

# Risk Factors for Heart Disease among U.S. Adults: A Population Study

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## Background

Heart disease (HD) has been the leading cause of death in the U.S. since 1960. According to several studies, it can be prevented to a certain extent by controlling some modifiable risk factors. Recent studies show a decreasing trend in the prevalence of HD among U.S. adults, which might result from advances in medical sciences and improvement in the management of risk factors and comorbidity factors.

## Objectives

The objective of this study is to determine common risk factors of HD among U.S. adults based on recent nationally representative data. We evaluated demographic characteristics (age, gender, race and education level), modifiable risk factors (BMI, smoking and sleep trouble) and common comorbidities (high blood pressure or hypertension, stroke, diabetes and asthma) of HD.

## Methods

This study included a total of 5569 U.S. adults of age  $\geq 20$  years from the 2017-2018 National Health and Nutrition Examination Survey (NHANES). HD status was defined if a person had one of the three conditions such as coronary artery disease, angina, and heart attack. The difference between the risk factors and HD status were evaluated by the Rao-Scott chi-square test for categorical variables and by linear regression for continuous variables. The crude and adjusted odds ratios (AOR) were obtained from univariate and multivariable logistic regression models, respectively. The final multivariable models were adjusted for relevant other factors. All analyses were weighted to account for the complex sampling design applied in NHANES.

## Results

Table 1 and Table 2 shows, all the considered factors significantly differed between HD and Non-HD U.S. adults except the education level. Table 3 shows, the U.S. adults with hypertension were associated with a higher risk of HD (AOR=2.94, 95% CI=1.76-4.92). Similarly, from Table 3 and 4, higher risk was also observed among U.S. adults with stroke history (AOR=1.70, 95% CI=1.57-2.50), diabetes (AOR=2.82, 95% CI=2.15-3.70), asthma (AOR=1.54, 95% CI=1.11-2.15), sleep trouble (AOR=1.65, 95% CI=1.11, 2.45) and had smoked at least 100 cigarettes in lifetime (AOR=1.74, 95% CI=1.17-2.58). BMI was not found significant. Among the demographic factors, age, gender and race were found significant. Education level was highly insignificant in multivariable model and was not deemed important in clinical perspective, and thus not included.

## Results (Cont.)

**Table 1.** Demographic characteristics by HD status of US adults of ages  $\geq 20$  years

Characteristics	HD N (Weighted %)	No-HD N (Weighted %)	p-value <sup>1</sup>
<b>Age (n=5534)</b>			
20-40 years	17 (1.1)	1667 (98.9)	<b>&lt;0.0001</b>
41-60 years	92 (4.7)	1770 (95.3)	
$\geq 61$ years	348 (17.0)	1640 (83.0)	
Mean <sup>2</sup> $\pm$ SE	65.1 $\pm$ 0.6	47.1 $\pm$ 0.5	
<b>Gender (n=5230)</b>			
Female	150 (4.6)	2561 (95.4)	<b>&lt;0.0001</b>
Male	282 (9.0)	2237 (91.0)	
<b>Race (n=5534)</b>			
Non-Hispanic White	246 (8.0)	1679 (94.15)	<b>0.001</b>
Non-Hispanic Black	76 (4.3)	1215 (95.7)	
Non-Hispanic Asian	32 (3.2)	773 (96.8)	
Hispanic or Others	103 (5.0)	1410 (95.0)	
<b>Education (n=5521)</b>			
Less than high school	120 (8.8)	998 (91.2)	<b>0.331</b>
High school	109 (7.1)	1209 (92.9)	
Some college/AA degree	146 (6.7)	1619 (93.3)	
College graduate/above	81 (5.7)	1249 (94.3)	

<sup>1</sup>Rao-Scott chi-square test for categorical and linear regression for continuous variables

<sup>2</sup>Weighted mean

**Table 2.** Comorbidity and modifiable risk factors by HD status among US adults of ages  $\geq 20$  years

Risk factors	HD N (Weighted %)	No-HD N (Weighted %)	p-value <sup>1</sup>
<b>BMI (n=5140)</b>			
Underweight & Normal (<25)	81 (4.4)	1247 (95.6)	<b>0.005</b>
Overweight (25-29.9)	143 (7.2)	1508 (92.8)	
Obese (>30)	193 (7.7)	1968 (92.3)	
<b>High Blood Pressure (n=5524)</b>			
Yes	350 (16.0)	1747 (84.0)	<b>&lt;0.0001</b>
No	107 (2.3)	3320 (97.7)	
<b>Stroke (n=5525)</b>			
Yes	99 (34.2)	169 (65.8)	<b>&lt;0.0001</b>
No	353 (5.7)	4904 (94.3)	
<b>Diagnosed Diabetes (n=5530)</b>			
Yes	195 (23.8)	672 (76.2)	<b>&lt;0.0001</b>
No	262 (4.5)	4401 (95.5)	
<b>Smoking (n= 5569)</b>			
Yes	285 (10.1)	2031 (89.9)	<b>0.004</b>
No	172 (4.2)	3046 (95.8)	
<b>Asthma Status (n=5529)</b>			
Yes	96 (9.3)	734 (90.7)	<b>0.011</b>
No	361 (6.3)	4338 (93.7)	
<b>Sleep Trouble (n= 5529)</b>			
Yes	208 (10.7)	1315 (89.3)	<b>&lt;0.0001</b>
No	248 (5.0)	3758 (95.0)	

<sup>1</sup>Rao-Scott chi-square test

## Results (Cont.)

**Table 3.** Demographic and comorbidity risk factors associated with heart disease with and without adjusting for other factors among US adults of ages  $\geq 20$  years

Characteristics	Crude OR (95% CI) <sup>1</sup>	p-value <sup>1</sup>	Adjusted OR (95% CI) <sup>2</sup>	p-value <sup>2</sup>
<b>Age</b>				
20-40 years (ref)				
41-60 years	4.57 (1.80, 11.63)	0.868	3.63 (1.66, 7.93)	0.655
$\geq 61$ years	19.07 (8.57, 42.42)	<b>&lt;0.0001</b>	10.51 (5.56, 19.86)	<b>&lt;0.0001</b>
<b>Gender</b>				
Female (ref)				
Male	2.06 (1.45, 2.93)	<b>0.0005</b>	2.15 (1.43, 3.25)	<b>0.001</b>
<b>Race</b>				
Hispanic or Others (ref)				
Non-Hispanic White	1.64 (0.93, 2.91)	0.001	1.95 (0.62, 2.29)	<b>0.016</b>
Non-Hispanic Black	0.86 (0.49, 1.51)	0.371	0.57 (0.25, 1.29)	0.102
Non-Hispanic Asian	0.62 (0.29, 1.34)	0.074	0.61 (0.30, 1.23)	0.210
<b>Education</b>				
Less than high school (ref)				
High school	0.63 (0.34, 1.14)	0.231	-	-
Some college/AA degree	0.74 (0.47, 1.16)	0.619	-	-
College graduate/above	0.79 (0.49, 1.27)	0.899	-	-
<b>High Blood Pressure</b>				
No (ref)				
Yes	7.93 (5.21, 12.08)	<b>&lt;0.0001</b>	2.94 (1.76, 4.92)	<b>0.001</b>
<b>Stroke</b>				
No (ref)				
Yes	8.56 (5.62, 13.05)	<b>&lt;0.0001</b>	1.70 (1.57, 2.50)	<b>&lt;0.0001</b>
<b>Diagnosed Diabetes</b>				
No (ref)				
Yes	6.61 (5.04, 8.67)	<b>&lt;0.0001</b>	2.82 (2.15, 3.70)	<b>&lt;0.0001</b>
<b>Asthma Status</b>				
No (ref)				
Yes	1.52 (1.06, 2.19)	<b>0.027</b>	1.54 (1.11, 2.15)	<b>0.014</b>

<sup>1</sup>Based on the univariate model without adjusting for other factors

<sup>2</sup>Based on multivariable model to predict HD risk adjusted for modifiable factors

**Table 4.** Modifiable risk factors associated with heart disease with and without adjusting for other factors among US adults of ages  $\geq 20$  years

Risk factors	Crude OR (95% CI) <sup>1</sup>	p-value <sup>1</sup>	Adjusted OR (95% CI) <sup>2</sup>	p-value <sup>2</sup>
<b>Smoking</b>				
No (ref)				
Yes	2.55 (1.84, 3.53)	<b>&lt;0.0001</b>	1.74 (1.17, 2.58)	<b>0.011</b>
<b>BMI</b>				
Underweight & Normal (<25) (Ref)				
Overweight (25-29.9)	1.68 (1.20, 2.34)	<b>0.027</b>	1.23 (0.82, 1.87)	0.902
Obese (>30)	1.81 (1.11, 2.95)		1.47 (0.843, 2.57)	0.174
<b>Sleep Trouble</b>				
No (ref)				
Yes	2.26 (1.69, 3.02)	<b>&lt;0.0001</b>	1.65 (1.11, 2.45)	<b>0.017</b>

<sup>1</sup>Based on the univariate model without adjusting for other factors

<sup>2</sup>Based on multivariable model to predict HD risk adjusted by demographic factors

## Conclusion

The modifiable risk factors such as smoking and sleep trouble, as well as the comorbidity risk factors such as hypertension, stroke history, diabetes and asthma significantly increased the risk of HD. By controlling modifiable risk factors and better management of comorbidity factors, the risk of HD may be reduced.