

# Estimation of Risk for Cardiovascular Disease within Different Adult Age Groups in Aruba: A Cross-Sectional Study

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## Abstract

**Background:** Cardiovascular disease [1] remains a leading cause of morbidity and mortality worldwide, driven largely by modifiable risk factors. Limited data exist on CVD risk in the Caribbean, particularly in Aruba. **Methods:** A cross-sectional study of 132 adults in Aruba assessed 30-year CVD risk, blood pressure, cholesterol, body mass index, and lifestyle habits. Statistical analyses included t-tests, ANOVA, Kruskal-Wallis, and correlation tests to examine differences across gender, ethnicity. **Results:** Males had significantly higher 30-year CVD risk, blood pressure, body weight, and unfavorable cholesterol profiles compared with females (0.01). Arubans exhibited higher blood pressure than Hispanics, while dietary patterns differed across ethnic groups. **Conclusion:** Gender, ethnicity are strongly associated with cardiovascular risk in Aruba. These findings highlight the need for tailored, culturally sensitive public health interventions to address disparities and reduce long-term CVD burden.

## Keywords

Cardiovascular Disease, Risk Assessment, Gender Disparities, Ethnicity, Cholesterol, Blood Pressure, Lifestyle Factors, Aruba

## 1. Introduction

Cardiovascular disease stands as the foremost cause of mortality, affecting more than 17.9 million lives annually, as reported by the World Health Organization [1] [2]. The surge in cardiovascular disease incidence, particularly in developing regions, can be primarily attributed to modifiable risk factors [2]. Intertwined

with environmental conditions and personal choices encompassing diet, exercise, and tobacco use, these factors significantly contribute to the untimely emergence of cardiovascular ailments [3]. Notably, a recent investigation in the Netherlands-Caribbean [4] region, specifically Aruba, uncovered that 78% of fatalities are linked to non-communicable diseases, prominently cardiovascular disease [5].

Aruba is a small island country located in the southern Caribbean Sea. It is situated in the Lesser Antilles and is one of the constituent countries of the Kingdom of the Netherlands. Aruba is approximately 29 kilometers (18 miles) off the northern coast of Venezuela in South America. It is part of the ABC islands, along with Bonaire and Curaçao, collectively called the Dutch Caribbean or the Caribbean Netherlands. Aruba has a diverse population with a mix of ethnic backgrounds. Most of the population is of mixed African, European, and indigenous descent. Other ethnic groups include Dutch, Venezuelan, Colombian, and Caribbean islanders. Dutch and Papiamentu are the official languages, with Papiamentu being the primary language spoken by the locals. Aruba has a relatively small population compared to its land area, making it one of the least densely populated countries in the world. The capital city of Aruba is Oranjestad, which is also the cultural and economic hub of the island. Tourism is a significant industry in Aruba, and it attracts visitors from around the world with its beautiful beaches, warm climate, and vibrant culture. The island's unique location, stunning natural landscapes, and welcoming population make Aruba a popular destination for tourists and a fascinating place to study various aspects of its population, including health and demographics.

This study focuses on adults aged 18 and above in Aruba, delving into the intricate interplay between individual environments and lifestyle choices in shaping their current health statuses. A cross-sectional study, employing the renowned Framingham [6] study methodology, is employed to accomplish this. Originating from the Mayo Foundation for Medical Education and Research, the Framingham [6] study offers a robust means of assessing cardiovascular disease risk via the Heart Disease Risk calculator [7]. By gauging the likelihood of future cardiovascular events, this methodology equips medical practitioners with the tools to initiate proactive preventive measures [7].

To operationalize this research approach, relevant metrics are garnered from the target population, encompassing vital variables such as BMI [8] and comprehensive health data about behavioral risk factors correlated with cardiovascular disease. Further enriching the dataset are critical demographics, including age, gender, height, weight, systolic blood pressure, total cholesterol [9] levels, dietary patterns, exercise routines, and general health assessments, which provide a holistic snapshot of participants' overall health statuses [10] [11].

Considering these endeavors, this study aims to comprehensively assess cardiovascular disease risk factors within the Aruban population through a cross-sectional analysis and, correspondingly, to identify specific individuals who might be disproportionately predisposed to heightened risk factors. In this study, the Fram-

ingham 30-year Cardiovascular Disease Risk Score (General CVD and Hard CHD models) was applied [6].

## 2. Methods

Medical history questions were coded numerically where each number corresponded to a specific response (e.g., 1 = Yes, 2 = No, 3 = Sometimes, etc.). Framingham risk score was used to calculate the 30 years of CVD risk.

## 3. Results

**Table 1.** Demographic breakdown.

Category	Count	Percentage
Gender		
Female	41.0	31.1%
Male	91.0	68.9%
Ethnicity		
African	5.0	3.8%
Aruban	56.0	42.4%
Asian	1.0	0.8%
Dutch	1.0	0.8%
Indigenous	3.0	2.3%
Latin American	62.0	47.0%

**Table 1** shows the demographic breakdown of study participants (gender, ethnicity). Counts and percentages are reported for each subgroup to provide context for subgroup analyses.

To fulfill our objective of meticulously scrutinizing the susceptibility of the Aruban population to cardiovascular disease risks, we conducted a comprehensive analysis of various health parameters. This analysis encompassed a range of factors, including 30-year cardiovascular risk, cholesterol levels, blood pressure, height, and weight, with a particular focus on gender differences.

### 3.1. Gender Differences in Cardiovascular Risk

As shown in **Table 2** and illustrated in **Figure 1**, males had a notably higher 30-year cardiovascular risk compared to females. This difference was statistically significant ( $p = 0.001$ ). Similarly, systolic and diastolic blood pressure values, detailed in **Table 3** and visualized in **Figure 2**, were significantly higher in males. Weight distribution, summarized in **Table 2** and displayed in **Figure 3**, also showed males with greater body mass.

The median 30-year cardiovascular risk for females is 21.29, with an interquartile range of 16.29 - 2.09, indicating moderate variability in risk within the female

group.

For males, the median 30-year cardiovascular risk is notably higher at 40.46, with an IQR of 17.53 - 3.31, indicating a more comprehensive range of risk among males compared to females.

The statistically significant difference in risk between genders (0.001) suggests that males, on average, have a significantly higher 30-year cardiovascular risk compared to females.

Systolic Blood Pressure:

Females have a median systolic blood pressure of 127.71 mmHg with an IQR of 18.29 - 2.09, indicating relatively consistent values within the female group.

Conversely, males have a higher median systolic blood pressure of 145.33 mmHg with an IQR of 23.84 - 3.31, suggesting a more comprehensive range of values compared to females.

The statistically significant difference in systolic blood pressure between genders (0.001) indicates that males, on average, have significantly higher systolic blood pressure levels than females.

Diastolic Blood Pressure:

Females exhibit a median diastolic blood pressure of 79.27 mmHg with an IQR of 10.13 - 2.09, signifying relatively consistent values within the female group.

Males have a higher median diastolic blood pressure of 89.02 mmHg with an IQR of 15.88 - 3.31, indicating a broader range of values compared to females.

The statistically significant difference in diastolic blood pressure between genders (0, 01) suggests that males, on average, have significantly higher diastolic blood pressure levels than females.

Weight:

Females have a median weight of 84.21 kg with an IQR of 21.17 - 2.09, indicating relatively consistent weight values within the female group.

Males have a higher median weight of 98.23 kg with an IQR of 28.44 - 3.31, signifying a wider range of weight values compared to females.

The statistically significant difference in weight between genders (0, 01) suggests that males, on average, have significantly higher body weight compared to females.

**Table 2** shows gender differences in 30-year CVD risk, blood pressure, and weight.

**Table 2.** Gender differences in cardiovascular risk and physical measures.

Gender	30-year CVD Risk (Median)	Systolic BP (mmHg)	Diastolic BP (mmHg)	Weight (kg)
Female	21.29	127.71	79.27	84.21
Male	40.46	145.33	89.02	98.23

### 3.2. Blood Pressure Analysis

Blood pressure analysis confirmed significant gender differences. As detailed in **Table 3** and **Figure 2**, males demonstrated higher mean systolic and diastolic pressures compared to females, underscoring a greater risk burden.

### 3.3. Cholesterol Levels

Cholesterol levels also differed significantly by gender. **Table 4** and **Figure 4** show that females had higher HDL cholesterol and lower total cholesterol, while males had lower HDL and higher total cholesterol values ( $p < 0.05$ ).

### 3.4. Ethnic Differences in Blood Pressure

Ethnic disparities were evident, with Arubans showing higher systolic and diastolic blood pressure compared to Hispanics, as presented in **Table 5** and **Figure 5**. These findings suggest both genetic and lifestyle contributions.

### 3.5. Dietary Habits by Ethnicity

Dietary patterns varied by ethnicity. As shown in **Table 6**, Arubans reported higher fruit and vegetable intake, whereas Hispanics reported greater saturated fat consumption. These trends highlight important cultural differences in nutrition.

### 3.6. Correlation Analysis

Correlation analyses revealed significant associations between increasing age and higher cardiovascular risk. Elevated systolic and diastolic pressures, as well as cholesterol levels, were correlated with greater risk, reinforcing age as a critical factor.

Overall, the results reveal significant gender disparities in cardiovascular risk factors and differences in blood pressure, cholesterol levels, and dietary habits among ethnic groups.

The following tables summarize key findings:

**Table 3.** Blood pressure differences by gender.

Gender	Systolic BP (Mean $\pm$ SD) (mmHg)	Diastolic BP (Mean $\pm$ SD) (mmHg)
Female	127.71 $\pm$ 18.29	79.27 $\pm$ 10.13
Male	145.33 $\pm$ 23.84	89.02 $\pm$ 15.88

**Table 4.** Cholesterol differences by gender.

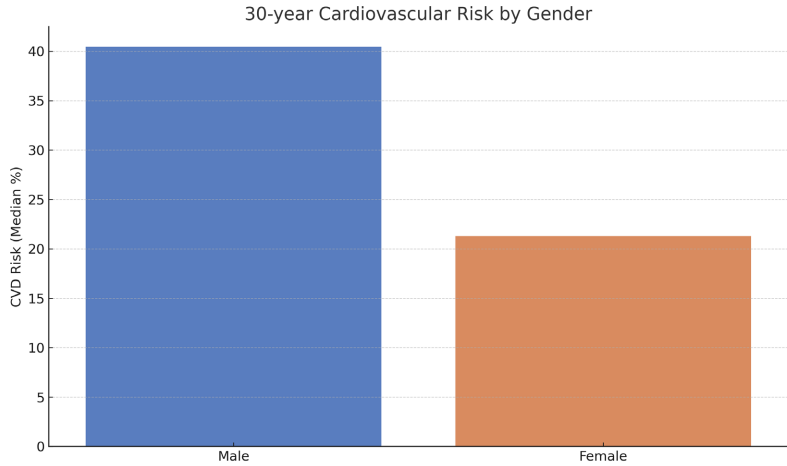
Gender	HDL Cholesterol (Mean $\pm$ SD) (mg/dL)	Total Cholesterol (Mean $\pm$ SD) (mg/dL)
Female	24.69 $\pm$ 6.57	123.68 $\pm$ 35.09
Male	20.18 $\pm$ 5.72	135.49 $\pm$ 37.14

**Table 5.** Blood pressure differences by ethnicity.

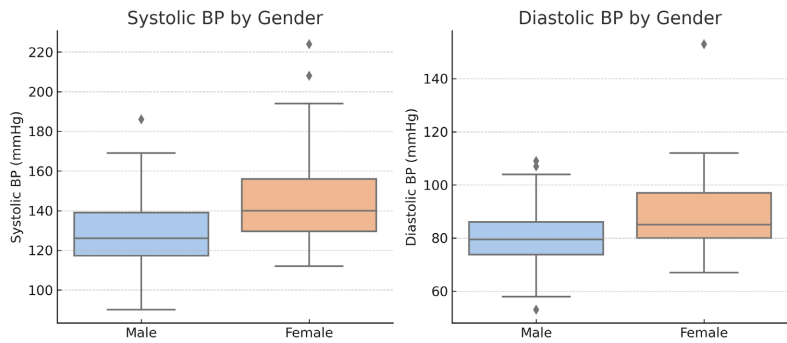
Ethnicity	Systolic BP (Mean $\pm$ SD) (mmHg)	Diastolic BP (Mean $\pm$ SD) (mmHg)
Arubans	140.40 $\pm$ 24.48	85.46 $\pm$ 14.74
Hispanics	125.66 $\pm$ 17.22	78.63 $\pm$ 10.26

**Table 6.** Dietary habits by ethnicity.

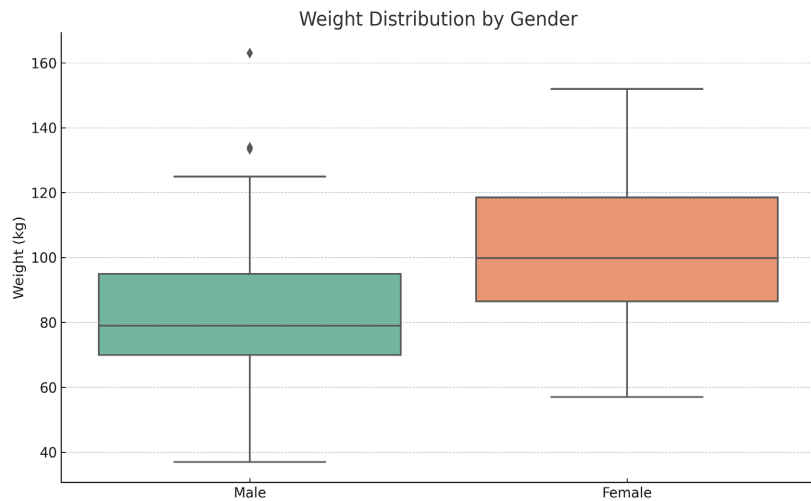
Group	Dietary Habits—Fruits/Vegetables	Dietary Habits—Saturated Fats
Arubans	Higher fruit/vegetable intake	Lower saturated fat
Hispanics	Lower fruit/vegetable intake	Higher saturated fat



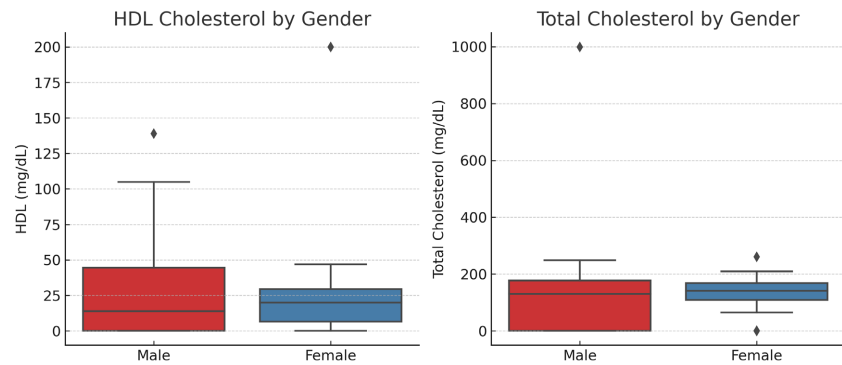
**Figure 1.** 30-year cardiovascular risk by gender.



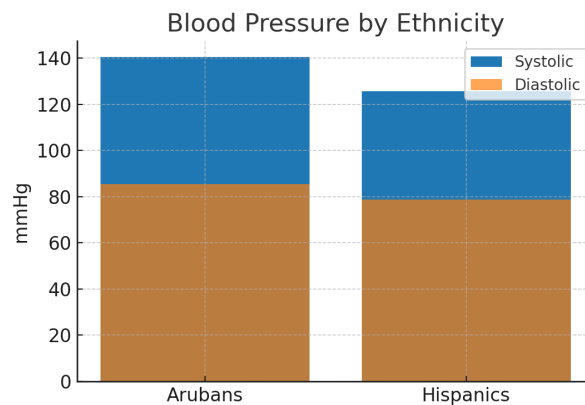
**Figure 2.** Blood pressure differences between males and females.



**Figure 3.** Weight distribution by gender.



**Figure 4.** Cholesterol levels (HDL and Total) by gender.



**Figure 5.** Blood pressure differences by ethnicity (Arubans vs. Hispanics).

## 4. Discussion

The findings of this cross-sectional study shed light on the diverse range of cardiovascular risk factors and their interplay within the population of Aruba. The results highlight significant disparities based on gender, ethnicity, offering valuable insights for public health interventions.

### 4.1. Gender Disparities

The gender disparities observed in this study are consistent with global trends. As summarized in **Table 2** and **Figure 1**, males demonstrated nearly double the 30-year cardiovascular risk compared to females. Supporting evidence from **Table 3** and **Figure 2** further illustrates significantly higher blood pressure levels in males, while **Figure 3** and **Figure 4** highlight their less favorable weight and cholesterol profiles. These combined factors confirm the heightened vulnerability of males to cardiovascular disease.

### 4.2. Blood Pressure and Cholesterol

The significant differences in blood pressure and cholesterol levels (**Table 3** and **Table 4**, **Figure 2** and **Figure 4**) reinforce the biological and behavioral mechanisms underlying gender disparities. Males exhibited higher systolic and diastolic

pressures alongside elevated total cholesterol and lower HDL levels, aligning with established risk patterns for hypertension and dyslipidemia.

### 4.3. Ethnic Differences

Ethnic differences also shaped cardiovascular risk profiles. As shown in **Table 5** and **Figure 5**, Arubans consistently presented with higher blood pressure compared to Hispanics, suggesting genetic and lifestyle influences.

### 4.4. Correlation and Age

The correlation analysis demonstrated that advancing age is strongly associated with increased cardiovascular risk. This finding, consistent with the broader literature, is reinforced by significant associations between elevated blood pressure and cholesterol levels and higher risk scores [7] (**Tables 3-5**). Age therefore remains a non-modifiable but critical determinant of cardiovascular disease in the Aruban population.

### 4.5. Implications

The integration of demographic, physiological, and behavioral data underscores the need for targeted public health interventions. For example, strategies addressing male-specific risk factors (**Figures 1-4**), hypertension among Arubans (**Figure 5**), can inform more effective, culturally tailored prevention campaigns.

### 4.6. Limitations and Future Directions

This study is not without limitations. The cross-sectional design prevents establishing causality, and the relatively small sample size may limit generalizability. Future research with more extensive and diverse samples can further validate these findings. Additionally, longitudinal studies can provide insights into the progression of cardiovascular risk factors over time.

Additionally, as participants were recruited at health fairs through convenience sampling, the potential for selection bias should be acknowledged, which may limit the generalizability of the findings.

## 5. Conclusions

This study highlights the multifaceted nature of cardiovascular disease risk in Aruba. As demonstrated through integrated analyses of gender, ethnicity, males consistently showed higher long-term risk, blood pressure, weight, and unfavorable cholesterol profiles (**Tables 2-4, Figures 1-4**). Ethnic differences, particularly the higher blood pressure observed among Arubans compared to Hispanics (**Table 5, Figure 5**), further emphasize the importance of culturally relevant interventions. Correlation analyses confirmed the well-established relationship between advancing age and elevated cardiovascular risk, underscoring the need for proactive prevention across all demographics.

In conclusion, effective cardiovascular disease prevention in Aruba requires a nuanced, demographically sensitive approach. Public health strategies should prioritize male-focused risk reduction, hypertension management in specific ethnic groups, and targeted nutritional education. By integrating these findings into practice, policymakers and healthcare providers can more effectively mitigate long-term cardiovascular disease burden and promote equitable health outcomes in the Aruban population.

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## Ethics Approval and Consent

This study was conducted in accordance with the Declaration of Helsinki. Ethical review and approval were waived for this study because only anonymized data were used. Informed consent was obtained from all participants at the time of data collection.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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