterns of pharmaceutical treatment for hypertension differ somewhat between older men and women. Men's lower likelihood of using thiazide diuretics has been noted elsewhere,[7,8] and may stem from concern about the effects of these drugs on erectile function.[27,28] Research suggests that diuretics are especially effective in reducing SBP, and should be the first drug used in treating hypertension.[20,29] In this regard, the CHMS data provide no evidence that men are receiving preferential treatment. Nor are men being more aggressively treated: nearly equal percentages of men and women are using three or more types of antihypertensive medication.

The higher PP in women than in men has been observed in other older populations.[10,30] Sex-related biological factors may explain the difference—specifically, lowered estrogen levels after menopause may contribute to a decrease in aortic diameter, resulting in a rise in PP.

Hypertension remains uncontrolled in one-sixth of men and nearly one-third of women aged 60 to 79 who are using antihypertensive medication. However, comparisons with data from the United States indicate a Canadian advantage in hypertension control. In 2005, among a representative sample of Americans aged 65 to 80 under care for hypertension, the condition was uncontrolled in 37% of men and 47% of women.[8] Estimates from the population-based 2007-2008 National Health and Nutrition Examination Survey indicate uncontrolled hypertension in more than 50% of older, community-dwelling Americans with the condition.[31]

Limitations

The CHMS response rate was just over 50%, meaning that in nearly half of households contacted, arrangements could not be made for a resident to participate. Although adjustments were made to the survey weights to ensure that the sample is representative of the target population according to socio-demographic characteristics, differences in health status (specifically, BP) were not accounted for.

The data are cross-sectional, so a temporal relationship between individual characteristics and hypertension control cannot be inferred. In particular, the sex disparity in uncontrolled hypertension may be partly due to incidence-prevalence bias.[32] Because being male is a strong risk factor for cardiovascular mortality independent of hypertension,[33] men with uncontrolled hypertension are more likely to die sooner than their female counterparts. Thus, the higher prevalence of uncontrolled hypertension in women aged 60 to 79 may be partly because men with uncontrolled hypertension are more likely to die from causes related to the condition than are women, and at younger ages. As a result, by age 60, the higher prevalence of uncontrolled hypertension in women might be partly due to their better chance of survival with the condition at earlier ages, compared with men.

The validity of information based on self-reported data (education, income, marital status, physical activity, disease prevalence, smoking) is unknown.

A small percentage of respondents who were identified as having hypertension based on medication use may have been misclassified, because antihypertensive medication may occasionally be prescribed for other conditions. But, of current users of medications classified as antihypertensive agents (according to the DIN), equivalent percentages of men (13.6%) and women (13.7%) reported that they were *not* taking medication for "high blood pressure." Therefore, this potential source of misclassification probably did not contribute to the differences observed between the sexes in BP control.

The CHMS provides no information on some potentially relevant characteristics, including medication adherence and daily sodium consumption.

Small sample size precluded examination of specific antihypertensive medications, or combinations thereof, in relation to hypertension. Also, in some instances, failure to attain statistical significance may have been due to small sample size.

Conclusion

This analysis suggests that the higher likelihood of hypertension control in older men than women is not explained by differences in age, co-morbidity, type of antihypertensive medication used, BMI, or socio-demographic characteristics. Because of the widespread prevalence of hypertension among older Canadians and its importance as a risk factor for cardiovascular disease and stroke, understanding of sex-specific factors related to hypertension control remains an important issue. Future cycles of the CHMS will provide an opportunity to continue to explore factors underlying the differences in hypertension control between older men and women. ■

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