

# High Blood Pressure in Panama: Prevalence, Sociodemographic and Biologic Profile, Treatment, and Control (STROBE)

Anselmo J. Mc Donald Posso, MD, Jorge A. Motta Borrel, MD, Flavia Fontes, MSc, Clara E. Cruz Gonzalez, MSc, Alvaro A. Pachón Burgos, MD, and Alberto Cumbreira Ortega, MSc

**Abstract:** The objective of this study is to estimate the prevalence, treatment, and control of high blood pressure, hypertension (HBP) in Panama and assess its associations with sociodemographic and biologic factors.

A cross-sectional, descriptive study was conducted in Panama by administering a survey on cardiovascular risk factors to 3590 adults and measuring their blood pressure 3 times. A single-stage, probabilistic, and randomized sampling strategy with a multivariate stratification was used. The average blood pressure, confidence intervals (CIs), odds ratio (OR), and a value of  $P \leq 0.05$  were used for the analysis.

The estimated prevalence of HBP was 29.6% (95% CI, 28.0–31.1); it was more prevalent in men than in women, OR = 1.37 (95% CI, 1.17–1.61); it increased with age and was more frequent among Afro-Panamanians (33.8%). HBP was associated with a family history of HBP with being physically inactive and a body mass index  $\geq 25.0 \text{ kg/m}^2$  or a waist circumference  $>90 \text{ cm}$  in men and  $>88 \text{ cm}$  in women ( $P < 0.001$ ). Of those found to have HBP, 65.6% were aware of having HBP and taking medications, and of these, 47.2% had achieved control ( $<140/90 \text{ mm Hg}$ ).

HBP is the most common cardiovascular risk factor among Panamanians and consequently an important public health problem in Panama. The health care system needs to give a high priority to HBP prevention programs and integrated care programs aimed at treating HBP, taking into consideration the changes in behavior that have been brought about by alterations in nutrition and sedentary lifestyles.

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**Abbreviations:** BMI = body mass index, BP = blood pressure, CI = confidence interval, CVD = cardiovascular disease, DBP = diastolic

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From the Department of Endocrinology and Metabolism (AAPB), Hospital Rafael Hernández, David, Chiriquí; Gorgas Memorial Institute of Health Studies (AJMDP, JAMB, ACO); Ministry of Health of Panama (FF); and School of Statistics (CECG), Faculty of Sciences, University of Panama, Panama.

Correspondence: Anselmo J. Mc Donald Posso, Gorgas Memorial Institute of Health Studies, Justo Arosemena Avenue and 35th Street, Panama (e-mail: ansemc@hotmail.com).

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blood pressure, GMI = Gorgas Memorial Institute of Health Research, HBP = high blood pressure, hypertension, INEC = Panama's National Institute of Statistics and Census, MOH = Panamanian Ministry of Health, NHANES = National Health Survey of the United States, OR = odds ratio, PREFREC (for its acronym in Spanish) = PREFREC (for its acronym in Spanish) Survey on Risk Factors Associated With Cardiovascular Disease, SBP = systolic blood pressure, WHO = World Health Organization.

## INTRODUCTION

Epidemiologic and health indicators show that in Latin America cardiovascular diseases (CVDs) have become the main causes of death.<sup>1,2</sup> According to the World Health Organization (WHO), CVD will be the leading cause of death and disability in the world by 2020. The number of victims worldwide from CVD is expected to increase to 20 million/y and this figure probably will rise to  $>24$  million deaths by 2030.<sup>3</sup> Panama's National Institute of Statistics and Census (INEC) estimated in 2012 that CVD accounted for 26.9% (4667/17350) of all medically certified deaths in the country that year.<sup>4</sup>

High blood pressure, hypertension (HBP) is one of the major modifiable risk factors for CVD, more specifically, for diseases such as heart failure, kidney failure, stroke, myocardial infarction, and acute coronary syndromes.<sup>3,5–8</sup> The treatment and control of HBP is also one of the most effective public health interventions to prevent CVD and premature cardiovascular death.<sup>2,3</sup>

Until 2012, there were no population surveys in Panama that could be used to estimate the prevalence of HBP. The 2011 Survey on Risk Factors Associated With Cardiovascular Disease (PREFREC for its acronym in Spanish) is the first study done in Panama where biologic measurements of CVD risk factors, such as blood pressure (BP), lipid levels, and blood glucose levels, were obtained from a large sample of urban, rural, and indigenous communities of Panamanians.<sup>9</sup>

The aim of this article is to report on the prevalence, treatment, and control of HBP in Panama and also assess its associations with sociodemographic and biologic factors.

## METHODS

### Research Design and Area of Study

PREFREC was a cross-sectional, descriptive study conducted by the Gorgas Memorial Institute of Health Research (GMI) and the Panamanian Ministry of Health (MOH) in the transisthmian zone of the Republic of Panama. The study area encompassed the provinces of Panama,

Colon, and the Madugandí Guna Comarca (formerly called Kuna Madugandí). This area contains Panama City, the capital of Panama (metropolitan health region), and the health regions of Western Panama, San Miguelito, East Panama, and Colon where 60.4% of all Panamanians 18 years or older reside. Panama is located at the southernmost end of Central America (see Figure 1) and has a population approximately of 3,800,000 inhabitants.<sup>10,11</sup>

**Study Sample**

We sampled houses, employing a single-stage, probabilistic, and randomized sampling strategy with a multivariate stratification that was developed by the INEC. This sampling strategy was carried out separately for urban, rural, and indigenous areas, based on maps produced by the year 2000 National Census of Panama. The sample was stratified according to the education level of the study population. A total of 3590 individuals aged 18 years and older who agreed to participate in the study (maximum 2 adults/household) were evaluated from the sampled houses. Pregnant women, people with body mass index (BMI) <18.5 Kg/m<sup>2</sup>, and individuals for whom measurements of BMI, waist circumference, and BP could not be obtained were excluded from the analysis. These exclusions reduced the sample size to 3406.

Individuals identified as having HBP were those who, at the time of the survey, were taking antihypertensive medications and/or people who had an average systolic blood pressure (SBP) of ≥140 mm Hg and/or an average diastolic

blood pressure (DBP) of ≥90 mm Hg.<sup>12</sup> Individuals with HBP who reported a history of physician-diagnosed HBP were classified as being aware of having HBP. Those who were taking antihypertensive medication and had an SBP measurement <140 mm Hg and an DBP measurement <90 mm Hg were classified as controlled, and those who had an SBP measurement ≥140 mm Hg and/or DBP ≥90 mm Hg were classified as not under control.<sup>12</sup> Individuals who had SBP measurements ≥140 mm Hg and/or DBP ≥90 mm Hg but not a reported history of HBP were classified as having HBP unawareness.

**Biologic and Socioeconomic Variables**

Age was defined as the years from the time of the individual’s birth until the day the survey was conducted; sex was defined by the phenotypical characteristics that distinguish men from women; area was defined by the geographic domain where the respondent usually lives (urban, rural, or indigenous); schooling was defined as the highest level of education attained by the participant be it primary, secondary, university, or postgraduate education; marital status was defined as being single, married, civil union, separated, divorced, or widowed; ethnic group was defined by the participant’s self identification as an Afro-Panamanian (Panamanian of African descent), Mestizo, white, native American (Amerindian), or of Asian descent. The monthly family income was defined as the total amount of United States dollars (USD) received by the family of the participant every month.

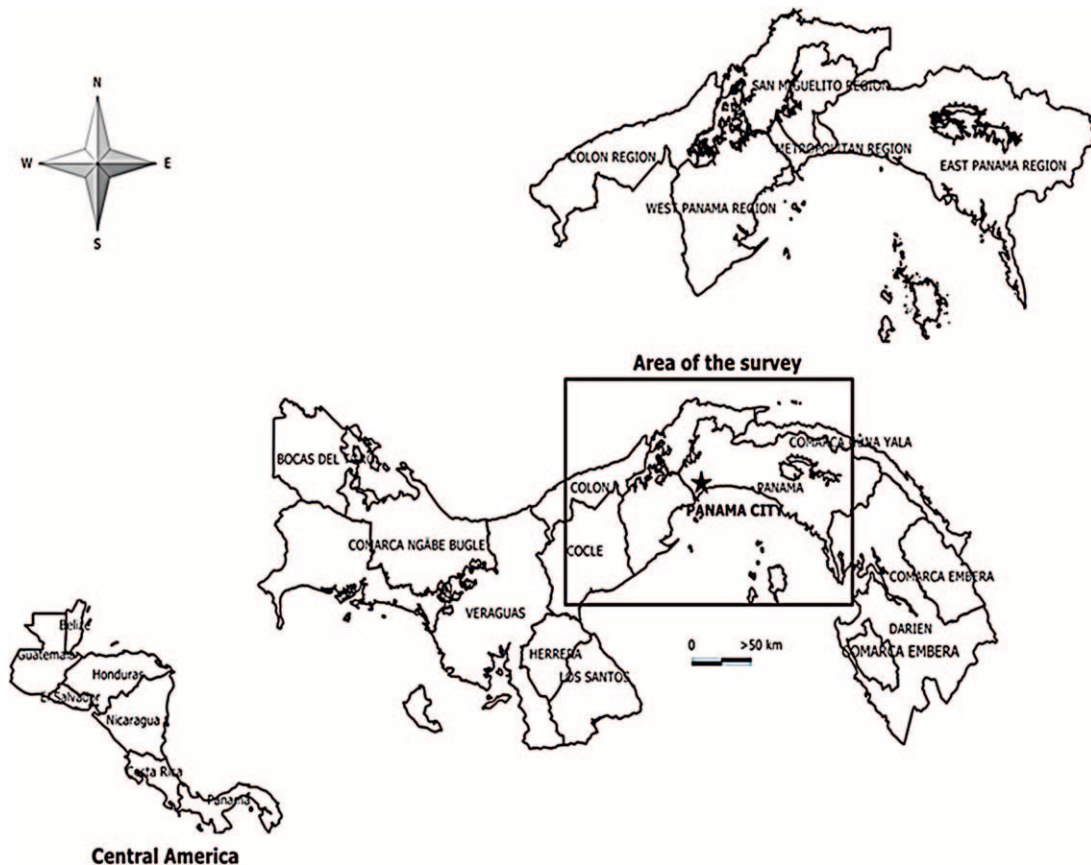


FIGURE 1. Republic of Panama. Political and administrative divisions.

The BMI was calculated by dividing the weight in kilograms by the height in square meters ( $\text{kg}/\text{m}^2$ ) and categorized into 3 mutually exclusive groups based on WHO and NCEP-ATP III (the Third Report of the National Cholesterol Education Program, Adult Treatment Panel III) criteria.<sup>13</sup> Underweight was defined as a BMI of  $<18.5 \text{ kg}/\text{m}^2$ , normal weight was defined as a BMI of  $18.5\text{--}24.9 \text{ kg}/\text{m}^2$ , overweight was defined as a BMI of  $25\text{--}29.9 \text{ kg}/\text{m}^2$ , and obesity was defined as a BMI  $\geq 30 \text{ kg}/\text{m}^2$ . Abdominal obesity in women was defined as a waist circumference  $>88 \text{ cm}$  and in men  $>90 \text{ cm}$ .<sup>14–16</sup>

Any sport, exercise, or activity that required energy expenditure associated with aerobic work was considered as physical activity. Those who engaged in  $<60 \text{ min}/\text{wk}$  of physical activity were considered as physically inactive, those who engaged in physical activity lasting 60 to 149  $\text{min}/\text{wk}$  were considered as having insufficient physical activity, and those who engaged in  $>150 \text{ min}/\text{wk}$  of physical activity were considered physically active.

### Data Collection Instruments and Procedures

The data collection instrument was a structured form (survey), developed by researchers from GMI, specialists from the Department of Chronic Diseases of the MOH, and representatives of the Pan American Health Organization in Panama. The planning process for the study included a pilot survey test that served to evaluate the methodology, procedures, instruments, and the organization of the fieldwork, and reduce errors and the risk of bias during the survey. Nationally recognized specialists in the fields of endocrinology, cardiology, and public health also validated the instrument.

University graduates and students in their final year of health sciences education were trained in interviewing and survey management to standardize the data collection process. In the indigenous areas, interpreters who spoke the indigenous dialect supported the people who administered the survey.

### BP Measurement

The measurement of BP was performed with calibrated automatic sphygmomanometers made by American Diagnostic Corporation model 6013, which had cuff sizes for people with normal weight and for people who were obese. Before starting the fieldwork, the measurements of the automatic sphygmomanometers were validated with aneroid sphygmomanometers. All interviewers were trained in the handling and proper use and care of the equipment, procedure for BP measurement, and use of the appropriate cuff size for people with obesity.<sup>17</sup>

Three BP measurements were made in the right arm of each person with the participant seated and with a minimum of 5 minutes between the start of the survey and the first measurement, and between the second and third measurements.<sup>17</sup> An average of these 3 BPs was used to define the participant's BP. The classification of HBP according to the seventh report of JNC VII, the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure 2003 was used.<sup>12,18</sup>

The National Bioethics Committee of the Republic of Panama approved the study. All participants were informed about the objectives of the study, and they signed an informed consent.

### Analysis Plan

The prevalence estimates from the study sample were calculated as percentages with 95% confidence intervals (CIs).

For area, age, sociodemographic, and biological variables, odds ratio (OR) and *P* values were calculated using  $2 \times 2$  tables for subjects with HBP and without HBP. For all cases, a value of  $P \leq 0.05$  was considered statistically significant.<sup>19,20</sup>

The data were processed using SPSS (version 19) (SPSS Inc, Chicago, IL), Microsoft Excel 2010 (Microsoft Corporation, Washington DC), and Epi Info, version 3.5.1 (Centers for Diseases Control and Prevention, Atlanta, GA).

## RESULTS

### General Characteristics

A total of 3406 adults aged 18 years and older were studied of which 1034 were men (30.4%) and 2372 were women (69.6%). The average age of the study subjects was 46 years (48 for men, 44 for women), and the median age was 45 years (49 for men, 43 for women).

### Prevalence of HBP by Sex, Age, and Area of Residence

BP values  $\geq 140/90 \text{ mm Hg}$  were found in 24.5% (836/3406) of the study subjects; among men, the prevalence was 33.5% (346/1034) and among women, 20.7% (490/2372). Of the total sample, 19.4% (661/3406) were receiving antihypertensive medicines; among men, the prevalence was 18.0% (186/1034) and among women, 20.0% (475/2372).

Of those found to have BP values  $\geq 140/90 \text{ mm}$ , 41.3% (345/836) were unaware of being hypertensive, of which 48.7% (168/345) were men and 51.3% (177/345) women.

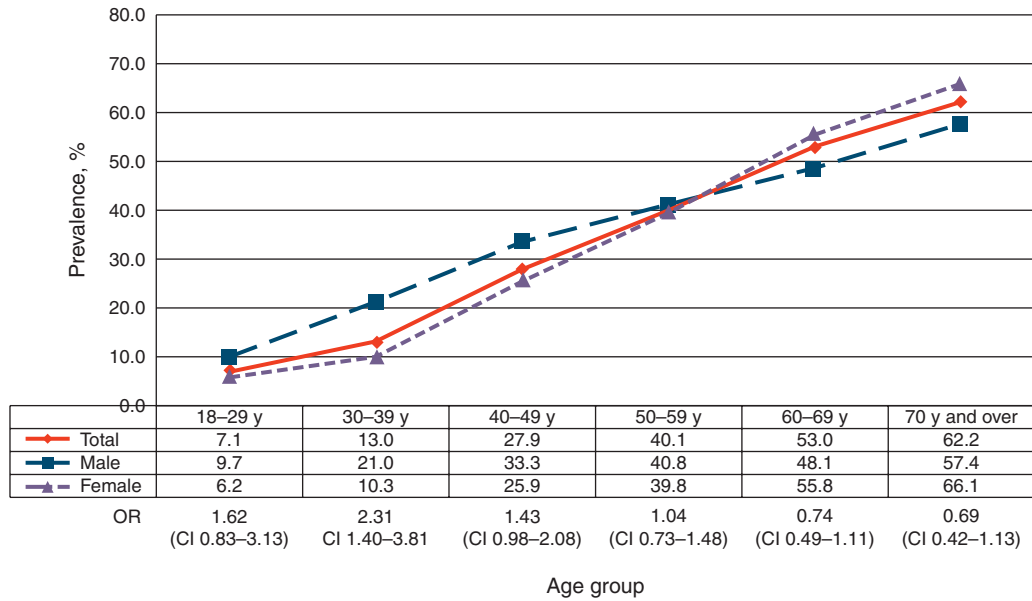
The sum of those who were taking antihypertensive medication and those unaware of being hypertensive totaled 29.6% (1007/3406); this prevalence was 34.2% (354/1034) among men and 27.5% (653/2372) among women, OR = 1.37 (95% CI, 1.17–1.61),  $P < 0.001$ .

With increasing age, the prevalence of HBP also increased, and it was higher among those 60 years or older than among those  $<60$  years of age, OR = 4.65 (95% CI, 3.90–5.54),  $P < 0.001$ . Being 50 years or older was associated with HBP for women, OR = 5.96 (95% CI, 4.89–7.25),  $P < 0.001$ , and this was also the case for men, OR = 3.29 (95% CI, 2.51–4.32),  $P < 0.001$ . Overall, HBP tended to be higher among men  $<50$  years of age than among women of the same age group, OR = 1.46 (95% CI, 1.19–1.79),  $P = 0.001$ ; among those 60 years or older, the prevalence tended to be higher in women than in men, OR = 1.35 (95% CI, 0.99–1.83),  $P = 0.06$  (see Figure 2).

Those who lived in urban areas had a prevalence of HBP of 31.7% (512/1615; 95% CI, 29.4–34.0), whereas those who lived in indigenous areas had a prevalence of 10.8% (21/194; 95% CI, 6.5–15.2) (see Table 1). Furthermore, living in an urban or rural area was associated with a higher HBP prevalence than living in an indigenous area, OR = 3.65 (95% CI, 2.31–5.77),  $P < 0.001$  (see Table 1).

### Prevalence of HBP According to Sociodemographic Variables: Ethnocultural Identification, Marital Status, Educational Level, and Income Status

The prevalence of HBP was 33.8% (249/736; 95% CI, 30.4–37.2) among Afro-Panamanians, 32.1% (130/405; 95% CI, 27.6–36.6) among whites, and 31.1% (571/1835; 95% CI, 29.0–33.2) among Mestizos. The lowest prevalence of



**FIGURE 2.** Prevalence of HBP (adjusted rates) according to age group and sex. HBP=high blood pressure, hypertension, PREFREC= Survey on Risk Factors Associated With Cardiovascular Disease. Source: PREFREC, 2010-2011.<sup>9</sup>

HBP was found among Amerindians (Gunas) 11.4% (41/360; 95% CI, 8.1-14.7) (see Table 2).

With regards to income, men who had a monthly family income of 1000 USD had a prevalence of HBP of 47.9% (45/94; 95% CI, 37.8-58.0), whereas women, with a similar family income, had a prevalence of 26.6% (37/139; 95% CI, 19.3-34.0) OR = 1.88; 95% CI, 1.20-2.94; P = 0.005 (see Tables 2 and 3).

In so far as marital status, HBP prevalence was highest among widows, 64.5% (80/124; 95% CI, 56.1-72.9),

OR = 5.31 (95% CI, 3.58-7.91), P < 0.001 (see Tables 2 and 3).

The prevalence of HBP was higher among those with no schooling or only with an elementary school education, 38.1% (95% CI, 35.5-40.7) when compared with those with a high school or university education, 24.0%, (95% CI, 22.2-25.8). However, men with a university education had a higher prevalence of HBP, 31.9% (61/191; 95% CI, 25.3-38.5) when compared with women with a similar level of education, 21.6%, (101/467; 95% CI, 17.9-25.4) (see Table 2).

**TABLE 1.** General and Specific Rates of HBP by Sex According to Area and Age

Variables	General Rate of HBP			Specific Rate of HBP			Specific Rate of HBP		
	Frequency	%	95% CI	Frequency	%	95% CI	Specific Rate of HBP		
							Frequency	%	95% CI
Total	1007/3406	29.6	28.0-31.1	354/1034	34.2	31.3-37.1	653/2372	27.5	25.7-29.3
Area									
Urban	512/1615	31.7	29.4-34.0	162/459	35.3	30.9-39.7	350/1156	30.3	27.6-32.9
Rural	474/1597	29.7	27.4-31.9	183/493	37.1	32.8-41.4	291/1104	26.4	23.8-32.9
Indigenous	21/194	10.8	6.5-15.2	9/82	11.0	4.2-17.8	12/112	10.7	5.0-16.4
Age, y									
18-29	47/660	7.1	5.2-9.1	17/176	9.7	5.3-14.1	30/484	6.2	4.1-8.3
30-39	86/663	13.0	10.4-15.5	35/167	21.0	14.8-27.2	51/496	10.3	7.6-13.0
40-49	195/698	27.9	24.6-31.3	64/192	33.3	26.6-40.0	131/506	25.9	22.1-29.7
50-59	258/643	40.1	36.3-43.9	82/201	40.8	34.0-47.6	176/442	39.8	35.3-44.4
60-69	232/438	53.0	48.3-57.6	78/162	48.1	40.4-55.8	154/276	55.8	49.9-61.7
70 and over	189/304	62.2	56.7-67.6	78/136	57.4	49.1-65.7	111/168	66.1	58.9-73.2

CI = confidence interval, HBP = high blood pressure, hypertension, PREFREC = Survey on Risk Factors Associated With Cardiovascular Disease.

Source: PREFREC, 2010-2011.<sup>9</sup>



**TABLE 2.** General and Specific Rates of HBP by Sex According to the Sociodemographic Variables

Sociodemographic Variables	General Rate of HBP			Men			Women		
	Frequency	%	95% CI	Specific Rate of HBP			Specific Rate of HBP		
				Frequency	%	95% CI	Frequency	%	95% CI
<b>Ethnic groups</b>									
Afro-Panamanian	249/736	33.8	30.4–37.2	70/198	35.4	28.7–42.1	179/538	33.3	29.3–37.3
Mestizo	571/1835	31.1	29.0–33.2	225/567	39.7	35.7–43.7	346/1268	27.3	24.8–29.7
Asian	6/26	23.1	6.9–39.3	3/11	27.3	1.0–53.6	3/15	20.0	0.0–40.2
Native	41/360	11.4	8.1–14.7	14/115	12.2	6.2–18.2	27/245	11.0	7.1–14.9
White	130/405	32.1	27.6–36.6	38/127	29.9	21.9–37.9	92/278	33.1	27.6–38.6
<b>Monthly family income</b>									
600 USD and less	813/2780	29.2	27.6–30.9	273/815	33.5	30.3–36.7	540/1965	27.5	25.5–29.5
601–999 USD	72/255	28.2	22.7–33.8	26/102	25.5	17.0–34.0	46/153	30.1	22.8–37.3
1000 USD and more	82/233	35.2	29.1–41.3	45/94	47.9	37.8–58.0	37/139	26.6	19.3–34.0
<b>Marital status</b>									
Single	167/681	24.5	21.3–27.8	55/209	26.3	20.3–52.3	112/472	23.7	19.9–27.6
Free union or married	677/2350	28.8	27.0–30.6	272/754	36.1	32.7–39.5	405/1596	25.4	23.2–27.5
Separated or divorced	74/217	34.1	27.8–40.4	18/41	43.9	28.7–59.1	56/176	31.8	24.9–38.7
Widow	88/151	58.3	50.4–66.1	8/27	29.6	12.4–46.8	80/124	64.5	56.1–72.9
<b>Schooling</b>									
No schooling/elementary	498/1307	38.1	35.5–40.7	178/424	42.0	37.3–46.7	320/883	36.2	33.1–39.4
High school	334/1410	23.7	21.5–25.9	110/407	27.0	22.7–31.3	224/1003	22.3	19.8–24.9
University	162/658	24.6	21.3–27.9	61/191	31.9	25.3–38.5	101/467	21.6	17.9–25.4

CI = confidence interval, HBP = high blood pressure, hypertension, PREFREC = Survey on Risk Factors Associated With Cardiovascular Disease, USD = United States dollar.  
Source: PREFREC, 2010–2011.<sup>9</sup>

**Prevalence of HBP According to Biologic Variables: Family History, Physical Activity, Waist Circumference, and BMI**

HBP was more prevalent among those with a family history of HBP, 32.8% (95% CI, 29.9–35.7) than among those without a family history of HBP, 23.2% (95% CI, 19.3–27.1). HBP was also more prevalent among those classified as physically inactive 32.1% (95% CI, 30.4–33.8) than among those classified as physically active 18.8% (95% CI, 15.0–22.6) or even among those classified as engaging in insufficient physical activity. Men with a waist circumference >90 cm and women with a waist circumferences >88 cm had a higher prevalence of HBP than those men and women with smaller waist circumferences. The same was observed for men and women with BMI ≥25.0 kg/m<sup>2</sup> (see Table 4).

**Risk Factors Associated With HBP**

For men, HBP was associated mainly with being 50 years old or older (OR = 3.29 [95% CI, 2.51–4.32], *P* < 0.001), being physically inactive (OR = 2.71 [95% CI, 1.91–3.86], *P* < 0.001), having a waist circumference of >90 cm (OR = 2.10 [95% CI, 1.60–2.76], *P* < 0.001), having a family income of USD 1000 or more per month (OR = 1.88 [95% CI, 1.20–2.94], *P* = 0.005), having a BMI ≥25.0 kg/m<sup>2</sup> (OR = 1.79 [95% CI, 1.37–2.33], *P* < 0.001), having no schooling or only elementary school education (OR = 1.78 [95% CI, 1.36–2.34], *P* < 0.001), or being Mestizo (OR = 1.72 [95% CI, 1.31–2.26], *P* < 0.001) (see Table 3).

For women, HBP was associated mainly with being 50 years old or older (OR = 5.96 [95% CI, 4.89–7.25], *P* < 0.001), having a waist circumference >88 cm (OR = 2.85 [95% CI, 2.27–3.57], *P* < 0.001), having a BMI ≥25.0 kg/m<sup>2</sup> (OR = 2.39 [95% CI, 1.92–2.96], *P* < 0.001), being physically inactive (OR = 2.20 [95% CI, 1.40–3.50], *P* < 0.001), having no schooling or only an elementary school education (OR = 1.97 [95% CI, 1.64–2.38], *P* < 0.001), having a family history of HBP (OR = 1.95 [95% CI, 1.57–2.42], *P* < 0.001), being Afro-Panamanian (OR = 1.43 [95% CI, 1.16–1.77], *P* = 0.001), or living in urban areas (OR = 1.31 [95% CI, 1.09–1.57], *P* = 0.004) (see Table 3).

**HBP Awareness, Treatment, and Control**

Of the 1007 people documented as having HBP, 65.6% (661/1007; 95% CI, 62.7–68.5) were taking antihypertensive medications, 33.7% (339/1007; 95% CI, 30.8–36.6) were aware of having HBP but were not taking medication, and 34.3% (345/1007 (95% CI, 31.4–37.2) were unaware of having HBP. Of the 661 people who were taking medications for HBP, 47.2% (312/661; 95% CI, 43.4–51.0) had BP values of <140/90 mm Hg and 52.8% (349/661; 95% CI, 49.0–56.6) had BP values ≥140/90 mm Hg (see Table 5).

More subjects >60 years of age were aware of having HBP when compared with those 40–59 years old (OR = 1.61 [95% CI, 1.18–2.19], *P* = 0.002). Nevertheless, the percentage of those with controlled HBP decreased with increasing age as demonstrated by better HBP control

**TABLE 3.** Risk Factors Associated With HBP by Sex in Panama

Risk Factors	Men		Women	
	OR*	P Values	OR*	P Values
Sex and area variables				
Area				
Urban	1.09 (0.83–1.42)	0.56	1.31 (1.09–1.57)	0.004
Rural	1.28 (0.98–1.67)	0.07	0.90 (0.74–1.08)	0.25
Indigenous	0.22 (0.10–0.45)	<0.001	0.30 (0.16–0.57)	<0.001
Age, y				
18–29	0.17 (0.09–0.28)	<0.001	0.13 (0.09–0.20)	<0.001
30–39	0.46 (0.30–0.69)	<0.001	0.24 (0.18–0.33)	<0.001
40–49	0.95 (0.67–1.34)	0.83	0.90 (0.72–1.13)	0.38
50–59	1.42 (1.02–1.97)	0.04	2.02 (1.61–2.52)	<0.001
60–69	2.01 (1.41–2.86)	<0.001	4.04 (3.10–5.27)	<0.001
70 and over	3.03 (2.06–4.45)	<0.001	5.97 (4.22–8.45)	<0.001
Sociodemographic variables				
Ethnic groups				
Afro-Panamanian	1.06 (0.76–1.49)	0.77	1.43 (1.16–1.77)	<0.001
Mestizo	1.72 (1.31–2.26)	<0.001	0.97 (0.81–1.17)	0.81
Asian	0.72 (0.15–2.98)	0.76	0.66 (0.15–2.50)	0.77
Native	0.24 (0.13–0.43)	<0.001	0.30 (0.19–0.45)	<0.001
White	0.80 (0.52–1.22)	0.32	1.35 (1.02–1.78)	0.03
Monthly family income				
600 USD and less	0.86 (0.62–1.18)	0.37	0.99 (0.77–1.26)	0.96
601–999 USD	0.63 (0.38–1.03)	0.06	1.14 (0.79–1.66)	0.53
1000 USD and more	1.88 (1.20–2.94)	0.005	0.95 (0.63–1.43)	0.88
Marital status				
Single	0.63 (0.44–0.89)	0.01	0.78 (0.61–0.99)	0.04
Free union or married	1.36 (1.00–1.85)	0.05	0.72 (0.60–0.88)	<0.001
Separated or divorced	1.53 (0.78–3.00)	0.24	1.25 (0.89–1.76)	0.22
Widow	0.80 (0.32–1.96)	0.76	5.31 (3.58–7.91)	<0.001
Schooling				
No schooling/elementary	1.78 (1.36–2.34)	<0.001	1.97 (1.64–2.38)	<0.001
High school	0.58 (0.44–0.77)	<0.001	0.63 (0.52–0.76)	<0.001
University	0.88 (0.62–1.25)	0.51	0.68 (0.53–0.87)	0.24
Biologic variables				
Family history of HBP				
Yes	1.23 (0.93–1.64)	0.02	1.95 (1.57–2.42)	<0.001
No				
Physical activity				
Physically active	0.42 (0.29–0.59)	<0.001	0.47 (0.29–0.74)	<0.001
Insufficient physical activity	0.82 (0.43–1.56)	0.62	1.22 (0.63–2.37)	0.64
Physically inactive	2.71 (1.91–3.86)	<0.001	2.20 (1.40–3.50)	<0.001
Waist circumference				
Men, >90 cm; women, >88 cm	2.10 (1.60–2.76)	<0.001	2.85 (2.27–3.57)	<0.001
Men, ≤90 cm; women ≤88 cm				
BMI, kg/m <sup>2</sup>				
18.5–24.9	0.56 (0.43–0.74)	<0.001	0.42 (0.34–0.52)	<0.001
25.0–29.9	1.71 (1.27–2.32)	<0.001	2.14 (1.67–2.73)	<0.001
≥30.0	1.93 (1.34–2.79)	<0.001	2.69 (2.10–3.44)	<0.001

BMI = body mass index, HBP = high blood pressure, hypertension, OR = odds ratio, PREFREC = Survey on Risk Factors Associated With Cardiovascular Disease, USD = United States dollar.

\*For each category of the variables studied, OR and P value were calculated between total of people with HBP and without HBP with relation to the same variable.

Source: PREFREC, 2010–2011.<sup>9</sup>

among the 18 to 39-year-old group than among those who were 60 years and older, OR = 2.62 (95% CI, 1.37–5.04), P = 0.002 (see Figure 3).

### DISCUSSION

PREFREC is the first cardiovascular risk factor study ever to have been conducted in Panama where BP was

**TABLE 4.** General and Specific Rates by Sex of HBP According to Biologic Variables

Biologic Variables	General Rate of HBP			Men			Women		
	Frequency	%	95% CI	Specific Rate of HBP			Specific Rate of HBP		
				Frequency	%	95% CI	Frequency	%	95% CI
Family history of HBP									
Yes	705/2149	32.8	29.9–35.7	231/591	39.1	36.1–42.1	492/1558	31.6	28.8–34.4
No	257/1106	23.2	19.3–27.1	116/370	31.3	27.1–35.5	141/736	19.2	15.6–22.8
Physical activity									
Physically active	78/415	18.8	15.0–22.6	53/255	20.8	18.4–23.2	25/160	15.6	10.0–21.3
Insufficient physical activity	40/221	18.1	13.0–23.2	17/96	17.7	16.4–19.0	23/125	18.4	16.6–25.2
Physically inactive	889/2770	32.1	30.4–33.8	284/683	41.6	37.9–45.3	605/2087	29.0	27.0–30.9
Waist circumference									
Men, >90 cm; women, >88 cm	760/2118	35.9	33.9–37.9	228/543	42.0	37.8–46.2	532/1575	33.8	31.4–36.1
Men, ≤90 cm; women ≤88 cm	247/1288	19.2	17.0–21.4	126/491	25.7	21.8–29.6	121/797	15.2	12.7–17.7
BMI, kg/m <sup>2</sup>									
18.5–24.9	258/1240	20.8	18.5–23.1	128/470	27.2	25.2–29.2	130/770	16.9	14.2–19.5
25.0–29.9	401/1217	32.9	30.3–35.6	145/371	39.1	36.4–41.8	256/846	30.3	27.2–33.4
≥30.0	348/959	36.7	33.6–39.7	81/193	42.0	38.2–45.8	267/756	35.3	31.9–38.7

BMI = body mass index, CI = confidence interval, HBP = high blood pressure, hypertension, PREFREC = Survey on Risk Factors Associated With Cardiovascular Disease.  
 Source: PREFREC, 2010–2011.<sup>9</sup>

measured. The results from PREFREC suggest that the prevalence of HBP is 29.6% (95% CI, 28.0–31.1) among subjects 18 years of age or older who live in the highly urbanized provinces of Panama and Colon, an area where approximately 60% of the country’s population resides. Based on this prevalence estimate, HBP is probably the most common cardiovascular risk factor in Panama.<sup>9,11,21,22</sup>

The results reveal that HBP in Panama is associated with the following factors: age, living in an urban area, having no formal education or only an elementary level education, having a family income >1000 USD/mo if men, being physically inactive, having a larger than normal waist circumference, and having a BMI ≥25 kg/m<sup>2</sup>. These associations give new insights on the risk factors of HBP in Panama and complement existing information that have been reported for other countries in the Americas.<sup>1,2,5,7,21,23–31</sup>

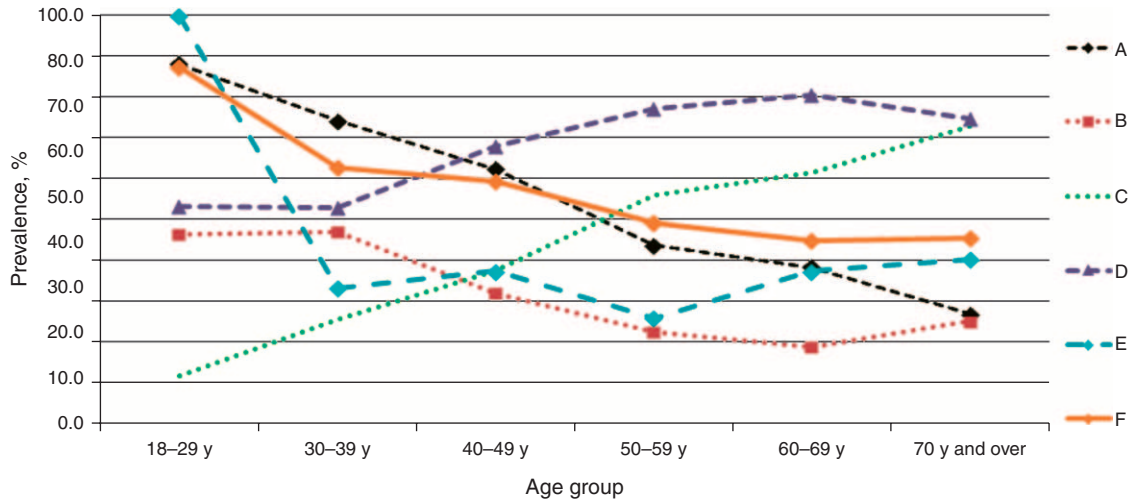
The high prevalence of HBP (29.6%), especially the prevalence of 7.1% seen among those aged between 18 and 29 years of age, is of concern because it implies that there may be >400,000 subjects with HBP in the provinces of Panama and Colon who should be receiving care for this condition and because it resembles the prevalence found in economically affluent countries.<sup>29,32</sup>

In the last 3 decades, the per capita gross domestic product of Panama increased almost 5-fold and the percentage of people living in urban areas grew from 50% to 75%.<sup>33,34</sup> This rapid increase in economic growth and urbanization has resulted in significant nutritional and lifestyle changes.<sup>35–38</sup> Changes in occupation, transportation, and technology directed at leisure time activities at home have also contributed to increased sedentary behavior and reduced physical activity.<sup>39,40</sup> Therefore, the problem of

**TABLE 5.** BP Classification Among People With HPB According to Sex

BP Classification	Total			Men			Women		
	Frequency	%	95% CI	Frequency	%	95% CI	Frequency	%	95% CI
Normal	106/1007	10.1	8.6–12.4	18/354	5.1	2.8–7.4	88/653	13.5	10.9–16.1
Pre-HBP	206/1007	19.7	18.0–22.9	49/354	13.8	10.2–17.4	157/653	24.0	20.8–27.3
HBP	695/1007	69.0	66.2–71.9	287/354	81.1	77.0–85.2	408/653	62.5	58.8–66.2
Stage 1 hypertension	481/695	69.2	65.8–72.6	202/287	70.4	65.1–75.7	279/408	68.4	63.9–72.9
Stage 2 hypertension	214/695	30.8	27.4–34.2	85/287	29.6	24.3–34.9	129/408	31.6	27.1–36.1

BP = blood pressure, CI = confidence interval, HBP = high blood pressure, hypertension, PREFREC = Survey on Risk Factors Associated With Cardiovascular Disease.  
 Source: PREFREC, 2010–2011.<sup>9</sup>



**FIGURE 3.** HBP in Panama: awareness, treatment and control according to age and sex. A, unaware (men); B, unaware (women); C, aware and treated (men); D, aware and treated (women); E, controlled (men); F, controlled (women). HBP = high blood pressure, hypertension, PREFREC = Survey on Risk Factors Associated With Cardiovascular Disease. Source: PREFREC, 2010–2011.<sup>9</sup>

HBP in Panama has to be analyzed and managed in the light of these lifestyle alterations.

As reported by other studies, we found a progressive increase in the prevalence of HBP with aging.<sup>1,32,41–43</sup> More than half of the adults of 60 to 69 years were found to be hypertensive as well as 62.2% of those older than 70 years, something comparable to the prevalence reported for North Americans<sup>8,27</sup> and Mexicans from Monterrey of the same age group.<sup>44</sup> This finding is an alert of the heightened risk for CVD for many older adults in Panama for cerebrovascular disease and dementia.<sup>45</sup> It also highlights important and difficult clinical issues in the management of systolic and secondary HBP in the elderly.

The prevalence of HBP was shown to be higher in men than in women,<sup>2,29</sup> differing from what has been found in other studies.<sup>27,32,42</sup> However, the prevalence of HBP among those 60 years or older was higher in women than in men.<sup>3,46,47</sup> The lower prevalence of HBP noted in men >60 years of age may in part be related to the lower prevalence of obesity seen in Panamanian men >60 years when compared with women of the same age group.<sup>48</sup> The prevalence of HBP among of those who reside in indigenous areas was almost 3 times lower than among those who live in urban areas. Native Americans (Gunas) had the lowest prevalence of HBP of all the ethnocultural groups evaluated in Panama. The lower prevalence of HBP seen among the Gunas may in part be because of their diet, higher levels of physical activity during their daily activities, and also a lower prevalence of obesity. A low prevalence of HBP was reported by Kean<sup>49–51</sup> among the Gunas in 1943 and has also been reported in indigenous groups from Honduras and North America.

When looking at ethnocultural factors, the highest percentage of HBP was found among the people with African descent, a finding that has been previously reported in Panama and in other countries of this continent.<sup>27,30,41,52–54</sup> Food preferences influenced by ethnocultural factors, a higher prevalence of obesity, and a lower socioeconomic status common in women of African descent probably predispose them to a high prevalence of HBP.<sup>30,41,55,56</sup>

Elevated BP was inversely proportional to the level of education attained, being higher among those subjects with no schooling or with an elementary school education than among those with a high school or university education. This inverse relationship has also been reported by other authors.<sup>47,57</sup> A higher education level may sensitize people to the health risks associated with HBP to follow healthier lifestyles and better access to health care.

In men, we found an association between a family income >1000 USD/mo and HBP, but this was not the case for women. This difference in the prevalence of HBP in part may be because in Panamanian men there is an association between higher income and abdominal obesity, but this is not the case for women.<sup>48</sup> In women with a higher income, a slender figure is socially valued and better weight control is possible because they have the means to choose healthier diets and engage in exercise routines, whereas a larger body size, in general, is not perceived as a social handicap for men.

The increases in sedentary behavior and consumption of diets high in carbohydrates and in salt-rich processed foods, which have taken place in the last decades, have led to increases in obesity, larger waist circumferences, and physical inactivity, which have been strongly associated with HBP by this study. Therefore, public health programs aimed at controlling HBP will have to develop strategies and effective mechanisms to modify the unhealthy behaviors brought about by recent changes in lifestyles.

The prevalence of subjects with HBP who were taking antihypertensive medications was higher than that reported by other countries in this continent, such as Peru in 2006 and Mexico (Encuesta Nacional de Salud y Nutrición, 2006)<sup>6,23</sup> but lower than that reported by the National Health Survey of the United States (NHANES) 2011–2012.<sup>29</sup> In PREFREC, BP was found to be controlled in 47.2% of the those who reported to be taking antihypertensive medications, and these results are also higher than the ones reported by Peru and Mexico in the National Health Survey 2000 and, again, lower than the one reported in NHANES in 2011–2012.<sup>6,29,31</sup>



Overall, 52.8% of those receiving treatment for HBP had levels  $\geq 140/90$  mm Hg, but the prevalence in older adults was even higher. Uncontrolled HBP may be not only because of nonadherence to drug treatment,<sup>41</sup> but also because of a host of factors such as not making the needed lifestyle and dietary changes, which are an integral part in the management of HBP, not using the appropriate combination of medicines indicated in the systolic HBP of the elderly, or socioeconomic factors that limit access to health care.<sup>18,58</sup> Although the percentage of subjects under treatment with controlled HBP was higher than what has been reported in other countries,<sup>2,3,6,32</sup> it is discouraging to find out that almost 1/3 of those found to have HBP in this study were unaware of being hypertensive.

### Limitations

Despite the fact that this study was conducted with a methodology aimed at reducing bias, there was a higher participation of women than men. This result may be related to the type of sampling strategy that was used (stratified according to education level) and the usual greater participation of women in population-based research. Although the PREFREC sample included the 2 provinces where  $>60.4\%$  of the inhabitants of the country reside and also included urban, rural, and indigenous areas, PREFREC is not a national study and could have had differences with results from a nationwide study that has not been done yet. The use of automatic sphygmomanometers could have caused underestimation or overestimation of BP levels. However, proper training of the interviewers in the handling, care, and calibration of equipment, use of an appropriate cuff size, coupled with BP measurement on 3 occasions, and the use of average BP for statistical analysis decreased the risk of measurement error. Another limitation in the scope of the study was that we did not include in this analysis the association HBP with diet, salt intake, or alcohol consumption.

Because of budget limitations, the study could not be conducted across the country.

### CONCLUSIONS

The results of this study provide the first estimate of the prevalence of HBP in Panama and its association with socioeconomic and biologic variables. From these estimates, we can conclude that HBP is the most common cardiovascular risk factor among Panamanians and that the health care system needs to give a high priority to HBP prevention programs and integrated care programs aimed at treating HBP. A greater effort is needed to diagnose the large number of hypertensives who are unaware of their condition. Similarly, new strategies need to be introduced in the clinical management of older adults to reduce the incidence of preventable CVD. However, most importantly, all initiatives directed at the prevention and control of HBP in Panama will have to take into consideration the changes in behavior that have brought about changes in nutrition and sedentary lifestyles that are at the heart of this serious public health problem.

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