

# Cardiovascular Risk Assessment among Professional Truck Drivers in the City of Ouagadougou

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## Abstract

**Introduction:** In Burkina Faso, despite the frequency of cardiovascular diseases, little data exist on the assessment of their risk. **Objective:** Estimating cardiovascular risk among professional truck drivers in the city of Ouagadougou using the modified Framingham risk score. **Methods:** This was a cross-sectional descriptive and analytical study with prospective recruitment which took place from January 2022 to October 2022 during the various medical visits of heavy goods vehicle drivers carried out in the health services of the Occupational Health Office (OST) of the city of Ouagadougou. Cardiovascular risk was estimated using the modified Framingham risk score, which predicts the risk of developing cardiovascular disease over ten years. Data were collected using questionnaires and analyzed using Epi Info 7 version 7.2.4.0, SPSS Statistics version 27.0.1, and Excel 2019 software. **Results:** This study estimated 10-year cardiovascular risk among professional truck drivers in Ouagadougou using the modified Framingham risk score in a cross-sectional occupational-health sample. Among 258 male drivers aged 30 years or older, 59.3% were classified as low risk, 34.5% as moderate risk, and 6.2% as high risk. Drivers aged over 45 (n = 45) had a high cardiovascular risk of 13.33%, 11.11% among smokers (n = 90), 13.46% among drivers with high blood pressure (n = 104), 6.40% among drivers with dyslipidemia (n = 203) and 100% among diabetic drivers (n = 11). The manuscript reports higher risk categories in relation to age, sedentary lifestyle, number of years of driving experience and alcohol consump-

tion. **Conclusion:** Cardiovascular risk assessment revealed a significant cardiovascular risk among professional truck drivers in our study. The results of our study will allow for the implementation of effective therapeutic strategies for cardiovascular prevention, thereby reducing morbidity and mortality in the workplace, particularly in the transport sector.

## Keywords

Cardiovascular Risk, Modified Framingham Risk Score, Heavy Goods Vehicle Drivers, Medical Examination, Ouagadougou (Burkina Faso)

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## 1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death worldwide, as highlighted in a report by the World Health Organization (WHO): it is estimated that 19.8 million people died from cardiovascular disease (CVD) in 2022, representing about 32% of all deaths worldwide, and of these deaths, 85% were caused by a myocardial infarction or stroke [1]. According to projections, the WHO estimates that by 2030, 23.6 million people will die from CVD and CVDs are expected to remain the leading cause of death [2]. Cardiovascular diseases are the leading cause of morbidity and mortality in the United States, accounting for one in four deaths [3]. In Africa, the burden represented by CVDs is increasing so rapidly that they have become a public health problem [4]. CVDs are one of the three causes of medical evacuation in Burkina Faso, according to the Burkina Faso Society of Cardiology (SO.CAR.B), and the prevalence of cardiometabolic risks was high in the workplace in Burkina Faso at 29.9% according to a study published in 2017 [5].

Over the past ten years, the landscape of cardiovascular risks (CVR) related to work has changed considerably with the increase in psychological and organizational constraints, under the pressure of economic issues and due to the intensification of work [6].

Individuals at risk of cardiovascular events are often asymptomatic for a long time, hence the importance of CVR assessment. Prevention of CVD is based on a multi-risk strategy in which all CVR factors must be targeted [7].

In Burkina Faso, the trend in epidemiological studies on cardiovascular health is primarily oriented towards studying the prevalence of cardiovascular disease risk factors rather than focusing on predicting CVR.

The transport sector, a key economic driver, is a vital link in the development chain of Burkina Faso, a landlocked country. The development of this sector depends on the well-being of its stakeholders, including drivers.

Compared to the general population, drivers, due to their working conditions and lifestyle, have increased risk factors for CVD [8].

The objective of this work was to estimate the cardiovascular risk among professional truck drivers in the city of Ouagadougou.

## 2. Materials and Methods

### 2.1. Study Framework, Type and Population

This was a cross-sectional descriptive and analytical study with prospective recruitment, conducted from January 2022 to October 2022. The study was conducted in the occupational health services of the medical zones and the clinic of the office of occupational health (OST) of the city of Ouagadougou.

The study population consisted of professional heavy goods vehicle drivers who had been regularly residing in the city of Ouagadougou for at least one year, had undergone a medical examination, and had a medical file with a summary of additional examinations.

The following were not included in the study: drivers of light vehicles, professional drivers of heavy vehicles not regularly residing in the city of Ouagadougou or not having a medical file, and drivers who indicated a refusal.

### 2.2. Data Collection and Analysis

Data collection was carried out using an anonymous questionnaire, inspired by the WHO STEPS questionnaire and administered by a doctor after a clinical examination. The questionnaire was administered in French or the local language (*Mooré* and *Dioula*) depending on the participant's understanding, using vocabulary adapted to the study population, including:

- socio-demographic and professional data: sex, age, level of education, workstation and function;
- clinical and paraclinical data: family history, smoking, diabetes, weight, height, blood pressure, laboratory tests, and lipid profile.

Cardiovascular risk assessment was performed using the modified Framingham risk score according to the Canadian Cardiovascular Society of 2009 [9].

The Framingham risk score is a recognized medical algorithm designed to estimate the probability of developing CVD based on several key factors. It considers the following criteria:

- Sex and age ( $\geq 30$  years);
- Systolic blood pressure;
- Total cholesterol;
- HDL cholesterol;
- Diabetes;
- Smoking.

Cardiovascular risk was estimated from a mathematical model that assigns risk points to each risk factor, the sum of which is converted into the probability of a major coronary event (myocardial infarction, stroke) over the next 10 years. It was stratified into low, moderate, and high. It is considered low if the Framingham risk score is less than 10%, moderate if it is between 10% and 19%, and high if it is greater than or equal to 20%.

The percentage risk of CVD is doubled for individuals aged 30 to 59 years with-

out diabetes if there is a positive family history of early CVD in an immediate family member before age 55 for men; this is known as the modified Framingham risk score [9].

Subjects with diabetes over the age of 30 and subjects with atherosclerotic disease are considered from the outset to be at high risk [10].

The following cardiovascular risk factors were identified:

- Age and sex: Male  $\geq 45$  years (WHO criteria);
- High blood pressure (HBP): systolic-diastolic blood pressure greater than or equal to 140/90 mmHg;
- Presence of a family history of CVD: HBP, heart disease, diabetes, stroke;
- Diabetes: fasting blood glucose greater than or equal to 7 mmol/l, checked twice, according to the criteria proposed in 2006 by the WHO.

Dyslipidemia: Total cholesterol  $\geq 5$  mmol/L, LDL cholesterol  $\geq 4.1$  mmol/L, HDL cholesterol  $\leq 1$  mmol/L, and triglycerides  $> 1.7$  mmol/L.

- Obesity: Body mass index greater than or equal to 30 kg/m<sup>2</sup>;
- Smoking: Current or cessation within the last 3 years;
- Regular alcohol consumption: 1 to 2 drinks/day ( $\geq 20$  g);
- Sedentary lifestyle: low energy expenditure while sitting or lying down during waking hours ( $\leq 1.5$  metabolic equivalents);
- Unbalanced diet: high in saturated fatty acids, sugar, and sodium, low in potassium.

The sample size was calculated using Schwartz's formula [11], assuming a 95% confidence level, a 5% margin of error, and a prevalence of high blood pressure in Burkina Faso of 29.6% [12].

The survey was conducted in several stages:

First, the blood sampling stage: blood samples for analysis were taken from the inside of the elbow of subjects who had been fasting for at least 8 hours. This was performed by an accredited laboratory 48 hours before the medical visit. All results were checked twice.

Next came the anthropometric measurements, performed before the physical examination: blood pressure was measured using an automatic sphygmomanometer (OMRON) on the subject at rest, having been seated for 10 - 15 minutes. Three successive measurements were taken, and the average of the last two readings defined the blood pressure. Drivers with high blood pressure who were on medication were considered as such.

The weight was obtained using SECA brand mechanical bathroom scales, all calibrated, with a needle dial and a maximum capacity of 150 kg with an accuracy of 100 g.

Body mass index is interpreted according to WHO recommendations.

Finally, the questionnaire stage involves the physician completing the questionnaire based on the interview, anthropometric measurements, and medical history, after conducting a physical examination.

The drivers' medical records were reviewed to identify other medical histories.

The survey involved 365 professional drivers. Among them, 6 refused to participate in the study and 37 were excluded for incomplete files.

Data entry and analysis were performed using Epi Info 7 version 7.2.4.0 and SPSS Statistics version 27.0.1. Pearson's chi-squared test was used to analyze the relationship between variables with a significance level of  $p < 0.05$ . Graphs were created using Excel software version 2019.

The study began after approval from an ethics committee. Informed, free, and voluntary consent was obtained from all participants. Anonymity and data confidentiality were maintained.

### 3. Results

Of a total of 322 truck drivers included in the study, 64 were under 30 years of age, so the CVR estimation was carried out on 258 drivers according to the criteria of the modified Framingham risk score (age  $\geq 30$  years).

#### 3.1. Sociodemographic and Professional Characteristics of Drivers

All drivers in our study were male. The average age of the drivers was 39 years  $\pm$  6.32, with a range of 30 to 56 years. The 30 - 40 age group was the most represented, at 59.30%. By job type, tanker truck drivers were the most represented. More than half of the drivers had less than 10 years of driving experience, representing 60.9%. Married drivers represented 94.57%. A primary school education was the most common, at 40.70%. Fruit consumption ( $\geq 3$  portions of 80g) and vegetable consumption ( $\geq 3$  portions of 80 g) were frequent in 37.20% and 72.48% of drivers, respectively.

Sociodemographic and occupational characteristics are presented in **Table 1**.

**Table 1.** Distribution of heavy goods vehicle drivers according to socio-demographic and professional characteristics (n = 258).

Characteristics	Effective	Frequency (%)
Sex		
Female	0	0
Male	258	100
Workstation		
Dump trailer truck	28	10.85
Tanker truck	178	69
Public transport bus	52	20.15
Years of experience		
Less than 10 years old	155	60.90
10 years and older	103	39.10

## Continued

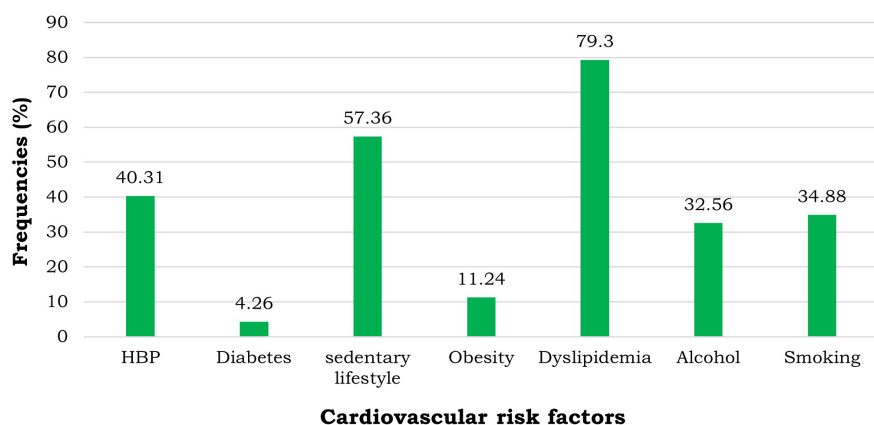
Age			
30 - 40 years old		153	59.30
40 - 50 years old		93	36.05
Over 50 years		12	4.65
Marital status			
Bachelor		13	5.04
Widower		1	0.39
Married		244	94.57
Level of study			
No official instructions		80	31.01
Primary		105	40.70
Secondary		69	26.74
Superior		4	1.55
Eating habits			
Consumption of fruit	No	162	62.80
	Yes	96	37.20
Consumption of vegetables	No	71	27.52
	Yes	187	72.48

### 3.2. Cardiovascular Risk Factors

Among the cardiovascular risk factors identified in the drivers ( $n = 258$ ), a family history of early cardiovascular disease in an immediate family member was found in 17 drivers (6.6%); these included HBP ( $n = 13$ ), diabetes ( $n = 5$ ), and stroke ( $n = 1$ ).

Of the 104 drivers with HBP, 75 were receiving treatment. Eight out of 11 drivers with diabetes were receiving treatment. No driver had atherosclerotic disease.

Dyslipidemia, sedentary lifestyle, and high blood pressure were the main risk factors identified, as shown in **Figure 1**.



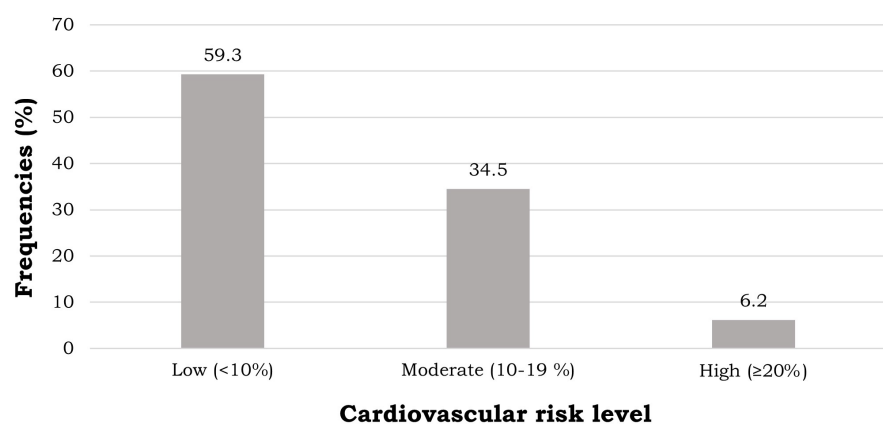
**Figure 1.** Prevalence of cardiovascular risk factors among heavy goods vehicle drivers ( $n = 258$ ).

### 3.3. Cardiovascular Risk Estimation

Cardiovascular risk estimation was performed using the modified Framingham risk score according to the Canadian Cardiovascular Society and included age, sex, smoking, total cholesterol, HDL cholesterol, blood pressure, diabetes and family history of cardiovascular disease.

Cardiovascular risk was high ( $\geq 20\%$ ) in 6.20% of drivers. **Figure 2** shows the distribution of drivers according to cardiovascular risk level.

Drivers aged over 45 ( $n = 45$ ) had a high cardiovascular risk of 13.33%, 11.11% among smokers ( $n = 90$ ), 13.46% among drivers with HBP ( $n = 104$ ), 6.40% among drivers with dyslipidemia ( $n = 203$ ) and 100% among diabetic drivers ( $n = 11$ ).



**Figure 2.** Description of the cardiovascular risk level among drivers.

### 3.4. Factors Associated with Cardiovascular Risk

Bivariate analysis found a statistically significant link between cardiovascular risk level on the one hand and age ( $p < 0.001$ ), alcohol consumption ( $p = 0.025$ ), sedentary lifestyle ( $p = 0.039$ ), and number of years of driving experience ( $p = 0.013$ ) on the other.

Multivariate analysis identified associated factors such as age, sedentary lifestyle, number of years of driving experience and alcohol consumption.

**Table 2** shows the results of the regression model comparing the probability of having a moderate or high risk, with a low risk as the reference.

**Table 2.** Multivariate analysis by logistic regression.

Variables	Cardiovascular risk level			
	Moderate (10% - 19%)		High ( $\geq 20\%$ )	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Age				
<45 years old	1.218		1.498	
$\geq 45$ years old	[1.092 - 1.359]	<0.001	[1.239 - 1.811]	<0.001

**Continued**

Level of study				
Before secondary school	1.527		3.606	
From secondary school	[0.537 - 4.344]	0.427	[0.703 - 18.498]	0.124
Years of experience				
<10 years old	3.115		0.120	
≥10 years old	[1.042 - 9.311]	0.042	[0.015 - 0.940]	0.043
Sedentary lifestyle				
Yes	0.926		0.195	
No	[0.461 - 1.859]	0.828	[0.049 - 0.785]	0.021
Obesity				
Yes	2.595		4.326	
No	[0.871 - 7.734]	0.087	[0.840 - 22.280]	0.080
Alcohol				
Yes	0.365		0.824	
No	[0.171 - 0.781]	0.009	[0.215 - 3.155]	0.777

The reference category is: Low; OR: Odds ratio, CI: Confidence interval.

## 4. Discussion

### 4.1. Cardiovascular Risk Assessment

The modified Framingham risk score allowed for the estimation of a low CVR in 59.3% of drivers, a moderate risk in 34.5%, and a high risk in 6.20%. A similar trend, but in different proportions, was found in Foba's study [13] in a workplace setting in Mali, with a low risk in 87.16%, a moderate risk in 8.95%, and a high risk in 3.89% of workers.

These results highlight a significant CVR among drivers. This underscores the need to implement a CVR prevention strategy in this professional environment.

### 4.2. Factors Associated with Cardiovascular Risk Level

The effect of age on CVR was significant in our statistical analysis (OR = 1.218,  $p < 0.001$ ); the older a person is, the greater the probability of having a high cardiovascular risk. This corroborates the results of scientific research that has shown that the risk of cardiovascular disease increases significantly after age 50 in men, related to arterial stiffness and the thickening of the heart walls.

The number of years of driving experience was a determining factor (OR = 3.115,  $p = 0.042$ ); drivers with less than 10 years of experience were most exposed to moderate and high CVR. This trend can be explained by the fact that the experience acquired over time allows older drivers to better manage the risks associated with the arduous nature of the work, and on the other hand, they are increas-

ingly giving way to younger drivers in order to find a calmer and less stressful life, better suited to their age or state of health. This result corroborates that of A.I.N Arnaud *et al.* [14] among freight truck drivers in Cote d'Ivoire.

Educational attainment did not have a significant impact on CVR (OR = 3.461,  $p = 0.236$ ). All drivers, regardless of their educational level, had the same probability of exposure to moderate and high CVR. This reflects the arduous nature of the work and the impact of other factors, such as psychosocial factors.

Sedentary behavior had a significant effect on CVR levels (OR = 0.195,  $p = 0.021$ ): drivers with sedentary behavior were the most exposed to high CVR. This finding corroborates the results of Duclos [15], who found in his study a relationship between sedentary behavior and the risk of mortality from CVD.

Obesity did not have a significant impact on CVR level (OR = 2.595,  $p = 0.087$ ); all obese drivers had the same probability of exposure to moderate and high CVR. This result could be explained by the fact that obesity increases the risk of CVD by accelerating the atherosclerotic process through various mechanisms [16].

Alcohol had a significant effect on CVR level (OR = 0.365,  $p = 0.009$ ); the higher the alcohol consumption, the greater the likelihood of having a high CVR. This corroborates the results of numerous observational studies that link the risk of developing CVD to increased alcohol consumption [17].

### 4.3. Limitations

- The cross-sectional nature of the study introduces a selection bias in our sample.
- There is no CVR prediction model developed from population studies in Burkina Faso. Therefore, cardiovascular risk assessment using the modified Framingham risk score may lack precision.
- The Framingham risk score does not consider certain key cardiovascular risk factors, such as obesity and sedentary lifestyle, which are important for assessing the individual cardiovascular risk level of our study population.
- The study sample focused on professional drivers in the city of Ouagadougou who receive an annual medical check-up, which could limit the generalizability of the results.

### 5. Conclusions

Cardiovascular risk assessment using the modified Framingham Risk Score revealed a significant CVR among the professional truck drivers in our study. The probability of experiencing a cardiovascular event such as a heart attack or stroke within the next 10 years was less than 10% for 59.3% of drivers, between 10% and less than 20% for 34.63%, and more than 20% for 6.20%.

This assessment, though rarely performed, is a means of early detection of CVDs and allows for the implementation of effective therapeutic strategies for cardiovascular prevention. It will therefore contribute to information and education programs for this professional group, particularly regarding high blood pres-

sure, tobacco use, diabetes, healthy and balanced diets, and lifestyle. However, the daily application of the risk score cannot be considered a substitute for a clinical evaluation.

Current therapeutic guidelines advocate a step-by-step approach, progressively intensifying pharmacological treatment combined with lifestyle modifications and minimally invasive imaging in individuals at moderate and high risk, ranging from monotherapy with a potent statin to combination therapies to achieve LDL cholesterol targets. However, more rapid recourse to combination therapies is recommended for secondary prevention and in high-risk individuals undergoing primary prevention. The goal is to avoid or limit the risk of cardiovascular events regardless of the level of each individual risk factor.

Risk models have been developed to help healthcare professionals make treatment decisions, and research is ongoing to refine CVR assessment tools. Future developments could include advanced biomarkers, genetic information, and algorithmic calculators to create more comprehensive risk profiles.

## Conflicts of Interest

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

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