

FACTORS DRIVING THE DIVERSITY OF MEAT RECIPES COOKED, VENDED AND CONSUMED IN URBAN ZONES IN EASTERN OF THE DEMOCRATIC REPUBLIC OF THE CONGO

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Abstract

Meat is an important source of animal protein in the daily diet of people, after fish. Meat is considered as a luxury food during festive events in eastern D.R. Congo. Meat grilling and roasting are common urban practices because of condiments required during the roasting process to make it tastier. The present study was initiated with an idea to identify meat recipes consumed in Bukavu (Bagira health zone). The sub-aim was to identify determinants associated with the occurrence of the diversity of meat recipes. A cross-sectional study was conducted in four areas of Bagira health zone (Bukavu city) after checking available literature. The study was based on a survey of 380 respondents who were interviewed using a semi-structured questionnaire. Collected data was entered into the software and Microsoft Excel 2010 analyzed using Epi Info 7.3.0 release. The statistical significance was set at $p < 0.05$. The results revealed the existence of twenty-seven recipes of meat consumed by the population. People consume different categories of meat, including seven recipes of viscera, sixteen recipes of flesh legs, four recipes made from animal heads combined to tendon members, bones and animal skins. The taste and smell of the recipe type depended on cooking methods and on types of basic ingredients added during the cooking process. Respondents indicated that fried meat into tomato sauce (33%), followed by the meat broth (23%) and meat broth with vegetables (22%) were the common meat recipe. Other less common recipes included fried meat with vegetables, roasted/grilled meat and fried steak. Three determinants were found to be statistically associated with the diversity of meat recipes: education level ($p = 0.002$), numbers of year's spent making different kinds of meat recipes ($p = 0.002$) and household size ($p < 0.05$). The variety of meat recipes made by people are significantly ($p < 0.05$) influenced by the socio-demographic and economic conditions of households. Although this was expected, cultural background was not statistically linked to the diversity of meat recipes found in the health zone studied. Further gastronomic investigations should be conducted to determine the nutritional value of different meat recipes and to explore potential linkages with high prevalence of metabolic diseases in this area. There is a need to strengthen nutrition education to the public. Public health educators should promote the consumption of diversified diets/recipes of high nutritional values to keep healthy.

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1. INTRODUCTION

Worldwide, gastronomic research is well published. Different types of traditional and modern recipes consumed by different human communities are described worldwide (Muteba, 2014; Noreen, 2005). Although gastronomic research is well published in terms of benefits,

information on local food consumption remains largely unavailable in eastern D.R. Congo. The benefits of different kind of foods and their cultural meanings (values) are poorly documented in DR Congo. Yet, it is common to observe prevalence of consumption of certain type of food items in some parts of the country. In eastern DR Congo, there exists a

diversity of food items consumed by people. These food types are linked to tribal, cultural and environment characteristics. In some areas, there is prevalence of certain meat types, even when they are not nutritious food types. Factors driving the persistence of certain type of meat recipes in the urban society remain largely undocumented in eastern DR Congo. Similarly, there is prevalence of metabolic diseases in the same kind of environments. It is not clear if high prevalence of some metabolic diseases (diabetes, pressure...) may be related to the food behavior (the kind of food items people consume or not). Hence, the need to investigate on the diversity of animal protein sources consumed by people.

In eastern D.R. Congo, public health education emphasizes on the consumption of animal proteins to keep healthy given the fact that malnutrition is rising in the province. It is likely that nutrition messages are not well packaged because the general understanding of the public is that consuming animal food type is prospective covering deficiency in animal proteins required by the body. These days, there is tendency of mushrooming of eating places in urban environments. Most public eating places are specialized in making different kind of meat recipes that are affordable to all kinds of clients. Different types of recipes are allied to cooking practices and to the knowledge of the cooker. For each type of recipe, a variety of ingredients and flavors are mixed during cooking. Also, the cooking time, mode of display of food items depends on cook's knowledge and experience. At the household level, any kind of meat is consumed and people feel they are happy. However, consumers are not always aware that some kinds of ingredients are not always healthy/nutritious. Since, there is a diversity of meat recipes that is found in public eating places, it is important to collect needful information likely being used by health educators. The public need to be educated about the nutritional value of different recipes they use. Some people (with access to finance or not) are seen ever eating fatty parts of the

meat. People consume these parts assuming they are ingesting animal proteins. This tendency requires that the public should be educated on food types, food composition and on healthy eating. It is therefore important to make an inventory of types of meat recipes that are made by cooks so as to appreciate which ones are healthy (with high nutritional values) so that they can be recommended to consumers from different cultural backgrounds (Stlvetsky, 2012; Poulsen *et al.*, 2009).

Literature indicates that when people migrate to urban settings they migrate with their traditions and cultures. Food taste and recipes diversity are largely dependent on cultural background. The invention of new kind of food may be the resultant of desire to satisfy the demand. Recipe diversity manufacturing is largely driven by socio-psychological traits (taste, smell and traditional or cultural background). In addition, in traditional African societies, some recipes were developed as medicines. Some recipes are used for therapeutic treatments of certain human diseases. African local people are aware that certain types of meals prepared in certain ways can be used to treat some specific human diseases. For example, eggplant is believed to be a good preventive and remedy against diabetes and pressure (heart attack) diseases. People do not eat quality; food behavior has something to do with attachment to spiritual connection (background). Some food items are believed to play specific socio-cultural functions. Specific types of recipes are made for various purposes: special visitors, weeding ceremonies. It is also believed that feeding on young leaves of cowpea may help young mothers not to miscarry their first pregnancy. Some other special vegetable recipes are made to feed couples. These special recipes are believed to increase libido and reduce on the discomfort of a couple during sexual activities (WFP, 2008; WHO, 2004; FAO, 2009).

When people migrate to urban environments, they carry their traditional knowledge of food types. Also, the environment where people have been living has an influence on the

development of new food types since recipes are made of natural products that are locally available. People always migrate to urban environments with their cultural food habits and knowledge. There is therefore a mixture of food knowledge practices and habits (cooking methods...). This is the process leading to the development of new food recipes in urban areas. Practically, the diversity of recipes is therefore born from mixture and exchange of food knowledge practices between people from different back grounds or tribes. Food recipes are being developed by communities for various purposes (FAO, 2013, 2009).

In a country like DR Congo with more than 500 tribes, it is likely that when people meet in urban areas, they will tend to display and market for their food knowledge. Hence, people with more nutritious (gustative) food items may take the lead in terms of influencing the choice of people over certain types of food items. Urbanization therefore has a significant impact on the development of a diversity of recipes since people meeting in urban environments will exchange knowledge and experience. It is also likely that cooking methods (ingredients used, time spent cooking) may influence the type of food. Food is the first medicine. Good food is not only the tasty one but also the one that contains essential nutritious elements. Since, cultural backgrounds influence the diversity of food recipes, it is important to know if attachment to certain types of meal does not have negative impacts on the health of consumers. In a region with high prevalence of metabolic diseases, it may be good to check if consumption pattern of certain foods is linked to high prevalence of specific metabolic diseases, given the fact that local people are attached to the diversity of recipes in urban environments in eastern DR Congo (Laisney, 2012; Yonkeu, 2003).

This study was therefore conducted in order to make an inventory of meat recipe types available in order to determine which ones were more healthy/nutritious than others. It is believed that the identification of more nutritious foods may help and guide food

processing companies producing food items suitable to all kind of desired and demanded by consumers. The other aim was to identify some specific recipes that may be used to treat malnutrition and anemia in women. In fact, there is a high rate of malnutrition in young children and pregnant/ lactating women in eastern DR Congo. The output of this study may help to sensitize local people about the nutritional value of different recipes to which they attach too much importance. It is a duty of scientists to avail and participate in the education of the public on basic facts such as the value of what is consumed or preferred in the society. Hence, results to be yielded may help in educating people on good feeding practices. For example, there is a category of people buying bacon and believing it is the best meat rich in proteins, yet this is fat rich in energy.

Among identified knowledge gaps include the fact that different types of food recipes from one kind of animal/plant are described worldwide, literature that the prevalence of a diversity of food recipes may be linked to human communities with strong cultural background. What is missing in the literature is the clear linkage between food habits and prevalence of certain metabolic diseases in some areas of the world. In addition, socio-economic determinant factors involved in the prevalence of a certain type of food in a given society are poorly described. In eastern DR Congo, such factors are not known, yet, meat recipes are diversified here. The key gap identified in this study is therefore the identification of the causes and contributors of the prevalence of a certain type of meat recipes in Bagira health zone. It is believed that the identification of such factors may be used to influence (during sensitization campaigns, public nutritional education sessions) the behavior and attitudes of the public, turning towards consuming healthy (nutritious) meat recipes rather than being attracted to consuming any kind of meal because of colors and appearance or type of smells and tastes. The identification of these factors is essential to

build a powerful program which can be used to make people more conscious and knowledgeable about the difference between nutritious food and tasty/ smelly foods.

The key research problems to be addressed by this study survey include (i) to find out if different recipes had similar and comparable biological/nutritional values (properties). The big challenge is that a certain group of humans is found attached to the consumption of a given meat recipe. Yet, the literature indicates that some kind of meat items may be linked to the development of some metabolic diseases. Field observations suggest that some other people are attached to certain categories of meat recipes because of its affordability (cheap price...). Those cheap meat recipes are generally not healthy. Hence, the need for the public to be aware of the dangers of such cheap foods. The society is entitled to knowledge about healthy feedings. In some cases, Sometimes, rich people believe they must eat luxury foods (eat too much meat every day). In this case, people consume meat and ignore to equilibrate with energy sources. It is common to observe people over feeding on meat during festive seasons. Good meat may be perceived as expensive by a category of consumers. The majority of people may consume good meat only during festive seasons (wedding parties, festive seasons and celebration ceremonies). In Bagira health zone, it is common to observe people consuming unwholesome parts of animal meat (the part that is rich in energy source). Therefore, several culinary methods (cooking methods) of meat have been developed to satisfy and meet the demand of several kinds of people. Hence, meat parts that should be used to feed other domestic animals (fatty and bony parts), are frequently being used in various kind of recipes for humans. The fatty parts are cooked in several different ways to meets desire and wants of some poor people who may want to feel psychological happy to have consumed whatever is called a meat, even fatty parts.

Meat is known as key major source of animal protein. However, abuse may link to the development of metabolic diseases. Some meat

recipes may be demanded by consumers, yet they are poor in basic nutrients. It is therefore important to make a screening of different forms of food recipe presentation to help understand better why and how and diversity of consumers is attracted to a certain type of recipe in a given area. The key element is to identify determinants of the prevalence of a given type of recipe. It is likely that the mode of presenting food may stimulate or increase consumer appetite. In addition, physical aspect cooking method (type of ingredients mixed) may be among key drivers to consider when trying to explain reasons for the prevalence of certain types of meat recipes in a given area.

The rationale (justification) behind this work is linked to the existence of a diversity of meat recipes that are currently found in the society (Bagira health zone) and for which the public have strong attachments as preferred food items. There is a need to check which ones are healthy (those that are more rich in animal proteins) and that can be recommended to health/nutrition educators.

Man needs to eat to maintain its physiological balance, motor and psychism. This is possible with consumption of diversified food items, and by making a good of choice of food types and by eating food that is healthy, balanced and varied (WHO, 2004; WFP, 2008; FAO, 2009; Laisney, 2012; Muteba, 2014).

The diversity of feeding practices is largely influenced modernism, urbanization and technology development (FAO, 2013; Ofouémé-Berton, 1993; Noreen, 2005). Worldwide, not all categories of populations have access to diverse food recipes. Food habits and diet diversity are unequally distributed worldwide. Access to a variety of food recipes depends on financial, economic, cultural and social factors. There is still a paucity of scientific knowledge about types of food recipes prepared/ consumed by peoples. In addition, factors likely explain the occurrence of various food recipes in a given community, remain largely unsurvey in eastern DR Congo (Laisney, 2012; Yonkeu, 2003).

Meat is an important source of animal protein in the daily diet of the population after fish in eastern of DR Congo (Stlvetsky, 2012; Poulsen *et al.*, 2009; Albrechtsen *et al.*, 2005). In South Kivu province (Bukavu town), meat is considered as a luxury food item. During festive events, in most butcherries, right piece categories of any kind of meat, are generally found being booked by rich families and sometime by middle class families (Babe *et al.*, 2018; CEMAC, 2011; R. Nyaminani, personal communication, 2016). To make it more enjoyable, consumers prefer preparing their own meat recipes following family desire and aspirations. Different meat recipes are generally consumed in a companion of other local food items. Middle class and poor populations are frequently observed purchasing viscera, head, skin, tendon and entrails of animals at local market and butcherries (ECOM, 2006).

Across Africa (Muteba, 2014; Edderai and Houben, 2002) gastronomic and nutritional research surveys are scanty. There is rarity of quantitative information about diversity of recipes, cooking methods, and culinary practices. Also, in Bukavu area, community gastronomic practices are not studied (Muteba, 2014; WFP, 2005). In addition, FEPOK, 2008; Bougler *et al.*, 2005a; Bougler *et al.*, 2005b report in their study that factors driving the occurrence meat recipes diversity (beef, goats, pigs and sheep), remain largely undocumented in Bukavu town (Bagira Health Zone). Thus, the main purpose of this study was to identify drivers determining the occurrence of the diversity of meat recipes in Bagira Health Zone.

2. MATERIALS AND METHODS

Study area

This study survey was conducted in the health zone of Bagira (Figures 1a, 1b, 1c). Administratively, Bukavu town (1488-2008m altitude; South latitude: 2°28'59.6", 2°30'3.0"; East longitude: 28°50'24.6", 28°48'35.8") is

composed of three health zones (Bagira, Kadutu, Ibanda). In its Northern part, Bukavu city is limited by Nyamuhinga River. In the Southern part, the town is limited by Weshu River. On the eastern part, Bukavu town (Figure-1a) is limited by Lake Kivu. In the Western part, Bukavu city is limited by the mountain Mbogwe. The population density of Bukavu city is of about 4568 inhabitants/km² (census 2011). The climate of Bukavu is a humid tropical climate. The dominant relief is mountainous. The landscape of Bukavu city is a vulnerable town because of frequent landslides and soil erosion. The vegetation typical mountainous grassland.

In Bagira health zone, there is high prevalence of metabolic diseases (malnutrition...). This food intake deficiency disease has been rising up since the start of epidemic wars. Women and children are mostly affected with malnutrition (UNICEF, 2002).

Traditional food habits are varied among people. For some tribes, local culture denies women and children, to consume certain kind of food items. Low income earners are the people having imbalance in food consumption in Bagira health zone. In Bagira health zone, cassava, potato, yam, sweet potato is the source of diet energy. Source of animal proteins include meat and fish; whereas source of vegetable proteins include beans, peas, and peanuts. Fruits and vegetables are occasionally consume by the population (Ministry of Planning/DRC Government, 2015).

Sampling procedure and sample size

The study survey was conducted in 4 out of 8 areas that compose Bagira health zone. These areas were randomly selected using the method of random sample. A total of 380 respondents were therefore interviewed. The sample size was relative to the proportion of the total number of households in the health area. Thus, the following areas were selected for the current study: Bagira, Buriba, Makoma and Nyamuhinga (Table 1).

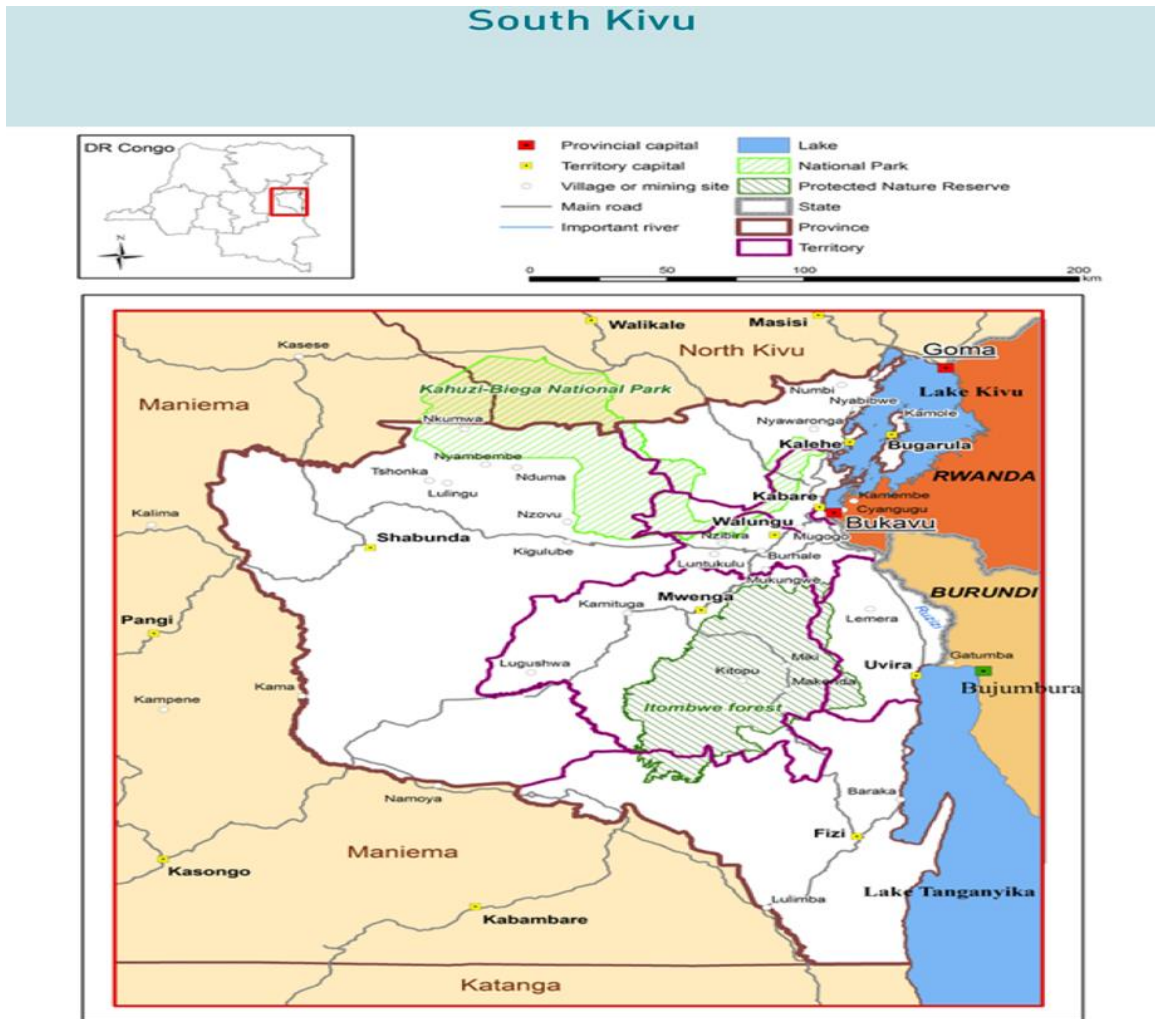


Figure 1a: Map showing the localization of Bukavu town within South Kivu Province

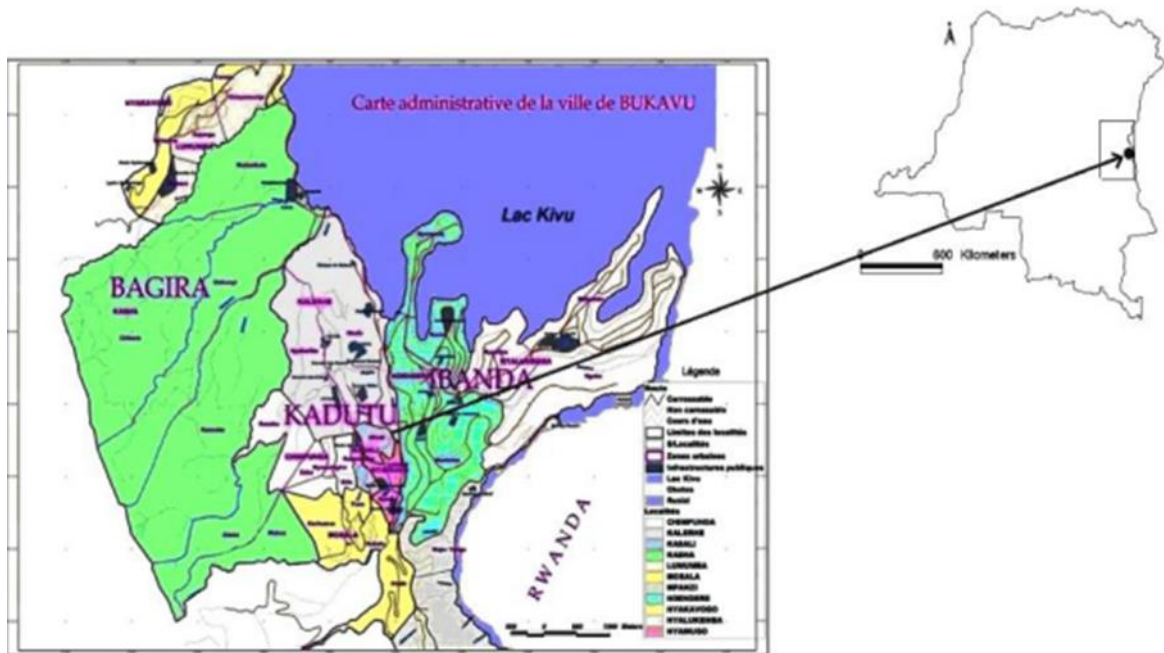


Figure 1b: Map showing the administrative division of Bukavu town: the study zone (Bagira Health zone) is colored in Green



Figure 1c: Details about physical characteristics of Bagira health zone

Survey methodology

At the start, different avenues and directions were identified within each health area. The different directions (avenues) were inspected one after another. The first house to investigate was the one located at the beginning of the selected direction, and the following was selected subsequently following a pre-determined sampling interval rate (k): interviews took place after walking for about 30m along away the direction (avenue). Practically, any adult encountered in the visited household during the survey, agreeing to be interviewed, was targeted by this study. Selected respondents were those consuming and or cooking different kinds of meat recipes.

Data collection

Interviews were conducted using a semi-

structured questionnaire. Each selected respondent was met at home. People interviewed included mostly mothers or her daughter. Only people 18 years and above aged were considered. Dependent variables included different questions related to the types of recipes of meat (cattle, goats, pigs and sheep). Issues related to socio-economic, cultural and demographic characteristics of respondents (age, sex, education, tribe, profession, marital status, household size, monthly income, number of meals taken per day, place of origin of the spouse, the length of residence in Bagira health zone, different kind of food requirements and local food prohibitions...) were considered as independent variables during data analyses.

Table 1: Sample distribution by Selected Health Aires of Bagira health zone

Health area	Pop. target	Number of households (N)	n	%
Bagira	13075	2179	76	20.00
Burhiba	24734	4122	143	37.63
Makoma	10682	1780	62	16.31
Nyamuhinga	17057	2843	99	26.05
Total	65548	10924	380	100.00

With; k (sampling interval) = $\frac{N}{n} = \frac{10924}{380} = 29$ households

Table 2: Mathematical Combinatorial method of estimating meat recipes for diversity

Number portion	Number of recipes	Conclusion
Diversity (>3 parts)	Diversity (>3 recipes)	Diversity (>3 recipes)
Diversity	No diversity	No diversity
No diversity	Diversity	No diversity
No diversity (≤ 3 parts)	No diversity (≤ 3 recipes)	No diversity (≤ 3 recipes)

Determination of the diversity of meat recipes

There was absence of a dearth of literature addressing this topic in the study country. Therefore, the study focused on statistical and mathematical estimates (inventories) of the existence of a variety of meat recipes in the study area. Diversity was calculated using nutritional approaches (and not ecological approaches). The following parameters were assessed: (i) numbers of consumed parts: a diversified, all household consuming at least three parts of the animal over the six distinguished by the study (flesh, viscera, head, tendons members, bones and skin); (ii) revenue source. So, any household consuming at least three recipes was considered as a household feeding on diversified meat recipes (high score of food kinds). The final diversity score was calculated by counting the number of recipe parts consumed as described in Table 2.

Statistical analysis

Raw data were entered into the Minitab English version17 (UK). Logistic regression analyses were calculated to identify factors likely influencing the prevalence of the diversity of meat recipes in Bagira health zone.

3. RESULTS AND DISCUSSION

Types of animals and parts consumed by respondents

Respondents consumed beef recipes (70%), goat/pig recipes (20%) and sheep recipes (5%). Overall, the flesh, guts, tendon and bones were the frequently consumed animal parts. Preferred animal parts varied from a type of animal to the other one. There were some variations in the consumption of pig and sheep meat recipes. The least consumed animal parts included the skin and head (Table 3).

Consumption of a variety of food recipes is a

practice largely influenced by individual and tribal differences and by culture. Historical-socio-cultural background traits influence significantly individual choices of a type of recipe to consume. Consumption patterns (at individual and household levels) may also influence the choice of the type of recipe to consume. Worldwide, household characteristics are reported to significantly influence the choice and diversity of recipes consumed by an individual (FAO, 2009; Ofouémé-Berton, 1993; Noreen, 2005; WFP, 2005). Similarly, household characteristics were found to be key drivers (determinants) in the prevalence of the diversity of meat recipes at Bagira health zone. According to Food Agriculture Organization, meat recipes are highly consumed in over 15 countries of the European Union. Hence, the highest diversity of meat recipes consumed around the world, is found in Europe (FAO, 2013; ECOM, 2006). In Europe, meat consumption is on average of about 83kg (beef), 16.5 kg (goat), and 2.2 kg (sheep meat) (Yonkeu, 2003; Poulain, 2002). However, worldwide, about 36.9% (pig), 28.5% (poultry), 22.3% (beef) of meat is consumed on a daily basis (Anon, 2016). In addition, consumption of pig meat is found to have a magnitude in developed countries following the new hygiene conditions favoring the consumption of white meat lower in cholesterol and purine acid (Hoek, 2003) for the lower risk of developing gout (Allard, 2011).

Also, in France, over the last two decades, beef meat price remained relatively high; consequently, consumers shifted their purchasing behavior from beef meat to pork and chicken meat, apparently with favorable price at the market (Laisney, 2012; Ofouémé-Berton, 1993; Bougler *et al.*, 2005a, b; Gibert *et al.*, 2001a). Other trends in meat consumption are published by Adjou-Moumouni (2006) for Benin; FEPOK (2008), Poulsen *et al.* (2009) and CEMAC (2011) for Congo-Brazzaville.

Table 3: Categories of meat consumed by types of animals studied

Animals	Cattle (380)		Goats (326)		Pigs (246)		Sheep (37)	
	N	%	n	%	n	%	n	%
Viscera	309	81.3	248	76.0	78	31.7	21	56.7
Flesh	368	96.8	310	95.0	232	94.3	37	100.0
Head	127	33.4	133	40.7	52	31.1	11	29.7
Tendon and bones	229	60.3	181	55.5	113	45.9	14	37.8
Skin	69	18.2	54	16.5	37	14.4	5	13.5

In this study, it a diversity of meat recipes was recorded in Bagira health zone. Seven recipes of viscera, sixteen recipes of flesh and four made from head, tendon of members (commonly called "Kinono"), bones and skin "Kikoba", were found being consumed by human communities from Bagira health zone. These recipes were regrouped into seven major types of meat recipes consumed in Bagira health zone.

Cooking methods of different types of meat recipes

Twenty-seven recipes of meat were found being consumed by the population of Bagira health zone: seven different types of recipes are made from viscera, sixteen from flesh parts and

four are generally made with head, tendon members, bones and animal skin. Out of the twenty seven, only seven types of meat recipes were frequently mentioned and acknowledged by all respondents. Cooking methods were varied, depending on the type of basic ingredients available to be mixed with when aiming at making the most desirable recipe. Meat fried in tomato sauce was the most frequently prepared kind of recipe (34% of respondents), followed by meat broth (23%) and meat broth with vegetables (22%). Less common meat recipe kinds included fried meat with vegetables, roasted or grilled, fried meat and steak (Table 4, Figure 2).

Table 4: Different types of meat recipes in Bagira health zone

Types recipes / Basic ingredients	Methods of cooking	N(=380)	%
1. Meat broth/ Meat, salt, onions, garlic, tomatoes, oil,	Slice the meat, rinse with water, dip the pieces into the pan, add the ingredients, then cover and bring to the fire.	88	23.15
2. Vegetable Bouillon/ Idem previous additions of ingredients more vegetables, powdered peanut	Proceed as the previous by adding vegetables and peanut powder.	84*	22.10
3. Meat fried in tomato sauce/ meat, salt, onions, garlic, tomatoes, oil	Slice the meat, wash the pieces, put the onions and salt and boil until tender it. Heat oil, immerse them meat and fry, add seasonings successively onions, tomatoes, cover and chill up to cooking. Or add condiments in oil before the meat and put it once we already have tomato sauce. Or fry without boiling.	131*	34.47
4. Meat fried/ Meat, salt, onions, oil	Cut; add spices, boil, and fry.	9	2.36
5. Meat Fried Vegetable/ Adding vegetables, peanuts	Proceed as the previous one and add the boiled vegetables before putting the water. Then peanut powder.	35	9.21
6. Roast or grill/ Meat salts onions, garlic, vinegar, oil	Wash the meat. Incise, marinate for 2 h at 8am. To roast adding oil to the current cooking. Or grill to high heat.	31	8.15
7. Steak/ meat, salt, onion, oil, margarine, garlic, leek, celery, lemon juice or vinegar	Wash meat, cut into volume choices, incision, put in a plastic utensil and flattened (Chevalier) allowing the meat to acquire a flattened shape. Add condiments chopped or shredded leaves and other spices. Confit, cover and rest more or less 4 hours. Heat oil, add margarine, frying meat.	2	0.52

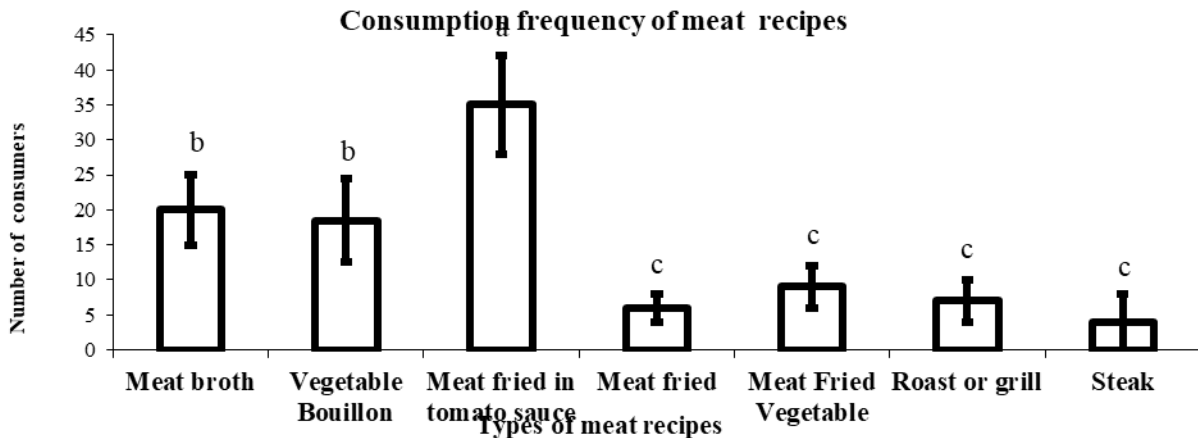


Figure 2: Consumption frequency variation with respect to types of meat recipes

When viscera is used, pre-boiled meat and broth recipe are the frequently demanded kind of recipes by consumers, followed by meat fried with onions and tomatoes. Flesh parts are frequently used to make fried and broth recipes. Spices are not frequently added to most organ and flesh based recipes. However, head, tendon, bone and skin based recipes are commonly spiced and frequently mixed with cassava leaves (called "Sombe" in local language).

In this study, a glut of meat recipes was found being produced and consumed by residents of Bagira health zone. The occurrence of the diversity of meat recipes is partly due to the fact cooks are willing to avail their cooking techniques to anyone free of charge. Hence, people learn new and classical cooking methods freely generation to generations. Eating behaviors are subjected to arbitrary cultural traits. In fact, nutritional and dietary factors appear to be some of the key identity components likely influencing food choices (Marie-Joëlle, 2009). In addition, Pillarella (2006) indicated that the family is the primary place of learning food cooking (culinary) practices across the childhood.

Results from this study indicated that meat is considered as a luxury food item, particularly during festive events. Hence, meat is frequently prepared into various kinds of recipes that are kept and served separately to guests of a given party. In urban areas, grill and roast recipe sare common meat recipes found served during

parties. These grill and roast recipes are prepared with special condiments to make them very tasty. Hence, gastronomic practices vary in response to specific needs and wants of consumers. Cooks are continuously learning and inventing new kind of recipes to satisfy different eating desires of different people from the community of Bagira health Zone.

During the current study survey, it was observed that all respondents knew too many kind of meat dishes (that are native to their villages of origin) even within one community (tribe). Hence, the number of new different kinds of dishes was discovered from even villages separated by even 5-20km only. For example, broth rancid cooked with palm oil (commonly known as "Male") was frequently found associated with members of the Bashi tribe (15% of respondents); broth rancid cooked with palm oil and peanut flour, or soy or sunflowers, was frequently associated with members of the Bahavu tribes (2.9%), the broth recipe cooked in mixture with peanut or soy and/or sunflower and tomato was frequently found being strongly associated with people from Lega and Batembo tribes. The meat broth prepared with tomatoes and onions was found to be consumed by all respondents from all cultural backgrounds and tribes.

Meat recipes are consumed most frequently in the company of food such as fufu (100%), bananas (22.4%), rice (19%), potatoes (56%) and potato fries (16.8%). Special recipes making is a very laborious and delicate work,

but women make efforts to satisfy their customs in order to gain their confidence. The culinary practices for making different kinds of recipes are an artefact of dietary practices known and transmitted culturally from a generation to another.

General characteristics of the population studied

The majority of respondents were aged between 20 and 34 years. Most respondents were catholic by religion. The household size of most respondent was of above 6 individuals. The average monthly income was of about 100US\$. The dominant tribe was the “Bashi”. Most respondents have an experience of about 2 years in recipes making (Table 5a, b).

Table 5a: Sociodemographic, economic and cultural characteristics of the population studied.

Characteristics	N=380	%
<i>Age group (years)</i>		
Less than 34	286	75.2
35 and more	94	24.7
<i>Gender</i>		
Male	44	11.6
Female	336	88.4
<i>Religion</i>		
Catholic	222	58.4
Protestant	158	41.5
<i>Civil status</i>		
Married	278	73.2
Single	102	26.8
<i>Household size</i>		
< 6	141	37.1
≥ 6	239	62.9
<i>Study level</i>		
Literati	255	67.1
Illiterate	125	32.9
<i>Seniority in the middle</i>		
≤ one year	50	13.2
≥ two years	330	86.8

Table 5b: (Concluded)

Characteristics	N=380	%
<i>Professional occupation</i>		
Official	41	10.8
Student	56	14.7
Trader	25	6.6
small business	100	26.3
Without/household	162	42.6
<i>Monthly income in US \$</i>		
Less than 50	46	12.1
50-100	107	28.1
Over 100	227	59.7
<i>Tribes</i>		
Bashi	251	66.0
Batembo	14	3.6
Bahavu	44	11.5
Lega	29	7.6
Others*	42	11.0

*Others (effective): Bembe (6), Fuliru (4), Kasai (3), Bangu (3), Banyanga (1) Basimba (1), Bakongo (2), Luba (1), Nande (6) Hema (2), Kusu (2) Songe (2), Kongolo (1) Do not know (8).

This seniority in the middle was of paramount importance in explaining the prevalence of diverse meat recipes. In fact, people who have lived for a while in a given urban area, ended by adopting new food behaviors (eating habits) from other people from different tribes. This process is called dietary acculturation by Pillallera (2006).

Recent migrant people from West Africa, have difficulties to integrate their new homestead. In fact, they tend to continue their original food and cultural practices, yet people living in this city since long time are said to be associated with hybrid food cultural practices from all over the world. Even after over staying in Canada, they remained too much attached to their original culinary diversity of meat recipes and other eating habits (Pillallera, 2006). It was also found that meat recipes preparation methods were closely linked with age of the respondent. Hence broth mixed with vegetables and roasting was practiced by women of different ages. Roasting was more associated

with young women while broth mixed with vegetables was more associated with mature women who have overstayed in the study zone. Such food practices are also found in and central Africa (Benin, Congo-Brazzaville, Nigeria) (Ansoms and Marivoet, 2010; Alouma, 2007; UNDP, 2008).

Determinants of the diversity of meat recipes

Several variables (education level, household size, monthly household income and the number of years of residency in the area) were found likely determining the diversity of meat recipes consumed in Bagira Health zone. However, logistic regression models indicated that the high level of education (ORa: 2.0; 95% CI: 1.29 to 3.22), the small size of the household (ORa: 1.6; CI 95%:1.04 to 2.46) and the number of years spent living in the area (ORa: 2.6; 95% CI: 1.39 to 4.96) were the most significant (P=0.002) factors (drivers) likely being associated with the prevalence of diversity of meat recipes (Table 6).

Table 6: Characteristics of respondents isolated associated with the diversity of meat recipes

Determinants	N=380	% Diversity	Crude OR (95% CI)	p-value	*ORa (95% CI)	p-value
<i>Study level</i>						
Lettrisme	255	64.3	1.9 (1.26 to 3.01)	0.002	2.0 (1.29 to 3.22)	0.002
Illiteracy	125	48.0	1			
<i>Length of residence</i>						
≥ 2 years	330	62.1	2.6 (1.44 to 4.93)	0.001	2.6 (1.39 to 4.96)	0.002
<2 years	50	38.0	1			
<i>Family size</i>						
<6	191	53.4	0.6 (0.41 to 0.95)	0.027	1.6 (1.04 to 2.46)	0.031
≥ 6	189	64.6	1			
<i>Monthly income in dollars (US \$)</i>						
<100	223	54.7	1			0.072
100-200	101	59.4	1.2 (0.75 to 2.01)	0.429		
> 200	56	75.0	2.4 (1.23 to 5.08)	0.005	1.8 (0.94 to 3.57)	

*ORa: Odds ratio adjusted

In fact, generally the regression models revealed that socio-demographic, economic and cultural characteristics of the population (household with small number of individuals, high level of education, the number of years lived in the area or seniority in the medium) were identified to be significant ($P < 0.05$) positive determinants of the diversity of meat recipes found in Bagira health area. Noreen (2005) addressing this thematic, found the coexistence of various determinants of healthy eating among native peoples in Canada. In addition, he found that young female people (<34 years) were more involved in healthy eating and cooking than other human being groups.

These results corroborate observations previously recorded in Kinshasa (DRC) by UNICEF (2002), USAID (2012), and WFP (2008). The high frequency of women in gastronomic initiatives may be explained by the fact that they are more involved in housework than men. In addition, worldwide, there are more female children being born on daily basis than male children (UNICEF, 2002). Also, female children are more permanent at home (mostly in kitchen watching carefully whatever their parents are doing). In addition, old women in the kitchen are mostly thinking on how to make delicious meals to keep and attract their spouses. In this study, it was found that respondents from households with a small number of people (household average size of less than 6 individuals) were more associate with making more different kinds of meat recipes. Similar findings are reported elsewhere by other studies (USAID, 2012; Muteba, 2014). Also, the higher level of education was found to be positively associated with the diversity of recipes found in Bagira health zone. Family with members having a low level of illiteracy rate were likely learning new innovative strategies and technologies for making new recipes, as it has been reported by other authors WFP (2008), Ansoms and Marivoet (2010), Muteba (2014).

Overall, the education level was found to be one of the key determinants of food

consumption (diversity of recipe consumption) because members of educated families were assumed to be more exposed and likely copying extra cultural gastronomic knowledge. In this study, it was also found that the level of monthly income was linked to the diversity of recipes. Also Pillarella (2006) and other authors Marie-Joëlle (2009), Ansoms and Marivoet (2010), Hubert (1991), UNDP (1998) indicated that food choices and the consumption of diverse food recipes were linked to the level of income in that richer families were ready to consume more expensive/delicious meals and diverse kind of recipes than less resourced families, as it has been highlighted by previous workers (Ministry of Planning/DRC Government, 2015; Poulain, 2002; Ansoms and Marivoet, 2010; Alouma, 2007; UNDP, 2008). The key implication of this study is that information gathered in this gastronomic study can be easily used when advising the public on how to make right choices over a diversity of meat types that can be found at local market. Good choice of food type to consume is critical to keep healthy. Using invaluable information developed in this study, the public should be educated on how to make affordable, healthy (nutritious) meet recipe choice rather than consuming any kind of meat recipe that may be poor in nutrient contents. The key limitation in this study was the inability to conduct chemical analysis so that the nutritional value/composition of each type of meat recipe is established. The key weakness of this work was the inability to be able to link the current prevalence level of metabolic diseases in the study area with frequency of consumption of certain meat types.

It is therefore recommended that in the future, researchers should assess nutritional value of all kind of meat recipes found in Bagira as well establishing linkages with health outcomes of consumers.

The significance of this research work is that this study is the first of its kind in South-Kivu province, trying to highlight that the diversity of meat recipes, but also trying to bring to raise the conscious of the public that not all meat

recipes being promoted/consumed are healthy/nutritious. The abusive consumption of some food recipes may be associated with high prevalence of metabolic diseases in eastern DR Congo.

The novelty aspect of this work was to collect information that can be used to increase the awareness of the public about the nutritional value of meat recipes so that people can make wise/ rational decisions in the choice of what to consume.

The information generated in this study may be used by medical officers to explore in details the linkage between rising prevalence of metabolic diseases and food habits, especially in urban settings.

4. CONCLUSION

In the current study, it was hypothesized that the population of Bagira health zone was culturally heterogeneous in terms of meat based recipe consumption and cooking. It was subsidiary assumed that the diversity of meat recipes may be related to social, demographic, economic and cultural characteristics of households. The hypotheses were confirmed according to the findings.

Beef based recipes were mostly consumed by most respondents interviewed. The animal flesh was the category mostly consumed across all kind of animals eaten and locally available. There were seven meat recipes frequently consumed or prepared by respondents.

Logistic regression analyses indicated some significant ($P=0.002$) associations between the variety of meat recipes and some socio-economic characteristics of respondents (level of education, monthly household income, age, seniority in the area).

Cultural background was the key driver (determinant) identified to be strongly linked to the variety of meat recipes found prepared/consumed by residents of Bagira health zone.

Based on these few findings, it is likely that such information may be used when developing new strategies to improve the

nutritional status of the population by making everyone in the community aware of the existence of diverse food recipes. In the future innovative investigations should be carried out to determine nutritional quality of these different recipes. It should be interesting to assess nutrient intakes from these different recipes made from animal meats. Such information may help to correct and adjust nutritional practices of the population with regards to recommendations by the World Health Organization and the World Food Programme about minimum amount of animal protein to be consumed on a daily basis. There is a need to conduct comprehensive assessment of determinants of the diversity of other food recipes from different cultural background within DR Congo in order to identify which ones can be used in the formulation of special diets (therapeutic diets for some kinds of patients administered in hospitals) for the population of Bukavu town, South-Kivu province in eastern DR Congo. The conservation of this recipe food richness is very essential for future generations. Hence, the importance of carrying detailed analyses about the nutritional qualities of diverse food recipes, promote some of them, industrially commercialize some of them, even at the international level while discouraging those recipes that are of less nutritional value to human beings interested in consuming these recipes. In brief, promoting only healthy/nutritious food recipes that are designed based on either traditional/local or modern/imported cultural background is vital.

Authors' contributions

This work was carried out in collaboration between all authors. Authors Nabintu T.F. and Wimba K.L. designed the study, wrote the protocol and interpreted the data and produced the initial draft. Authors Ombeni J.B., Mbaka J-M. and Munyuli B.M.T. conducted the field study, gathered the initial data and performed preliminary data analysis. All authors read and approved the final manuscript.

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