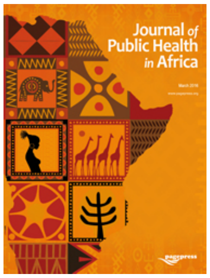


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**Sodium, potassium food intake and global cardiovascular risks in Togo**

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**Contributions:** TSK, JCS, conceived this study and participated in its design and coordination; TSK, JCS, MB, participated in the study design and data collection; TSK, KMT, performed statistical analyses; TSK, wrote the first draft of the manuscript; TSK, JCS, MNP, MB, GES, subsequently revised the manuscript. All authors read and approved the final manuscript.

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## Abstract

**Objectives**. To assess urinary sodium/potassium intake and identify its links with global cardiovascular risk (RCVG) according to the WHOPEN approach to WHO/ISH (International High Blood Pressure Society).

**Methods.** It was a cross-sectional and analytical study that took place from July 6, 2020, to September 17, 2021, in Togo, in the Aneho, Notse and Dapaong localities.

It focused on 400 adults selected by sampling. The analysis of two urine samples was done. Cardiovascular risk scores were determined from specific graphs that take into account age, gender, systolic blood pressure, diabetes status and smoking behavior.

**Results.** Among the 400 respondents, 49% lived in rural areas. The average age was 41 (30; 51) years. The average sodium and potassium intakes were respectively 3.2 g (1.04-5.99) or 7.95 g of salt and 1.4 g (1.89-5.62) per day. The risk of excessive sodium intake was 2.39 times higher in urban areas than in rural ones (p=0.049). Residing in rural areas was associated with high potassium intakes compared to urban ones (OR=3,2 IC [1.89-5.62]). Thirteen percent (13%) of respondents were likely to develop at least a deadly or non-deadly cardiovascular disease in the next 10 years 'time, of whom 5% present a high risk. Excessive sodium intake increases by 2.10 times the risk of a deadly cardiovascular disease occurrence.

**Conclusions.** Sodium intakes are high while potassium intakes are low with a subsequent global cardiovascular risk (GCVR) in the three cities. Sodium intakes were associated with VCVR. It is necessary to take steps to reduce excessive sodium intake and improve potassium intake.

## Introduction

Cardiovascular risk is the likely occurrence of a cardiovascular disease or accident (heart and artery disease) [1, 2]. The WHO guidelines indicate the global cardiovascular risk (CGVR) deadly or not (myocardial infarction or stroke) at ten years, depending on the age, sex, systolic blood pressure, smoking habits, total blood cholesterol rate (optional) and the presence or absence of sugar diabetes [3, 4]. Numerous studies proved the existence of a direct link between high sodium intake (versus potassium) and high blood pressure, the main component of cardiovascular disease [5-8]. Nationwide surveys such as the World Health Organization (WHO) STEPwise [9] or the Demographic and Health Surveys (IDS) [10] provide useful information on cardiovascular disease control indicators, but the execution periodicity is often too long and does not respect set standards in developing countries. Moreover, they do not make it possible to assess in real time the quantities of salt intake per individual. According to the WHO assessment, the largest part of the population intakes twice as much salt as the daily set 5g salt intake throughout the world. People therefore expose themselves to a higher risk of heart attack and stroke, which, according to assessments, claim three million deaths every year [11]. In Africa, salt intake varies from 6.9g to 10.6g per person/day [12]. In Togo, just like in most other countries, the absence of data on salt/sodium and potassium intake, the WHO estimated the level of salt intake at more than 10 g/d/person in 2010 [9]. The national Non-Communicable Diseases (MNT) control program in Togo abides by the WHO recommendations, the objective of which is to reduce the salt intake by 30% among the populations. As a result, the objective of our study aimed at assessing the urinary sodium and potassium intake, identifying the associated socio-demographic factors, and determining the links between these intakes and the global cardiovascular risk (RCVG) according to the WHOPEN approach of WHO/ISH (International High Blood Pressure Society).

## Materials and Methods

### *Setting of the study*

The study took place in three of Togo's six health regions. These are specifically the Savannah, Plateaux and Maritime regions located respectively in the north, center and south of the country. They are the most populated regions in Togo. The largest urban areas such as Dapaong, Notse and Aneho were respectively chosen in these regions for the study. In each locality, rural and urban areas were surveyed.

### *Nature of study*

It was a cross-sectional that analytical study that took place from July 6, 2020, to September 17, 2021.

### *Target populations*

They were made up of adults aged 25 to 64 in the cities of Dapaong, Notse, Aneho and in their neighborhoods.

***Inclusion criteria***

Were included in this study people aged 25 to 64, apparently in good health, both men and women living in the study areas for at least six months and not suffering from any chronic disease or not on an exclusive diet.

***Exclusion criteria***

Were excluded respondents who had not provided two urine samples and/or in whom the measures of risk factors were not effective (high blood pressure, diabetic status, and smoking behavior).

***Non-inclusion criteria***

Pregnant women and people under medication that provided them with sodium and/or potassium such as effervescent tablets, Kaleorid etc. were excluded from this study.

***Sampling methods and techniques***

The sampling was carried out according to the probability method and the technique of random sampling at several levels with proportional allocation. Both these methods were applied to select the villages and households in each locality depending on whether the place of residence was urban or rural. According to the 2017 MICS survey in Togo, urban and rural areas represented respectively 44 and 56% of the population. The 1st degree was made up of villages and city quarters. Among the list of these villages and city quarters, 10% were randomly selected. The 2nd degree consisted of households and the 3$^{rd}$ of individuals in households. The step of the survey was determined by relating the number of households in the identified locality to the total number of households to be surveyed in each area. A random number between 1 and the survey step was given to the first randomly selected household. The other households were chosen by adding the step to the previous number. For the choice of the respondents, the head of household was chosen. When the father and mother were present at the time of the survey and they were all eligible, a simple random choice was applied to identify the one who was selected.

***Sample size***

The sample size was calculated by applying the Schwartz formula while considering the prevalence of excessive salt intake at 50% (exact prevalence not known in Togo). By taking into consideration the possibility of refusal (5%), we increased and rounded the size of the sample to n = 400. By considering the weight of each locality, this size was distributed proportionally to the population of each of the three localities of studies (scope).

***Variables in this study***

The dependent variable was the global cardiovascular risk defined according to the WHO and the International High Blood Pressure Society (ISH) [13]. We used the WHO/ISH prediction charts of the global cardiovascular risk (RCVG) for the Afro-D zone which take into consideration the age, sex, systolic blood pressure, smoking habits and the presence or absence of sugar diabetes to assess the cardiovascular risk rate in 10 years 'time [13]. The risk falls into two categories: less than 10% and equal to or more than 10%.

The independent variables were dietary intakes of sodium and potassium measured in urine and sociodemographic factors.

Correction of urinary spot result values to obtain 24-hour sodium and potassium intake values was obtained by using the following formulae [15 ;16]

[Na-24hours] (mg) = [Na-SpotU] (mg) x 24-hour urine volume (L) (A) or

[Na-24hours] (mg) = [Na-SpotU] (mg)/ [creatinine-SpotU] (mg) x Estimated Creatinine-24 hours (mg) (B).

Potassium

[K-24hours] (mg) = [K-SpotU] (mg) x 24-hour urine volume (L) (A) or

[K-24hours] (mg) = [K-SpotU] (mg)/ [creatinine-SpotU] (mg) x Estimated Creatinine-24 hours (mg) (B).

*Na SpotU and K SpotU=Na and K measured from spot urine sample*

***Data collection procedures***

For the collection of urine (spot), two test-tubes were given to everyone to collect the urine samples on the eve. Two collections were made on the very day: the first between 6 and 8 a.m. and the second one in the afternoon. At least 10 ml of urine was collected at each time. After labeling the tubes, the samples were cooled in an insulated box at a temperature between +2° and +8°, because of the stability of the parameter and was taken to the reference lab on the 3rd day by the postal office transport company. of Togo (SPT). The urine analysis was carried out by kinetic method with colorimetric reaction (Jaffe reaction); the device used for the analysis was the Kenza Max, Bio labor diagnostic brand. The sociodemographic variables were collected by a kobocollect electronic questionnaire with geolocation of the people surveyed (latitude, longitude, and accuracy). The RCVG components were collected thanks to clinical measures (BP, smoking status) and biological measures (capillary glycaemia and hemoglobin glycated). BP was taken in a seated position further to a five-minutes ‘rest of both arms in an interval of 15-minute separating two doses. Capillary blood glucose was measured by taking a drop of blood after a finger prick. The finger was cleaned with a cotton ball soaked in water. The drop of blood was placed on the strip placed in the glucometer and then the reading was recorded.

***Data processing and analysis***

Data were analyzed with STATA software version 16.1. The link between sodium/potassium intake and sociodemographic factors was determined by logistic regression with univariate and multivariate analysis. Likewise, the link between global cardiovascular risk (GCVR) and urinary sodium/potassium intake was analyzed by a logistic regression model (univariate and multivariate).

***Ethical considerations***

The ethics committee expressed its opinion before collection (Opinion No. 019/2021/CBRS of May 27, 2021). Local authorities namely district executives, mayors and chief officers gave their permission prior to the collection. The information notices were duly sent to the respective populations as regards the dates of the investigators' visit for the collection. The collection objective and process were clearly explained to people before the questionnaire was administered. Only participants who gave their free and clearly expressed consent were included in the sample. As for the data, they were collected and strictly kept confidential within the team carrying out the study. The results after analysis and processing were communicated to the participants.

## Results

***Descriptive characteristics of participants***

Among the 400 people surveyed, participants from Aneho, Notse and Dapaong localities represented respectively 109 (28%), 149 (37%), and 142 (35%). Women made up 66% of the sample. The average age was 40 years with an interquartile range of 30 to 51 years. Among the respondents, 51% lived in urban areas (Table 1).

Urine samples were collected at least once from 100% of respondents.

***Level of sodium and potassium intake***

In the three localities, the average urinary potassium was lower than normal (<3.5g/d/p): 1.4g/d/p (0.9-2.4); p=0.0278. It varied from 1.3g/d/p (0.6-2.4); 1.4 g/d/p (0.9-2.4) and 1.5 g/d/p (0.8-2.3) respectively at Aneho, Dapaong and Notse. On the other hand, sodium intakes were higher than normal in the three localities and varied from 3g/d/p (1.8-4.9); 3.3g/d/w (1.7-4.7); 3.5 g/d/p (2.3-5.8) respectively in Notse, Aneho and Dapaong, i.e. an average urinary sodium of 3.2g/d/p (2-5.2)>3.2g/ d/p; p=0.1060 (Table 2). By deduction, the salt intake within the surveyed populations varied from 7.6g/d/p (4.6-12.3), 8.3g/d/p (4.3-11.6) and 8 .8g/d/p (5.7-14.6) respectively in Notse, Aneho and Dapaong. That is an overall average intake of 7.95g of salt per day and per person (Table 2).

Excessive sodium intake (3.2 g) was more frequent in urban areas (52.50%) than in rural ones. (47.49%). On the other hand, low potassium intake was more frequent in urban areas (50.82%) than in rural ones (49.17%) (Table 3).

***Sodium and potassium intake and link with cardiovascular risks***

In univariate analysis, urban residence was associated with high sodium intake at the 20% threshold. In multivariate analysis (final model), the same factor increased the risk of sodium intake 2.39 times (p=0.049) (Table 4). With regard to potassium, univariate analysis at the 20% threshold identified rural residence as a factor associated with high potassium intake; in multivariate analysis (final model), this factor was likely to increase the intake of foods rich in potassium by 3.23 times (p<0.001) (Table 5). A total of 52 (13%) people surveyed were likely to develop a deadly or non-deadly RCVG within 10 years 'time (Table 6) In univariate analysis in the final model, only excess sodium intake was significantly associated with overall cardiovascular risks. It would increase by 2.10 times the occurrence of global cardiovascular risk (RCVG) in people surveyed in 10 years' time (Table 7)

**Discussion**

This study is the first one to make sodium and potassium intake levels available in Togo based on urine tests. Like most recent studies of salt intake levels, sodium/salt intake is above recommended set standards as opposed to potassium intake which remains considerably low [17-20]**.**

***Sodium and potassium intake***

In 2014, for the sake of study, the WHO *carried out in Togo (what???)* like in most countries without data on salt intake, an intake level of 10g/d/person [21]. To fight against this excessive intake, Togo set itself the objectives to reduce salt intake by 20% in 2022 and 30% in 2025, i.e., an intake of approximately 8 and 7 g/d/person respectively [22]. In the light of the results of our study, efforts are remarkable but they must be maintained as they are still far from the WHO recommendations which set a daily intake of less than 5g/d/person [23, 24]. The low potassium intake in our study confirms the low intake of fruits and vegetables noted in the results of the STEPS-Togo survey carried out in 2010. This deficiency is also observed in most African studies [25, 26] and is always explained by the low intake of fruits and vegetables, potential sources of potassium [27, 28]. The high salt intake observed in urban areas versus rural areas could be explained by the dietary transition which facilitates the accessibility to foods with a high sodium content [29, 30].

According to the 2010 STEPwise approach, the risk assessment found that 81.5% of the 2,702 Togolese surveyed were suffering from at least one risk factor cardiovascular disease (MCV) of which 16.1% were suffering from 3 to 5 risk factors combined. These results differ from the ones in our study whereby 74.8% were suffering from a single risk factor associated with (RCVG). This difference could be explained by the number of factors identified in the study [31]. The study by Vusirikala A, et al. conducted in Kenya showed that 94.5% of respondents (2895) would present a “low” a cardiovascular risk over the next 10 years and only 1.7% (51) would present a “high” risk [32]. These noticeable differences could be explained by the study backgrounds. In fact, shanty towns are supposed to be mostly populated by youngsters who are less likely to be subjected to (MCV). The same tendencies were noticed in South Asia, notably in the studies by Ghorpade et al. and Mettananda et al. in which respectively 17% and 11% were likely to have at least a moderate or high cardiovascular risk occurrence [33-35]. The minor difference noticed as compared to our study could be explained by the size of the sample.

Sodium intakes were associated with the occurrence of cardiovascular disease in the next ten years. This similarity was observed by Maharani et al in their study carried out in Indonesia on factors associated with a high cardiovascular risk [35]. Several studies around the world have long demonstrated the links between urban environment, favorable to excessive salt intake, and global cardiovascular risk (RCVG) in Asia, Africa and in the Middle East [36-38]. Systematic reviews carried out from 2015 on salt (regularly updated) have confirmed the negative effects of excessive sodium/salt intake on health. On the contrary, reducing these intakes and intake of food rich in potassium could offer more health benefits [39-42]**.** Unfortunately, our study could not find an association between potassium intakes and RCVG. This could be due to the urine collection method used to assess potassium intake. In fact, it was found that the use of urine samples instead of 24-hour urine samples reduces the magnitude of the linear association with cardiovascular risk [43]. Likewise, spot urine is insufficient to reflect the daily potassium intake, given the insufficient intakes sometimes due to the shortage of fruits and vegetables (seasonal availability) and individual variability in the intake of potassium-rich foods [44-46].

***Sodium-intake reduction strategies and potassium-intake optimization***

The results of our study showed that Togolese have eating behaviors conducive to cardiovascular diseases. As cardiovascular risk is often asymptomatic, the capacity of the health system to provide information and diagnostic services to the population is crucial in the prevention awareness campaigns. The Ministry of Health should promote community participation in the prevention, early detection, and monitoring of risk factors for non-communicable diseases [47]. Reducing salt intake is essential as recommended by the WHO. This reduction calls for high-impact intervention strategies with proven effectiveness that includes good legislation, community awareness programs for target groups and especially in urban areas, good regulation of the sodium content in industrial foods while considering the evaluation studies of the salt intake levels within the communities as well [48-53]. Foods rich in potassium are abundant in Togo. Therefore, concrete actions such as the promotion of such foods with a high-potassium content, particularly vegetables and fruits, if they are well conditioned, should be taken by the Ministry of Health and the Nutrition service. Togo already has multi-sectoral policy and action plan documents developed since 2018. The support of all sectors through a common discussion framework will be likely to reduce salt and food rich in potassium intake.

Some limitations of this work are worth mentioning. We were unable to collect 24-hour urine (golden-tests), given our limited resources and the epidemiological context of the Covid-19 pandemic. Indeed, it was difficult to keep the respondents in the health centers due to the Covid-19 prevention measures. To solve this issue, we extrapolated the results of the urinary spots from the formula of Tanaka and Kawasaki [54]. Besides, the smoking status used to assess the GCVR was reported by respondents themselves.

## Conclusions

The daily intake of sodium (Na) is high and that of potassium (K) low and 13% of the population studied were likely to develop deadly or non-deadly GCVR within 10 years and among whom 5% presented a high risk. A link between excessive sodium intake and RCVD was identified. Therefore, to reduce the occurrence of these MCVs in the next ten years, it is important to act on the modifiable factors, which include excessive salt intake. The use of effective strategies will guarantee the success of this reduction.

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**Table 1. Distribution of respondents by socio-demographic characteristics, Notse, Aneho, Dapaong in Togo.**

| | Notse<br>N = 149 | Aneho<br>N = 109 | Dapaong<br>N = 142 | Total<br>N = 400 | p |
|---|---|---|---|---|---|
| **Age** | | | | | |
| Minimum-Maximum | 25-64 | 25-64 | 25-64 | 25-64 | |
| Median (Q1-Q3) | 41 (33-50) | 42 (35-53) | 37 (29-51) | 40 (30-51) | **0,027** |
| **Age group (years)** | | | | | **0,014** |
| 25-35 | 41 (27,5) | 26 (23,9) | 62 (43,7) | 129 (32,2) | |
| 35-45 | 46 (30,9) | 36 (33,0) | 30 (21,1) | 112 (28,0) | |
| 45-55 | 35 (23,5) | 21 (19,3) | 24 (16,9) | 80 (20,0) | |
| 55+ | 27 (18,1) | 26 (23,9) | 26 (18,3) | 79 (19,8) | |
| **Sex** | | | | | 0,167 |
| Female | 107 (71,8) | 68 (62,4) | 89 (62,7) | 264 (66,0) | |
| Male | 42 (28,2) | 41 (37,6) | 53 (37,3) | 136 (34,0) | |
| **Location** | | | | | **<0,001** |
| Rural | 84 (56,4) | 61 (56,0) | 51 (35,9) | 196 (49,0) | |
| Urban | 65 (43,6) | 48 (44,0) | 91 (64,1) | 204 (51,0) | |
| **Level of education** | | | | | 0,077 |
| No education | 55 (36,9) | 33 (30,3) | 37 (26,1) | 125 (31,2) | |
| Primary | 58 (38,9) | 37 (33,9) | 52 (36,6) | 147 (36,8) | |
| Secondary | 32 (21,5) | 38 (34,9) | 46 (32,4) | 116 (29,0) | |
| University | 4 (2,7) | 1 (0,9) | 7 (4,9) | 12 (3,0) | |
| **Religion** | | | | | **<0,001** |
| Animist/other | 30 (20,1) | 70 (64,2) | 35 (24,6) | 135 (33,8) | |
| Christian | 118 (79,2) | 20 (18,3) | 64 (45,1) | 202 (50,4) | |
| Mouslim | 1 (0,7) | 19 (17,5) | 43 (30,3) | 63 (15,8) | |
| **Profession** | | | | | **<0,001** |
| Others | 18 (12,1) | 16 (14,7) | 39 (27,5) | 73 (18,2) | |
| Merchant/Reseller | 38 (25,5) | 40 (36,7) | 31 (21,8) | 109 (27,3) | |
| Housewife | 25 (16,8) | 27 (24,8) | 54 (38,0) | 106 (26,5) | |
| Paysan/Cultivateur | 68 (45,6) | 26 (23,9) | 18 (12,7) | 112 (28,0) | |

*Test de rang de Kursaal-Wallis ; Test de chi-deux de Pearson ; Test exact de Fisher

**Table 2. Sodium and potassium consumption levels, Notse, Aneho, Dapaong in Togo, 2021.**

| Na/K & Salt intakes | Notse | Aneho | Dapaong | Total | P* |
|---|---|---|---|---|---|
| | **n = 149** | **n = 109** | **n = 142** | **n = 400** | |
| Urinary Na (g) | 3 (1,8-4,9) | 3,3 (1,7-4,7) | 3,5 (2,3-5,8) | **3,2 (2-5,2)** | 0,1060 |
| Equivalent* in salt intake | 7,6g/j (4,6-12,3) | 8,3g/j (4,3-11,6) | 8,8g/j (5,7-14,6) | 7,95 (4,9-12,9) | |
| Urinary K (g) | 1,5 (0,8-2,3) | 1,3 (0,6-2,4) | 1,4 (0,9-2,4) | **1,4 (0,9-2,4)** | **0,0278** |

*Comment**: *Salt intake was estimated by multiplying urinary sodium values by 2.5* **[55]**

**Table 3. Distribution of respondents according to urinary intake.**

| Urines intakes | Urban N = 204 | Rural N = 196 | Total N = 400 | P |
|---|---|---|---|---|
| **Natriuresis** | | | | 0,299* |
| < 2 | 47 (23,0) | 54 (27,6) | 101 (25,2) | |
| ≥ 2 | 157 (77,0) | 142 (72,4) | 299 (74,8) | |
| **Kaliuria** | | | | 0,833* |
| < 3,5 | 184 (90,2) | 178 (90,8) | 362 (90,5) | |
| ≥ 3,5 | 20 (9,8) | 18 (9,2) | 38 (9,5) | |

* chi-square test of independence

**Table 4. Factors associated with high sodium consumption (2.3 grams and above): binary logistic model, Notse, Aneho, Dapaong in Togo, 2021, n=400.**

| | Univariate | | | Initial model | | | Final model | | |
|---|---|---|---|---|---|---|---|---|---|
| | **RC** | **95%CI** | **p** | **RCa** | **95%CI** | **p** | **RCa** | **95%CI** | **p** |
| **Age (years)** | | | | | | | | | |
| <40 | - | - | - | - | - | - | - | - | - |
| ≥40 | 1,24 | 0,57-2,70 | 0,582 | 1,20 | 0,43-2,27 | 0,993 | 1,12 | 0,51-2,48 | 0,771 |
| **Sex** | | | | | | | | | |
| Female | - | - | - | - | - | - | - | - | - |
| Male | 1,97 | 0,83-5,46 | 0,152 | 2,41 | 0,87-7,65 | 0,107 | 1,88 | 0,78-5,28 | 0,1888 |
| **Cities** | | | | | | | | | |
| Notse | - | - | - | - | - | - | - | - | - |
| Aného | 1,18 | 0,38-4,00 | 0,777 | 0,77 | 0,21-3,14 | 0,705 | - | - | - |
| Dapaong | 0,48 | 0,19-1,14 | 0,107 | 0,41 | 0,15-1,07 | 0,072 | - | - | - |
| **Location** | | | | | | | | | |
| Rural | - | - | - | - | - | - | - | - | - |
| **Urban** | **2,55** | **1,14-6,30** | **0,030** | **2,09** | **1,07-5,41** | **0,018** | **2,39** | **1,04-5,99** | **0,049** |
| **Level of education** | | | | | | | | | |
| None | - | | | - | | | | | |
| Primary | 0,94 | 0,35-2,45 | 0,894 | 1,12 | 0,38-3,26 | 0,834 | | | |
| Secondary and abode | 0,81 | 0,30-2,12 | 0,663 | 0,77 | 0,22-2,69 | 0,675 | | | |
| **Religion** | | | | | | | | | |
| Animist/Others | - | - | - | - | - | - | | | |
| Christian | 0,31 | 0,09-0,86 | 0,039 | 0,37 | 0,09-1,24 | 0,128 | | | |
| Mouslim | 0,29 | 0,07-1,05 | 0,063 | 0,59 | 0,12-2,81 | 0,504 | | | |
| **Profession** | | | | | | | | | |
| Farmer/Cultivator | - | - | - | - | - | - | | | |
| Merchant/Reseller | 0,56 | 0,18-1,57 | 0,279 | 1,62 | 0,41-6,37 | 0,483 | | | |
| Homewife | 0,94 | 0,29-3,11 | 0,922 | 2,41 | 0,56-11,12 | 0,242 | | | |
| Others | 0,63 | 0,19-2,10 | 0,443 | 1,32 | 0,26-6,64 | 0,731 | | | |

ORa = Adjusted odds ratio; 95% CI = 95% confidence interval; Hosmer and Lemeshow goodness of fit (GOF) test: p=0.1926

**Table 5. Factors associated with high potassium consumption (3.5 grams and above): binary logistic model, Notse, Aneho, Dapaong in Togo, 2021, n=400.**

| | Univariate | | | Initial model | | | Final model | | |
|---|---|---|---|---|---|---|---|---|---|
| | **OR** | **95%CI** | **p** | **ORa** | **95%CI** | **p** | **ORa** | **95%CI** | **p** |
| **Age (years)** | | | | | | | | | |
| <40 | - | - | - | - | - | - | - | - | - |
| ≥40 | 0,97 | 0,65-1,45 | 0,869 | 0,73 | 0,43-1,21 | 0,220 | 0,66 | 0,38-1,12 | 0,128 |
| **Sex** | | | | | | | | | |
| Female | - | - | - | - | - | - | - | - | - |
| Male | 1 | 0,65-1,52 | 0,993 | 1,83 | 0,99-3,43 | 0,058 | 1,57 | 0,91-2,75 | 0,109 |
| Location | | | | | | | | | |
| Urban | - | - | - | - | - | - | - | - | - |
| **Rural** | **1,94** | **1,29-2,92** | **0,002** | **3,74** | **2,22-6,42** | **<0,001** | **3,23** | **1,89-5,62** | **<0,001** |
| **On the Streets** | | | | | | | | | |
| No | - | - | - | - | - | - | - | - | - |
| Yes | **0,06** | **0,02-0,13** | **<0,001** | 0,06 | 0,02-0,14 | <0,001 | **0,11** | **0,03-0,29** | **<0,001** |
| **Level of education** | | | | | | | | | |
| None | - | - | - | - | | | | | |
| Primary | 0,65 | 0,40-1,05 | 0,079 | 0,75 | 0,39-1,46 | 0,398 | | | |
| Secondary and above | 0,51 | 0,30-0,85 | 0,010 | 0,84 | 0,36-1,97 | 0,685 | | | |
| **Religion** | | | | | | | | | |
| Animist/Others | - | - | - | - | - | - | | | |
| Christian | 1,9 | 1,21-3,01 | 0,006 | 0,68 | 0,31-1,41 | 0,304 | | | |
| Mouslim | 0,86 | 0,44-1,63 | 0,642 | 2,25 | 0,82-6,17 | 0,113 | | | |
| **Profession** | | | | | | | | | |
| Farmer/Cultivator | - | - | - | - | - | - | | | |
| Merchant/Reseller | **0,38** | **0,22-0,66** | **0,001** | 1,12 | 0,49-2,60 | 0,793 | | | |
| Homewife | **0,37** | **0,21-0,63** | **0,001** | 0,89 | 0,39-2,04 | 0,774 | | | |
| Others | **0,36** | **0,19-0,66** | **0,001** | 0,8 | 0,29-2,22 | 0,674 | | | |

ORa = Adjusted odds ratio; 95% CI = 95% confidence interval; Hosmer and Lemeshow goodness of fit (GOF) test: p=0.258

**Table 6. Global cardiovascular risk distribution of respondents, Notse, Aneho, Dapaong in Togo, 2021.**

| | Notse N = 149 | Aneho N = 109 | Dapaong N = 142 | Total N = 400 | P* |
|---|---|---|---|---|---|
| **RCVG-1** | | | | | 0,208 |
| <10% | 124 (83,2) | 95 (87,2) | 129 (90,8) | 348 (87,0) | |
| 10%-20% | 12 (8,1) | 9 (8,3) | 8 (5,6) | 29 (7,2) | |
| 20%-30% | 12 (8,1) | 3 (2,8) | 5 (3,5) | 20 (5,0) | |
| 30%-40% | 1 (0,7) | 2 (1,8) | 0 (0,0) | 3 (0,8) | |
| **RCVG-2** | | | | | 0,154 |
| <10% | 124 (83,2) | 95 (87,2) | 129 (90,8) | 348 (87,0) | |
| 10% et plus | 25 (16,8) | 14 (12,8) | 13 (9,2) | 52 (13,0) | |

Comment: *le RCVG1 is the cardiovascular risk defined according to the WHO/ISH map with 4 modalities and RCVG2 is the variable defined in two modalities to allow statistical analysis because with 4 modalities we have variables not indicated for analysis.*

**Table 7. Factors associated with high overall cardiovascular risk (10% and above): binary logistic model Notse, Aneho, Dapaong in Togo, 2021, n=400.**

| | Univariate | | | Initial model | | | Final model | | |
|---|---|---|---|---|---|---|---|---|---|
| | **RC** | **95%CI** | **p** | **Rca** | **95%CI** | **p** | **Rca** | **95%CI** | **p** |
| **Location** | | | | | | | | | |
| Urban | - | - | - | - | - | - | - | - | - |
| Rural | 1,05 | 0,58-1,88 | 0,877 | 0,85 | 0,45-1,57 | 0,597 | - | - | - |
| **Level of education** | | | | | | | | | |
| None | - | | | | | | | | |
| Primary | 0,69 | 0,35-1,35 | 0,284 | | | | | | |
| Secondary and above | 0,44 | 0,20-0,93 | 0,037 | | | | | | |
| **Religion** | | | | | | | | | |
| Animist/Others | | | | | | | | | |
| Christian | 0,96 | 0,52-1,81 | 0,907 | | | | | | |
| Mouslim | 0,29 | 0,07-0,88 | 0,051 | | | | | | |
| **Natriurie (grammes)** | | | | | | | | | |
| <2 | - | - | - | - | - | - | - | - | - |
| **≥2** | **2,01** | **0,96-4,74** | **0,084** | **2,4** | **0,98-5,80** | **0,056** | **2,10** | **1,02-4,90** | **0,046** |
| **Kaliurie (grammes)** | | | | | | | | | |
| <3,5 | - | - | - | - | - | - | - | - | - |
| ≥3,5 | 0,77 | 0,22-2,04 | 0,634 | 0,68 | 0,19-1,92 | 0,499 | - | - | - |
| **Cities** | | | | | | | | | |
| Dapaong | - | - | - | - | - | - | - | - | - |
| Notse | 2,00 | 0,99-4,20 | 0,057 | 2,01 | 0,94-2,69 | 0,433 | 2,09 | 0,96-4,39 | 0,056 |
| Aneho | 1,46 | 0,65-3,29 | 0,352 | 1,50 | 0,26-2,32 | 0,206 | 1,54 | 0,68-3,47 | 0,296 |
| **Profession** | | | | | | | | | |
| Others | - | | | | | | | | |
| Commerçant/Resseler | 2,97 | 1,03-10,71 | 0,061 | 2,90 | 0,93-10,71 | 0,060 | | | |
| Homewife | 2,84 | 0,98-10,31 | 0,074 | 2,74 | 0,98-7,30 | 0,074 | | | |
| Farmer/Cultivator | 3,09 | 1,09-11,09 | 0,051 | 3,00 | 0,94-10,07 | 0,051 | | | |

ORa = Adjusted odds ratio; 95% CI = 95% confidence interval; Hosmer and Lemeshow goodness of fit (GOF) test: p=0.97