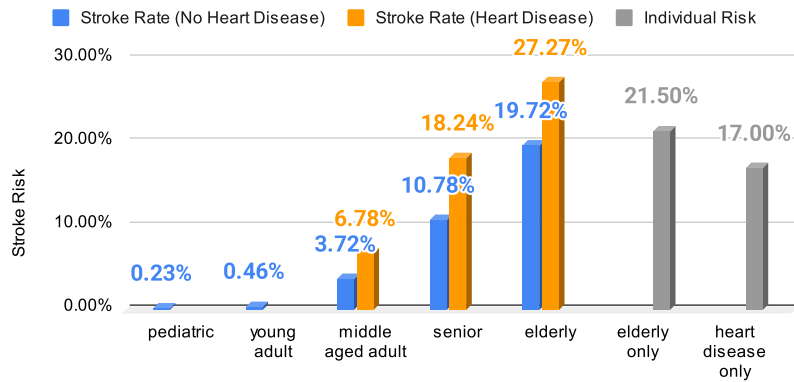


## Two Features (Bivariate) vs Target Analysis

### Age and Heart Disease vs Stroke Analysis

Age	Stroke Rate (No Heart Disease)	Stroke Rate (Heart Disease)	Individual Risk	Insights
pediatric	0.23%			Elderly patients with heart disease are at a 27.27% risk of having a stroke, while elderly patients without heart disease are at a 19.72% risk of having a stroke.
young adult	0.46%			
middle aged adult	3.72%	6.78%		
senior	10.78%	18.24%		
elderly	19.72%	27.27%		
elderly only			21.50%	When compared to the individual risk factors, the presence of age and heart disease significantly increased the risk of having a stroke by six to ten percent.
heart disease only			17.00%	

#### Age and Heart Disease Stroke Risk



### Age and Hypertension vs Stroke Analysis

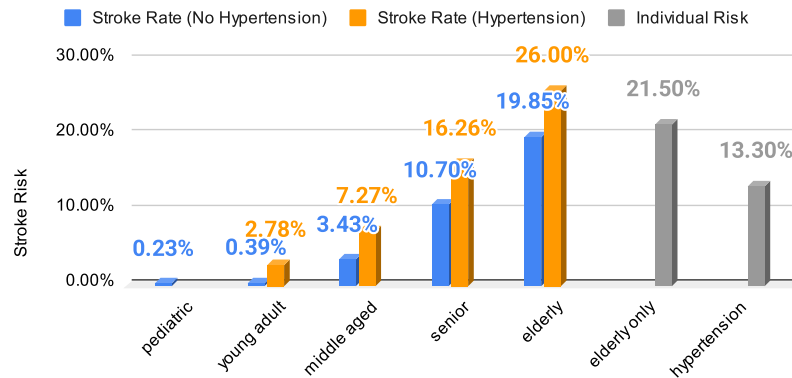
Age	Stroke Rate (No Hypertension)	Stroke Rate (Hypertension)	Individual Risk	Insights
pediatric	0.23%			Elderly patients with hypertension are at a 26.00% risk of having a stroke, while elderly patients without hypertension are at a 19.85% risk of having a stroke.
young adult	0.39%	2.78%		
middle aged adult	3.43%	7.27%		

senior	10.70%	16.26%	
elderly	19.85%	26.00%	
elderly only			21.50%
hypertension only			13.30%

When compared to the individual risk factors, the presence of age and hypertension significantly increased the risk of having a stroke by four to thirteen percent.

Except for pediatric aged patients, combining age and hypertension leads to a sharp rise in stroke risk.

### Age and Heart Disease Stroke Risk



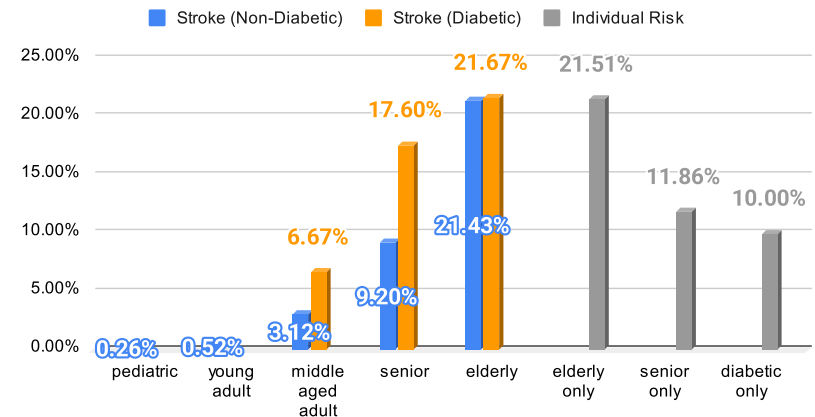
Stroke risk rises significantly when age and heart disease combine

### Age and Glucose Level vs Stroke Analysis

Age	Hypoglycemic	Normal	Prediabetic	Diabetic	Age Only
pediatric	0.70%	0.24%	0.00%	0.00%	0.23%
young adult	0.50%	0.58%	0.37%	0.00%	0.46%
middle aged adult	3.14%	3.09%	3.18%	6.67%	3.84%
senior	7.50%	8.56%	12.50%	17.60%	11.85%
elderly	23.08%	22.97%	15.38%	21.67%	21.51%
Glucose Only	3.58%	3.58%	3.78%	10.00%	

Age	Stroke (Non-Diabetic)	Stroke (Diabetic)	Individual Risk
pediatric	0.26%		
young adult	0.52%		
middle aged adult	3.12%	6.67%	
senior	9.20%	17.60%	
elderly	21.43%	21.67%	
elderly only			21.51%

### Age and Diabetes Risk of Stroke



senior only		11.86%
diabetic only		10.00%

### Insights

Based on the heatmap visualization of the stroke risk of each age and glucose level combination, senior and elderly patients that have diabetes have the strongest risk of having a stroke.

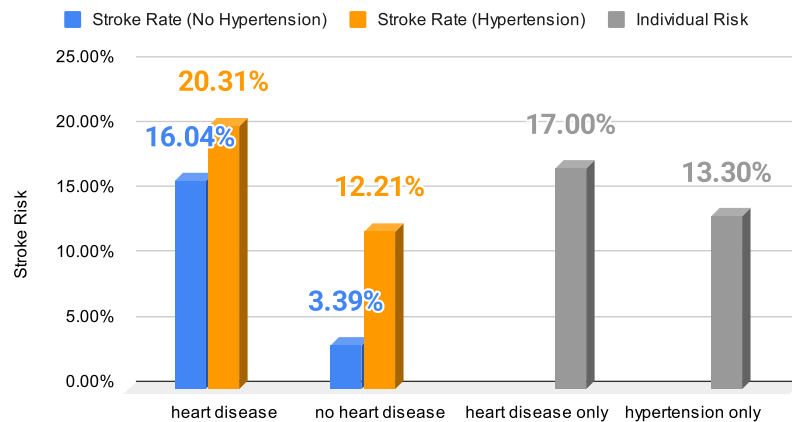
Narrowing down our glucose level to non-diabetic and diabetic, the bar chart shows that middle aged adults and seniors that have diabetes are about twice as much at risk of having a stroke when compared to the same group that do not have diabetes.

Elderly patients do not show a significant change in their risk of having a stroke when diabetes or no-diabetes is factored in, staying nearly the same as the baseline 21.51% risk of having a stroke as an elderly patient.

### Heart Disease and Hypertension vs Stroke Analysis

Heart Disease	Stroke Rate (No Hypertension)	Stroke Rate (Hypertension)	Individual Risk	Insights
heart disease	16.04%	20.31%		Patients with both heart disease and hypertension have a 20.31% risk of having a stroke, which represents a 3% to 7% increase compared to patients with just one of those risk factors.
no heart disease	3.39%	12.21%		
heart disease only			17.00%	Patients with neither heart disease nor hypertension are four times less likely to experience a stroke compared to patients who have both conditions.
hypertension only			13.30%	Among patients with hypertension, those who do not have heart disease have a lower stroke risk than the overall hypertensive population.

### Heart Disease and Hypertension Risk of Stroke

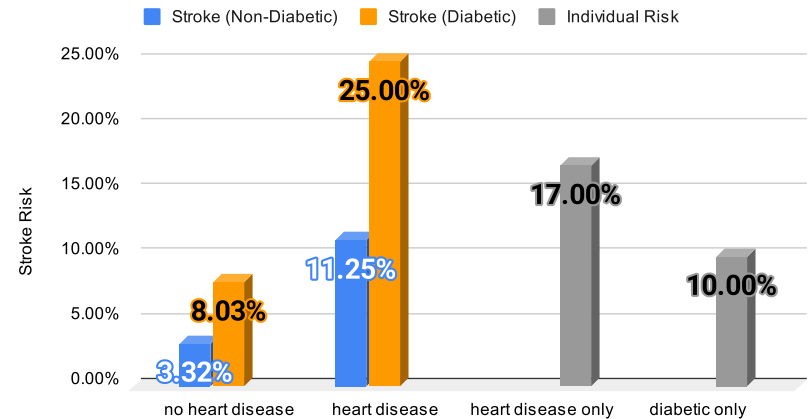


### Heart Disease and Glucose Level vs Stroke Analysis

Heart Disease	Hypoglycemic	Normal	Prediabetic	Diabetic	Heart Disease Only
heart disease	14.29%	7.87%	16.28%	25.00%	17.00%
no heart disease	3.17%	3.41%	3.21%	8.03%	4.18%
glucose only	3.58%	3.58%	3.78%	10.00%	

Heart Disease	Stroke (Non-Diabetic)	Stroke (Diabetic)	Individual Risk
no heart disease	3.32%	8.03%	
heart disease	11.25%	25.00%	
heart disease only			17.00%
diabetic only			10.00%

### Heart Disease and Glucose Level Risk of Stroke



### Insights

Based on the heatmap visualization of the stroke risk of heart disease and glucose level combination, patients with heart disease and patients with diabetes poses the highest risk of having a stroke.

Narrowing down our glucose level to non-diabetic and diabetic, the bar chart shows that patients that have heart disease and diabetes are more than twice as much at risk of having a stroke when compared to patients that have heart disease but not diabetes.

Patients that have diabetes but with no heart disease are three times less likely to have a stroke and patients that do not have either condition is eight times less likely to have a stroke.

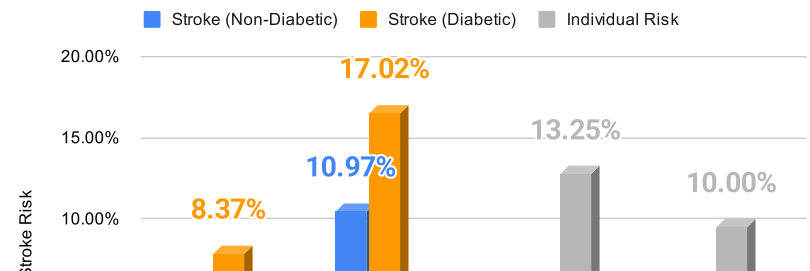
When compared to individual risk factors, patients with both heart disease and diabetes increase their risk of having a stroke by 8% to 15%.

### Hypertension and Glucose Level vs Stroke Analysis

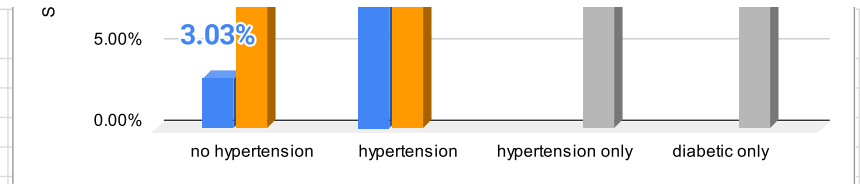
Hypertension	Hypoglycemic	Normal	Prediabetic	Diabetic	Hypertension Only
no hypertension	2.73%	2.91%	3.55%	8.37%	3.97%
hypertension	14.04%	12.00%	6.41%	17.02%	13.25%
glucose only	3.58%	3.58%	3.78%	10.00%	

Hypertension	Stroke (Non-Diabetic)	Stroke (Diabetic)	Individual Risk
no hypertension	3.03%	8.37%	
hypertension	10.97%	17.02%	

### Hypertension and Diabetes Risk of Stroke



hypertension only			13.25%
diabetic only			10.00%



### Insights

Based on the heatmap visualization of the stroke risk of hypertension and glucose level combination, patients with hypertension and patients with diabetes poses the highest risk of having a stroke.

Narrowing down our glucose level to non-diabetic and diabetic, the bar chart shows that patients that have both hypertension and diabetes have a 17.02% risk of having a stroke, which is twice as much as the risk of a patient that has diabetes but not hypertensive.

A patient with both hypertension and diabetes increases their risk of having a stroke by 4% to 7% compared to having just one of these risk factors.

### Bivariate Analysis Summary

Combined Features	Combined Stroke Risk
Elderly and Heart Disease	27.27%
Elderly and Hypertension	26.00%
Heart Disease and Diabetes	25.00%
Elderly and Diabetes	21.67%
Heart Disease and Hypertension	20.31%
Hypertension and Diabetes	17.02%

### Bivariate vs Stroke Analysis

