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## May Measurement Month 2018: an analysis of blood pressure screening results from Ecuador

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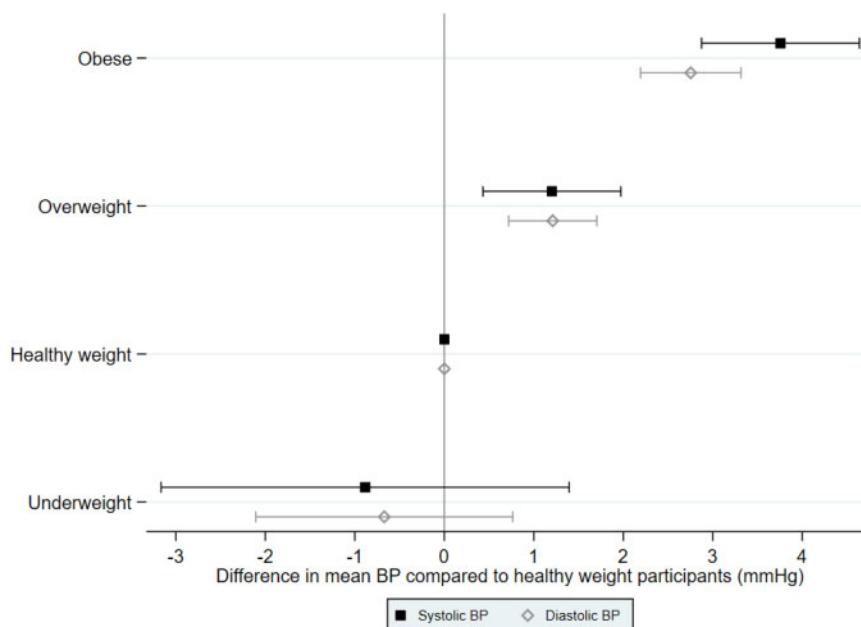
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### KEYWORDS

Antihypertensive agents;  
Hypertension;  
Ecuador;  
Hypertension screening;  
Blood Pressure;  
Treatment

Elevated blood pressure (BP) is a growing burden worldwide, leading to over 10 million deaths each year. May Measurement Month (MMM) is a global initiative by the International Society of Hypertension (ISH) aimed at raising awareness of high BP and to act as a temporary solution to the lack of screening programmes worldwide. An opportunistic cross-sectional survey of volunteers aged  $\geq 18$  was carried out in May 2018. A volunteer cross-sectional survey was carried out in May 2017 across 33 health centres. Blood pressure measurement, the definition of hypertension (HTN) (mean of the 2nd and 3rd BP measurement  $\geq 140/90$  mmHg or who were medicated for high BP), and statistical analysis followed the standard MMM protocol. In total, 11 922 individuals (53.7% female) were screened during MMM18. After multiple imputation, 4563 (38.3%) had HTN. Of individuals not receiving antihypertensive medication, 1302 (15.0%) were hypertensive. Of individuals receiving antihypertensive medication, 933 (28.6%) had uncontrolled BP. MMM18 was the largest BP screening campaign done in Ecuador. Hypertension was detected in 38.4% of those screened and almost 4 out of 10 were either not on treatment or were not controlled to the BP goal. These results suggest that appropriate screening can help to identify a significant number of people with high BP. These data should attract the attention of doctors and health care system in Ecuador.

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**Figure 1** Difference in mean blood pressure according to body mass index from linear regression models, adjusted for age, sex, and antihypertensive medication, with healthy weight as the reference category.

## Introduction

In Ecuador, there are few epidemiological studies about the prevalence of arterial hypertension (HTN). In 1999, the results of the PREHTAE study<sup>1</sup> were presented, a survey of 10 000 people that showed a prevalence of 28% in three cities in the country. The National Health Survey (ENSANUT),<sup>2</sup> a document of the Ministry of Public Health in people between 18 and 59 years, found a prevalence of 9.3%. In 2010, the same researchers presented the SABE<sup>3</sup> survey in people between 57 and over 80 years and found a prevalence of 46%. The Institute of Statistics and Census (INEC)<sup>4</sup> showed a cardiovascular mortality of 27%, and ischaemic heart disease mortality of 15%. May Measurement Month 2017 (MMM17)<sup>5</sup> data on 6984 individuals, of which 50.5% were male and with an average age of 46.6 years, found a prevalence of HTN of 28.2%. Of hypertensive individuals, 8.2% were not receiving treatment. It is striking that, among hypertensive patients taking medication, 25.4% were not controlled.

In light of these findings it was felt important to join the MMM18 campaign which, as originally planned, is designed to raise awareness of high blood pressure (BP) and provide a temporary solution to the lack of BP screening programmes.

## Methods

The MMM18 co-ordinator and national leader in Ecuador was Dr Ernesto Peñaherrera Patiño. Verbal informed consent was obtained from responders. We enrolled individuals from 25 sites in the country to measure BP and complete the MMM18 survey. The most frequent sites were from Quito, Guayaquil, Milagro, Loja, Manabi, Duran, Cerecita, and Machala. The study involved 140 people who

were properly trained 3 months prior to the start of the programme. We used our own resources for training and we trained students of Medicine, respiratory therapy, Rotary Club members, and we also made posters, flyers, and radio interviews on several occasions. The survey and measurement stage lasted 3 months during which the most commonly used device was the validated upper-arm cuff oscillometric monitor OMRON 7120. After answering the survey, the individual sat for 5 min with their feet resting on the floor and the back on the back of the chair before three measurements were made semi-automatically at intervals of 1 min between measurements. Participants were also asked about their height and weight. Hypertension was identified if the BP of the individual (mean of 2nd and 3rd readings) was equal to or greater than 140/90 mmHg or if the individual was on antihypertensive medication. The original analysis made use of multiple imputations to impute the mean of the 2nd and 3rd BP reading, where this was missing.<sup>2</sup> The necessity for doing this in drawing comparisons across individuals was underlined by our finding of significant differences among the 1st, 2nd, and 3rd BP readings.

The data were collected in a previously designed database. The data were sorted, copied, and sent by the national leader, Dr Ernesto Peñaherrera and were analysed by the MMM18 project team.

## Results

Measurements were taken from 11 922 individuals. The average age was of respondents was 48.7 ( $\pm 17.8$ ) years of which 53.7% were female, 46.2% male; 96.5% of screenees were of mixed ethnicity. The average BP after three measurements was 122/76 [systolic blood pressure/diastolic blood pressure (SBP/DBP)] mmHg. The average BP of the

2nd and 3rd measurements was 121/76 mmHg, of which 4533 (38.3%) were detected with high BP. After multiple imputation, 4563 (38.3%) were found to have HTN. Of those, 3261 (71.5%) were aware of their diagnosis and 3261 (71.5%) were on medication, of which 2328 (71.4%) were controlled. The proportion of all hypertensives controlled was 51.0%. The proportion of people with HTN of those who did not take medication was 1302 out of 8661 (15.0%).

Based on a linear regression model, patients with Type 2 diabetes had on average 3.1/0.9 mmHg higher SBP/DBP than those without diabetes. Similarly, current smokers (vs. non-smokers) were associated with 1.7/1.0 mmHg higher SBP/DBP. Overweight [body mass index (BMI) 25.0-29.9 kg/m<sup>2</sup>] and obese (BMI  $\geq$  30.0 kg/m<sup>2</sup>) patients vs. healthy weight patients were associated with 1.2/1.2 mmHg and 3.8/2.8 mmHg higher systolic and diastolic BPs, respectively (Figure 1).

## Discussion

This survey is the largest BP survey to be carried out in Ecuador. The biggest anticipated impact is implementing correct BP measurement and the number of people trained to do so, which should have a multiplicative effect which we hope will extend to the rural zones of this country and in minor hospitals. In addition, these MMM data will help the authorities implement actions to control and treat arterial HTN. In relation to MMM17, we have more hypertensive people 38.3% vs. 28.2%<sup>5</sup> but this may reflect differential sampling. Rates of hypertensive individuals with uncontrolled BP despite receiving medication and hypertensive individuals not on medication appears to be higher in MMM18 compared with MMM17 (28.6% vs. 25.4% and 15.0% vs. 8.2%,<sup>5</sup> respectively).

## Acknowledgements

Thanks to the researchers and collaborators who participated in MMM18: España Yermania, Cabezas Javier,

Narvaez Stephania, Davila Esteban, Carvajall Catalina, Amaguaña Tatiaina, Alarcon Mercedes, Quilca na, Perez Andrea, Castillo Cristian, Maldonado Angela, Ordoñez Anahy, Romero Marlon, Romero Alejandra, Caiche Evelyn, Calero Andrea, Padilla Ginger, Frerres Dagma, Naranjo Carlos, Navrrete Catherine, Vera Jhonny, Naranjo carlos, Caicedo Ana, Macias Bella, Benalcazar Maria, and 60 more people, whose names it was not possible to obtain, to whom we send our sincere thanks.

## Funding

The MMM18 was held with funds at the national level. There are no conflicts of interest in the execution and planning of this programme. We have not received fees or stipend in relation to this project.

**Conflict of interest:** none declared.

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