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**FACTORS INFLUENCING HUNTING AND CONSUMPTION OF RODENTS BY
CHILDREN IN THE LASSA FEVER ENDEMIC AREA OF FARANAH IN GUINEA**

By

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DECLARATION

I do hereby declare that apart from people's knowledge that have been duly acknowledged, this thesis is the result of my hard work under competent supervision.

I take full responsibility for any shortcomings in this work.

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DATE

DEDICATION

I dedicate this research to my father, Mr Soka DOUNO and my mother, Mrs Fatoumata KEITA for their constant support and encouragement, as well as their faith in my endeavours.

I pray to God that He keeps them healthy for long with us!

This work is also dedicated to my wife Dr Gnèpou Ivette MAMY, and my children Marie-Jeanne Soka DOUNO and Mamadi Soka DOUNO for their constant support and love, and their invaluable endurance during my absence for this programme. May Allah grant our humble family a long life in health and happiness!

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ABSTRACT

Background: Lassa fever (LF) is one of the most threatening viral diseases in West-Africa. It is a zoonotic disease which is transmitted to humans by the contact with an infected multimammate mice (*Mastomys natalensis*) which is known as the main animal reservoir of the disease. The main route of the primary transmission (rodent to human) is the contact with food or household items contaminated with rodent urine or faeces. Furthermore, human behaviours such as rodents hunting and consumption has been reported as a risk factor of primary transmission of LF in certain endemic countries. The aim of this study was to explore factors that influence rodents hunting and consumption by children in the endemic area of LF of Faranah in Guinea.

Methods: a qualitative approach using an ethnographic methods was employed to carry out this study. Participant observations in children's hunting expeditions and informal discussions with community members were first done, and then ten (10) IDIs with adults and four (4) FGDs with children were also conducted in two (2) of the six (6) villages where LAROCS Project is conducting research on LF in Faranah (Guinea). The data collected was transcribed and coded using QSR NVivo 12 software for thematic analysis.

Results: the main factors that influence children to hunt and consume rodents were the scarcity of meat in the family meal, the generational culture, the source of income for children, the non-occupation of children during the dry season, and crop protection in the fields. From the capture of rodents (including *M. natalensis*) to its preparation for consumption, children undertake all kinds of manipulation, putting them into direct contact with the biological liquids of the animals, and then exposing them to the risk of primary transmission of LASV.

Conclusion: it is obvious that children are in direct contact with *M. natalensis* in these villages through hunting during dry season; therefore, community-based actions considering these rodent hunting motivating factors should be taken and behaviour change communication should be urgently done to stop this practice which constitute a huge risk of a potential outbreak of LF epidemic in these area.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
ABSTRACT	v
TABLE OF CONTENTS.....	vi
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS AND ACRONYMS	x
CHAPTER ONE.....	1
INTRODUCTION.....	1
1.1. Background.....	1
1.2. Problem statement	3
1.3. Research questions	5
1.4. Objectives	5
1.4.1. General Objective	5
1.4.2. Specific objectives	5
1.5. Significance of the study	5
1.6. Conceptual framework	6
1.6.1. Narrative of the framework.....	8
CHAPTER TWO.....	9
LITERATURE REVIEW.....	9
2.1. Introduction to Lassa fever (LF).....	9
2.2. Historical account of LF.....	9
2.3. Epidemiology of LF.....	9
2.4. The reservoir/host of LASV	11
2.5. Transmission of LF.....	12
2.5.1. Rodents-to-human (primary transmission)	12
2.5.2. Human-to-human (secondary transmission).....	12
2.6. Pathogenesis of LF	13
2.7. Clinical presentations of LF	13
2.8. Complications of LF.....	14
2.9. Treatment.....	15
2.10. Prevention and control.....	15
2.10.1. The individual	16
2.10.2. The community	16

2.10.3. Vaccine	16
2.11. Rodent hunting and consumption in the context of LF endemicity	17
CHAPTER THREE	19
METHODOLOGY.....	19
3.1 Introduction	19
3.2. Study site	19
3.2.1 General setting	19
3.2.2 Specific setting.....	20
3.3. Study design	25
3.4. Study population and sampling	25
3.5. Data collection tools and technique.....	26
3.5.1. Participant observations	26
3.5.2. Informal discussions	27
3.5.3. In-Depth Interviews	27
3.5.4. Focus Group Discussions.....	27
3.6. Data processing and analysis	28
3.7. Establishing Trustworthiness.....	29
3.8. Ethical considerations.....	30
CHAPTER FOUR.....	31
RESULTS.....	31
4.1. Introduction	31
4.2. Sociodemographic characteristics of participants	31
4.3. Knowledge on Lassa fever	32
4.4. Knowledge on animals that can transmit a disease and hunted by children.....	33
4.4.1. Utilization of animals as medicine.....	39
4.4.2. Risks known by participants regarding rodent hunting by children	40
4.4.3. Roles of parents to prevent these risks.....	43
4.4.4. Precautions to be taken by children to avoid risks.....	44
4.5. Factors motivating the hunting and consumption of rodents by children	46
4.5.1. Nutritional reasons: scarcity of meat in the family meal	46
4.5.1.1. Poverty	48
4.5.1.2. Inexistent of butchery in the villages	49
4.5.1.3. Children’s contribution in searching meat for the family	52
4.5.2. Cultural reasons	54
4.5.2.1. Childhood and boyish identity	57

4.5.2.2. Childhood stubbornness	58
4.5.3. Rodent hunting as a source of income for children	59
4.5.5. Non-occupation of children during the dry season	60
4.5.4. Crop protection on the farms.....	61
4.6. Rodent handling practices by children	62
4.6.1. Places and techniques for rodent hunting	62
4.6.2. Animals frequently hunted and captured by children	69
4.6.3. Prey’s sharing and cooking practices.....	71
4.7. Summary of the results	73
CHAPTER FIVE.....	75
DISCUSSION	75
5.1. Introduction	75
5.2. Knowledge about Lassa fever and animals that can transmit disease to humans.....	75
5.3. Factors motivating rodent hunting and consumption	80
5.4. Rodent handling practices	84
5.5. Risk of primary transmission of Lassa fever	84
5.6. Limitations of the study	85
CHAPTER SIX.....	87
CONCLUSION AND RECOMMENDATIONS.....	87
6.1. Conclusion.....	87
6.2. Recommendations	88
REFERENCES	90
APPENDICES	98
1. Information sheet.....	98
2. Consent form.....	99
3. Interview guide.....	100
3.1. Interview guide for IDIs with adults.....	100
3.2. Interview guide for FGDs with children.....	102
4. Mastomys natalensis, the vector of LASV	104
5. Key identification for small mammals in Guinea	105
6. Pictures from participant observations on the fields	110

LIST OF FIGURES

Figure 1	Conceptual framework	7
Figure 2	Lassa fever risk map in West Africa	11
Figure 3	Study sites location relative to Faranah	24
Figure 4	Influencing factors of rodent hunting and consumption by children in the study villages	74

LIST OF ABBREVIATIONS AND ACRONYMS

BSL4	Biosafety Level 4
CDC	Centres for Disease Control and prevention
CHWs	Community Health Workers
DNA	Deoxyribonucleic Acid
FGDs	Focus Group Discussion
HF	Haemorrhagic Fevers
IDs	Informal Discussions
IDIs	In-Depth Interviews
INS	Institut National des Statistiques (National Institute of Statistics)
LF	Lassa Fever
LAROCS	Lassa fever in Guinea and Sierra Leone: rodent control and seasonality of human exposure to rodents
LASV	Lassa Virus
MERS	Middle East Respiratory Syndrome
PCR	Polymerase Chain Reaction
RNA	Ribonucleic Acid
SARS	Severe Acute Respiratory Syndrome
SPH	School of Public Health
SOBS	Social and Behavioural Sciences
UG	University of Ghana
VHF	Viral Haemorrhagic Fevers
WHO	World Health Organisation

CHAPTER ONE

INTRODUCTION

1.1. Background

Lassa fever (LF) is one of the most threatening viral diseases in West-Africa (Fichet-Calvet et al, 2009), where it affects about 300,000 people in the region and causes 5,000 to 10,000 deaths annually (WHO, 2005) . Richmond & Baglolle (2003) reported that in Guinea, Nigeria and Sierra Leone (some of the endemic countries), about 59 million people might be at risk of LF, with three million new cases every year, up to 67,000 deaths, and three million reinfections. However, other neighbouring countries such as Mali, Ghana, Côte d'Ivoire, Burkina Faso, Togo and Benin are also at risk (CDC, 2015). Beyond the endemic area, cases have been also reported within travellers in Britain, the Netherlands and Germany (Richmond et al., 2002). The disease is caused by a virus belonging to the *Arenaviridae* family, called Lassa Virus (LASV) (Richmond & Baglolle 2003), which has been detected for the first time in Nigeria in 1969 (Buckley et al., 1970).

Lassa fever is a zoonotic disease which is transmitted to humans by the contact with an infected multimammate rat (*Mastomys natalensis*) which is known as the main animal reservoir of the virus (Lecompte et al., 2006). Although, other species of rodents have been discovered to be a new reservoir (Olayemi et al., 2016). The main route of the primary transmission (rodent to human) is the contact with food or household items contaminated with rodent urine or faeces (WHO, 2016). Furthermore, human behaviours which maintain residents of rural areas in contact with these rodents have been reported in certain endemic countries. For instance in Nigeria (where frequent epidemics occurred), and in Sierra Leone and Guinea, rodents hunting and consumption has been reported as a risk factor of primary transmission of LF (Bonwitt et al., 2016; Mofolorunsho, 2016; Ter Meulen et al., 1996).

These hunting activities are mainly described as boys' activities in some villages in Sierra Leone (Bonwitt et al., 2016).

According to Fichet-Calvet et al., (2010), *Mastomys natalensis* represents more than 95% of rodent's community found in the houses in rural villages of Faranah in Upper Guinea. The proportion of *Mastomys natalensis* infected with LASV in Guinea was found to be 11.3%, with a variation from 0% in low endemic zones to up to 32.1% in high endemic zones (Lecompte et al., 2006). In the same region where the endemicity is high, rodents are mainly concentrated in houses and proximal cultivation sites, with relative abundance and seroprevalence varying seasonally (Fichet-Calvet et al., 2007). Trapping success was two times higher in homes and ten times lower in proximal cultivation sites during the dry season (November - April) compared to the rainy season. This effect could be driven by the periodicity of human agricultural activities, which include fields burning for new farms, swamps cleaning and crops storage in the houses at the beginning of dry season. Consequently, fields burning destroys *Mastomys natalensis* habitats in the field, and push them to find safe places in human houses, while crops stored in the houses attract them indoors where they set up their new habitats. Therefore, LF incidence in humans is reportedly highest in the dry season because of human cohabitation with rodents indoors (McCormick et al.1987), leading to the possibly infective contact. This further might implicate contact with rodents in the household as a key mode of transmission.

Beyond indoors contact, rodents' migration between houses and proximate fields has been notified by Mariën et al., (2018) in Faranah villages. In their study, they found that 11% of *M. natalensis* easily moves between houses and proximate fields.

Participation of children in hunting activities has been also reported by Bonwitt et al. in Sierra Leone. They found out in their study that catching wild animals forms part of the domestic

responsibilities of children in a household, and that it is believed in rural communities that a boy who has never caught an animal is considered to be lazy (Bonwitt, et al., 2017).

In such an endemic area, better understanding of factors influencing rodents' consumption by children is important to define better interventions for behavioural changes needed in these rural communities to break the primary transmission chain of the disease.

1.2. Problem statement

Viral Hemorrhagic Fevers (VHF) in general remain an entire public health problem in some part of the world. Lassa fever is one of these diseases which is an important public health concern in rural areas in West-Africa.

According to WHO, (2012), the risk of LF transmission is higher in rural areas where about 80% of *Mastomys natalensis* found in the houses are infected in endemic zones (Adebayo et al., 2015; WHO, 2012). Furthermore, human behaviours have been also reported as risky practices in these endemic areas (Akoua-Koffi et al., 2006; Bonwitt et al., 2016). For instance, in Nigeria where LF outbreaks frequently occur (Mofolorunsho, 2016; Mustapha, 2017), rodents' consumption has been reported as one of human behaviours that favour the primary transmission of LASV (Tobin et al., 2015).

In Guinea where people live predominantly in rural milieu (INS, Guinée, 2017) and could be at risk of LF primary transmission, Ribavirin which actually constitute the sole treatment at the earlier stage of the disease is not available in public hospitals, and there are only two laboratories where LASV test can be done (Conakry the capital city, and Kindia, another city located at about 300 km from Faranah). This reality shows how weak the health system is in a context of high endemicity of LASV. In fact, previous researches on Lassa fever and its reservoir reported human seroprevalence in different regions of the country (Lukashevich et al., 1993; Ter Meulen et al., 1996; Townsend et al., 2014).

In a previous study in Faranah, rodent populations were sampled in houses in the dry season along transects through the villages to assess their abundance (Fichet-Calvet et al., 2007). Then, the nature of contacts between rodents and people in their houses has been widely explored: rodents eat their food and destroy their belongings, make noise at night and bite their fingers when they sleep, the close cohabitation and the inability to take rodents away from the domestic space have been reported (Kelly & Sáez, 2018).

Although, knowing that in rural communities in West-Africa, children are widely involved in rodents hunting activities as a step of their life (Bonwitt et al., 2017), no study has been done about their rodents hunting and consumption behaviours in this endemic area of Guinea, whilst that could constitute another key mode of primary transmission of LF to human beings. The proof is that 11% of *Mastomys natalensis* (the main reservoir of LASV) migrate between houses and proximate cultivation fields (Mariën et al., 2018) where small children usually go to hunt during dry season; hence it was worthy to identify children rodents handling practices that might put them at increased risk of LF infection, and also explore the underlying factors that motivate them to hunt and consume rodents in the endemic area of Faranah in Guinea.

1.3. Research questions

1. What is the knowledge of children and their parents on Lassa fever infection in Faranah villages?
2. What are the factors that motivate children to hunt and consume rodents in Faranah villages?
3. What are the rodents handling practices among children in Faranah villages?

1.4. Objectives

1.4.1. General Objective

To explore factors that influence rodents' hunting and consumption by children in Lassa fever endemic area of Faranah in Guinea.

1.4.2. Specific objectives

- 1- To assess the knowledge of children aged 6 to 15 years old and their parents on symptoms, transmission modes and vectors of Lassa fever infection in Faranah villages;
- 2- To identify factors that motivate children to hunt and consume rodents in Faranah villages;
- 3- To identify rodents handling practices of children in Faranah villages.

1.5. Significance of the study

This study aimed at exploring factors that influence rodents' hunting and consumption by children in Lassa fever endemic area of Faranah in Guinea.

It is a complementary study to LAROCS Project's previous works in the same area that have already shown the abundance of rodents in houses and the nature of contact people have with them. Therefore, this study will provide new information about how and why this specific

group of people (children) in this endemic area are exposed to LASV primary transmission beyond houses (in the hunting/cultivation fields). That will provide a better understanding of the main reasons (factors) which are still driving children to rodents' hunting and consumption despite the awareness given by LAROCS Project team during its rodents' control activities in these communities. The findings will then allow us to define better interventions including children for the behavioural changes needed in relation to Lassa fever prevention within these communities. This could include finding other alternatives to rodents hunting and consumption by children in these villages.

Furthermore, this study will be of an immense value for community based projects which intend to implement measurements for controlling Lassa fever infection within rural communities in the endemic countries in West-Africa in general, and specifically for Guinean government and its Ministry of Health which can define an effective surveillance programme based on community members' understandings of the disease. Other Ministries such as Economics, Agriculture, and Education could also define programmes for reducing poverty in rural milieu, food security and children schooling, which could prevent them to involve in hunting activities.

Finally, this study will serve as a resource material for future researchers who might wish to undertake a similar or the same study with some other focus.

1.6. Conceptual framework

Rodents hunting and consumption is an activity that children practice during the dry season in these villages of Faranah. Therefore, this activity might be influenced by certain factors and it results in rodent handling by children which can put them at risk of LASV primary transmission to humans (contact rodent – human). The following schema illustrates these

factors that put children at risk of LF through hunting practice in this endemic area of Faranah.

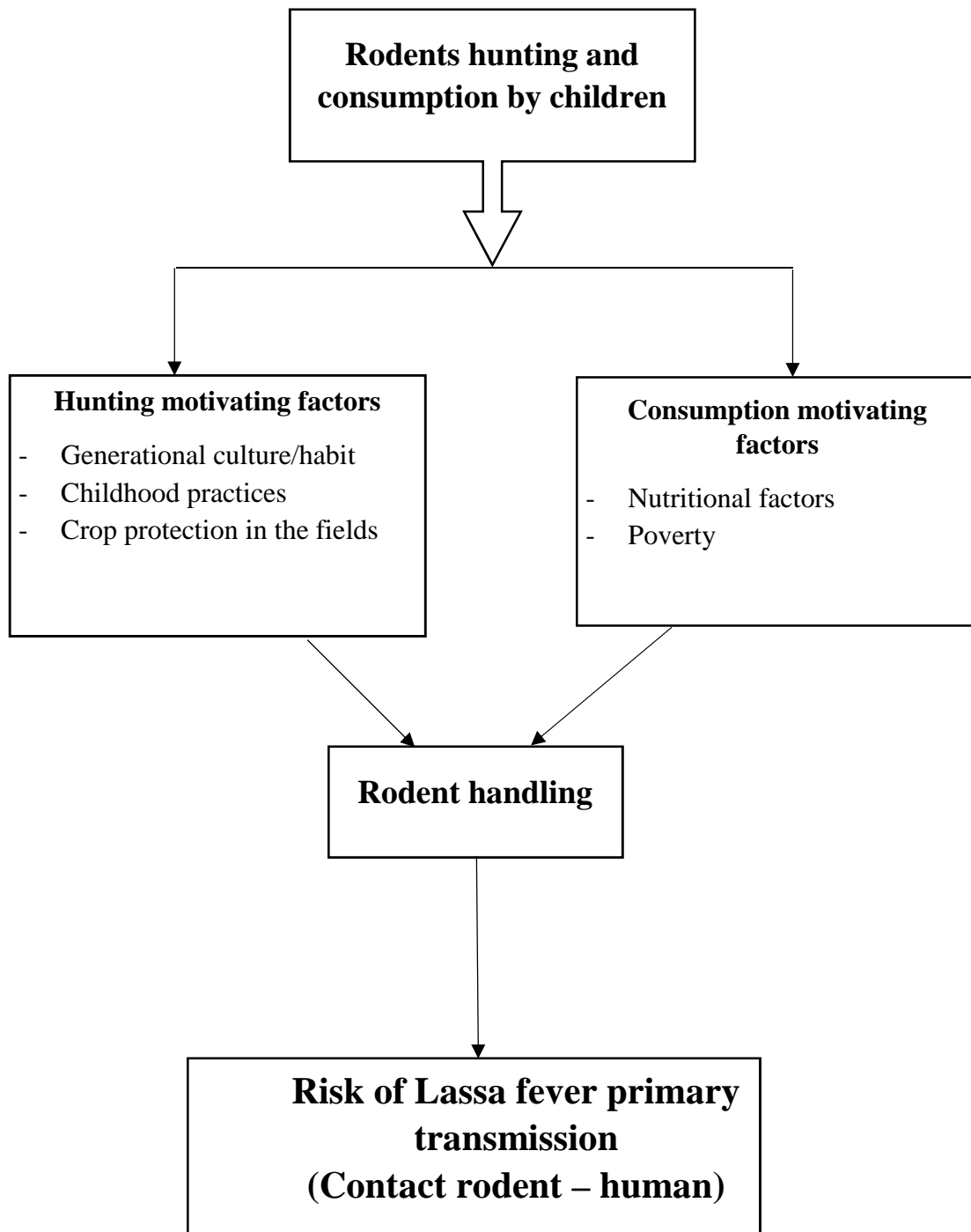


Figure 1: Mechanism of children involvement in rodents hunting and consumption in rural areas.

1.6.1. Narrative of the framework

This conceptual framework points out factors that motivate children to hunt and consume rodents, and then might expose them to Lassa fever primary transmission.

Commonly, in rural milieu in West-Africa, children are often involved in rodents hunting activities at their earlier age (Bonwitt et al., 2017). During the dry season, boys in these villages involve in digging burrows in the bush including old farms (fallow lands) and in proximal swamps to the villages to capture rats and mice they roast and grill to eat. This hunting activity which results in rodents handling and consumption, might be influenced by certain factors in rural communities. Ranging from nutritional to cultural factors (Bonwitt et al., 2016; Friant et al., 2015), many reasons can interact and result in rodent hunting practice in these rural settings.

Overall, hunting is known as a risky practice of zoonotic diseases which represent at least 60% of all human diseases (Taylor et al., 2001), and mammals are considered to be the main host reservoirs of most human zoonotic diseases (Cleaveland et al., 2001; Wolfe et al., 2007). Therefore, knowing that LASV is hosted by a multimammate rodent (*Mastomys natalensis*), when children involve in rodents hunting and consumption, they could be at an increased risk of getting primarily infected with LASV.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction to Lassa fever (LF)

Infection with LASV, a species of the Arenaviridae, results in a spectrum of illness from unapparent infection to LF, a severe multisystem disease that often has hemorrhagic manifestations (Robinson et al., 2016). Its initial clinical manifestations are difficult to differentiate from those of other common febrile illnesses, such as malaria, and a high index of clinical suspicion is required in the diagnosis (Akhuemokhan et al., 2017).

2.2. Historical account of LF

Lassa fever was first described in West Africa in the 1950s but the virus responsible for the disease was not identified until 1969 (Buckley & Casals, 1970) when two missionary nurses died in Nigeria, West Africa, and the cause of their illness was found to be LASV, named after the town in Nigeria where the first cases were isolated (Frame et al., 1970).. The nurse presumably acquired infection from an obstetrical patient residing in Lassa. She died approximately one week after the onset of symptoms. Subsequently, two more nurses that attended the first patient contracted the disease, which was later named Lassa fever and caused the death of one of them. Infectious virus was isolated from all three cases (Buckley, 1970).

2.3. Epidemiology of LF

LF accounts for an estimated 200,000 to 500,000 cases and 5000 deaths yearly in West Africa, particularly in Sierra Leone, Nigeria, Liberia and Republic of Guinea (WHO, 2005). Serological evidence of LF has also been found in Mali, Senegal and Central African Republic(Richmond & Baglolle, 2003). Severe and fatal disease may occur with all strains of

LASV, but, other than during the third trimester of pregnancy, in which maternal and fetal mortality are elevated, no prognostic indicators are known that would identify, prior to disease onset (Bausch et al., 2010).

The high seroprevalence for LASV specific antibodies in those Guinean (55%), Nigerian (21.3%) and Sierra Leonean (52%) populations tested indicates that most infections are mild or asymptomatic and do not require hospitalisation (Keenlyside et al., 1983; Lukashevich et al., 1993; McCormick et al., 1987; Tomori et al., 1988). This is supported by findings that more than 80% of persons who developed antibodies did not report a recent febrile illness (McCormick et al., 1987). LF is seen in both genders and all age groups (Grant et al., 2014). LF is commonly found in rural communities, where the over 70% and where poverty prevails and standards of living are low of the population resides. (E. Tobin et al., 2013).

The following map shows areas where LF outbreaks or high human seroprevalence have been reported from 1951 to 1989. This map draws the distribution of LF outbreaks and human seroprevalence relatively to the rainfall in these regions. It suggests that areas with between 1200 mm and 1500 mm of rainfall per year are at relatively low risk of LF; areas with above 1500 mm have a much higher risk and, finally, areas with in excess of 3000 mm of rainfall annually appear to be at zero risk (i.e. had no outbreaks of LF in that period), although these very high rainfall areas are not widespread (Fichet-Calvet & Rogers, 2009).

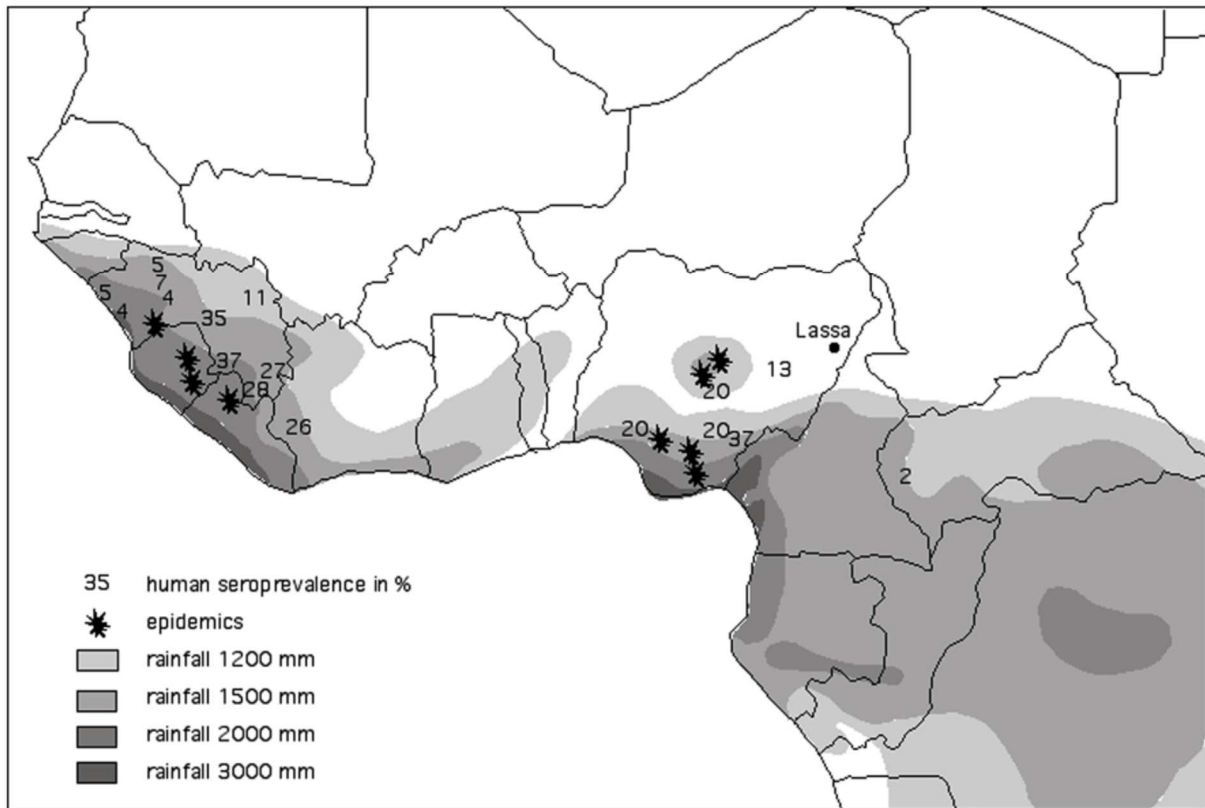


Figure 2: West and Central Africa mean annual rainfall (1951–1989 [28]), Lassa fever nosocomial outbreaks (stars) and human seroprevalence (numbers in %) (Fichet-Calvet & Rogers, 2009)

2.4. The reservoir/host of LASV

After the first outbreaks reported in Nigeria (Buckley & Casals 1970) and Sierra Leone (Fraser et al, 1974) in the seventies, the reservoir was identified in Sierra Leone, by isolating the virus in the multimammate rat, *M. natalensis* (see appendix 4), a species indigenous to Africa (Monath et al., 1974). This distribution of *M. natalensis* in West Africa is highly variable and in some areas, 50% of domestic rodents may be *M. Natalensis*. Since the rodents do not move far from their nest, and because LASV is transmitted vertically and horizontally in rodents, infection in local populations of rodents tends to cluster at village level (Fichet-Calvet et al., 2014; Ogoina, 2015).

2.5. Transmission of LF

There could be only two 2 modes of transmission: Rodent-to-human (the primary mode) and human-to-human (the secondary mode).

2.5.1. Rodents-to-human (primary transmission)

This could include the inhalation of aerosolized virus when women are sweeping rooms in the morning for example, the practices by staple food producers, which involve drying cassava flour (Gari) in the open air (Ogoina, 2015). The same practices are observed in rural villages in Guinea where rice, cassava and other grains are dried outside in the open air and in houses at night. This enables all types of rat including *M. natalensis* to contaminate the food with their excreta (Ogoina, 2015). Furthermore, the use of rat meat as a source of protein by people in some communities can also be another major way of primary transmission (Lukashevich, 2012). People can also get into direct contact with rodents' saliva and urine when these rodent lick and bite their fingers and feet, urinate on them from ceilings while they are sleeping during night (Bonwitt et al., 2017). It was also noticed during field work that people (women more often) get into direct contact with rodents' faeces that are often found in rice grains stored in the houses in the process of removing these faeces from the food.

2.5.2. Human-to-human (secondary transmission)

It essentially happens during direct contact with blood, tissue secretions or excretion of infected humans, and/or contaminated hospital equipment including reused needles in hospital settings (Ogoina, 2015),. The sexual contact with infected human is also pointed out and it is stated that the virus may be excreted in the urine of patient for 3-9 weeks from the onset of illness, and it can be transmitted via semen for up to 3 months (Richmond & Baglolle, 2003). Nosocomial transmission of LASV was well described during the outbreaks that occasioned the discovery of the virus more than 3 decades ago (Lo Iacono et al., 2015).

Transplacental transmission from infected mother to unborn child has been also reported to be associated with poor prognosis for mother and foetus (Ogoina, 2015).

2.6. Pathogenesis of LF

After inoculation, LASV replicated first in dendritic cells and other local tissues, with subsequent migration to regional lymph nodes and spread by lymph and blood monocytes to a wide range of Tissues and organs occurs. Thus, the pathogenesis of FL would mainly relate to the disruption of cellular function by the virus. And most often patients die without significant bleeding and histopathological lesions are generally not serious enough to explain the death (Grant et al., 2014).

The level of viremia is highly predictive of the disease outcome. In a study involving 137 patients with Lassa fever, patients that presented with viremia $< 10^3$ median tissue culture infectious dose (TCID₅₀)/ml on the day of hospitalization had 3.7 times greater chance of survival than those admitted with higher levels of viremia. Similarly, the probability of fatal outcome in patients with serum titers $> 10^3$ TCID₅₀/ml and serum levels of aspartate aminotransferase (AST) ≥ 150 international units (IU)/L was 21 times higher than that in patients not meeting either of these criteria (Yun et al., 2012). The humoral response often lags, with neutralizing antibodies typically appearing after recovery in survivors and not at all in most fatal cases (Khan et al., 2008).

2.7. Clinical presentations of LF

Lassa fever is highly variable disease with a broad range of manifestations and many degrees of severity. There are no firm clinical predictors or pathognomonic signs. Lassa fever presents at its early stage with symptoms and signs indistinguishable from those of other viral, bacterial or parasitic infections common in the tropics such as malaria, typhoid and other viral

haemorrhagic fevers (Tobin et al., 2013). Incubation periods range from 7 to 10 days, followed by a flu-like illness that lasts 2 to 3 days, with a progressive fever, chills, malaise, weakness, headache and myalgia in the back or the limbs (Fichet-Calvet, 2013). The pharynx may be erythemic or even exudative, a finding which has at times led to misdiagnosis of streptococcal pharyngitis. Gastrointestinal signs and symptoms occur early in the course of disease and may include nausea, vomiting, epigastric and abdominal pain and diarrhoea (Grant et al., 2014).

Clinically discernible haemorrhage is seen in fewer than 20% of cases and never in the first few days of illness. Hematemesis, melena, haematochezia, metrorrhagia, petechiae, epistaxis, and bleeding from the gums and venepuncture sites may develop, but haemoptysis and haematuria are infrequent. Severe LF appears to result from an insufficient immune response, with higher levels of viremia and lower anti- body titers in fatal cases relative to survivors (Fichet-Calvet, 2013).

2.8. Complications of LF

Clinical complications such as pleural and pericardial effusions, facial oedema, bleeding from mucosal surfaces, and neurological manifestations occur. Capillary lesions cause haemorrhage in the targeted organs of the stomach, small intestine, kidneys, lungs, and brain; and among the clinical signs, sore throat, vomiting, and bleeding are highly correlated with poor outcome, resulting in death after a mean period of 12 days after the onset of illness (Idemyor, 2010). Maternal mortality from LF is reported to be high in pregnant women compared with non-pregnant women, and this risk is significantly higher in the third trimester than the first two trimesters (Price et al, 1988).

2.9. Treatment of LF

Ribavirin, the antiviral drug is effective in the treatment of LF, but only if administered early in the course of illness. In a study of LF in Sierra Leone, it was observed that patients with a high risk of death who were treated for 10 days with intravenous ribavirin, begun within the first six days after the onset of fever, had a case- fatality rate of 5% (1 of 20) ($p = 0.002$), while patients whose treatment began seven or more days after the onset of fever had a case fatality rate of 26% (11 of 43) ($p = 0.01$). The study confirmed the efficacy of ribavirin in the treatment of LF and that it should be used at any point in the illness, as well as for post-exposure prophylaxis. Supportive treatment is often necessary and includes fluid replacement, blood transfusion, and administration of paracetamol, phylometadione, ringer lactate, haemacel, quinine and broad spectrum antibiotics (Yunusa et al., 2015).

2.10. Prevention and control of LF

One of the possible prevention of primary transmission of LASV to humans can be achieved by avoiding contact with *M. Natalensis* rodents, especially in endemic areas of the disease. Food should be kept away from rodents and premises that are constantly cleaned to prevent rodents from entering their homes. The illumination campaign against bush burn and the rat hunt for eating must be intensified in endemic areas. Trapping and the use of rat poisons are effective in trying to reduce rodent populations when conducted at community level (Saez, Haidara, Camara, & Fichet-calvet, 2018). However, storage of grains in modern silos will also help prevent contamination of the grain stored by infected rodents (Ogbu, 2014). Therefore, Ministry of Agriculture and NGOs working in this sector could be also involved for sensitising people about good ways of storing grains.

2.10.1. The individual level

The affected person should be admitted to a special centre for the treatment. Health care providers and close associates of the patient should wear protective clothing, masks and gloves. Excreta from affected persons should be properly disposed (Yunusa et al., 2015).

2.10.2. The community level

Animal husbandry and fisheries should be encouraged in order to provide alternative sources of first-class proteins for rat eaters. Regular and sustainable environmental sanitation is needed to prevent rat breeding (WHO, 2012). This could be done by regular health education in rural communities by NGOs involving community leaders and authorities. The public should be made aware of the mode of contact of LF and its high case fatality rate using print and electronic media. Community involvement and participation is necessary to provide sustainable LF control. Food vendors should be educated on the need to prevent food contamination with LF virus. Grains, flours and left-over foods should be adequately covered to prevent contamination by rats. Rodenticides should be used for the destruction of rats in homes, and development of LF vaccine should be facilitated. Regular seminars should be held for health-care providers on early diagnosis and treatment of LF, while diagnostic kits should be made available in district hospitals. Affected people should be referred early to the special centre in order to prevent or limit the evolution of the disease (CDC, 2015).

2.10.3. Vaccine

Lassa virus (LASV) testing is limited to BSL-4 facilities, which are scarce and inconvenient. Genetic diversity among LASV strains requires vaccine candidates to induce a broad cross-protective immunity. Several vaccine candidates showed protection against LF in animal models. However, only ML29 conferred sterilizing immunity with broad pre- and post-exposure protection and no adverse events in healthy or immuno-compromised animals (Zapata et al., 2015).

2.11. Rodent hunting and consumption in the context of LF endemicity

Hunting and consumption of wildlife by humans is an ancient practice that has been incriminated in zoonotic disease transmission (Wolfe et al., 2005). More specifically, rodent hunting or capturing and consumption have been reported in Southeast Asian where more than 80% of the participants to a study by Suwannarong et al., (2015) reported having hunting or capturing rat/mice, and more than 70% stated that they had prepared rodents in the year preceding the study. Further on, rodents hunting and consumption have been documented by Isaacson, (1975) in Southern Africa as she reported that “children and adults commonly hunt and catch small rodents, which are then roasted, often incompletely, and eaten. Almost invariably, *Praomys (Mastomys) natalensis* urinates when frightened and contaminates the hands of the person handling it. In view of the known persistence of the Lassa virus in urine, this tendency may play a role in the transmission of the disease to man”.

Other studies on bush meat reported that large rodents are hunted and consumed in Western and Central Africa (Dufour et al., 2013; Rivers et al., 2006). In Nigeria for instance, 95% of respondents among hunting communities who participated in a study of Friant et al., (2015) reported that they had previously hunted rodents. Furthermore, frequent consumption of grass cutter (*Thryonomys swinderianus*) and the giant rat (*Cricetomys gambianus*) during the “hunger period” has been documented in Sierra Leone (Brown & Davies, 2007), while hunting and consumption of all species of rodents except shrews have been reported in the study by Bonwitt et al., (2016) in the same country. This study also underlined rodent manipulation practices which consist of singing over fire, eviscerating, butchering and preparing (roasting, grilling and/or stewing) to eat. At each stage of the manipulation, people remain exposed to the biological fluids of these animals such as urine and blood.

In Guinea, Ter Meulen et al., (1996) reported rodent consumption as a possible risk factor of LASV transmission to humans. In this study, although there was no significant association

between rodent consumption and LASV antibodies (OR= 2.2; $p=0.1$), the history of a febrile illness with transient or permanent hearing impairment was significantly associated with rodent consumption (OR=4.6; $p=0.003$). In fact, their evidence was based on the comparison of a region with a high prevalence of LASV antibodies (14%) with a region with a low prevalence (2.6%). They noted that “rodents were much more numerous in the high prevalence region and they were consumed by 91.5% of the population, compared with 0% in the low prevalence region, perhaps because of the availability of meat from livestock in Pita but not in Gueckedou”. Further on, in the endemic area of Faranah (Klempa et al., 2013), rodent hunting and consumption have been reported in the villages where LAROCS project is conducting research activities on LF (Kelly & Sáez, 2018). In fact in these villages, *M. natalensis* have been tested positive to LASV during the project research activities, emphasizing again the potential risk of primary transmission of LASV to humans (Saez et al., 2018). Other studies also reported rodent hunting and consumption in rural settings in Guinea where children about 7 years old and adolescents engage in this practice (Inapogui et al., 2007; Kernéis et al., 2009).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section provides an overview of the methodological approach used to carry out this study. It includes the study setting, study design, the population and sampling process, and data collection technique. It also explains the data storage and management process, the trustworthiness strategies as well as the analysis process. Finally, ethical considerations and utilization of the results are explained in this chapter.

3.2. Study site

3.2.1 General setting

Republic of Guinea is located in West-Africa, bordered by Guinea – Bissau, Senegal, Mali, Cote d'Ivoire, Liberia, Sierra Leone and the Atlantic Ocean. It has an area of 245,861 km² and is divided into eight (8) administrative regions and 33 prefectures (INS Guinée, 2017).

In 2016, Guinea population was 11 233 034 inhabitants, with a density of 46 inhabitants per km². Life expectancy is estimated to be 61 years. The majority of the population is illiterate (67%), living below the poverty line (55%) and in the rural milieu (71%) where agriculture is the main activity (INS Guinée, 2017)

Across the country, the Gross Enrollment Ratio (GER) in primary school is 75.1%. This refers to the percentage of children in primary school level within the total population of children aged 6-11 years. This ratio varies from a region to another and according to the residence. In Faranah region, the GER is globally 59.3%, whilst in rural milieu, this ratio comes down to 46.7% against 111.1% in the counterpart urban areas (INS Guinée, 2017). This is an important indicator showing that in rural areas, the majority of children do not go to

school and this reality exposes boys to get involved in rodent hunting in villages. However, it should be noted that even though in some villages many of children go to school, rodents hunting still continues to be practiced by them.

The National Health System is divided into: primary level (413 health centres and 726 health posts), secondary level (7 regional hospitals, 26 prefectural hospitals and 8 communal medical centres), and tertiary level (3 national hospitals). In 2012, the country had a ratio of roughly one doctor and one nurse per 10,000 inhabitants, with a geographical disparity. At the primary level, community Health Workers (CHWs) support health care and prevention within communities (MSHP Guinée, 2015).

3.2.2 Specific setting

Faranah prefecture served as the site for our study. It belongs to the savanna region of Upper Guinea and is located 452 km from the capital city Conakry. It is an essentially agro-pastoral zone, with a population estimated at 299 612 inhabitants which is predominantly rural. The prefecture of Faranah has 11 sub-prefectures and one urban commune (INS Guinea, 2017).

Majority of people in the villages recognize themselves as Malinke and Djallonke and they have been traditionally hunters and farmers. They produce rice which is the staple food, and cassava which is also consumed in case of shortage of rice and/or for preference. Rice is cultivated in swamps and uplands. In both settings, preparation of the fields is required and it drives to rodent hunting by children and even some adults who catch big mice and either eat them or take them to their children left in the villages. From November to the beginning of January (harvest period), people harvest rice, they first gather and pack it in the fields before transporting it to their houses for storage. At this moment, mice in their quest of nurture, found their habitat in the gathered rice in the fields and this offers the opportunity to children and their parents to catch them during rice transportation to the village.

In Malinke and Djallonke communities, children are educated in the family through farm work and other associated domestic tasks in the village. From about age 5, children have free movement in the village, if they cannot go yet to the farms with their parents, they are left with other family members such as their sisters or grandparents. About age 7, gender-based separation and division of labour occurs regarding the types of game and tasks to involve in: male children are among themselves, they play football and other games considered as male games. Later on, they start forming age-based groups to go for hunting in the nearby swamps in order to get initiated before they could be able to follow their elder brothers. They also follow their fathers to the farms to get initiated to farm work such as ploughing, fencing, planting cassava, taking care of cows and scattering birds. As for girls, they stay with their mothers who initiate them to domestic tasks such as cooking, fetching water, cleaning and taking care of their younger siblings.

Sending children to school is a decision taken by the head of the family who is the husband. School in public sector is free but parents must buy school supplies and uniforms for their children and pay their annual contributions as members of pupil parents associations. More often, this cost is earned by selling some crops after harvest and this represents a major challenges for some families for sending their children to school. More male than female children are sent to school and the main reason could be associated to gender roles and expectations in these rural settings as people might think that girls should stay with their mothers to learn reproductive roles (household chores) since they will be wives in the future. However, in some of the villages, more children are not in school and this makes boys involve more in rodent hunting practices.

In dry season, a normal day in the life of male children starts in the morning. After accomplishing some familial tasks they were charged by parents, they form groups among friends and either go to the bush or play in the villages.

Professional and opportunistic hunting is practiced all over the year whilst rodent hunting which is mainly children's activity is practiced during the dry season when harvest is done, fields are put to fallow and bushfire is allowed. "Donso" are the traditional hunters among the Malinké and Djallonké society, they are not many nowadays. Traditionally, they are known to be initiated in the art of hunting and the knowledge of the bush. They are trained to know herbs that can treat different diseases, some herbs also serve to protect them and to "call" on the animals they want to hunt. However, nowadays the category of hunters is broader, almost all men have a gun which they take when they go to their farms. Children who practice rodent hunting are not considered as hunters in the sense of "Donso"; rather, their hunting is called "Fèlèli" in Malinké, which can literally mean "looking for" in the sense that they are looking for small animals and they do not use gun.

Faranah prefecture is known as an endemic area for Lassa fever in Upper Guinea (Fichet-Calvet et al., 2016; Lukashevich et al., 1993). Since 2013, LAROCS Project is implementing a rodents control intervention and research activities on LF in six villages of this prefecture. Mainly, the project is eliminating mice in the houses in these villages in order to reduce and/or limit human – rodent contact, as a way of reducing LASV prevalence in rodents and disease incidence in humans. This study was carried out in two of these research villages which are Brissa and Yèrèwalia.

Brissa is a village located in the northern part of Faranah at a distance of 27 km. with a population about 1,000 inhabitants, the residents are mainly Malinke and they practice agriculture as the main activity, then animal husbandry which is mainly focused on cattle. In this village, there is a very old school of two (2) classes built by the community members themselves; there are also four (4) sources of drinking water (boreholes) of which two (2) are functional. There is no health post, residents go to Faranah City for health care. Visibly,

children are less schooled in this village, parents mentioning the lack of a good school and teachers transferred by the government as the reason for the non-schooling of children.

As for Yèrèwalia, it is also another village located at 10 km from the city of Faranah in the southern part. The inhabitants are essentially Djallonkés and are estimated at about 500 residents in this village. As in Brissa, the main activity is agriculture, followed by animal husbandry. There is no health post also in this other village, leading residents to resort to health services in the city of Faranah. There are two (2) sources of drinking water (boreholes), and a school of three (3) classes and one direction. Obviously, many children attend school as many were found in classrooms during data collection.

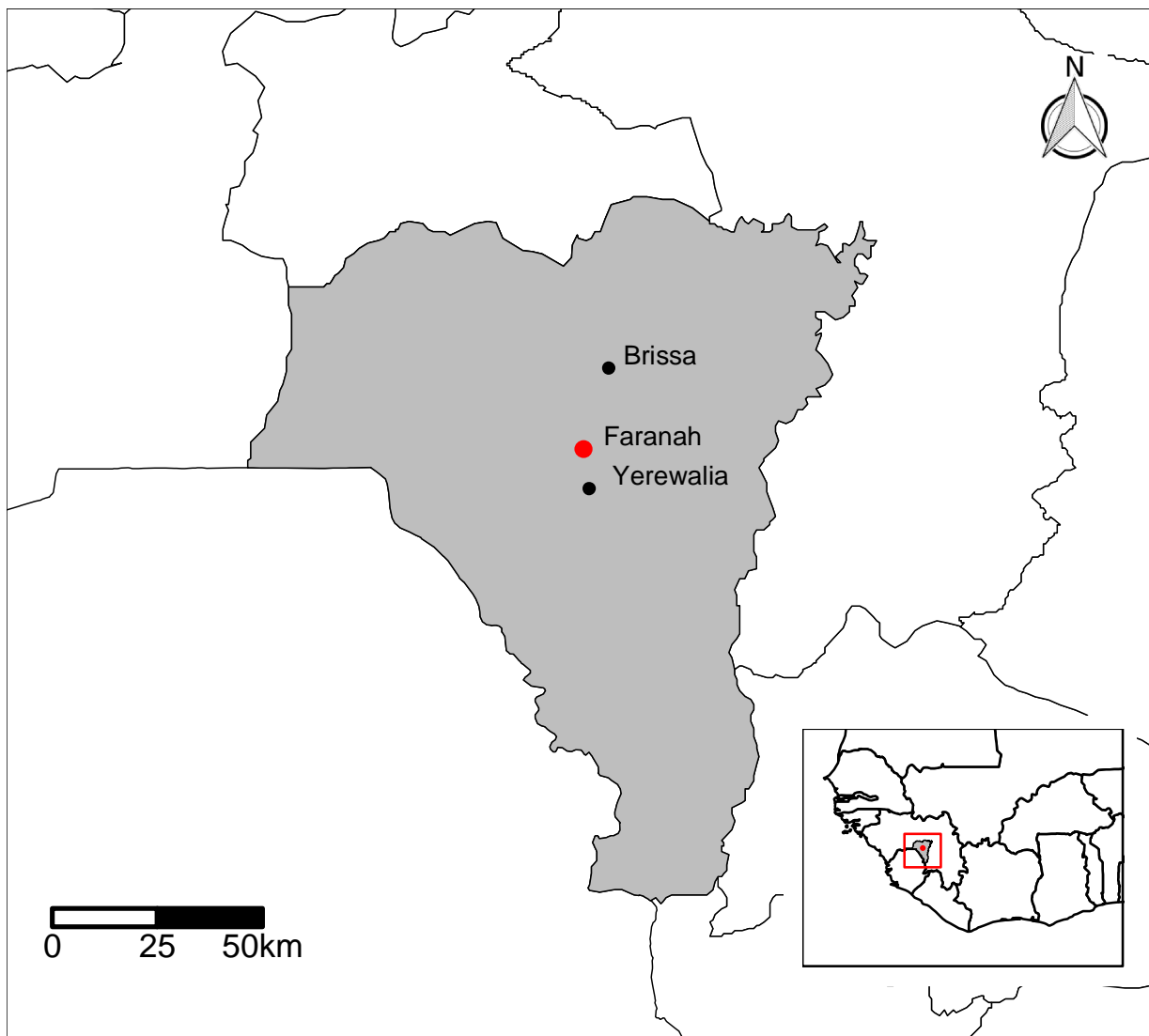


Figure 4: Study sites location relative to Faranah.

3.3. Study design

An exploratory study using a qualitative research approach was used to conduct this study. More specifically, ethnographic methods (Creswell, 2014) were applied for gathering information. “Ethnography is a design of inquiry coming from anthropology and sociology in which the researcher studies the shared patterns of behaviors, language, and actions of an intact cultural group in a natural setting over a prolonged period of time. Data collection often involves observations and interviews” (Creswell, 2014). Therefore, ethnography enabled to explore and understand the patterns of behaviours and actions of these cultural group regarding the practice of rodent hunting by children in their villages.

In these regards, the researcher had previously spent six (6) months (January – June 2018) visiting these villages on the daily basis during LAROCS Project’s survey about the correlation between the presence of rodents (infected and non-infected) and house characteristics and household hygiene, distributing a survey questionnaire, and assisting the project’s anthropologist in human – animal interactions research. This experience gave a broad understanding of hunting practice and then guided the formulation of the research question of this study. It also facilitated the data collection within six (6) weeks in these villages (December 2018 – January 2019).

3.4. Study population and sampling

The overall residents of the two villages were initially targeted for this study. Specifically, children practicing rodents hunting and their parents or family members, as well as children not participating in rodent hunting and their parents were concerned by the interviews.

Purposive sampling was used to select participants within these categories of people in the villages. In each village, five (5) adults were identified through informal conversations,

approached and then invited for the interviews. Furthermore, children in the villages were also identified for FGDs and participants observations in their hunting sessions.

3.5. Data collection tools and technique

To have a whole understanding of rodent hunting by children in these villages, data was collected using participant observations, informal discussions and interviews with their parents (IDIs) as well as with children themselves (FGD).

Two different semi-structured interview guides were used for this study; one was used for IDIs with adults, and the other was used for FGDs with children. For the field notes, a word-file sheet was designed to write down memos. An audio recorder was used to record all the interviews (IDIs and FGDs) during this study. Interviews were conducted in Malinke, the main local dialect language spoken in these two villages. There was no need of interpreter given that the local dialect of the participants is the researcher's mother tongue.

3.5.1. Participant observations

In the villages, groups of children who hunt rodents were identified first; then, their parents were informed about the goal of the study and permission was sought from them to participate in their children's hunting sessions. In all, four (4) participant observations (2 per village) were done in these villages. In the first village, I participated in the two (2) types of rodent hunting that children practice: the first was rat (*Cricetomys gambianus*) hunting in the bush with two big boys (about 11 to 13 years old), and the second hunting session was held in the nearby swamp of the village and it concerned mice with a group of four (4) younger boys (about 6 to 12 years old). In the second village, all the two hunting sessions concerned mice and then were held in the swamps with two (2) groups of five (5) and (6) children respectively. These participant observations helped to identify and describe children's hunting techniques and rodent handling practices. The activities were documented immediately after

the fields as memos in Word-file format, photographs were also taken during the hunting sessions.

3.5.2. Informal Discussions

Four (4) informal discussions were done with some community members in the villages as well as on their farms. I participated in cassava field and cashew nut plantation fencing in the first village, as well as rice harvesting in a swamp in the second village. During these activities, informal discussions were done on rodent hunting by children and the motivating factors of this practice, upcoming information was promptly elaborated in word-file (memos) to document these activities during the field work.

3.5.3. In-Depth Interviews

Based on preliminary data from informal discussions and previous experience in the regions, in-depth interview allowed to triangulate information by deeply discussing with parents on this practice of rodent hunting by their children, namely the motivating factors and their knowledge on Lassa fever. A total of ten (10) IDIs were conducted with adults (men and women) in the two (2) villages (5 adults per village). All the interviews were done in the villages in interviewees' houses, except one which was done in the person's swamp after a few moment passed on helping him harvesting rice.

3.5.4. Focus Group Discussions

Furthermore, Focus Group Discussions (FGDs) were also conducted with different groups of children. Then, two (2) FGDs were done with them in each village. Only one FGD had 11 participants whilst the three (3) others had 12 participants each, making the participants 47 children in these four (4) FGDs. In order to raise contradictory ideas about the subject, children who do not hunt were also included in the discussions to explore the reasons for which they do not hunt.

3.6. Data processing and analysis

First of all, the recorded interviews were transcribed verbatim and prepared for data coding. The transcription was done by the researcher and an assistant, and all the transcripts were edited and cross-checked with the audios by the researcher to correct grammatical errors and possibly jumped sections from the audios. All the transcription was done from Malinke to French first, and then translated into English. This process of transcribing the interviews is helpful for the researcher to immerse more into the content and gain more understanding of the subject from repeatedly listening to and reading the transcribed interviews. Data gathered were stored on the personal pass-warded computer of the principal investigator with limited access to the research team.

For the analysis, the coding process began by importing all the transcripts into QSR NVivo 12 software for analysis. Thematic analysis was used employing both deductive and inductive process as described by (Braun & Clarke, 2006). This includes the following steps: familiarizing with the data by reading more the transcripts to get immersed into the content, generating initial codes, searching for themes, reviewing the themes, defining and naming the themes, and producing the report (Braun & Clarke, 2006). The inductive component of the analysis was based on the existing literature on LF, hunting, public health and anthropological theories which helped the researcher to build up a framework for the interpretation of the data. On the other hand, the deductive process was based on new information that emerged from the data gotten from the participants in this study.

A codebook was created based on the objectives of the study, each transcript was opened in the NVivo software and line-by-line reading and coding into nodes of all the statements were done. The coding was reviewed, where some nodes were rearranged and others merged to develop themes and sub-themes. Throughout the coding process, codebook developed initially was revised and refined. Afterwards major themes and sub-themes emerged and, each node

was exported back into word for easy reading, further interpretation of the data, and selection of the best quotes which will be presented in the results section of the work.

3.7. Establishing Trustworthiness

To ensure the trustworthiness of the study's findings, the strategies suggested by Lincoln & Guba, (1985) were applied. These strategies include credibility, transferability, dependability and confirmability (or neutrality).

In this study, triangulation was applied by collecting data from multiple sources and by using multiple methods; that allowed to ensure credibility, dependability and confirmability (Lincoln & Guba, 1985). In addition, credibility was also ensured through prolonged engagement with community members and peer debriefing. The researcher, as a member of LAROCS project team, has been visiting these villages on the daily basis during six months (January – June 2018); and the data was collected within six (6) weeks. Peer debriefing was done by the researcher's supervisors in the school as well as in LAROCS project. The transferability was ensured by giving a "thick description" of methods and procedures applied in data collection and analysis.

As for the neutrality (confirmability) (Lincoln & Guba, 1985), there was no personal relationship between the researcher and the participants; however, the researcher acknowledged that the relationship built during rodent control activities in these villages could have influenced some participants' responses. Again, given that qualitative research is an interpretative research, researcher biases, beliefs, and assumptions can intrude into the analysis of data (Strauss & Corbin, 1998); therefore, the researcher acknowledged also that his prior experience and knowledge on rural communities and their culture could influence the interpretation of the data.

3.8. Ethical considerations

The protocol was reviewed and approved by the Guinean National Ethics Committee for Health Research (N°: 027/CNERS/19). Following that, permission was sought from local health authorities of Faranah before data collection.

In the villages, participants received information about the research in Malinke. The study information sheet and consent forms for in-depth interviews and focus group discussions were read, translated and explained to the participants, parents and/or guardians. Then, every participant was given a written consent form to sign up before starting any data collection. For children, their parents or guardians were asked to sign up the written consent form and their assent was asked as well. Participants' right to decline participation and their ability to withdraw at any time were emphasized. All the respondents were given assurance that any information they provided was strictly going to be used solely for academic purposes and their confidentiality would be therefore assured.

CHAPTER FOUR

RESULTS

4.1. Introduction

In this chapter, the results of this study are presented according to the research questions. Participant observations supported by thorough discussions with participants resulted into different themes that added insight to the research questions posed in this study. Valuable information was then obtained about children and their parents' knowledge on Lassa fever infection, factors that motivate children to hunt and consume rodents, and children's rodents handling practices in these villages of Faranah.

4.2. Sociodemographic characteristics of participants

A total of 10 adults and 47 children (boys) participated in IDIs and FGDs respectively in these two (2) villages. An equal number of adult participants was selected in the two (2) villages; they included community leaders, elderly people, men and women in the community who shared their knowledge and views on rodent hunting practiced by children. As for children, 23 in Brissa and 24 in Yèrèwalia were involved in four (4) FGDs.

The mean age of the adult participants was 50, ranging from 35 to 70 years old. They were all married and Muslims, practicing agriculture as the main activity even though two (2) of them declared that they were carpenter and driver. The majority of them have no formal education (7/10). Among them, four (4/10) were women and three of these women (3/4) were housewives whilst the fourth was a merchant.

Concerning children, their mean age was 10.6 ranging from 6 to 15 years old. The majority was students (37/47) and most of these students (23/37) were from Yèrèwalia (the village housing a governmental school) where only one child was not in school. Among the

unschooled boys in Brissa (10), one declared himself as an apprentice-mason whilst the others reported that they were farmers.

It should be noted that in the rural villages in Guinea, it is common that people (especially women) do not know their age neither their children's age; therefore, both women participants and children's age was estimated in this study. For the specific case of children, they always refer to their friends and state that they are age mate.

4.3. Knowledge on Lassa fever

In this study, most of the adult participants to the in-depth interviews (IDIs) reported that they have no idea about the disease in quest, and all the children who participated in the focus group discussions (FGDs) affirmed that they do not know Lassa fever.

“I have not heard of that disease yet and I do not know its signs because they did not tell me about it” (35 years old woman, IDI-V2).

“We do not know that disease, Sir” (all the children in the different FGDs).

Rather, most of the study participants (both adults and children) referred to Ebola virus disease (EVD) during discussions, since the country faced an outbreak of this disease in 2014-2016. Particularly, children could easily recall this event by stating that they were forbidden to hunt and eat rodents and other wild animal meat. This is illustrated by some quotes as follows:

“There was a moment, when there was the outbreak of the Ebola virus disease; they banned people from eating these rodents, arguing that it could transmit disease to humans” (70 years old man, IDI-V1).

“I have not heard of that disease yet. The disease because of which we were forbidden to eat bush meat, even the rat, we were not eating it, is Ebola; and that's over, so we can eat it safely now. Even bats, we were told not to eat it during Ebola. At that

moment, my father had even forbidden me to go into the bush and warned me that he would kill my dog if I did not stop hunting. Finally, he killed my dog to prevent me from going for hunting. It was when it was declared that Ebola was over that we started hunting again” (13 years old boy, farmer, FGD-V1).

However, few adults reported that they had heard of Lassa fever through LAROCS project workers who come for mice elimination and other research activities in their houses. They always referred to the project workers as “mice catchers” and to the disease as “mice disease”. Some of them were even able to explain some symptoms of the disease whilst others confused it with malaria, as we can see in these citations:

“I did not know this disease until mouse elimination project arrived. They told us that this disease causes bleeding from the nose and all the openings of the man” (47 years old man, community leaser, IDI-V2).

“They told me that it starts with hot body (fever) and headaches; we then think of malaria whilst it's not that. You will take all the medicines to cure this fever but impossible; as long as you do not deal with the medicine against this disease transmitted by mice, you will not be cured” (55 years old man, community leader, IDI-V1).

“I do not know the signs of that disease. What has been said to me is that it can aggravate malaria in the body ...” (65 years old man, IDI-V2).

Globally, the study results revealed that participants in this study have poor information about Lassa fever and it was easily assimilated to Ebola virus disease.

4.4. Knowledge on animals that can transmit a disease and hunted by children

Concerning animals hunted by children that can transmit a disease to humans, various opinions emerged from discussions with adult participants. Most of them cited some animals hunted by children that they recognize as being able to transmit a disease to humans. Among

these animals, the most cited was the squirrel, which according to them, is able of causing hernia in a child who frequently eats its meat, which makes it a meat reserved for adults, meaning that even though children catch it during hunting, they give it to adults who can eat it without any problem, as one participant says: “*children do not eat squirrel anyway, when they kill it, they give it to adults, because this animal causes hernia in a child, it is adults that can eat it without problem*” (35 years old woman, IDI-V2). One of the participants even specified that it is mainly the male squirrel that is more involved in the occurrence of the hernia: “*the male squirrel can cause herniation in the child over time if he eats his meat regularly*” (65 year old man, former hunter, IDI-V2).

All the children who participated in the FGDs during this study also share this belief that squirrel is the animal that can lead to hernia in a child who regularly eats its meat, as one of them stated that “*the squirrel causes the hernia in the child, when we kill it, we give it to adults who can eat it without problem.*” (10 years old pupil, FGD-V2).

In addition, other animals such as monkeys, rats and mice were cited by some participants as being able to transmit some diseases to humans. This is the case of the monkey that they incriminated in the occurrence of epilepsy, epistaxis, headache and colds in humans.

“*What I know, I heard that monkey can transmit epilepsy to humans ...*” (35 years old woman, IDI-V1).

“*Monkey can also cause epistaxis. I do not eat it, there are some who eat it but it's rare here*” (9 years old pupil, FGD-V1).

“*Monkey can cause headaches and cold*” (10 years old pupil, FGD-V1).

As for the rat, whilst no adult reported that it could be the cause of a human disease, children gave various opinions about this animal which they described as the cause of certain human

diseases. One child reported that there was a time when the consumption of this animal and many other bush animals was banned.

“Before, they had said on the radio not to eat mice, rats and monkeys because of the disease. It has been said for a long time, so we even told ourselves that if we catch them now, we will eat them” (8 years old pupil, FGD-V2).

Another child thinks that it is possible for the rat to transmit disease to human beings since it feeds on everything, hence children should not eat its meat but they just do it because of the need and desire for protein. Further on, he believes that Ebola virus disease can be transmitted to humans by rats.

“Maybe the rat can cause diseases we do not know, because it feeds on everything, even human waste, we eat the rat just because we want to eat meat, otherwise we should not eat it, it puts its mouth everywhere ... there is Ebola that the rat can transmit to humans” (14 years old, apprentice mason, FGD-V1).

In the specific case of mice, many adults revealed that they have been informed that mice can transmit a disease to humans and that this information was given by the LAROCS project team during mice elimination activities in their villages. One of the community leaders in one of the villages was even able to mention some symptoms of the disease that he learned from his various discussions with the LAROCS project team.

“The team members of the ongoing Lassa project in our village here informed us that mouse can transmit diseases to humans, they said that it carries a dangerous virus that can cause serious illness to humans which is difficult to cure; so we understood that thanks to this project ... I have not seen yet someone suffering from this disease but they told me that it starts with hot body (fever) and headaches; we then think of malaria whilst it's not that. You will take all the medicines to cure this fever but impossible; as long as you do not deal with the medicine against this disease

transmitted by mice, you will not be cured". (55 years old man, community leader, IDI-V1).

"The mouse can cause health problems. Before, we did not know it, but we know now, the mouse can transmit disease" (65 years old man, former hunter, IDI-V2).

Other adults admitted that they used to see the project team in their villages during mice elimination activities in their houses, and these team members told them that they came to conduct research on a disease that mouse can transmit to human beings.

"The project workers said that they came for research about a disease that mice can transmit to humans but I cannot describe this disease, because I do not know anything about it" (45 years old man, IDI-V1).

"I heard through you who come to capture mice in our houses here that mouse can transmit a disease to human but I do not know exactly the type of disease" (42 years old women, IDI-V1).

However, this study revealed that although some adults are informed of the dangerousness of mice to human health by the project team, they do not consider bush mice hunting and consumption by children as a wrong practice, believing that it is only those in houses that carry the disease they were informed about by the project team. This is the case of the community leader who has even been able to describe some symptoms of Lassa fever who wonders if it is only mice in the houses that are involved in the transmission of the disease or if those in the bush are also concerned:

"... Children also hunt bush mice, not mice in the houses, they do not eat those ones. Anyway, I do not know now if it's mice in our houses that carry the virus or it's those in the bush" (55 years old man, community leader, IDI-V1).

Another adult participant also raised other reasons for which children do not eat mice in the houses, he stated that “... *As for mice, children only eat those in the bush, not those in the houses in the village. Our grandparents told us not to eat them, because there are cemeteries in the villages where these mice go to dig their burrows in the graves of humans to stay there, that's why they do not like these mice at all*” (61 years old man, community leader, IDI-V2).

In the same light, all children believe that mice in homes are different from those in the bush, and that it is only those in homes that carry diseases.

“... *They say not to eat mouse in houses, because she even enters latrines, she eats anything; if you eat it, you can contract a disease that is in her blood*” (15-year-old pupil, FGD-V2).

In addition, during an informal discussion with a group of children, one of them mentioned the reasons why they eat bush mice and not those in houses: “*We eat mice from swamps because they feed on rice; not those in the houses. Those in the houses eat poison and there are some who do not die, if we eat them, it's not good for us, we can die*” (Boy about 10 years, Informal Discussion-A2).

Another reason was mentioned by this other child who pointed out that it is the same mice that migrate between houses and the swamps, he reported that “*in the rainy season, when there is water in the swamps, the mice migrate to the houses to shelter and seek food there. In the village, they eat anything, even human faeces in latrines; that is why we do not eat those in the houses. When they are in the swamps here, they feed only on rice*” (13-year-old boy, Informal Discussion).

It is important to note that this boy is the only participant who mentioned the migration of the mice between houses and the swamps following the seasons. All other participants (both adults and children) reported that they were not the same mice.

Again about mice, children also brought out different opinions during group discussions. Some admitted that their parents and other adults in the villages told them to stop eating mice because they can transmit disease to humans.

“I heard from adults in the village saying that mice transmit a disease to human being, they did not tell us what kind of disease it is, they just told us to stop eating mice. It was the district president who told us”, (15-year-old student, FGD-V2).

“Me, my mother told me to stop eating mice, that they transmit the disease to human being” (12-year-old student, FGD-V2).

In contrast to their friends who did not name any mouse-transmitted disease, some children still mentioned hernia, atrocious abdominal pain, malaria, and Ebola as diseases caused by mice. However, only one of them said that it was his parents who told him that.

“It's the mouse that transmits Ebola to humans, but as Ebola is over, that's why I eat it”, (11-year-old student, FGD-V1).

“My parents also told me to stop eating mice, that they cause hernia to someone”, (10-year-old student, FGD-V2).

For another child, contracting an illness by eating an animal's meat depends on how the meat is prepared. According to him, when a meat is not well cooked, it causes abdominal pain. However, a few children reported that they had no information from adults about a disease that could be transmitted by mice to humans. Among them, one has also said that digging rats and mice burrows was forbidden to him because of snakes that are in these same burrows.

“No adult told us about this, and even if it was said, I did not know about it” (15-year-old student, FGD-V2).

“I have been told to stop digging burrows because there are snakes that can be found inside, either mouse or rat burrows”, (12-year-old student, FGD-V2).

Contrary to adults who cited certain animals that can transmit disease to humans, some adults insisted that a healthy animal cannot transmit disease to humans. This is illustrated by the following quotes:

“Ah, what I know about that, any sick animal which dies, I do not eat that animal's meat, because if you eat such meat, the disease that killed that animal can kill you too. Apart from that, I do not know a healthy animal that can transmit disease to humans” (70 years old man, IDI-V1).

“I do not know an animal that kills; myself, I was a hunter but I do not know such an animal. Even those who say that the monkey makes sick is wrong, it found the patient sick ...” (65-year-old man, former hunter, IDI-V2).

4.4.1. Utilization of animals as medicine

Discussing about animals hunted by children and which are likely to transmit disease to humans, the notion of treatment of certain diseases by the meat of certain animals was rather mentioned. Specifically, it was reported by all participants in this study (both adults and children) that among the animals hunted by children, rat meat is an effective medication that cures high blood pressure. It is important to note that this belief is widely shared in all the villages where this research was conducted.

“It has been reported that rat meat heals high blood pressure, there are even adults who send children to hunt for these rats to eat for the purpose of treating high blood pressure” (55 years old man, community leader, IDI-V1).

“...rat is a medicine that treats high blood pressure; when you boil this meat without adding oil or Maggi cube, you drink this soup, it prevents and treats high blood pressure” (65 year old man, former hunter, IDI-V2).

This information is also confirmed by children during the group discussions, as reported by one of the participants: *“we hunt the rat because it is the remedy that cures high blood pressure, that's why many people like to eat it, it treats this disease”* (12 year old unschooled boy, FGD-V1).

Moreover, the use of rat meat in the treatment of high blood pressure was reported by many of the inhabitants of these localities in informal discussions. It is a widespread belief in both villages and in Faranah downtown given that occasionally, some city residents even let the commission to some LAROCS project workers to bring back for them rat meat if they found it for sale with the children in the villages.

Furthermore, to refute the idea that an animal can transmit a disease to man, a participant, declaring himself as a former hunter, at first denied that by saying *“even those who say that the monkey sick it's wrong, it found the patient sick ...”* before confirming that *“rat is a drug that treats high blood pressure ...”*, and give a personal experience on another animal whose meat would have cured his dizziness : *“I myself, it is the warthog meat that treated my dizziness that had disturbed me a lot ...”* (65 year old man, former hunter, IDI-V2).

4.4.2. Risks known by participants regarding rodent hunting by children

This study also found out the different risks that are encoring children and that the participants themselves perceive and know as related to rodent hunting. Mainly, the results of the study revealed that the major risk related to rodent hunting that all the participants (both adults as children) know and fear from is snakebite which can occur during children's hunting sessions. They all stated that it is common that children meet snakes in rat and mouse burrows

when digging these burrows bare hands and this can result in snakebite. On the issue, all adult participants emphasized this aspect of rodent hunting reporting that this remains their major concern when their children go out for hunting rodents.

“... There are disadvantages associated with the risk of snakebite that could be in the burrows they dig” (61 year-old man, community leader, IDI-V2).

“Hunting rats or mice through digging burrows have a lot of risks, because more often, snakes also enter the same burrows” (70 years old man, IDI-V1)

Children themselves confirmed this information by saying that:

“... Digging burrows is a risk, because by doing it, you do not know if it's a snake that is there or what, we just do it by "man's courage" (13 year-old pupil, FGD-V1).

“Sometimes in the bush, we can meet a big snake and we try to run away, we can even be injured during that running” (15 year-old pupil, FGD-V2).

To further highlight this risk of snakebite for children during rodent hunting, an adult even told a story of child death due to such an incident in a nearby village:

“Once, I went to Sansanko (a nearby village) and I found a case of snakebite. A group of children went for hunting; they dug a first burrow in which they captured a rat. Afterwards, they saw a second one that they began to dig. One of the children brought his hand into the burrow to check, unfortunately, there was a snake in it that immediately bit him on his hand. They tried to transport him to a nearby village to treat him, but unfortunately he died on the way behind our village here” (55 years old man, community leader, IDI-V1).

Another adult also explained his personal experience with snakebite during his childhood by narrating that *“It is only God who protects children during hunting; myself, I was bitten twice by snake during my childhood, but I did not have a problem, at that time, the snakebites were*

not so serious, but now when a snake bites someone, it is only God who saves him” (65-year old man, former hunter, IDI-V2).

Furthermore, an adult provided more details on snakebite risk by explaining that this risk is higher when it comes to rat burrows that are located on the termite mounds where snakes are also looking for rats in these burrows; and lower when it is mouse burrows in swamps which are not deep.

“As for mice that are in the swamps behind the village here, there is not enough risk, because the burrows are not deep; as soon as they dig a bit, they catch mice; but it is rat burrows that are dangerous, because they are on the termite mounds, and then snakes also follow the same rats in these burrows, so there are two hunters for one prey: both children and snakes chase the same rats in the same burrows, so it is only God who protects our children” (55 years old man, community leader, IDI-V1).

In addition to this major risk known to all, other constraints have been reported by both adults and children such as difficulties related to digging hard rat burrows, thirst, hunger, long walk in the bush, injuries and tiredness.

“Walking and digging burrows require a lot of efforts. On their return sometimes, my son even has wounds in the palms of his hands due to burrows digging; the skin of his hands explodes by digging the burrows” (35 year-old woman, IDI-V1).

“Some people can be injured during hunting, spine can puncture someone’s feet and injure them. Sometimes, we even do not catch any prey, there is also a risk of meeting snake that can bite some” (15 year-old pupil, FGD-V2).

Beyond these risks which were reported by almost all the participants in this study, a community leader also pointed out that rodent hunting can sometimes be the cause of school abandonment by some children in his village. He stated that *“hunting even makes them often not continue their studies”* (47-year-old man, community leader, IDI-V2).

In the same light, a child qualified as "champion" of rodent hunters in his village reported in an informal discussion that he dropped out of school for the benefit of farm activities. As for him, the fact that there is not a good school in his village was the main reason for this abandonment. His father also affirmed that his son is a very tough boy who loves the bush a lot.

“He loves the bush a lot, he always goes out hunting small animals, he can even stay there until night ...” (Father of a child hunter, Informal Discussion-V1).

4.4.3. Roles of parents to prevent these risks

Knowing these risks, adult participants were asked about the roles they might play to protect children from these consequences. Thus, various opinions emerged from participants in this study. For some, *« we need to do awareness to inform children about the danger of these rodents ... »* (55-year-old man, community leader, IDI-V1); for others:

“It is to forbid children from going out hunting rodents. At my home here, since your arrival (the project), my children do not do that anymore” (47-year-old man, community leader, IDI-V2).

“It is the parents who must take care of children, otherwise I have no other ideas on that” (61-year-old man, com lead, IDI-V2).

Furthermore, the study also explored the ability of parents to control their children in order to protect them from these risks related to hunting they talked about. Overall, all adults interviewed in this study had a feeling of inability to control their children and forbid them from hunting rodents, reporting that they have always tried to no avail to dissuade them by explaining to them that there are snakes in the burrows they dig.

« When a mother sees her child going for hunting, she tells him not to go because there are snakes which enter these burrows they dig; but most of the children go there

without informing their parents, it is only on their return that they see them with the rats. If I could do anything about that, if it was of my own will, my child would not go for rodent hunting ... » (70-year-old man, IDI-V1).

« When some parents tell their children not to go hunting, they hide from them to go ... » (47-year-old man, community leader, IDI-V2).

With this feeling of weariness, parents argued that children cannot stop hunting rodent because of their childhood stubbornness, as this mother said: *« They cannot stop this because they are stubborn, you will talk to them until you run out, they will not understand. Maybe you can do something for them to stop, giving them food, clothes or whatever, but parents cannot do anything about it, we talked to no avail. The only way for us is to send them elsewhere to the family members in the cities. ... They always go for hunting with dogs, they spend the whole day in the bush in this dry season, whether we like it or not, they will always go, whatever you do for them » (45 year old woman , IDI-V2).*

Some children even confirmed this information from their parents by admitting that they cannot stop hunting because of the desire to eat animal protein.

« Ah!!! Sir, we, we cannot stop mice hunting here, because we often want animal protein » (10-year-old student, FGD-V2).

Many others also reported that their parents have always told them to stop hunting rodents because of snakes that can be found in the burrows they dig.

4.4.4. Precautions to be taken by children to avoid risks

During the focus group discussions, the children made different suggestions regarding the precautions they must take to avoid the risks associated with rodent hunting they practice. Regarding the risk of snakebite during burrowing, some children believe that it is always safe

to avoid putting one's hand into a burrow, and also to be accompanied by hunting dogs that are able to detect the presence of a snake in a burrow through their sense of smell.

“It is dangerous to dig burrows without being accompanied by a dog; if you do not have a dog it is not safe to put your hand in a burrow. When we see a burrow, we incite the dog to feel the entrance, if the dog gets excited and digs, we also dig it, because it means that there is a prey; on the other hand, if the dog moves back and gets away from the burrow, we move away from it too, because that means there is a snake in it” (13-year-old unschooled boy, FGD-V1).

As for the precautions to be taken to prevent illness, most children stated that they must stop eating the meat of the animals involved in the transmission of diseases.

“We must stop eating everything that can cause disease to us, for instance they say that we must not eat mice because they even enter toilets and eat whatever they see, if we eat them, we may contract the disease that is in their blood” (15-year-old pupil, FGD-V2).

On the subject of stopping the mice hunting, one child highlighted that the desire for animal protein can make some hide themselves to hunt and eat mouse meat, as he narrated:

« We must stop eating mice, we must avoid them, but those who hunt mice want to eat meat, so they can hide to capture them, roast them and eat them » (10-year-old Student, FGD-V2).

Unlike these previous interviewees, other children emphasized the cleanliness in preparing meat before eating it.

“That is the cleanliness. It is necessary to put the meat in the clean bowls, to wash well the meat then to prepare it, otherwise, it is the dirt which gives the abdominal pains” (13-year-old pupil, FGD-V1).

As for them, one must just wash and cook well the meat before eating it to avoid diseases.

4.5. Factors motivating the hunting and consumption of rodents by children

This study also explored the factors that motivate children to hunt and eat rodent meat in these villages. In-depth discussions with both adults and children allowed us to have a broader understanding of the reasons for this practice. The themes that emerged from these discussions were categorized to form the influencing factors of rodent hunting that are developed in this section.

4.5.1. Nutritional reasons: scarcity of meat in the family meal

Unanimously, all the participants (both adults and children) in this study reported that meat is rare in people's daily meal in their localities, hence they claim that this is the main reason that brings children to seek for how to fill the void through the hunting of small animals in dry season.

« Here, having meat to eat is difficult, it is occasional, either for children or for adults, it is rare to find meat ... » (45-year-old man, IDI-V1).

« It's very difficult to have meat here at home; if the children do not go for hunting, they can do more than a month without eating meat. Even professional hunters who are here rarely kill game ... » (42-year-old woman, IDI-V1).

To better illustrate this lack of meat in his village, an adult reported that this protein is only consumed on holiday occasions.

“Here, when we eat meat on a day of feast celebration, we have to wait for next year's party too; we eat it almost once a year. Unless someone's animal gets sick, in this

case, he kills it and sells meat but even that is rare, they take everything to butchers in town to sell” (65 years old man, former hunter, IDI-V2).

In addition to these holiday occasions, some participants also mentioned that sacrifice occasions are other opportunities that allow people to eat meat in the villages.

“Here at home, it is difficult to have meat outside the hunting ... Eating meat is an occasional event with us here, it is often during the Tabaski (Aïd el-kebir) celebration that everyone eats meat or during occasionally sacrifices ...” (47-year-old man, community leader, IDI-V2).

In the same light, children also reaffirmed that this phenomenon is a reality in their different families. One of them reported that *“If we do not hunt, we rarely eat meat, there are some who do not even get it in the week. An adult hunter must kill a game, bring it to the village to sell, and your parents must have money to buy it. That's why we can stay for long time without eating meat if we do not go to hunt rodents” (14-year-old unschooled boy, FGD-V1);* and another confirmed this fact by saying that *« I can spend a month without eating meat at home » (9-year-old student, FGD-V2).*

Another child informed that apart from the small bush animals that they hunt, they also resort to death domestic animals to grill with friends and eat.

“We only eat meat of small animals from the bush. Other than that, if chicks die for example at home, or chickens, sheep, we can take them and skin them, we contribute between friends, each gives 500 Guinean francs (about 0.05\$), we buy oil, Maggi cube, we roast and then eat” (10 years old pupil, FGD-V2).

It has also been revealed in this study that the most accessible animal protein in these villages remains fish; however, they underlined that access to fish is also noticed only during the rainy season, as noted by this participant:

“Here, the animal protein is rare, it is only in the rainy season that one gains fish, as soon as water dries up in the backwater, it is finished, one does not gain anymore ...”

(70-year-old man, IDI-V1).

Another adult also reported that fish is the most consumed in the village.

Overall, after asserting that access to meat in these villages is difficult, all participants in this study unanimously reported that children practice rodents hunting to find meat to eat.

Therefore, in exploring the causes of this scarcity of meat in these villages, discussions with participants brought out two (2) main causes of this phenomenon which are poverty and inexistence of butchery in the villages.

4.5.1.1. Poverty

Some adult participants did not fail to remind that it is poverty which is preventing them from getting meat that is sold in butchery in the city (Faranah town). They emphasized poverty by stating that even though professional hunters kill game sometimes and sell meat in the village, if a parent does not have money, he cannot get it for his family.

“Ah, a child does not earn money from himself to buy meat, so if they have to eat meat outside of their hunt, it is through their parents who must give it to them. The money business depends on God; it is like food, the day you earn means to buy it, that day you will eat well. There are times when hunters kill game that you can see, but if you do not have money you will not be able to get it, all of these factors are related to poverty. Those who earn the meat price, they are those who eat meat” (70-year-old man, IDI-V1).

“... Since a farmer does not earn money to buy meat, we can spend one to two months or more than that without eating meat due to lack of resources ... We do not buy it because we are poor, here we do not have somewhere to earn money other than going to the fields” (61 years old man, community leader, IDI-V2).

Another participant also reported that it is because of the lack of means that parents are not able to get meat for their children and that is what inevitably pushes them to hunt rodents.

“Children go for hunting because of meat, since the parents cannot afford to find it for them” (47 years old man, com leader, IDI-V2).

Children also mentioned that the consumption of meat in the family meal depends entirely on the means of their parents, as a boy stated that *“sometimes, if your parent has money, he can buy meat for you to eat in the family, but if he has no money, you do not even think about it even though you want”* (11 years old pupil, FGD-V1).

4.5.1.2. Inexistence of butchery in the villages

This other element was also emphasized by the participants during discussions. Speaking of the scarcity of meat, all the adults interviewed mentioned that there is no place where meat can be found on sale in their respective villages.

« In this dry season, children go for hunting to find meat to eat because in the village here, we do not find meat to buy and give to them, there is no butchery here that is why they go into the bush to look for it. There, everything they get, they do it thanks to their endurance and luck » (45 year old man, IDI-V1).

They pointed out that the only way to get meat in the villages is to go to the city (Faranah town) and buy it there or to give money to someone who is going there to buy it. Apart from that, they must wait for a professional hunter to kill a game and sell the meat in the village, which is not always the case because, according to the participants, the hunters prefer to sell their game in town for more profits.

“There is no butchery here. It is when hunters kill a game and they have pity of the people of the village to sell it here. They pile it up at 10 000 GNF (about 1\$) the pile and if you have money, you go and buy it; otherwise you must send the money to

Faranah to buy meat for you ... It is not easy my brother; sometimes we do not even see the game killed by these hunters because they take it all to Faranah (the town city) for sale, they just give heads, legs and intestines to their parents here and sell the meat in Faranah” (45-year-old woman, IDI-V2).

“Sometimes children can get meat when their parents send money to the city to buy it, maybe once a month. There is no butcher's shop here or any other meat shop here; if you want some and you have money, you have to send the price to town to buy it. Here, it is when a hunter slaughters a game that you can see meat on sale on here” (45 years old man, IDI-V1).

However, although the inexistence of butchery in these villages was mentioned by the participants, some of them still pointed out that when someone's ox is sick in the village and tends to die, if the animal is in agony and the person has no longer time to transport the animal to the city to sell to the butchers, he quickly slaughters it and sells the meat to the inhabitants of the village.

« ... We eat meat almost once a year here; unless someone's animal gets sick, he kills it and sells the meat; even this is rare, they bring everything to the butchers in town to sell. There is no butchery here, access to meat is very difficult » (65-year-old man, former hunter, IDI-V2).

Beyond these two main reasons of the scarcity of meat mentioned by almost all adult participants in these villages, two other participants raised other different causes which are population growth and deforestation.

The first thinks that *« there is meat deficit now because the population has increased compared to the past, so nutritional needs have also increased. In our time, there was a lot of meat, it was easy to have it, we neither hunted rat nor mouse at that moment ... That is why children go for hunting rats and mice » (70-year-old man, IDI-V1).*

As for the second, he thinks that deforestation is the cause of the removal of wild animals from man habitat and that is why professional hunters rarely kill game and as a result, meat is rare in the village. In addition, he reported that it is the extensive animal husbandry practiced by the nomadic Fulani which is the cause of the forest destruction.

« Fulani have invaded our forests with their livestock, which are progressively destroying wildlife and driving away animals such as grass cutters, bushbucks, buffaloes and others. Wild animals no longer have shelter, all the places where they could shelter are completely destroyed by cattle livestock, the forest is completely destroyed by the Fulani cattle ... » (55-year-old man, community leader, IDI -V1).

In these regards, participants pointed out that it is because of the need to have meat to eat that children continue hunting rodents, as an adult stated that *« ...the only benefit for which they catch mice and rats is to have meat to eat to satisfy their desire ... » (55-year-old man, community leader, IDI-V1)*, and another pursued that *« it is the desire to eat meat that children like hunting, because something you need to eat, wherever that thing is, you will go and look for it » (70-year-old male, IDI-V1).*

As for children, it is the desire to eat meat that motivates them to go for rodent hunting.

« The advantage of hunting is to eat meat that contains vitamin ... even the mouse meat contains vitamin » (15-year-old student, FGD-V2).

« The advantage is that the meat is greasy, when you grill it and eat, it is good for the body that gains extra fat, the meat is soft, and it shines the body. Rat meat is tastier than mouse, but the mouse is also tasty » (11-year-old student, FGD-V1).

In regards of these factors, children also contribute in searching meat for the family, this brought out the following sub-themes:

4.5.1.3. Children's contribution in searching meat for the family

As one participant previously reported it, this scarcity of meat in the family meal affects both children and adults who do not eat it as frequently as children. Faced with this situation, the majority of adult participants stated that during the dry season, some parents ask their children to go for hunting to find meat for the whole family. However, they said that this was only told to elder children who can hunt big rodents like rats, grass cutters, squirrels and other big game.

“As for the mice, they are the ones who go out to capture them and it is they who eat them, nobody asks them to go there. As for rats, parents can sometimes ask them to go for hunting, because adults eat rat meat. When they come back from the hunt, there are some who give their parts to their mothers for the sauce, but this is rare ... » (42-year-old woman, IDI-V1).

« It is to the elder ones that we ask to go for hunting but not to small children, because they cannot properly hunt; as for them, they can hunt mice for example. These big guys go with their hunting dogs ... » (45-year-old woman IDI-V2).

During the FGD with children, the elder children unanimously reported that their parents asked them to go for hunting to get meat for the family sauce.

“It is very difficult to have meat in our village here, that's why our parents sometimes tell us to go for a walk in the bush to get meat for the sauce. Me, it's my mother who asks me sometimes. I go for rats, squirrels, bushbucks, in short, everything you gain as prey.” (11 years old pupil, FGD-V1).

"Our parents can ask us to go for hunting big game, but not for rats and mice" (15-year-old pupil, FGD-V2).

Again, to emphasize their contribution in looking for animal protein for the family, a child narrated that « *the advantage of hunting is to prevent one's mother from buying dried fish regularly for the sauce ...* » (12-year-old unschooled boy, FGD-V1); a way of saying that when a child brings meat to the house, his mother no longer has an animal protein problem for the family sauce, hence she no longer has to buy the dried fish that are often on sale in these villages. Another also reported during an informal discussion that he shared the prey he caught the day before with his family: "*even yesterday, alone, I caught 4 rats and a xerus with my dogs ... my parents gave a rat and took the rest for the family meal*" (about 12-year-old unschooled boy, Informal Discussion-V1).

Some children also specified that parents always gave them the safety instructions of not putting their hands into the burrows because of the snakes that may be there.

"When going out into the bush, your mother tells you: if you dig a burrow, do not bring in your hand because you do not know if there is a snake or anything else dangerous; your father also tells you that if you get your hand into a burrow, if you have a problem, it is because you have been looking for it" (13-years-old child, farmer, FGD-V1).

As for the smaller children of the discussion groups, they reported that their parents do not ask them to go for hunting. Some also pointed out that their parents rather forbid them from going for hunting, but despite this ban, they still go anyway. This can be noted in the quotes below:

"No, we are not told to go for hunting, it is we who decide to go there, nobody asks us" (9-year-old-pupil, FGD-V2).

"I, my mother told me to stop digging rats and mice burrows, because sometimes there are snakes that can be in these burrows" (9-year-old unschooled, FGD-V2).

However, this information about parents demanding their children to go for hunting was not shared by all adult participants interviewed in this study. A few of them instead reported that no parent asks his child to hunt for the family, as one of them explained that *"no, parents never tell children to go for hunting for the family; they rather forbid them from going into the bush, but they hide to go there. During the dry season, snakes hide in these burrows, so parents tell them not to go there"* (65-year-old man, former hunter, IDI-V2).

Furthermore and unlike all the other participants, one of them even stated that since they learned through the LAROCs project workers that the mouse is dangerous for health, children stopped eating even the bush mice that they used to eat before.

"At first, we were not afraid to eat mouse meat, but currently they do not eat it at all. Before, they ate bush mice, even I who am the adult, when I went to clear the swamps, there is a species called "Faragbön", when I killed with the machete, I lit the fire for roasting and eating it, but since the workers of this project came here, everyone stopped eating mouse meat, even when we see them in the swamps now, we do not do not kill it, and even though we kill them, we throw them away " (65-year-old man, former hunter, IDI-V2).

4.5.2. Cultural reasons

Beyond the nutritional reasons, the findings of this study also revealed that culture plays an important role in keeping children in this practice of rodent hunting. Overall, almost all adult participants emphasized rodent hunting as a common practice in rural villages. According to an adult, *"most children practice rodent hunting during the dry season, but not in the rainy season. In the dry season, as soon as there is bushfire, they will start their rodent hunting"* (70-year-old man, IDI-V1).

Another reported that *"there is no burrow in the villages of our region here that is not dug, there is none at all; rodent hunting is a widespread practice"* (65-year-old man, former hunter, IDI-V2).

In addition, during an informal discussion in one of the villages, a young adult put a special emphasis on the current practice of rodent hunting in the villages of Faranah in these terms:

"Rodent hunting is very widespread in the villages of Faranah. In our village here, children do not even do it enough; in Gnayah, for example (referring to another village), children can catch more than 15 rats and several mice per day ..." (Young man, Informal Discussion).

In discussing this cultural aspect of rodent hunting in these villages, adult participants consistently linked this practice to the notion of generation, elucidating that this is a practice experienced by all generations in these villages at a specific age interval of their lives (from about 6 to 15 years). This is what is called in this study, "the generational culture", meaning that children gradually get involved in age-group hunting practices and learn the techniques by following and imitating their elders. An adult specified in this light that *"children practice this hunting mainly because they are informed that their elders from previous generations were hunting rodents, which is what gives them the courage to do so; it has become a kind of custom, a generational culture, all children practice it at this age"* (55-year-old man, community leader, IDI-V1).

In these regards, it was revealed that rodent hunting is an ancient phenomenon in these villages that all children practice during childhood and adult males perpetuate the practice. Overall, almost all male adult participants reported that they all hunted rodents during their childhood in the dry season.

"Children go for hunting because it is an old practice; we were all born and found that it was practiced and it continues to be so during the dry season ... " (45-year-old man, IDI-V1).

"Hunting you're talking about has not started in our time, it is since the time of our great grandparents that the practice of hunting has started ... Even I who am speaking to you now, I practiced it when I was a child, so it is hard for children to stop it (55-years-old man, community leader, IDI-V1).

"Throughout the dry season, children hunt rodents all the time. I do not know the case of the big cities but all the children of the villages practice it, even me, I practiced it when I was a child ... " (47-years-old man, community leader, IDI-V2).

In emphasizing the ancient nature of rodent hunting, an adult within the sixties explained how they practiced rodent hunting at their time during an informal discussion.

"When we were children, we used to surround hunting area with fire; then, after the fire burns the area, we picked up the killed mice and then dug the burrows to catch those who took refuge there. At home we set fire and singed all the mice over fire to remove the hair, we eviscerated them, and mounted them on sticks shaped like skewers, and seasoned them with salt and pepper to roast them. After grilling them, we waited for them to cool before starting to eat in groups while chatting and playing with friends. At that time, there were not enough diseases but nowadays, this is no longer feasible because there are lots diseases that threaten the human beings" (Adult in his sixties, Informal Discussion).

Later on, the concept of family inheritance was also mentioned in this study. One participant, who viewed hunting as a family inheritance revealed that his family is a hunter family and

that all her children inherited this practice from their father, as she argued that *"my children inherited hunting from their father, our house is a hunter house. Since their grandparents to them, everyone hunts"* (35-year-old woman, IDI-V2).

4.5.2.1. Childhood and boyish identity

In group discussions, a child also referred to childhood as a motivating factor for rodent hunting, as he stated that *"... there is childhood too; during our childhood, that is what we do ..."* (8-year-old pupil, FGD-V2).

According to children, rodent hunting is a normal activity that they practice, as one of them stated that it is through rodent hunting that they identify themselves as brave boys in the villages. He reported that *"a boy should not sit like that without going for a walk in the bush to get something ..."* (15-year-old unschooled boy, FGD-V1).

Subsequently, those who practice rodent hunting have a particular perception of those who do not practice it because of the prohibition of their parents. This is shown in the quotes below:

"Those who do not have "man courage" to dig burrows are "women", they are not bold like a man" (13-year-old pupil, FGD-V1).

"Those who cannot do it are "women", they do not have the heart of a man; they are "fake men". When you come with your prey, they follow you to give them" (12-year-old unschooled boy, FGD-V1).

This information is also confirmed by adults who reported that children who go for hunting do not agree to share their meat with those who do not go, since they assume that they refused to go, so they qualify them as "lazy" and "fake men". Children who do not go for rodent hunting are those who have obeyed the ban of their parents, but they constantly undergo peer

pressure from their friends who go there and gain meat to eat, given that they refuse to share the fruits of their hunting with them. This is quoted as follows:

“When those who go for hunting kill rodents, back in the village, those who did not go want to eat others’ meat. In their turn, those who went to hunt refuse to give them, arguing that they are lazy because they refused to go with them to the bush, they are not “real boys” like them, so they do not share their meat with slackers as they are. This is how they mock at those who do not go hunting by calling them “lazy, idle and false boys”. They tell them this: “my friend, I will not give you my meat, I went in the bush to look for it; you too, can’t you go? Don’t you know the road? “. This motivates them to go hunting, since they also want to eat meat like their friends” (55 years old man, community leader, IDI-V1).

“Laugh ... They mock at them of course. When they come back from hunting, those who did not go come to them because they also want to eat meat, but their parents do not allow them to go. Those who went also do not agree to share their meat with them because they are not part of their group” (35 years old woman, IDI-V1).

Another participant pointed out that it is rare to see children in villages who do not hunt rodents, as he stated that *“it is very rare to see children here who do not go there; they will not gain meat from what others who hunted prepare to eat. They consider them as slackers”* (61-year-old man, community leader, IDI-V2).

4.5.2.2. Childhood stubbornness

On the other hand, some adults also reported that it is the stubbornness of childhood, distraction and habit that make children continue to hunt rodents despite the prohibition of parents because of snakes in the burrows they dig.

« Children go for hunting because of their instinct and stubbornness, if not I who am in front of you here, I am always opposed to that practice of children because there are many risks related to hunting. It is childhood stubbornness if not they gain nothing in this; they are too stubborn, they do not listen to parents, they hide from us to go” (45-year-old woman, IDI-V2).

“The day before yesterday, I saw my children going for hunting mice and I told them to stop. Adults always tell children to stop digging burrows, but they cannot stop, because during dry season, they have nothing to do, it is only that which occupies them, it is what distracts them in some way) (55 years old man, community leader, IDI-V1).

Some children also mentioned the same childhood stubbornness and distraction as other factors that motivate them to hunt, as we can read these quotes below:

“It is the desire to eat meat and the stubbornness of childhood” (10-year-pupil, FGD-V2).

“Bush is also a refuge place for us, because when we are there, we can do our childhood stubbornness together with hunting without being interrupted by parents. In the village, when we are stubborn, parents blame us but if we are in the bush, we are sheltered from them. We can spend good moments with friends by hunting and eating together” (15-year-old pupil, FGD-V2).

4.5.3. Rodent hunting as a source of income for children

The results of this study revealed that rodent hunting constitute a source of income for children in these villages. Unanimously, all participants in this study (both adults and children) admitted that the rat is the preferred animal among rodents captured by children to sell. The given reason for selling rat is that its meat is considered to be an effective drug that treats high blood pressure.

“Sometimes, they can take rats home to sell them to some people who say it is a medicine that treats high blood pressure; there are even some people from Faranah (the city) who buy them for the purpose of treating high blood pressure ...” (55-year-old man, community leader, IDI-V1).

"Everyone buys the rat: man, woman, adult and child; even I buy it because it is a medicine that treats high blood pressure ... They sell a rat at 5,000 GNF (about 0.5 US Dollars) " (65 years old man, former hunter, IDI-V2).

During the group discussions, all the children said that they sell rats to adults in the villages after hunting, as one stated that *"we catch them for sauce, there are some that we also sell for money ..."* (12-year-old unschooled boy, FGD-V1).

In addition, the sale of rats was also reported during informal discussions by some interlocutors; this is the case of a young man who reported that *"children sell some rats and eat others. It is the adults who buy them with them, especially since people have heard that rat meat treats high blood pressure, it has become a good deal for children, because adults are very interested in and eat them in order to treat this dreaded disease."* (Young man, Informal Discussion). Another child hunter affirmed that *"even yesterday I caught two rats, I sold one to 5,000 GNF (about 0.5 US Dollars), then I bought the groundnut oil and the Maggi cube with the money for grilling the second and I ate"* (unschooled adolescent, Informal Discussion).

4.5.5. Non-occupation of children during the dry season

During this study, participants also linked rodent hunting to the fact that children are free from all the farm activities during the dry season. They explained that at that time, given that farm activities have greatly diminished (especially those which require much the assistance of the children like the surveillance of the fields and crop transportation to the villages), children are found free in the villages and as a result, they hunt rodents in age-groups.

"During the dry season, as farm work has decreased in the village, almost all children are free; that is why they form groups and go for hunting mice and rats, which consists of digging burrows to catch these rodents. There are some parents who do not school their children, so they are at any time in the bush hunting rodents when they

have nothing else to do. Children who are in school are under control, they take advantage of their free time to go for hunting occasionally; sometimes, after the evening classes at 5 pm, the first thing that comes to their mind is to go to dig mice burrows. They do not go far, they go in the shallows, just behind the village, and it is a place of recreation for them” (55-year-old man, community leader, IDI-V1).

The same thing was reported by children who pointed out that in the dry season, they have no other task to do in their families, which pushes them to go in the bush to hunt rodents, as one stated that *“during our childhood, it is what we do if we have no other task to do”* (10-year-pupil, FGD-V1).

4.5.4. Crop protection on the farms

Crop protection on the farms was also cited as one of the factors motivating rodent hunting by children. On this point, an adult explained that previously, the protection of cultivation fields was the first goal of rodent hunting and it was more focused on grass cutters which destroyed many rice fields. However, he notified that currently, these grass cutters have almost disappeared because of deforestation.

“Hunting started since the time of our great grandparents who practiced it to exterminate grass cutters in order to protect the cultivation fields and to have meat; but nowadays, animals are rare because there is no more forest, that is why we lack meat here ” (55-years-old man, community leader, IDI-V1).

Some of the children who participated in group discussions also mentioned the same reason, as one of them said that *“we go for hunting to reduce the bush animals, they destroy the groundnut a lot; rats and monkeys come to eat our groundnuts in the fields at harvest time, that is why we hunt them particularly”* (10-years-old unschooled boy, FGD-V1).

4.6. Rodent handling practices by children

To better understand children's rodent handling practices, participant observations were done during various children's hunting sessions both in the bush (including old farms) and in swamps. In addition, discussions were held with participants on three (3) main topics: places and techniques for rodent hunting, animals frequently hunted and captured, and prey's sharing and cooking practices.

4.6.1. Places and techniques for rodent hunting

The results of this study indicated that there are mainly two (2) rodent hunting places that children attend based on the type of rodents hunted and the age of the children involved: the bush (including old farms) where the elder children from about 12 years old on go for hunting rats, and the swamps where the youngest aged from about 6 to 11 go for hunting mice. However, mice hunting can also be done in the bush when they identified mice burrows there.

"If it is mice, we go to the swamps, there is even a swamp very close to the village; even when you are at the borehole behind here, you can see children there digging burrows. If there are mice in a burrow, it is easily recognized because we see dry earth powder at the entrance of the burrow, so we dig it to capture them. If it is rats, we go to the bush, we look for burrows at the termite mounds" (13 years old pupil, FGD-V1).

Regarding the techniques, all the participants unanimously reported that the main rodent hunting technique is digging of the burrows in which these animals are housed.

"After the bush fires, children can see the burrows of mice they dig; at a certain level, they find the nest of the mice in which they can see little mice; Then, they continue to dig the different communications of the burrow until they catch the big mice ... If it's a rat, they dig the burrows at the termite mounds to capture them ..." (45 year old man, IDI -V1).

"... They take hoes and go into the swamps to dig the mouse burrows to satisfy their desire to eat meat" (42 year old female, IDI-V1).

For other animals such as squirrels, participants reported that children also use slingshots to hit them in the trees. In the bush, elder children are accompanied by hunting dogs that help them to chase animals.

"They dig burrows to catch rats, they also use dogs to chase them; as for squirrels, they hit them with slingshots" (35-year-old woman, IDI-V2).

In addition, they are accompanied by hunting dogs that help them detect burrows where there is prey through their sense of smell, and then chase animals that try to escape.

"We go out into the bush with dogs; when we see a burrow, we guide the dogs that smell all around, if there is a rat, we dig the burrow and catch it. If it is a squirrel, we chase it; if it enters a burrow, we dig to capture it; if it is a squirrel in a tree, we hit it either by hands, or with a slingshot, as soon as it falls, the dog catches it" (13-year-old-pupil, FGD-V1).

Practically, participant observations allows to better understand the practices of a given action done by a group of person. Therefore, we had four participant observations during this study to better identify the places and hunting techniques that children use to capture rodents in these villages.

4.6.1.1. Techniques for hunting rats in the bush: narrative of a participant observation (V1)

In one of the research villages, together with two young boys known to be "champions" of the rat hunters in the village, I participated in a hunting session with them in the bush. They were about 11 to 13 years old and none of them were in school. Each one of them took his hunting instruments namely the hoe and the machete and we were accompanied by a dog belonging to the youngest boy.

After walking a few hundred meters from the village, we were already in the bush and we immediately starting looking for rat burrows that are found most often at termite mounds. It is a wooded savanna dotted with trees, reeds and foliage, with sparse spaces and traces of fire that could be observed in places. At each termite mound, the boys checked the different burrows around it by calling the dog, which is able to detect the presence of an animal through its sense of smell. When the dog lingers around a burrow, it means that there is a strong chance to meet an animal (rat and/or striped ground squirrel most often) in that burrow. Therefore, children put their hands in search of animal's hair and other objects that can certify their presence. For the specific case of the rat, it is common that he puts stones or a solid object at the entrance of its burrow to block it, it is his protective shield to prevent access to any predator: this phenomenon is similar to the fact that the human being closes his door at night while sleeping to avoid being stolen.

After about half an hour of walking during which we checked all the burrows seen on our way with the dog, we finally found a termite mound on which the dog lingered for long time smelling the many burrows that were all around. Suddenly, with their hands, the two kids began to search for hair and other objects that can notice the presence of a rat in these burrows. At each gesture, I exclaimed by saying to them: *"do not put your hands in the burrows, you do not know what you can find, there may be a snake"*. They have always been stubborn, making me sure that it is their job and that they know how to do it. They also assured me that if there is a snake in a burrow, the dog flees and moves away from the burrow, which allows them to understand that they must move away from it. Within the following minutes, one of them brought out from the burrow some rat hairs and showed it to us, then that made them sure that there was at least one prey that had to be captured at all costs. The two children began to dig the three (3) main burrows of this termite mound which was too hard in this dry season. With the dog, we carefully guarded the termite mound to

prevent the animal from escaping. One after another, we progressively dug these burrows; with each advance, they put their hands to identify the different communications of the burrow and to bring back the ground already dug.

After nearly an hour of digging the burrows, the dog became more and more excited, offending the entrance of the burrows, digging with his paws and mouth and uttering shouts of aggression. These were signs of certainty of the presence of an animal. Suddenly, one of the children saw the rat in the burrow and exclaimed: *"I saw it, it's a big rat, it's there, stand on the other side and send the dog over there"*. Thus, the guard was mounted in front of all possible emergency exits; the elder boy continued to dig on one side while the dog did the same thing on the other. From time to time they put a long stick into the burrow to sting the rat and push him out through the other exit guarded by the dog. As a result of this unbearable pressure, the rat suddenly burst through the dog's exit and with a violent jerk, the dog grabbed it by the trunk and began to swing it violently from left to right to kill it. The boys rushed on the dog to pull the rat out of his mouth, by gently tapping him on the back and telling him to leave him, the elder boy took it by the tail and hit it hardly on the ground to kill it. When the rat was killed, he took the machete and slaughtered it, the younger boy took it in turn by the tail he passed through the cut throat to take it out through the mouth to form a kind of bag so that it becomes easy to hold it. He then held it by its long tail and hung it up on his shoulder and we went back to the village.

Mainly, this is how children proceed to dig and catch a rat in the bush during their hunting practices (see appendix 6 for photos).

4.6.1.2. Mouse hunting techniques in the swamps: narrative of a participant observation (V2)

This hunting session was about mice, children led me to a swamp located less than 500 meters from the village. It was about 11 am when we took the path of that shallow. Children were five (5) from the village, they were about 10 to 13 years old, and were accompanied by a dog belonging to one of the team members. Two of them had slingshots; they thus separated from us by telling me that we would meet in the shallow. They scattered through the bush looking for squirrels and birds in the trees they were trying to kill. After less than a quarter of an hour of walking, we arrived in the swamp where we found another group of children making a cassava garden fence with their father. There was also another dog with this group of children that we found there. The other two boys with slingshots also joined us without any prey; they reported that they missed a squirrel in a tree.

As soon as we arrived, children scattered in the swamp in search of burrows as usual. Each child, after having found some, exclaims saying "*come here, I have seen a burrow*". So everyone rushes in to check and starts digging. Since there was only one hoe with the group, the burrows were dug one after the other and children helped each other, because the principle is that those who do not work enough will not get meat when sharing captured mice after the hunting session. With this, they rushed to dig the first two burrows, but no mice were seen. While they were eagerly digging the third burrow, a mouse suddenly spurted and hid in the rice stalks. So, children searched for it by snooping in all the hidden corners, but to no avail. Children came back to burrows and continue watching with all their attention while others were still digging. On their side, dogs also were digging burrows with their paws and mouths under the watchful eye of the children.

The search for burrows and digging continued unabated, each one was contributing. While some were removing the rice stalks from the burrows to strip them, the others were bringing

back the ground powder to free the entrance of the burrow. In this atmosphere of teamwork, a small mouse (pup) was brought out with the hoe from the burrow and children suddenly rushed on it and caught it. This encouraged children and they were convinced that the doe (the female mouse) and the other pups were there. So they continued digging and suddenly the other pups came out and tried to flee, but they were automatically captured one after the other by children, using every means to catch their prey. Some trample them with their feet sometimes even naked, others plunge on them and catch them with their hands. Then, the doe also appeared and suddenly, underwent the same fate as its pups; it was captured by one of the children and everyone shouted for joy and was narrating how he did to capture one of the mice. In all, one doe and five (5) pups were captured. Two of the five pups were wounded in their tails during capture, skin and fur were completely removed, leaving the tails of both mice bloodied.

Each one willing to keep the captured mice, the elder boy decided that the boy who has a larger pocket on his clothes keeps them; this is how the boy wearing panties with large pockets took the six (6) dead mice and put them in his pocket. On the question of the name of the species caught, no consensus was found between children; while one gave a name to the species, the other contradicted it by proposing another name. Discussion was focused on two local names: "*Gnina gbènin*" and "*Soumbou gninanin*". Obviously, it is a species that is not big, with a smooth and red fur, 12 nipples arranged on the ventral side as follows: three on each side (right and left) on the thorax (at the top of the abdomen), and three on each side (right and left) at the bottom of the abdomen. The number of mice given birth to is probably not huge (only 5 pups were found with the doe in the burrow). This description corresponds to the species *Uranomys ruddi* (Fichet-Calvet, pers. Com., see appendix 5).

After this first capture, we continued our journey in joy, children still looking for other burrows, searching here and there and dug at the slightest suspicion. Sometime later, they

discovered a large burrow which they began to dig immediately while raising the guard around the burrow and by blocking all the exits. After a few minutes of digging, three (3) pups were suddenly brought back by hoeing; then two others, and three others of the same birth generation; hence a total of eight (8) pups. Each child rushed on the one he saw running away and captured it with his hand, or with his foot, treading on it; that's how they were all captured. Since the burrow had several communications, children were convinced that the doe was still there; so they continued to dig and suddenly, pups smaller than the first ones also emerged from the burrow. With the same rush and the same techniques, they were all caught by children, they were thirteen (13) and were visibly of the birth that followed the first generation of the eight (8) pups that were previously caught from the same burrow. Still convinced of the presence of the doe, children continued digging the various communications of the burrow; after a few minutes, the doe suddenly spurt and children began to chase it until it was caught too. In total, a doe and 21 pups were captured in this burrow; the children were shouting with joy and everyone reported the tactics he used to capture at least one mouse. Regarding the name of this species, there was no discussion, all were unanimous that it is "*Faragbön*", the species that is big and gives birth to several pups at the same time. When I observed the ventral side of this mouse, I saw two rows of nipples, we count them, and there were a total of twenty (20) nipples arranged in two rows on the ventral side of this mouse. This description corresponds to *Mastomys natalensis* (Fichet-Calvet, pers. Com., see appendix 5), the main species responsible of the primary transmission of Lassa virus to human being. When I asked if they used to catch this species, children reported that it is the one that they catch most often because it cannot run fast, and it also gives birth to many pups.

These are mice hunting techniques in the swamps used by children that were observed during these participant observation these research villages (see appendix 6 for photos).

4.6.2. Animals frequently hunted and captured by children

The results of this study identified the type of rodents that children catch most often during the different hunting expeditions they undertake. Almost all of the adult participants asserted that children hunt and kill rats and mice in these villages. In addition, other rodents such as grass cutter and squirrel are sometimes caught by children as well.

“It is the rat that they kill a lot, hunting is primarily initiated for rats; in addition to that, they also kill mice and squirrels. As for the mice, they only eat those in the bush, not those in the houses in the village” (61 years old man, community leader, IDI-V2).

“Mice and rats are the two that they hunt and kill a lot” (70 years old man, IDI-V1).

Furthermore, participants made it clear that rats were hunted by elder children whilst mice were the target of their younger brothers.

“As for the mice, it is only the little children who are interested in them” (45 years man, IDI-V1).

However, a contrary opinion was expressed by a participant who asserted that it is the grass cutters that the elder children hunt, while the little ones are interested in hunting rats.

“It is the grass cutters they hunt but the moment has not arrived yet. As for little children, it is rats that they kill” (65 years old man, former hunter, IDI-V2).

Coming to children, they mentioned many rodents that they kill including rat, mouse, squirrel, and grass cutter. However, rats and mice were the most cited in the different focus groups.

“It is rats and mice that we kill most often, there is also grass cutter in the cane bush but not everywhere ... Sometime, if we go to cane bush, we settle fire to bring grass cutters out; if one comes out, we chase it with dogs, if we catch it, we slaughter it and take it home.” (15-year-old pupil, FGD-V2).

“There are also squirrels, monkeys and mongooses that we kill” (14-year-old unschooled boy, FGD-V1).

In addition, each child spoke about the animal he prefers to hunt during these discussions. Therefore, it was noticed that this preference was directed by age and physical ability to capture a prey, meaning that the elder and stronger children like hunting rats and other big animals for more meat, as this boy stated:

“I like hunting rat because when I catch a lot, I can give some to my parents, sell some, and then prepare some for myself to eat. After rat, it is mice because when it's late and I cannot go to the bush to hunt rats, I go to the nearby shallow, I fire the rice stalks to allow me to visualize the burrows well; or I search for burrows that I dig. While digging, as soon as I reach their nest in the burrow, mice come out and I catch them” (12-year-old unschooled boy, FGD-V1).

In the same vein, one of his friends went on to say that *“mainly, we hunt rats, monkeys, squirrels, and even bushbuck. We used to hunt mice but now we don't because mouse meat has become small for us, the work is tiring while the meat is small, that is why we prefer rats and squirrels which are bigger. Hey, here they are (indicating the little boys in the group), they are the ones who hunt mice ... (laugh in the whole group)”* (15 year's old unschooled boy, FGD-V1).

On their side, the smaller children who are not able to dig rat burrows that are hard enough, choose to hunt mice in the swamps where the soil is wet and easy to dig, as one stated that *“as for me, it is mice I hunt because I cannot catch a rat, it is mice that I can catch”* (7-year-old pupil, FGD-V1).

In exploring the species of mouse they catch most often, children from about age 6 to 12 unanimously reported in all the discussion groups that it is "Faragbön" they capture more often. That is the species whose description matches *M.natalensis*.

“Sometimes, we can catch up to 20 mice, it is « Faragbön » (Mastomys natalensis) that we catch a lot, then « Kassan » (Rattus rattus) ...” (11 years old pupil, FGD-V1).

This information about the species was confirmed during participant observations in both villages. During all the hunting sessions in the swamps with children, almost all the mice caught were the *M. natalensis* which they called « Faragbön » (see picture 4 above).

4.6.3. Prey’s sharing and cooking practices

The results of this study revealed that the method of sharing and preparing the meat depends on the hunting group and the number of prey caught. According to adults, young people (adolescents from 17 years up to young man about 30 years) who go for hunting grass cutters in the bush can sometimes roast their prey there and eat, as they can bring it to the village to share. As for the little ones who hunt mice in the swamps, the adults unanimously reported that they bring the captured mice home to roast and eat them.

“When the young boys go for hunting here, sometimes after the hunting session, the prey they will gain, they can roast it in the bush there and eat, they can also send it home and share; that's young people who go for hunting grass cutters. As for the little children, they kill the mice and come with them to the village to roast and eat them” (45 years old man, IDI-V1).

“If it is a lot of meat, they put it in the cooking pot to cook it and eat; if it is not much, the roast to share it and eat. Even the day before yesterday, they went to the bush, they killed a caiman; they came to cook it in the pot at my elder sister’s house there” (45 years old woman, IDI-V2).

In addition, adults specified that when sharing their prey, children take into account the age of those who participated in the hunting session by then giving more meat to the elder ones.

“The day they catch a lot of mice, they share them according to age. The older one takes the bigger mouse and so on. Sometimes, everyone can have 2 to 3 mice depending on the number they caught” (42 years old woman, IDI-V1).

Another adult stated that after hunting, it is children themselves who cook their meat using the kitchen utensils of their mothers, as she mentioned that *“sometimes, when they come from hunting, they take oil with me here and cook their meat here in my cooking pot. Sometimes, if their meat is a lot, they share it and everyone carries his part to his home for cooking and eat”* (35 years old woman, IDI-V1).

During the group discussions with children, almost all of them reported the same thing as the adults but with more details on how they share and cook their meat.

“When I catch mice, I take them home, I singe them, I wash them and I put them in the cooking pot to grill them with oil. If I want too, I can roast them by seasoning them with salt to eat with my brothers and sisters who are with me” (11-year-old pupil, FGD-V1).

“If we catch plenty mice, everyone can get at least one. We singe them, eviscerate them, then roast them and eat” (10-year-old pupil, FGD-V2).

Afterwards, it should be noted that during participant observations, I could not observe how children singe and cook/roast mice meat in these villages. After mice hunting in the swamps, children kept their prey in their bedroom to wait for evening to cook and/or roast them to eat. This was due to the prohibition of lightening fire in the day time during dry season. They reported that to prevent fire accident in the villages in dry season, it is forbidden to cook in

the day time given that almost all the houses are thatch round huts, and the wind blows most often in that period, which can result in town fire in the dry season. However, I observed a rat sharing after a hunting session in one of the villages. The two boys singed the rat before eviscerating it, they gave the head, the legs and the tail to their dog and equally shared the rest, and everyone took his part home.

4.7. Summary of the results

The results of this study revealed that participants did not have a good knowledge on Lassa fever and the vector of the disease. The main factors that motivate children to hunt and consume rodents were the scarcity of meat in the family meal, the generational culture, the source of income for children, the non-occupation of children during the dry season, and crop protection in the fields. These factors can then be categorized into two groups which are:

- The underlying factors: which comprise the generational culture, the non-occupation of children during the dry season, and crop protection in the fields;
- The triggering factors: which are the scarcity of meat in the family meal and the source of income for children.

Finally, from the capture to the consumption of rodents, all forms of manipulation were practiced by the children, namely slaughtering, transportation, singing, eviscerating, cooking which includes grilling and/or roasting the captured prey, and consumption of the meat.

The following schema represents the synthesis of the factors influencing hunting and consumption of rodents by children in these villages (general objective of this study), and explains how these factors interact to result in the practice of rodent hunting by children.

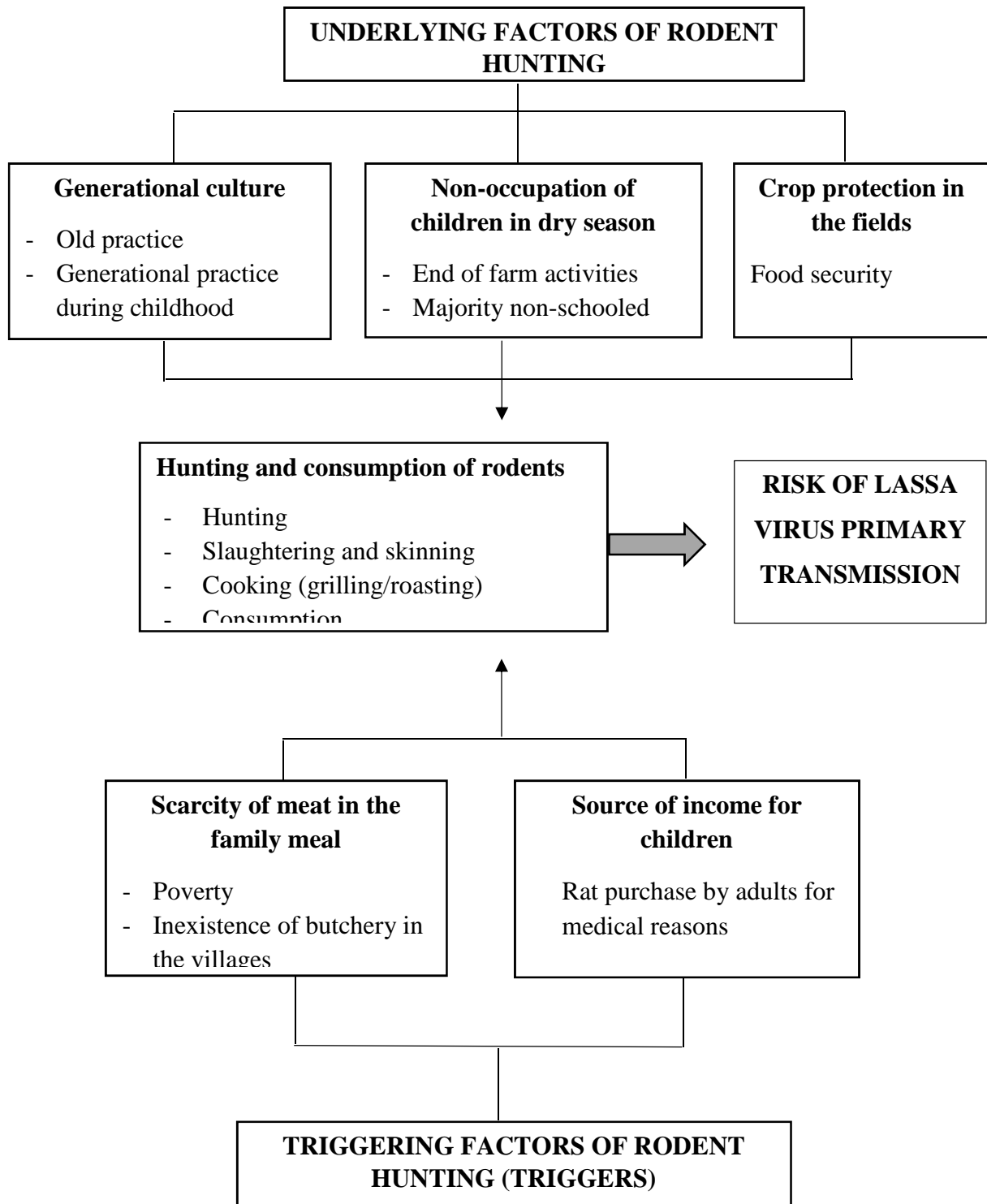


Figure 4: Influencing factors of rodent hunting and consumption by children in the study villages.

CHAPITRE CINQ

DISCUSSION

5.1.Introduction

This study aimed at exploring the factors that influence hunting and consumption of rodents by children in the Lassa fever endemic area of Faranah in Guinea. The key findings of this study are discussed according to the specific objectives and then compared with existing studies on what is known on the topic.

5.2.Knowledge about Lassa fever and animals that can transmit disease to humans

The results of this study indicated that the majority of participants in these villages have no idea of Lassa fever. Despite the LAROCS project research activities in these villages, people still lack adequate knowledge of Lassa fever.

These findings are different from those of a previous study by Saez et al, (2018) in which people recognized that they have gained knowledge on Lassa fever through LAROCS research activities in their villages. More so, Bonwitt et al., (2016) in Sierra Leone indicated in their study that the majority of respondents had already heard of Lassa fever which they described as a serious and fatal disease. Olowookere et al., (2017) also reported in their study in Nigeria that about 76% of participants had adequate knowledge about Lassa fever.

However, the contexts in Nigeria and Guinea are different in the sense that Nigeria is marked by the occurrence of almost yearly epidemics and public health campaigns through radios, television, print media (Mustapha, 2017; E. Tobin et al., 2013), whilst this is not the case in Guinea where researches were scarce on infectious diseases and it was not common to talk about epidemics before the outbreak of Ebola virus disease in the country. Although, this

situation has changed these last years with the creation of National Agency for Health Security and isolation units in the hospitals.

The lack of knowledge on Lassa fever among the participants of this study could be related to the fact that LAROCS is a research project, and sensitization, communication and community mobilization were not part of the project activities from the beginning. The communication activities at the beginning and during research activities are sometimes limited to participants and people found on spot in the villages. Further on, the fact that some people still reported that they do not know the disease could be a strategy to obtain and crosscheck information from the researcher. This has been now corrected through the surveillance activities, large sensitizations with community members and distribution of flyers. Participants have been informed through the informed consent process but the findings of this research reveal that there is still the need to encourage and continue communicating in order to inform as many people as possible and evaluate the knowledge of people taking part in research activities.

It should be reminded that despite all these activities previously mentioned, the main activities that capture more people's attention in these villages are mice elimination and capturing in their houses for samples from the captured mice for investigation purpose about the vector, coupled with free medical consultations and distribution of medicines during research activities and once a month when there is no research activities in these villages. This might seem like some inhabitants of these villages would accept the activities of the project because of this interest they feel immediately, namely the free medical treatment they receive, and the elimination of mice in their homes which allows them to store their food away from these mice. However during and after the Ebola Outbreak in Guinea, some of the villages stopped and refused to accept the project's activities in their villages, including the medical consultation and distribution of medication. This shows that the efforts done to communicate the objective of the project during the various research activities have not reached all the

community members in different villages and even those who took part in the activities need to be reminded about it. .

It is also important to underline that relationships between people coming from the capital city and those living in the villages are challenging. Trust is an ongoing and an everyday process in these villages and even the medical consultation has been increasing as the project continued its activities and people trust the team members progressively. Also some social adscription to “Sankaran” people to be known to have power using black magic prevented some of the team members during meetings with the communities to talk about a deadly disease. Finally, we should mention the reticence in the past history of Guinea to talk about epidemics. One recent example is the delay in the declaration of the Ebola outbreak in Guinea in 2014. This situation has changed now with more training of health staff and the creation of infrastructures for more resilience to epidemics.

In addition, this poor knowledge on Lassa fever by the participants in this study could also be linked to the distrustful attitude of rural communities towards health staff due to the Ebola Virus Disease (EVD) that occurred in the country in 2014 (Carrión Martín et al., 2016; La et al., 2015). Since the onset of this health crisis in the country, it has been difficult for people in general, and rural communities in particular to believe and accept public health programmes in their respective localities, hence some tend not to listen to the members of the intervention teams in their localities.

It is important to note that the few participants who reported that they had heard about Lassa fever were almost all community leaders in these villages. This could be related to the fact that these community leaders are always the first persons to contact in the villages for all activities in their localities, and they are almost always associated to minimize resistance in households in a post-Ebola context still marked by rural communities’ distrust vis-à-vis the health personnel. They are also the gatekeepers and any activity conducted in the villages

needs to be approved in written form (ordre de Mission) by the Health District Officer and local authorities. The project coordinator relies on the willingness of local authorities and people participating in meetings (each time the team visit a village) to pass on messages. This might allow them to be better informed about programs running in their localities.

In the same light, although the LAROCS project is eliminating mice in their houses and informing the inhabitants of the dangerousness of these mice for humans, all the participants in this study do not consider mice hunting and consumption by children as a health risk to humans. With the belief that it is only mice in houses that carry the disease (because these are the ones that the project team eliminates in their homes), and are dirty (because they go to the graves and toilets and they can eat poison in houses) they think that these are different from the mice that children capture in the bush and in the swamps to eat. As the result, they find no danger in hunting and eating bush mice which, according to them, feed only on rice in the swamps. The lack of knowledge on the Lassa fever vector has also been reported in the study by Bonwitt et al., (2016) in Sierra Leone where people think that shrews are the vector of LASV. So on, some children even described the mouse meat as delicious and greasy, containing vitamin. This consumption of mouse meat by children in the research villages of the LAROCS project has also been reported in the study by Kelly & Sáez (2018). The same facts were also reported in the study by Bonwitt et al., (2016) in Sierra Leone, where mouse meat was widely described by participants as a “tasty meat that makes a very good meal”. They also reported in the same study that participants stated that they do not eat house mice because of disgusting places such as latrines, cemeteries and garbage dumps these mice visit in the villages; which was also mentioned in our study, in addition to the fear of some children from ingesting poison that these mice could eat without dying in the houses when their parents try to eliminate them.

This could mean again that broad communication with clear messages about *M. natalensis* as the vector of the disease has not been effective in these villages.

However, other animals hunted by children have been cited as being responsible for the transmission of certain diseases to humans. The most frequently cited animal was the squirrel that would be the cause of the occurrence of hernia in children. This forced the children to give this animal to adults when it is captured during the hunt. To our knowledge so far, no scientific data proving this statement is yet available, further research on this topic could therefore be more informative. Unless this fact is proven, it could be an argument from adults to allow them to have their share of meat from children's hunting sessions, since in most cases these children are autonomous on their prey and prefer to prepare their meat separately from the family meal, fearing of not getting enough meat when it is eaten within the family.

Monkey has also been reported to cause epilepsy and epistaxis. This thought might be related to the EVD outbreak period, since at that time, messages on prohibition of bush meat consumption including primates and bats were broadcasted both in radios and by field agents.

In addition, regarding the knowledge on the risks associated with rodent hunting practiced by children, the only risk known and feared by all the participants (both adults and children) reported in this study is the risk of snakebite during burrows digging by these children. Moreover, this risk is reported to be higher when it is the rat burrows that are dug by children, since it is where snakes are found most often. This means that some parents would prefer that their children go to dig the mouse burrows in swamps where snakes are almost not found in the burrows to avoid being bitten. Paradoxically however, it has been found during participant observations that in these swamps, almost all the mice captured by children are *M. natalensis*, as has also been reported in Sierra Leone (Bonwitt et al., 2016). These findings are also

consistent with a previous study by Fichet-Calvet et al., (2007) which revealed that this species is abundant in houses and proximal cultivation fields in the same area.

No participants therefore referred to any health risk associated with the contact with rodents during hunting, further meaning that people in these villages have practically no knowledge on zoonosis in general, and Lassa fever and its modes of primary transmission in particular. These findings are contrary to those of LeBreton et al., (2006) in Cameroon and Subramanian, (2012) in Sierra Leone who indicated in their studies that 74% and 24% of participants respectively had a perception of risks associated with the contact with bush animals' biological fluids.

5.3.Factors motivating rodent hunting and consumption

The findings of this study revealed that the scarcity of meat in family meals in these villages was one of the main factors motivating children to hunt rodents for food in order to satisfy their desire for animal protein. Consumption of meat in these villages is almost always occasional (often during holidays and sacrifices), which pushes children to resort to rodent hunting in the dry season to cover this food deficit. This food reason for hunting in general and rodents in particular, is widely mentioned in the literature (Bonwitt et al., 2017, 2016; Friant et al., 2015; Suwannarong et al., 2015)

As a cause of this scarcity of meat, poverty and the inexistence of butchery in these villages have been mentioned. Access to meat in these villages is based exclusively on bush meat and it is sold in these villages only when a professional hunter kills a game, and a head of the family can only obtain it when he has the means to buy some. The notion of poverty was also reported in the study by Bonwitt et al., (2017) in Sierra Leone where it was reported that some people could even eat meat prohibited to them by their religion because of their inability to buy other meat.

In these rural villages, almost all the inhabitants are farmers and the farming practiced is subsistence farming. In addition to agriculture, they also practice extensive animal husbandry and most of them have cattle, some of which are entrusted to them by some parents living in large cities. In these villages, an ox is only killed on the occasion of sacrifices and/or the celebration of the two major Muslim feasts. To get money, they have to sell a part of their crops to meet other needs. For needs such as weddings, building proposes or buying a motorcycle, some sell a few oxen to meet these expenses. Therefore, this precarious economic situation and the inexistence of butchery could prevent parents from regularly finding meat for their families in order to satisfy the nutritional needs of their children. Some parents reported that if they could be able to provide enough meat to children, they would have abandoned rodent hunting. This statement is however contrary to that of some participants in the study by Bonwitt et al., (2016) in Sierra Leone where they stated that they would continue to eat mouse meat even though cow meat was available and affordable. This opinion is also shared by some children in our study who remain hesitant by saying that even though they get enough meat in the villages, they could continue hunting because of the habit.

Because of the lack of meat in the family meal, some parents ask their children to go for hunting for the family meal. Therefore, hunting has become one of the young boys' responsibilities as part of their contribution in the search for means for families' livelihood like meat. In the same way that children participate in farm activities (from ploughing to harvest) during the rainy season in rural areas, it is also their duty to go for hunting in the dry season to help their families have meat to eat. This family responsibility of children has also been reported in other studies, particularly in Sierra Leone and Thailand (Bonwitt et al., 2017; Setalaphruk & Price, 2007).

Generational culture has also been revealed as a motivating factor of rodent hunting in these villages. In the context of this study, the generational culture refers to all that children learn

during their childhood by referring to their elders, that is, any practice they learn by imitating their elders throughout their growth. Rodent hunting is therefore a common practice that children learn throughout their childhood in these villages, it is a kind of "required pathway" for any child growing up in this area and it is described as childhood activity. It thus tends to be part of the socialization process of children as it was also reported in a study by Kelly & Sáez, (2018) in the same region. It is even considered as an activity that any healthy and strong little boy must practice during his childhood. The same facts were reported by Bonwitt et al., (2016) in their study in Sierra Leone where rodent hunting has also been labelled as a practice of boys in villages.

By constantly reporting that they all practiced rodent hunting during their childhood, and that it has always been practiced since their great grandparents time, all male adults who participated in this study attributed a cultural and especially generational character to this practice, as to say that every boy of each generation has experienced this practice in these villages. The findings corroborate those from previous studies which also mentioned this cultural reasons for hunting and eating bush meat (Friant et al., 2015; Subramanian, 2012). It is also reported in the study by Setalaphruk & Price, (2007) in Thailand that children acquired knowledge on wild food resources through observation, participation, and practice with peers of the same generation as well as some family members. This interaction allows the transfer of knowledge from one generation to another.

Peer pressure also appeared in this study as a new information which is about the pressure that children can put on each other to take part in the hunting expeditions to show that they are “males” and to have access to meat, as those who do not take part in such activities are left out of the meat distribution.

In this study, it was found that rodent hunting is also a source of income for children in these villages. Indeed, it is the rats (*Cricetomys gambianus*) that elder children capture and sell to

adults in the village who buy them for medical reasons. Globally, hunting is a major source of income in rural areas as it has been documented in previous studies (Bonwitt et al., 2017; Kümpel et al., 2010; Schulte-Herbrüggen et al., 2013; Subramanian, 2012). However what is new is the finding that in these villages, the rat has become a source of income for these children thanks to the beliefs that the meat of this animal is an effective drug that treats high blood pressure; this belief is also spread in the city of Faranah. The use of bush meat for medical reasons has been also reported in Sierra Leone and Nigeria (Bonwitt et al., 2017; Friant et al., 2015).

Again, it was found in this study that the non-occupation of children by farm activities during the dry season also plays an important role in the common practice of rodent hunting in these villages. In rural Guinea where agriculture is the main activity, the dry season (October to March) corresponds to the break period in the villages, since the harvests are over and the preparation of the new fields has not yet begun. It is also a good time to hunt especially for rodents and other small animals. In addition, the majority of children in rural areas are not in school (INS Guinée, 2017), which means that at the end of the farm activities, they are free and there is no major family tasks to perform for their parents. Naturally, it is the rodent hunting that becomes the first option of choice for them given that other motivating factors are already gathered.

Finally, crop protection is another factor that was raised in this study. Indeed, rodents such as grass cutters, rats, mice and other small animals are also hunted in order to protect crop in the cultivation fields that these animals destroy a lot. Because of the threat that these animals pose to food security in rural villages, it is common for people to use rodent control techniques ranging from hunting for large rodents to poisoning for mice in houses. This findings are similar to a previous study by Bonwitt et al., (2017) in Sierra Leone where participants also reported that rodents constitute a threat to food security in their communities.

5.4. Rodent handling practices

It was revealed in this study that rodent handling begins at the prey capture site and continues to the home where the meat is most often cooked/roasted and eaten. From hunting to consumption, several steps are undertaken (hand-capture, slaughtering, transportation, skinning, eviscerating, cooking/roasting and consumption) and each step exposes children to the animals' body fluids namely, urine and blood. These same handling practices were identified by Bonwitt et al., (2016) in their study on rodent hunting and consumption in Sierra Leone. In general, these techniques are widely reported in the literature as being used by hunters throughout the hunting process (Bonwitt et al., 2016; Friant et al., 2015; Suwannarong et al., 2015)

Participant observations during this study revealed that the majority of mice caught in swamps were *M. natalensis*, meaning that this species is widely handled and consumed by children during the dry season in these villages. The smallest children aged about 6 to 10 years are most often in contact with these mice; as they are not yet able to follow their elder brothers who go to the bush to hunt rats, they go to the nearby swamps to the villages where burrows are easier to dig. This also constitutes for them the initiation stage of hunting and allows them to have their prey on which they are autonomous. In a study carried out in the same area, Fichet-Calvet et al., (2007) reported that *M. natalensis* were widely found in the houses and proximal cultivations fields surrounding the villages. In the same light, the migration of this species between houses and surrounding fields has also been documented in the study by Mariën et al., (2018) in the same research area.

5.5. Risk of primary transmission of Lassa fever

Based on the results of this study, as well as other researches conducted by the LAROCS project in these villages, it can be stated that the risk of primary transmission of LASV in

these villages exists because of the permanent and direct contact that children have with *M. natalensis* during hunting, handling and the consumption of these mice. In fact, the seroprevalence of LASV in both *M. natalensis* and humans has been previously determined in LAROCS project research villages. For example, in Yèrèwalia and Brissa (which were the sites of this study), 17.8% (8/45) and 3.8% (2/52) of *M. natalensis* were positive to Lassa respectively (Saez et al., 2018). Moreover, human seroprevalence has been also estimated at 40% in the Faranah region (Klempa et al., 2013).

In addition to these existing indicators, this study has allowed to understand that beyond the domestic space where residents are already in contact with mice in their houses, children also remain exposed to these mice during the hunting practice in the dry season, thus increasing the risk of LASV transmission in this endemic area.

It should also be noted that through this practice of mice hunting, children increase the risk for almost all the members of their families by bringing these mice home for roasting and/or grilling. At home, all their younger brothers and sisters who were not involved in the hunting session are associated with the cooking and the meat is shared with them. Rodents are even left in the rooms until evening time when the prohibition to cook is over, giving the opportunity to their young brothers and sisters to play with them before they are roasted and eaten. For grilling for instance, it is the cooking utensils of the family (knives, cooking pots and ladles especially) that are used to cut and grill the meat. All the materials touched during the cooking may be contaminated by the biological fluids of the mice being handled.

5.6.Limitations of the study

Information biases can be generated by this type of study. Since adults have been invited to express themselves on a sensitive issue related to their children's behaviours in the villages (consumption of rodents by their children), and since there is already a project that works

there and whose workers urged them to ban their children to consume, the social desirability bias could have been generated by this study if some parents had tried to hide this fustigated behavior of their children. Therefore, participant observations with the children during their hunting sessions, as well as informal discussions with several members of the concerned villages made it possible to minimize these biases by triangulating the data collected from these different sources.

Furthermore, the number of people interviewed in these villages remains small (five per village), meaning that it is not possible to generalize the findings of this study, especially in regards of people's knowledge on LF. Further studies considering larger participants could give more information on LF in these communities.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

This study was conducted in two villages in the Lassa fever endemic area of Faranah where rodent hunting is an ancient and widespread practice. In these villages, this activity is mainly practiced during the dry season by children from about 6 years and throughout their adolescence.

The interaction between the underlying factors and the triggers is the main motivation for the practice of rodent hunting by children in these villages. Therefore, in this dynamic of seeking meat for the reasons identified by this study, children are exposed to the biological fluids of these rodents through the different forms of manipulation they undergo with these animals throughout the process ranging from hunting up to meat consumption. The animals captured by children during these hunting sessions largely include the *M. natalensis* which is mostly caught in the swamps, exposing these children to the high risk of primary transmission of LASV in this endemic area.

It is therefore important, even urgent, to define appropriate community strategies that take into account these factors that motivate rodent hunting by children, while putting into place behavioral change communication mechanisms that can help people in these villages understand the risk encored by this young population and find ways to learn how to prevent and protect them from this risk.

Finally, the determination of human seroprevalence in a larger population, especially which of children in this endemic area, may be crucial for accurate information to define mass prevention strategies such as vaccine development.

6.2. Recommendations

This section suggests some strategies that could help to stop this practice of rodent hunting by children. Since the factors influencing rodent hunting by children are multiple and they interact, the recommendations will concern different structures whose combined efforts would certainly prevent Lassa fever through the limitation of contact with mice. In the light of the results of this study, it is then recommended:

6.2.1. To The LAROCS project:

- Develop and establish behavior change communication strategies in these villages in collaboration with health authorities ;
- Inform authorities and NGOs working on/with children to address children hunting by taking into account the needs of local communities in planning activities, including factors that motivate children to hunt;
- Conduct more research on the vector of Lassa fever beyond the domestic space;
- Consider other strategies for mice elimination beyond the domestic space;

6.2.2. To The Ministry of Health:

- Conduct, support and accompany research on Lassa fever in the endemic area of Faranah to avoid eventual epidemics;
- Strengthen the surveillance system with particular emphasis on Lassa fever in this endemic area;
- Identify and engage opinion leaders in these villages, train and equip them to provide communication at large to popularize knowledge on Lassa fever and its modes of transmission;

- Plan and sensitize by initiating social mobilization days on Lassa fever in this endemic area;
- Extend communication about the disease in radios, markets, schools, television in order to reach the population at large;
- Train community health workers on Lassa fever and equip them to provide outreach communication through door-to-door visits.

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APPENDICES

1. Information sheet

**Title: FACTORS INFLUENCING CONSUMPTION OF RODENTS BY CHILDREN
IN THE LASSA FEVER ENDEMIC AREA OF FARANAH IN GUINEA**

Principal Investigator: MOUSSA DOUNO

Address: SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF SOCIAL AND BEHAVIOURAL SCIENCES

UNIVERSITY OF GHANA, LEGON

Contact: 0500171899 / msokadouno@gmail.com

My name is Moussa Douno. I am a graduate student of University of Ghana, School of Public Health undertaking a research on “**factors influencing consumption of rodents by children in the Lassa fever endemic area of Faranah in Guinea**”.

One research assistant will be assisting me in this study. The study seeks to identify factors that motivate children to hunt and consume rodents. Participants are required to share their experiences on rodents hunting by children.

Personal information that will lead to identification of participants will not be included in the interview guide. Information given by participants is anonymous (will not bear names of participants), so they will not be identified. You are free to be part of the study and decide to leave at any point you want. However, be assured that your privacy and confidentiality will be respected. Be assured that the research come at no risk and no cost except the precious time that you will used to answer our questions. You can choose a place of convenience for our discussion.

2. Consent form

The above document describing the benefits, risks and procedures for the research title **“factors influencing consumption of rodents by children in the Lassa fever endemic area of Faranah in Guinea”** has been explained to me.

I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and am willing to give consent to participate in this study as a volunteer.

Date

Name and Signature or mark of volunteer

If volunteers cannot read the form themselves, a witness must sign here:

I was present while the nature and purpose of this study were read to the volunteer. All questions asked were answered satisfactorily regarding participation in this study, and volunteer gave consent to participate in this study.

Date

Name and Signature or mark of witness

If volunteer is below 18 years of age, a parent/Guardian must sign here:

I was present while the nature and purpose of this study were read. All questions asked were answered satisfactorily regarding participation in this study, and I gave consent to for my ward to participate in this study.

Date

Name and Signature or mark of Parent/ Guardian

I certify that the nature and purpose in this research have been duly explained to the above individual.

Date

Name and Signature of Person Who Obtained Consent

3. Interview guide

3.1. Interview guide for IDIs with adults

Respondents identity	
Age	
Sex	
Marital status	
Level of education	
Profession	
Ethnic group	
Religion	
Village	

Themes	Questions
Knowledge about Lassa fever infection	<ol style="list-style-type: none"> 1- Have you ever heard about a disease that could be contracted by the contact with rodents? If so, can you please describe it? 2- Have you heard about Lassa fever? What do you know about it? 3- Do you know some animals which could probably transmit a disease to human being? If so, what are there? 4- Do you know any animals hunted by children that might be dangerous for their health? If so, what are there? 5- What should you do to prevent children from this disease?
Motivating factors to hunt and consume rodents	<ol style="list-style-type: none"> 6- According to you, why do kids go hunting? 7- How do kids share their prey? 8- Are kids asked sometimes to hunt for the family? 9- Which benefit could children get from hunting?

	<p>10- Why do they like hunting?</p> <p>11- How often do they eat meat at home?</p> <p>12- Why do they hunt mainly?</p> <p>13- What do you propose as an eventual alternative for children to stop hunting?</p> <p>14- Is it a widespread practice?</p> <p>15- Why other kids don't like hunting? What are the main factors preventing kids not to hunt rodents? How these kids (those who does not hunt) are consider in their families?</p>
<p>Rodents handling practices</p>	<p>16- Which types of animals do they like hunting?</p> <p>17- Which ones do they kill more frequently?</p> <p>18- How do they proceed to capture/kill a prey (<i>observe, purchase with dogs, dig burrows, etc.</i>)?</p> <p>19- After killing an animal, what do they do with it (<i>slaughter, sell, cook, roast, etc.</i>)?</p> <p>20- How do they prepare it for eating (<i>cook, roast, give to parents, etc.</i>)?</p>
<p>Children in the family</p>	<p>21- How a normal day looks like in children life- girls - boys?</p> <p>22- What do they usually do in farms or bush apart from hunting?</p> <p>23- How children are educated?</p> <p>24- What are the main responsibilities of children (male and female/ages 0-4: 5-9: 10-14..) in the household? Are they the same when biological family or extended family?</p> <p>25- Children going to school, who decides?</p>

3.2. Interview guide for FGDs with children

Respondents' identity							
No	Age	Sex	Level of education	Profession	Ethnic group	Religion	Village
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							

Themes	Questions
Knowledge about Lassa fever infection	<ol style="list-style-type: none"> 1- Have you ever heard about a disease that could be contracted by the contact with rodents? If so, can you please describe it? 2- Have you heard about Lassa fever? What do you know about it? If yes, do you know how to protect yourself from the risks? 3- What should you do to avoid this disease? 4- Do you know any animals you hunt and which could probably transmit a disease to human being? If so, what are there? 5- Do you know any animals you hunt that might be dangerous for your health?

<p>Motivating factors to hunt and consume rodents</p>	<p>6- Why do you go to hunt? 7- How do you share your prey? 8- Are you sometimes asked to hunt for the family? 9- Which benefit could you get from hunting? 10- Why do you like hunting? 11- How often do you eat meat at home? 12- Why do you hunt mainly? 13- What do you propose as an eventual alternative for you to stop hunting? 14- How often do you eat meat at home?</p>
<p>Rodents handling practices</p>	<p>15- Where do you go usually to hunt? 16- Apart from hunting, what do you like to do when you are in the cultivation field? 17- Which types of animals do you like hunting? 18- Which ones do you kill more frequently? 19- How do you proceed to capture/kill a prey (<i>observe, purchase with dogs, dig burrows, etc.</i>)? 20- After killing an animal, what do you do with it (<i>slaughter, sell, cook, roast, etc.</i>)? 21- How do you prepare it for eating (<i>cook, roast, give to parents, etc.</i>)?</p>

4. Mastomys natalensis, the vector of LASV



Figure : Mastomys natalensis, the reservoir of Lassa virus (Boisen et al., 2015).

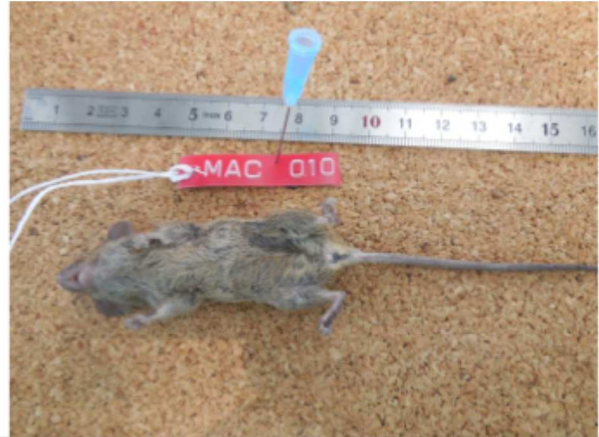
5. Key identification for small mammals in Guinea

W: weight, HB: head – body length, T: tail length, HF: hind – foot length, E: ear length

(Prepared by Elizabeth Fichet-Calvet)



Mus musculus
W = 10-16 g
HB = 70-88 mm
T = 74-79 mm
HF = 16-18 mm
E = 13-14 mm



Nipples: 3+2 = 10



Lophuromys sikapusi
W = 45-90 g
HB = 110-150 mm
T = 60-65 mm
HF = 22-23 mm
E = 17-18 mm



Nipples: 1+2 = 6



Lemniscomys striatus
W = 40-70 g
HB = 125-145 mm
T = 145-150 mm
HF = 25-28 mm
E = 16-19 mm

Nipples: 2+2 = 8



Mastomys natalensis
W = 50-90 g
HB = 120-150 mm
T = 110-130 mm
HF = 23-25 mm
E = 18-20 mm

Nipples: 9-12 in 2 ranks = 18-24



Praomys rostratus
W = 35-65 g
HB = 110-140 mm
T = 135-160 mm
HF = 23-26 mm
E = 18-21 mm



Nipples: 1+2 = 6



Rattus rattus juvenile
W = 30-70 g
HB = 115-145 mm
T = 120-180 mm
HF = 26-33 mm
E = 19-24 mm





Mastomys erythroleucus
W = 50-90 g
HB = 120-150 mm
T = 110-130 mm
HF = 23-25 mm
E = 18-20 mm



Nipples: 9-12 in 2 ranks = 18-24



Rattus rattus adult
W = 70-160 g
HB = 145-200 mm
T = 180-240 mm
HF = 33-37 mm
E = 22-24 mm



Nipples: 2+3 = 10



Crocidura spp

6. Pictures from participant observations on the fields



Picture 1: children digging rat burrows on a termite mound with their hunting dog.



Picture 2: a boy holding the caught rat (*Mastomys natalensis*), trying to pass the tail through the slaughtered throat to be able to easily hold it like a bag for carrying it home.



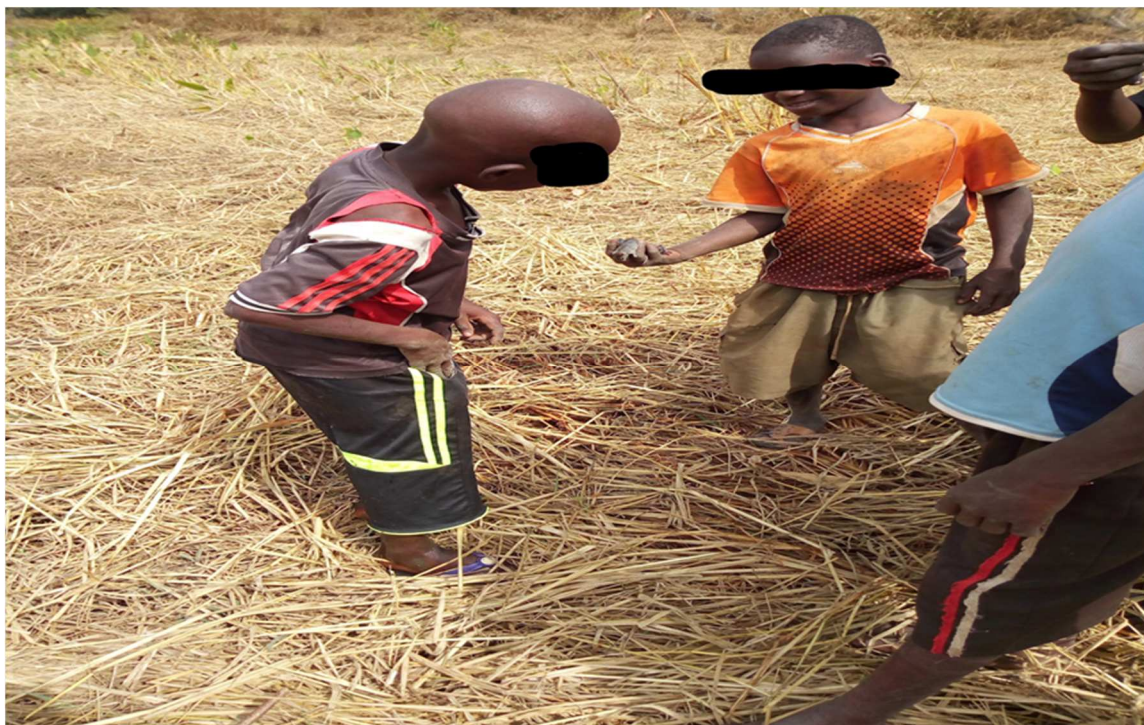
Picture 3: children digging mice burrows in the swamp.



Picture 4: children catching with their bare hands the mouse pups trying to escape from the dug burrows.



Picture 5: a doe (*Mastomys natalensis*) and its pups caught by children in the swamp.



Picture 6: a child putting the captured mice in his pockets for carrying home.



Picture 7: a boy eviscerating a rat (*Cricetomys gambianus*) after the hunting session.



Picture 8: captured mice (*Mastomys natalensis*) kept in the boys' room after hunting, waiting for evening to light fire and roast them for eating.