Factors associated to hypertension prevalence, unawareness and treatment among Costa Rican elderly

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Abstract

Reliable information on hypertension prevalence is crucial for health policies. Factors associated to prevalence, unawareness and treatment among Costa Rican elderly are identified. Data come from a nationally representative sample (n=2,827). Two blood pressure measures, previous diagnose and medications taken were recorded. Sex differences were found. Prevalence is 65% (Males=60%, Females=69%). Among hypertensives more men are unaware than women (32% vs. 20%), and among aware individuals more women are treated than men (83% vs.78%). Prevalence increases with age, overweight, obesity and family history of hypertension. Family history is inversely related to unawareness. Smoking is related to unawareness in men. Obesity, diabetes, heart disease, stroke, and home visits by health workers reduce unawareness for women. Treatment is associated to education, family history, diabetes and heart disease. Despite of national programs, unawareness remains high, particularly among men. Behavioral risk factors such as obesity and alcohol intake should be stressed in education programs.

Background

Hypertension is one of the major risk factors for the main cause of death in adult populations world wide: cardiovascular diseases (including ischaemic heart disease and stroke)[1]. It is also one of the most frequent chronic conditions in medical consultation [23]. The prevalence of hypertension has increased worldwide, partially because of the most stringent definition of hypertension [4]. Latin American and Caribbean countries are facing an overwhelming increase in their elderly populations [5,6]. The elderly population (60+) will increase from 300 thousand in the 2000 Census to almost 2 million in 2060 in Costa Rica [7]. Both the increase in this population and the phenomenon that has been described as epidemiological transition [8], make chronic diseases –hypertension included- increasingly important.

The awareness of hypertension has increased, more people have begun treatment, and treatment has also improved [9]. But there is still too much work to be done. The lowering of blood pressure either using antihypertensive medications or changing life styles is known to significantly decrease cardiovascular mortality and morbidity [10], as well as hospitalization and outpatient consultation costs. It has been convincingly shown that treatment of hypertension reduces the risk of stroke, coronary heart disease, congestive hearth failure, and mortality [11].

Hypertension is the condition with the highest outpatient consultation cost in Costa Rica [12]. Reliable information on the prevalence of hypertension is crucial in the development of national health policies on prevention, control, and early diagnose of

this condition [2,13]. Primary prevention of hypertension as a public health strategy is definitely warranted [14].

This study describes the prevalence of primary or essential hypertension among Costa Rican elderly. Primary or essential hypertension is defined as hypertension without a secondary cause. In general, it is said that about ninety-five per cent of patients who have hypertension have no obvious underlying cause, and as such, are classified as having essential hypertension [4]. This study also identifies co-factors associated to hypertension prevalence, unawareness and treatment in a nationally representative sample of about 2,800 individuals who underwent two blood pressure measurements during an interview conducted at the individual's home.

Methods

Data comes from the CRELES study (Costa Rica: Longevity and Healthy Aging Study). This is a longitudinal ongoing study from the University of Costa Rica, based on a nationally representative sample of 2,800 adults born in 1945 or earlier (aged 60+ in the interview) and residing in Costa Rica in the year 2000, with oversampling of the oldest old. Only data from the first wave are used in this study. This first wave fieldwork took place between November 2004 and September 2006. It is a probabilistic, nationally representative sample from the 2000 Costa Rican Population Census, which is stratified by age group, from which 60 *"Health Areas"* were selected with a probability proportional to the size of the population. *"Health Areas"* are administrative population units defined by the government with the purpose of providing health care services nation wide.

The CRELES study includes an interview, anthropometric measures, and blood and urine samples, which were collected in each individual's home, usually during a second visit. During the first visit, two blood pressure measures were taken, 30 minutes apart from each other. Blood pressure was measured using an automatic digital device (OMRON HEM-711AC, Dupont). It was also asked to individuals (or to a proxy respondent in about 20% of participants): *"Have you ever been told by a medical doctor that you had high blood pressure (hypertension)?"*. Interviewers also asked every individual to show the medications they were using, each of them (including the antihypertensives) were also recorded.

Antihypertensive medications included under our classification were: Calcium channel blockers, β blockers, diuretics and Angiotensin Converting Enzyme (ACE) blockers. Any individual taking any of these drugs was considered on antihypertensive treatment, regardless of the stated purpose of the medication.

Given that CRELES collected four blood pressure measures: two for diastolic pressure and two for systolic pressure, we defined as hypertensive individuals those who have *any* of the following characteristics: (1) have been told by a medical doctor that they are hypertensive; or (2) have a blood pressure of 140/90 or higher in three out of the four measures; or (3) were taking antihypertensive medications. The cutoff 140/90 is broadly used in research and clinical practice for adults [15]

It is worth to mention that about 10% of the sample had hypertension in the first measure (systolic and diastolic) but not in the second measure. These individuals were not classified as hypertensive because, as we will show, the first measure seems to be

overestimated and biased. As reported by Kearney et al. 2005 [13], having blood pressure measured on only one visit is the most usual strategy used in this kind of studies, but it may overestimate the prevalence of hypertension as compared to having it measured on two different visits. In order to avoid this overestimation we decided to define hypertension using the three out of four high measures strategy rather than using averages of the two measurements.

Hypertensive individuals were also classified according to their awareness status. An individual was classified as aware of his condition only if he was hypertensive according to any of the three aforementioned criteria *and* he (or the proxy) gave a positive response to the question *"Have you ever been told by a medical doctor that you had high blood pressure (hypertension)?"* This study does not attempt to make a clinical diagnosis of hypertension in each of the nearly 2,800 subjects in the sample. This would require a medical exam and several medical appointments. We simply propose an operational definition that allows to measure the prevalence of this disease and to identify subjects who are likely to be hypertensive, although probably unaware. A hypertensive person is classified as "treated" if he or she is currently taking antihypertensive medications as confirmed by the interviewer when actually reviewing the medications the person was taking. These definitions for hypertensive, aware, and treated individuals have also been used in other studies [16]

The analysis was stratified by sex. The variables included in the analysis of the possible determinants of hypertension are: age in ten-year age groups; education defined as having complete primary education or not; having a job; three categories of health insurance: contribution health insurance (public health insurance from

individuals' jobs, jobs of family members or from the corresponding pension plans derived from jobs), non-contribution health insurance (paid by the government for the destitute), and no health insurance; high/low income; living in the great metropolitan area of San Jose; co-residing with a partner; four categories of Body Mass Index (BMI) expressed in kg/m^2: underweight (<18.5), normal weight ($\geq$18.5 – 24.9), overweight (25-29.9), and obesity ($\geq$30); alcohol intake history; past and current smoking behavior; physical activity; family history of hypertension; having been home-visited by community health workers during the last year; high calories consumption ($\geq$3,000cal/day); high carbohydrate consumption ($\geq$400 g/day); high saturated fat consumption ($\geq$40 g/day) and five categories of self-reported health status ranging from excellent to poor. For the analysis of the determinants of hypertension unawareness and treatment all the previous variables were controlled for. In addition to those variables, it was also controlled for: having been diagnosed with diabetes; having had any heart disease and having had a stroke. These comorbid conditions were included in the latter models because they have previously shown to be related to unawareness [17].

The effect of the aforementioned cofactors on hypertension was analyzed using multivariate logistic regression models. Sampling weights were used in order to account for individual selection probabilities. All statistical analyses were done using STATA statistical package. These are the type of models that are usual in this kind of analyses [18]. The conditional probabilities of being aware given that the individual is hypertensive and that of being treated given that he has been previously diagnosed are also analyzed. The found relationships are interpreted as simple associations and not as causal relations, given the transversal nature of the information.

Results

General characteristics of the population

As Table 1 shows, the elderly Costa Rican population had a 76 mean age, with 53% females. The mean education was 5 years. More than half of the individuals were in the 60 to 69 age group and less than 3% were 90 years or older (it is worth noting that in the unweighted sample there are only 30% aged 60-69 and 10% aged 90 and over). Half of the elder men completed their primary education, whereas a slightly lower proportion of women did so. Half of the men had a job, but only 29% of women had one. More than 90% of individuals have a health insurance.

The percentage with low income is also higher in women, and there is a higher proportion of women living in the metropolitan area of the country. Most of men live with a partner (77%) whereas only 45% of women do so. The proportion of male individuals with normal weight according to their BMI is higher than that of women (32% vs. 25%). The prevalence of obesity is 19% among men, and 33% among women.

There is a marked sex difference in alcohol and tobacco consumption self-reports. From the male population, 93% reported to have ever consumed alcohol, and 68% had ever used tobacco. From the female population, 38% reported to have ever consumed alcohol, and 21% had ever used tobacco. The proportion of individuals who had any physical activity was higher in men (40% vs. 23%).

The percentage of women who reported family history of hypertension was higher as compared to men. More women than men reported to have been home visited by

community health workers. The calories, carbohydrates, and fat consumption were higher among men as compared to women. The percentage of men who reported having a diabetes diagnosis was 17%, whereas 24% of women reported to be diabetic. There is a similar proportion of males and females who have ever had heart disease (about 15%) or stroke (around 4%). Men report to have a better overall health status: 56% of males report good, very good or excellent health, whereas 50% of women report to be in any of those categories.

Reliability of the blood pressure measures

The two blood pressure measures have similar frequency distributions (Figure 1), although the second measure results in slightly lower values for both the diastolic (difference=-0.9, 95%CI:[-1.7, -0.25]) and for the systolic (difference=-2.8, 95%CI:[-4.1, -1.4]). The correlation between the first and second measure is 0.88 for systolic and 0.77 for diastolic, which means there is a reasonably high reliability in subsequent measures of blood pressure. The classification of hypertension with the 140/90 threshold separately in the two measures resulted in 84% of concordance (same classification in both measures); about 10% of participants had high blood pressure in the first measure but not in the second, and 5% only in the second measure. The Kappa coefficient of reliability is 0.68 for systolic and 0.60 for diastolic pressure (Kappas between 0.60 and 0.80 are indicators of a 'substantial' concordance [19]).

In order to explore the possibility of measurement error because of uncalibrated barometers or because of any other reasons related to the examiners, an OLS regression model was estimated separately for the systolic and the diastolic pressure, with explaining variables that included dummies for each of the interviewers and for

each three-month period in the two years of fieldwork. The regression model also included variables to indicate if it was the first or the second measure, as well as controls for sex and age. No significant effect was detected by examiner or quarter of fieldwork.

General facts about hypertension in Costa Rica

Factors associated with hypertension prevalence, unawareness and treatment are different by sex. Prevalence of hypertension in this population is high: 69% among females 60% among males (Table 2). A quarter of hypertensives are not aware of their condition. Unawareness is differential by sex, with a higher proportion of men being unaware of their hypertension (32% vs. 20%). Most of aware hypertensives are being treated, although there is a higher proportion of men who remain untreated (22% vs. 17% in women). Only about 27% of those hypertensives who are unaware of their condition are under treatment, with no differences by sex.

Factors that explain hypertension prevalence

As Table 3 shows, being obese is a risk factor for both sexes, although the odds of being hypertensive are much higher in obese men than in obese women (3.9 vs. 1.8). Family history of hypertension is also a significant risk factor associated to hypertension for men and women. There are some factors that explain the prevalence of hypertension which differ by sex. After controlling for other characteristics related to hypertension, the odds of being hypertensive are about 53% higher for women aged 70 to 79 as compared to those who are 60 to 69. Men 70 to 79, on the other hand, show a similar trend, although the odds of being hypertensive do not reach statistical significance for them. Being employed is a significant protective factor (or a selection

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factor) for men but not for women. The odds of being hypertensive are 45% lower for employed males as compared to the non employed ones. For men only, being underweight is associated to lower risk (OR=0.27) of being hypertensive, and overweight is a significant risk factor. For women only, the odds of being hypertensive are 38% lower for occasional drinkers as compared to non drinkers.

Factors related to Hypertension unawareness

Both men and women are less likely to be unaware of their condition if they have family history of hypertension. For men, the odds of being unaware of their condition are 2.9 times higher for current smokers as compared to non smokers (Table 4). Men who report either good or poor health are significantly less likely to be unaware of their hypertension than those men who report excellent health. Those women who are obese, diabetic, and have suffered heart disease or stroke are less likely to be unaware of their hypertension. Interestingly, having been home visited by community health workers halves unawareness among women and has no significant effect among men.

Factors associated with treatment among hypertensives

The odds of being treated are higher for both men and women –especially men- who have either of these characteristics: complete primary education vs. less than complete primary education, family history of hypertension, being diabetic, and having had heart disease.

Age is significantly related to treatment only for men. The odds of being treated increase as men age. Men who live in the great metropolitan area also have higher odds of being treated. Hypertensive men who are underweight are on the other hand, less likely to have treatment as compared to hypertensive men with normal weight. Obese women are more likely to be treated as compared to normal weight women.

Those hypertensive women who were home visited by community health workers during the previous year were also 75% more likely to receive treatment.

Discussion

Valid information on prevalence of hypertension is a very important input for public health policy. Hypertension has been named the "silent killer", and it is one of the most important risk factors for cardiovascular and cerebrovascular morbidity and mortality among the elderly. A reliable figure regarding the number of individuals with a condition is the beginning for the directing of efforts to make that population aware of their condition and have them treated.

Data on hypertension prevalence from CRELES show this is a public health hazard in the elderly. Not only because this data is not inflated by "white-coat effect" (phenomenon in which patients exhibit elevated blood pressure in a clinical setting but not when recorded by themselves at home), but also because no significant effect was detected by examiner or quarter of fieldwork.

Almost two-thirds of elderly Costa Ricans have high blood pressure, a figure that seems high.   Nevertheless, data from other populations such as Taiwan and the US also show that the prevalence of hypertension is actually high in the elderly population. The Social Environment and Biomarkers of Aging Study (SEBAS) indicate that nearly half of older Taiwanese represented by the study have high systolic blood pressure, and more than one-quarter have high levels of diastolic blood pressure.

Comparisons between Taiwan and the US have shown that the proportion of the older

population with hypertension is somewhat higher in Taiwan than in the U.S. (62% vs.

54%). For these comparisons, hypertension was defined as either elevated blood

pressure (systolic pressure ≥140 or diastolic pressure ≥90 mmHg) *or* taking

antihypertensive medication. Researchers also restricted the SEBAS sample to aged

55 and older and used only the first blood pressure reading [20]. According to a

population-based survey of older Mexican Americans, sixty percent of all subjects

had hypertension.[17]

Costa Rican elderly population has almost universal health insurance coverage. There

is growing evidence that uncontrolled hypertension occurs even in populations with

good access to health care [21]. There is also evidence that access is not the main

determinant of hypertension unawareness [18]. Therefore, access to health care does

not seem to explain these differences, which occur largely under the watchful eye of

the health care system.   The exception seems to be the outreach visits by primary

health workers, which halve unawareness among women. The primary health

program should try to extend this effect also to men. Health workers visited during

the previous year to about 40% of men and 46% of women, percentages that speak

well about the average of this Costa Rican program.

In Costa Rica one out of four hypertensive people are unaware of their condition.

This figure is still higher in the US, where close to one-third of the elderly are

unaware of their hypertension. There are differences among ethnic groups in the US:

unawareness proportion is 31% among non-Hispanic whites, 27% among non-

Hispanic blacks [18], and 37% among older Mexican Americans [17]. The group of

individuals who are unaware of their hypertension is probably made up of those have never been screened for hypertension, those who had been previously diagnosed but forgot the diagnosis, and the ones whose medical doctor did not consider their blood pressure levels to be sufficiently elevated to warrant the diagnosis [17].

It has been estimated that in the United States the control of hypertension could prevent 19% to 56% of coronary heart disease events in men and 31% to 57% of events in women [22]. Seventy three percent of unaware hypertensive Costa Rican elderly are untreated. This elevated figure reflects a clear unmet need. It suggests that a substantial number of cardiovascular events could be prevented by improved blood pressure treatment and control.

In Costa Rican elderly, being obese and having family history of hypertension are important risk factors for hypertension. The prevalence of hypertension increases as elderly individuals grow older, reaching a maximum among individuals in their seventies. Age is one of the most notable demographic trends in the prevalence of this condition across different populations [23]. The odds of being hypertensive are about 53% higher for women aged 70 to 79 as compared to those who are 60 to 69. Men 70 to 79, on the other hand, show a similar trend.

In the US for example, according to the 1999 to 2000 National Health and Nutrition Examination Survey (NHANES), age and obesity are important risk predictors [4]. Moderate alcohol consumption, on the other hand, appears to reduce a woman's chance of developing hypertension. Other studies have found similar results [24] and national medical guidelines recommend reducing alcohol consumption in Costa Rica

as well as in other countries. Hypertension is well known to depend on factors such as alcohol, obesity, and sedentary lifestyle [25]

Being employed showed to be a protective factor for men. Employed men had a significantly lower probability of being hypertensive. But those men who are employed may indeed have been a selected group with better health status than retirees or unemployed, having therefore a lower probability of being hypertensive. This result may be masking a selection effect of individuals who have certain characteristics that place them in a category of elderly men who are still suitable to be employed because of their better health, or whose jobs (probably because of greater physical activity levels) also help them to be healthier.

Being underweight does not seem to be a risk factor for hypertension in men. One possible explanation is that underweight is related to pathologies other than hypertension. Overweight and obesity are on the other hand, related to a higher probability of being hypertensive, as it has already been discussed [26]. Using standard figural stimuli [27], individuals who were part of this study were asked to classify their own body image whenever they attained their maximum weight. Among those currently underweight individuals, 67% classified themselves using images that corresponded to either underweight or normal weight. That is, most of the currently underweight individuals have never been overweight or obese. This could be related to underweight individuals' lower probability of being hypertensive mainly because of not having been exposed to overweight and obesity as risk factors over their life courses.

Family history of hypertension increases the probability of being aware of each individual's own condition. This could be a real effect, although it could be result of recall bias. The fact that current smokers are less likely to be aware of their condition than non smokers may be related to smokers seeking less health care services than their counterparts.

Male individuals who report good or poor health are more likely of being aware of their condition as compared to those with excellent health. It may be the case that being aware of their hypertension is one of the issues that they use to classify themselves as having a less than excellent overall health status. It may also be the case that the worse men feel about their general health, the higher the probability of seeking health care and being aware of their condition.

In a similar way, women who are obese, diabetic, or have suffered heart disease or stroke are probably more likely of using health care services, which would increase their likelihood of being aware of their hypertension since blood pressure measures are part of the standard procedures conducted during any physician visit. Women are usually more likely to stay at home than men, what would make them therefore more likely to be home visited by community health workers. As the results show, women who have been visited by a community health worker are more likely to be aware of their condition.

The prevalence of treatment among hypertensive aware women is also higher as compared to men. Regarding the factors associated with treatment among hypertensives, education seems to work as a mean for individuals, regardless of their

sex, to be compliant with their hypertension treatment. Similar as with awareness, family history of hypertension, diabetes, and heart disease are associated to a higher probability of being treated, just as it has been discussed for awareness. As men grow older, the probability of being treated also increases. This may be because of an increasing probability of having other conditions that also allow for hypertension treatment once the individual is in contact with the health care services.

The fact that hypertensive men who live in the great metropolitan area are more likely to be under treatment may be due to better access to health care facilities and services in the urban as compared to the rural areas. As it has been discussed before, since overweight but not underweight is related to hypertension, underweight hypertensive men have a higher probability of not being under treatment, whereas obese women have a higher probability of being under treatment.

One of the limitations of this study is that because of the nature of the data, we were not able to assess physician variables, including practice patterns, which are known to influence the differential hypertension diagnoses of patients [18].

Another limitation is that the estimation of prevalence uses the blood pressure measures taken during the interview. Therefore some individuals are classified as hypertensive without a clinical diagnosis of hypertension. As mentioned before, this would require a medical exam and several medical appointments. Our operational definition only allows to measure the prevalence of this condition and to identify subjects who are likely to be hypertensive.

Conclusions

In Costa Rica, there are different factors associated to hypertension prevalence, unawareness, and treatment in the elderly men and women. Compared with men, women are more likely to have hypertension, but less likely to be unaware of it, and more likely to be treated once they are aware of their condition. The prevalence of hypertension increases as elderly individuals grow older up to age 80. Other factors such as diabetes, heart disease, and family history of hypertension are also directly associated to unawareness and treatment of hypertension. Some life styles appear to be important in the prevalence of the condition. Obesity is directly related to hypertension for both men and women, and low alcohol consumption decreases the probability of having hypertension in women.

Despite the hypertension detection and education programs conducted in the country, unawareness of hypertension remains high, particularly among elderly men. Awareness and higher prevalence of treatment in women are probably related to women having their health better taken care of than men and also knowing more about their family history.

Accurate estimates of hypertension prevalence are essential as a source of primary information and for rational planning of health care services in developing countries. As mentioned by Kearney and colleagues [13], hypertension is a greater burden in developing countries than in the developed ones because the much larger population of developing countries results in a larger number of individuals affected.

Those modifiable factors identified to be associated with prevalence and awareness could be used in education programs aimed to the detection and treatment of those who are unaware of their condition. This is especially important because hypertension is a major modifiable risk factor for cardiovascular and kidney disease.

A public health strategy that includes primary prevention via changes in the lifestyles of the general population, such as weight reduction and decreased alcohol

consumption would result in a lower prevalence of hypertension. But still, the possibility of behaviors' changes should definitely be considered in their social context.   The Costa Rican primary health outreach program is having an important effect reducing unawareness among women. It would be important to have this effect extended to the male population too.

Because of their high prevalence of hypertension, different cut off points could be warranted for population studies in the elderly. In Costa Rican elderly for example, the third quartile of systolic blood pressure is 158 mmHg and 92 mmHg for diastolic blood pressure. Quartiles could be used as a means of defining a threshold for these populations.

Acknowledgements

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Figures

Figure 1 - Distribution of observed blood pressure measures.
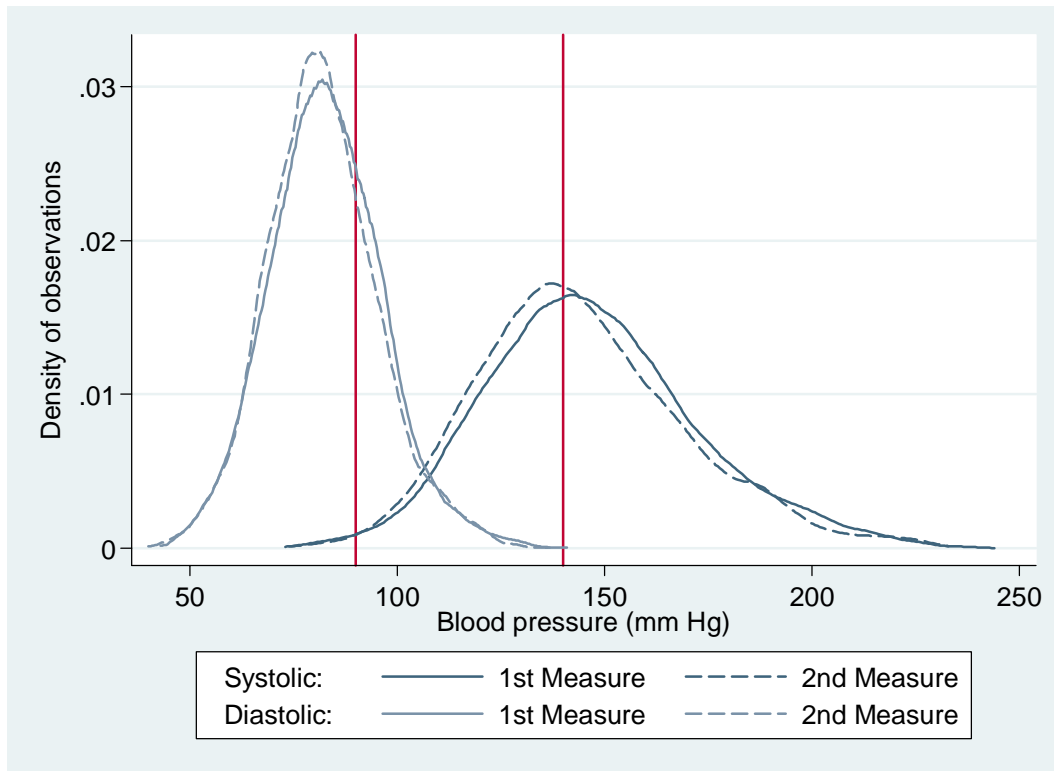
Tables

Table 1 - Characteristics of Costa Rican elderly.

Variable (n*)	Males (n=1,293)	Females (n=1,534)
Mean age (±SD)	76.3 (±10.2)	76.4 (±10.3)
Sex (2,827)	47.5	52.5
Age groups (2,827)		
60-69	55.5	52.4
70-79	31.1	31.9
80+	13.4	15.7
Complete primary education (2,815)	50.5	47.2
Has a job (2,827)	50.0	29.0
Has health insurance (2,827)	92.9	96.1
Low income (2,822)	33.6	36.5
Live in great metropolitan area of San Jose (2,827)	50.7	55.0
Co-reside with a partner (2,822)	77.1	45.3
Body Mass Index (2,703)		
Underweight	2.9	3.6
Normal	32.4	24.9
Overweight	45.6	39.0
Obesity	19.1	32.5
Alcohol consumption (2,827)		
Never	7.5	61.7
Has ever consumed	92.5	38.3
Tobacco use (2,827)		
Never	32.3	79.2
Has ever used	67.7	20.8
Physically active (2,827)	40.2	23.3
Family history of hypertension (2,527)	51.7	58.0
Home visits by community health workers (2,820)	39.4	45.9
Consumes >3,000 calories/day (2,819)	16.0	9.0
Consumes >400 carbohydrates/day (2,819)	20.1	11.3
Consumes >40 grams of fat/day (2,819)	15.9	12.2
Has ever been diagnosed as diabetic (2,827)	17.0	24.2
Has ever had heart disease (2,827)	15.5	14.7
Has ever had a stroke (2,827)	3.5	4.1
Self-reported health status (2,820)		
Excellent	9.9	5.7
Very good	14.1	13.0
Good	32.0	31.2
Fair	36.7	42.0
Poor	7.3	8.1

*Sample sizes are unweighted, whereas relative distributions correspond to weighted samples.

Table 2 - Relative distribution of hypertensive Costa Rican elderly by awareness and treatment status.

Classification	Total population (n)*	Males (n)*	Females (n)*
Total population	*(2,827)*	*(1,293)*	*(1,534)*
Hypertensives	64.5	59.8	68.8
*Hypertensives**	*(1,849)*	*(778)*	*(1,071)*
Aware	74.9	68.2	80.2
Unaware	25.1	31.8	19.8
Aware hypertensives	*(1,378)*	*(530)*	*(848)*
Treated	81.1	78.4	82.9
Untreated	18.9	21.6	17.1
Unaware hypertensives	*(466)*	*(246)*	*(220)*
Treated	27.1	27.0	27.3
Untreated	72.9	73.0	72.7

*Sample sizes are unweighted, whereas relative distributions correspond to weighted samples.
** Individuals with missing information on awareness of the condition (n=5) are not included in the relative distribution.

Table 3 - Multiple logistic regression showing factors associated with prevalence of hypertension in the Costa Rican elderly, by sex.

Variable	Males OR	Males 95% CI of OR	Females OR	Females 95% CI of OR
Being 70-79 vs. 60-69 yrs old	1.10	0.76 - 1.58	1.53 *	1.07 - 2.19
Has a job	0.55 *	0.37 - 0.81	0.94	0.54 - 1.64
Underweight vs. normal weight	0.27 *	0.11 - 0.69	0.53	0.28 - 1.03
Overweight vs. normal weight	2.04 *	1.40 - 2.98	1.41	0.97 - 2.04
Obesity vs. normal weight	3.92 *	2.34 - 6.57	1.83 *	1.19 - 2.80
Occasional alcohol drinker vs. non drinker	1.36	0.71 - 2.59	0.62 *	0.42 - 0.91
Family history of hypertension	1.98 *	1.40 - 2.79	2.21 *	1.62 - 3.03

* Significant at 0.05 level

Note: The following variables were also included in the model, but were not significant at 0.05 level and are not shown: 10-yr age groups from 60-69 up to 80+, education, having health insurance, income level, living in the great metropolitan area of San Jose, being married, tobacco use, physical activity, home visits by community health workers in the last yr, calories consumption, carbohydrates consumption, fat consumption, having had a stroke, and self-rated health status.

Table 4 - Multiple logistic regression showing factors associated with unawareness and treatment of hypertension among Costa Rican elderly hypertensives, by sex.

Variable	Males				Females			
	OR		95% CI of OR		OR		95% CI of OR	
Unawareness among hypertensives (1)								
Obesity vs. normal weight	0.92		0.53 - 1.58		0.40	*	0.22 - 0.73	
Currently smokes vs. never smoked	2.86	*	1.44 - 5.67		0.79		0.23 - 2.65	
Family history of hypertension	0.30	*	0.19 - 0.47		0.44	*	0.29 - 0.68	
Home visits by community health workers	0.92		0.58 - 1.48		0.49	*	0.31 - 0.79	
Diabetes	0.86		0.47 - 1.56		0.40	*	0.23 - 0.69	
Heart disease	0.77		0.45 - 1.34		0.48	*	0.25 - 0.90	
Stroke	0.63		0.26 - 1.50		0.32	*	0.14 - 0.75	
Good health status vs. excellent	0.35	*	0.16 - 0.78		0.76		0.33 - 1.74	
Poor health status vs. excellent	0.25	*	0.08 - 0.79		0.45		0.16 - 1.32	
Treatment among hypertensives (2)								
Being 70-79 vs. 60-69 yrs old	2.15	*	1.26 - 3.67		1.25		0.81 - 1.94	
Being 80+ vs. 60-64 yrs old	3.61	*	1.77 - 7.37		1.24		0.75 - 2.02	
Complete primary education	2.05	*	1.17 - 3.58		1.73	*	1.11 - 2.68	
Live in great metropolitan area of San Jose	1.80	*	1.08 - 2.98		1.42		0.96 - 2.12	
Underweight vs. normal weight	0.11	*	0.02 - 0.54		1.37		0.49 - 3.86	
Obesity vs. normal weight	1.55		0.76 - 3.15		1.99	*	1.20 - 3.30	
Family history of hypertension	2.98	*	1.79 - 4.95		1.61	*	1.11 - 2.34	
Home visits by community health workers	0.91		0.56 - 1.47		1.75	*	1.19 - 2.57	
Diabetes	2.33	*	1.19 - 4.58		2.21	*	1.43 - 3.43	
Heart disease	4.12	*	2.08 - 8.16		1.82	*	1.06 - 3.14	

* Significant at 0.05 level

The following variables were also included in the model, but were not significant at 0.05 level and are not shown:

(1) 10-yr age groups from 60-69 up to 80+, education, having health insurance, income level, living in the great metropolitan area, co-residing with a partner, alcohol consumption, physical activity, calories consumption, carbohydrates consumption, and fat consumption.

(2) Being employed, having health insurance, income level, co-residing with a partner, alcohol consumption, tobacco use, physical activity, calories consumption, carbohydrates consumption, fat consumption, and self-reported health status.