

Understanding Multi-Level Factors that Influence Risk of Rabies in Ghana

Formative Research in Greater Accra and Upper East Regions

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Child hunters and their hunting dogs interacting with the research team in Ada West in the Greater Accra region of Ghana.



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Acronyms

CCP	Johns Hopkins Center for Communication Programs
Co-I	Co-Investigator
EPI	Expanded Program on Immunization
FGD	Focus Group Discussions
FTS	Field Team Supervisor
GAR	Greater Accra Region
GHS	Ghana Health Service
GHSA	Global Health Security Agenda
HPD	Health Promotion Division
IRB	Institutional Review Board
JHSPH	Johns Hopkins Bloomberg School of Public Health
PI	Principal Investigator
SBC	Social and Behavior Change
UER	Upper East Region
USAID	United States Agency for International Development

Introduction

Background

The Johns Hopkins Center for Communication Programs (CCP) is the lead organization for Breakthrough ACTION, a five-year cooperative agreement from the United States Agency for International Development (USAID) to lead USAID's social and behavior change (SBC) programming around the world. Breakthrough ACTION is a partnership with Save the Children, ThinkPlace, ideas42, Camber Collective, International Center for Research on Women, and Viamo Communications.

Breakthrough ACTION programs support collective action and encourage individuals and communities to adopt healthy behaviors across multiple health areas, including behavior change interventions for priority zoonotic diseases. Through its work, Breakthrough ACTION harnesses the power of communication and integrates innovative approaches from marketing science, behavioral economics, and human-centered design to support governments, communities, families, and individuals to implement behavior change for healthier lives.

Introduction

In Ghana, adopting healthy behaviors is a key strategy for health promotion and improved health outcomes, and especially for managing preventable infectious diseases in the country. USAID Ghana invests in community health, social mobilization, community engagement, and health facility strengthening activities to promote healthy behaviors among the general population in Ghana, however behavior change at household and community level continues to be a need.

Breakthrough ACTION, in collaboration with the Ghana Health Service (GHS) Health Promotion Division (HPD), Veterinary Services, Ministry of Agriculture and Health, USAID, and other in-country stakeholders, is working to design communication strategies and salient public health messages to promote rabies prevention behaviors and safe shared living environments with animals among the general population. As part of this effort, the program conducted formative research to inform on-going national health priorities designed to decrease the prevalence of rabies and dog bites in Ghana.

Overview of Rabies in Ghana

It is essential to strengthen and maintain the capacity of Ghana to prepare and respond to health events through improved risk communication. The disease is endemic on all continents and the highest case incidence occurs in Asia and Africa where rabies potentially threatens over 3 billion people [1].

Understanding the epidemiology and culture of zoonosis in Ghana will provide a strong foundation for preventing and effectively responding to occurrence of zoonotic illness in the country.

Rabies is a zoonotic viral infection transmitted in saliva through bites and scratches of infected mammals. The Ghana Ministry of Health lists rabies as an epidemic-prone disease in Ghana and a key

priority zoonotic disease. The virus attacks the central nervous system targeting the brain and the spinal cord [1, 2, 3], with a case fatality ratio of almost '1' [1]. Surveillance data show increasing trends in rabies cases in Ghana, however poor reporting and surveillance have resulted in gross underestimations of cases and mortality. In Ghana, rabies virus has been identified in dogs, cats, monkeys, bats, cattle, sheep, and goats. Dogs, however, are the most predominant source, contributing 94% of rabid cases reported from 2014 to 2022 in the country [1]. Surveillance data from Ghana between 2018 and 2022 [1] show that while the distribution of rabies cases occurs in almost all the regions, the Ashanti Region (160 cases), Greater Accra Region (GAR) (132 cases), and the Upper East Region (UER) (83) have the highest prevalence of cases, with almost all of these being canine rabies. The Disease Surveillance Department of the GHS reported 97,366 dog bite cases between 2017-2022 [2], with the highest case prevalence in GAR (19,241; 19.76%). Data also show that in 2022, there were 16,907 cases of dog bites in humans, with the GAR accounting for the highest prevalence of 20.23%. In addition, a minimum of 1,000 cases of dog bites were recorded per month in 2022, with the month of May recording the highest number of cases in people (1,533). Out of 321 suspected human cases in Ghana in 2022, 204 resulted in death (unvalidated) [2]. Children are especially vulnerable to rabies, with four out of every ten rabies-related deaths in the African continent occurring in children under the age of 15 [4, 5].

Rabies is a preventable disease, however there is little information about community-level perceptions and behaviors that influence transmission of rabies in Ghana. Canine vaccination coverage between 2018 and 2022 is extremely low, peaking at 9.9% in 2018, decreasing to 6.1% in 2021, and increasing to 8.6% in 2022 [2]. Challenges include the absence of enforceable legal basis for control of rabies, poor regulation and monitoring of pet ownership including dog registration, licensing and vaccination, poor stray dog population control, limited follow-up of dogs that bite, and limited public awareness of rabies and vaccination requirements [1]. In addition, the GHS Disease Surveillance Department reported that data sharing between human and animal health, lack of funding for rabies-related activities, and the high cost and unavailability of post-exposure prophylaxis were challenges to managing suspected rabies cases in the population [2]. The GHS Disease Surveillance Department cites health communication and community engagement as key activities for planning rabies prevention [2]. Within this context, effective, credible, accurate, and correct health information and messaging is a critical step to motivate individuals and practice behaviors to live safely with animals. To this end, Breakthrough ACTION Ghana will continue to develop and implement a range of high-quality SBC interventions to decrease risk of rabies among the general population. To ensure a strategic approach for a national rabies prevention campaign, Breakthrough ACTION explored issues underlying beliefs and behaviors to identify actionable insights that will support the development of effective interventions that address the root causes of risk.

The purpose of the research is to provide information on community members' perceptions, attitudes, and knowledge related to rabies, and the factors influencing risk of illness, prevention behaviors, and reporting and uptake of treatment and support services for rabies. The research aims to provide high-quality data to inform evidence-based risk communication and community engagement programming for rabies in Ghana.

Aims and Objectives of the Study

The formative study explored community members' perceptions, knowledge, and behaviors associated with rabies. Specific objectives included to:

1. Understand awareness and knowledge of risk to health from animal-human interactions
2. Assess community members' knowledge of rabies
 - a. risk behaviors in animals and humans
 - b. symptoms of illness in animals and humans
 - c. rabies prevention strategies
 - d. reporting mechanisms for rabies
3. Understand factors (individual, community, structural, economic, socio-cultural norms, etc.) that influence animal-human interactions
4. Identify predisposing factors for risk and prevention of zoonotic illness
 - a. protective behaviors and strategies that decrease personal risk and/or prevent rabies (in animals, in individuals)
 - b. risk behaviors and practices that increase personal risk of rabies
5. Describe personal experiences with animal-human interactions such as rabies
6. Identify community needs in the context of rabies prevention and treatment

The results of the research may be used by GHS, in collaboration with Breakthrough ACTION and other local stakeholders, to develop national SBC interventions and resources that provide accurate information, address risk behaviors, and create demand for rabies prevention information and interventions among the general population.

Study Methods

Qualitative methods were used to collect information on rabies-related knowledge, perceptions, and behaviors. Focus group discussions (FGDs) were conducted with adult men and women 18 years and older, and with children between the ages 10-17 years.

Study Design

Study Sites

Regions and communities were selected with input from stakeholders at the GHS and Regional Health Directorate in Ghana. Selection of regions was made based on the following guidelines:

1. Current history of reported dog bites
2. Locale with high number of stray dogs
3. Market, agrarian, or hunting locale that contributes to supply and demand for bushmeat, livestock, or dogs for hunting
4. Community where activities increase the risk of bites and scratches from dogs, bats, raccoons, and other mammals that could serve as potential sources of rabies
5. Geographically well-defined and accessible locale
6. Represents a target area for behavior change messaging

The study was conducted among residents of communities in GAR and UER of Ghana. The total number of participating communities was 16 with eight in rural and eight in urban locations. See Table 1 below for a description of the regions, districts, and communities participating in the study.

Table 1: Regions, districts, and communities participating in study

Region	District	Community	
		Urban	Rural
Greater Accra	Accra Metro	Korle Bu	James Town
		Agbogbloshie	Korle Gonno
	Ada West	Sege	Kuluedor
		Akplabanya	Toflokpo
Upper East	Bolgatanga Municipal	Bolga Soe	Nyariga
		Tindonmoligo	Sumbrunga
	Bolgatanga East	Zuarungu	Dachio
		Yarigabisi	Katanga

Sites were selected based on local surveillance data on prevalence of rabies bites and cases, and on safety and stability of the area. In the UER, dogs are not only kept as pets or for security and hunting, but also serve as a traditional delicacy. This region has dog markets and the dynamics of dog keeping and handling and motivations for having animals are significantly different from geographic areas in southern areas of the country. The need for SBC interventions on rabies is critical to help communities adopt healthier practices that enable them to live safely with animals. The GAR has the largest human population per capita and dog breeding specifically for sale among the general population (including middle income strata) is increasing with potential to become normative. Proactive interventions are warranted to curb harmful practices that put the population at-risk of dog bites and rabies .

Study Participants

Selection of FGD participants was conducted in collaboration with community leaders, program staff working on rabies, and district health workers with awareness of individuals with specialized knowledge about rabies. Participants were purposefully selected based on their familiarity with local culture and community practices, personal and/or professional experiences with animals of interest including dogs, bush rodents, and bats, and on their ability to articulate in detail, the challenges operating at different levels of the community regarding preventing illness from animal-human interactions. This included (but was not limited to) community members, community leaders, hunters, traders, community health workers, animal health workers, program staff of community-based organizations working on zoonosis (and rabies specifically), and district health officers.

Adults (18 years and older) and children (10 – 17 years) participated in FGDs. Children were included to provide a richer understanding of the perceptions and cultural practices that put community members at risk of rabies (in Ghana, young children are sometimes used to hunt bats and bushmeat found in small spaces inaccessible to larger adults).

Sampling

Forty-eight FGDs among 480 individuals were conducted in two regions. FGD groups for community members were stratified by gender and age to facilitate comfort and ease of discussions. There were 10 participants in each FGD for efficient group dynamics and participation.

Field Work

The study principal investigator (PI) and Co-investigators (Co-Is) trained a local team of experienced data collectors on human subjects' ethics, the study procedures, recruiting and informed consent, study tools and strategies for eliciting rich detail, and field team logistics, supervision, quality assurance, and communication. The CCP PI supervised field work with the assistance of a Co-I and field supervisor.

Community entry

The study PI and Co-I conducted formal community entry procedures prior to the start of research

interviews in the study sites.

Ethical Review

The study was reviewed and approved by the Institutional Review Boards of the Johns Hopkins School of Public Health (JHSPH) in Baltimore, and the Council for Scientific and Industrial Research (CSIR) in Ghana. Informed written consent was obtained from all participants prior to the start of data collection.

Study Results

Data was collected over a period of three weeks in February and March 2023.

A summary of the results is presented below. Within each section, the main themes are outlined for each region, followed by a descriptive narrative. Main differences in themes and perceptions were observed by sex and location but not by age group.

Context of Animals

Participants described types and perceptions of animals usually found in their communities.

PRIMARY INSIGHTS: CONTEXT OF ANIMALS

- There are a wide variety of domestic and farm animals in study communities
- Responsibility for animal care is not well defined or enforced within communities
- Animals serve multiple purposes but their main functions center around being a source of food, security, and income
- The perceived value of animals, including dogs, may shift with changing personal and household circumstances
- Dog meat is perceived to be commonly consumed by participants from both regions
- Local markets exist for dog meat and for food prepared with dog and cat meat
- Dogs have spiritual significance in both study sites
- Allowing dogs to roam is deliberate and acceptable in UER where it is perceived as a necessity compared to GAR where it is perceived as neglect and a threat to safety

Types of animals

All groups of participants mentioned a variety of animals including domestic and farm animals such as fowl (guinea fowl, chicken, duck, turkey), dogs, cats, donkeys, horses, rabbits, pigs, sheep, goats, and cattle. Participants from GAR identified additional animals commonly found that may have links to risk of rabies such as monkeys, bats, and bush rodents.

Purpose for having animals

Overall, participants perceived that everyone in their community had an animal in their home. Participants identified several purposes for keeping animals including using them for farming, hunting, security, food, income, and transportation. Animal by-products such as waste were also used to fertilize soil on farms and the hide of dead animals was used to make footwear. Few individuals identified companionship and recreation as reasons for having an animal.

“The purpose of animals includes eating them as food, using them for farming, for transportation, and for security by the dog.” (Upper East, Urban, Child)

"The animals serve as food, pets, security, protection and are also used for recreational activities. Some of the animals are also sold to generate income. Dead animals and the droppings of animals are used as manure to fertilize the soil for crop cultivation." (Greater Accra, Urban, Male)

Security

Almost all participants described dogs and cats as essential for security in the home at night, when they were away from their home, including working on their farms. Dogs were also used as escorts when visiting city centers to ward off potential robbers.

"Animals behave in different ways depending on the type; for example, dogs start barking when a stranger comes to the house and ... cats scare away snakes at home." (Upper East, Urban, Child)

"My dog is a security that prevents thieves from entering my house in my absence or at night." (Upper East, Rural, Male)

"People rear animals for protection; cats are reared to protect the homes. An example is that cats protect our foodstuffs from rats. It [the cat] also kills insects, rodents and reptiles that visit our homes." (Greater Accra, Rural, Male)

Food

Animals were also reared to be a source of food for the household. Many participants from both regions perceived dog and cat meat to be *"a delicacy in this community"* and a common *"sweet and delicious"* source of meat enjoyed by the individuals in their communities. Some participants stated they reared dogs and cats specifically for food while others killed their dogs to eat when they could not afford to buy food. Others noted that selling dogs to abattoirs as meat for public consumption provided them quick access to money when they had a need.

Male 1: *"Almost all the animals mentioned including the dogs are eaten as food. Four of us here eat dog meat."*

Male 2: *"I know cat is eaten but not dog."*

Male 1: *"You don't know how to eat dog? It is very delicious!"* (Greater Accra, Urban, Male)

"Animals like the fowl, rabbits, guinea fowls, pigs are used for food. Some people also kill dogs for food. It used to be the Frafra people but everybody is now chewing dogs in this community. I chew dog myself, it's nice, it tastes better than goat." (Greater Accra, Urban, Male)

"Almost all the animals are used for food purposes. When things are hard and you are suffering you will eat the dog and it is fine." (Greater Accra, Urban, Female)

Participants confirmed that local dog meat markets exist in some areas and are known by community members. Individuals referred to the meat of dogs and cats as *"our meat,"* implying that consumption of this meat may be a community norm.

"They sell dog meat at lighthouse (Jamestown, Accra) with light soup, and people use cat meat to prepare stew to eat Gari (African food made from cassava). People really enjoy their [dog, cat] meat. Here in Jamestown that is our meat. It's expensive too." (Greater Accra, Rural, Female)

"They buy the dogs from Zebilla, Doaba, Kandiga, and other places. People from their individual homes bring the dogs to the market to sell and they also buy from there and kill to eat." (Upper East, Urban, Male)

Income

Participants described that animals were valued for a variety of reasons, nonetheless they also noted that animals, including dogs, were commonly sold for money in times of financial difficulty and emergencies. Participants reported that the sale of animals for money for food, including dogs, increases just before the planting season, when the last harvest has been consumed. Some participants mentioned rearing animals, including dogs, specifically for reproduction and selling of the offspring.

"I keep animals, because when there is an emergency, I can easily sell some. It is easy to sell a pig, good sheep, or a dog to solve a problem. We also sell dogs. The color of the dog determines the price or the market value or the price of it. For [instance], the pure black and pure white are the most expensive because that is what our dogs always demand for [are sold for]. We also have a special dog called Banindoohah." (Upper East, Urban, Male)

"With pigs and dogs, when they give birth plenty [have a lot of babies], we sell the piglets and make money paaa (a lot). It makes good business." (Greater Accra, Urban, Male)

"We have to sell more of the animals, even our dog, to buy food stuffs to supplement the food stuffs left, especially when it is getting to new sowing and planting season when hunger becomes very severe." (Upper East, Rural, Female)

Work

Animals, mainly cattle and dogs, are used in the context of work. Cattle are used to plough farms during the rainy season and dogs assist during hunts for bush meat.

"I use my cattle to plough my farm and other people's farms in this community. I also use my donkey to plough my farm." (Upper East, Rural, Male)

Dogs in particular are used by adult and child hunters to help capture prey.

"Many dogs can be found in the "kopes" [villages]. The people in the villages use them for hunting and for security on their farms. They do very well in hunting for other animals such as rabbits, alligators, and squirrels." (Greater Accra, Urban, Female)

"I train my dog for hunting because meat is expensive in this community. Hmm, my dog sometimes goes to the bush alone to hunt for meat for the family". (Upper East, Rural, Male)

Traditional rites

Some animals are used during certain cultural practices including traditional rituals, marriage dowry, and festive events. Participants from GAR described the protective role of fowl, dogs, and cats in the context of traditional healing and intervention to ward off illness, death, and evil. On the other hand, participants from UER described the sacrificial use of dogs for marital rites and to pacify the gods.

"I use my dog to perform marital rites in this community; I am a strong traditional believer, so I use my dog to pacify the gods. Personally, I sacrifice animals to my gods based on what the gods request for." (Upper East, Rural, Male)

"The dog is sometimes used to perform marital rites before marrying a lady from the Grune community. It also is used to perform an older male's funeral rites but not [just] anybody's funeral." (Upper East, Urban, Male)

"Dogs, like cats, also save lives. Dogs are exchanged with human lives to spare them from any death when the oracles are consulted." (Greater Accra, Urban, Female)

Some participants ascribed spiritual significance to animals, especially cats and dogs. These participants believed that dogs and cats offer spiritual protection by "sacrificing themselves" for the life of their owner. A few participants noted that they kept dogs and cats specifically for spiritual reasons because, as explained by a female in GAR, a widespread belief is when a cat "*licks, sleeps, or plays around the sick person, that sickness vanishes.*"

"Cats protect us from sickness or death. A cat can sense when something bad like sickness is coming upon you the owner; and it takes the sickness upon itself. When that happens, it will either die for the owner to live or it will leave the house and never return." (Greater Accra, Urban, Male)

"Dogs have spiritual eyes, they can see spirits. I was sent to the farm to bring a cutlass one day. The dogs went with me and were running ahead. When I was about to enter the farm I realized that they started barking wildly, they rushed against something and the thing pushed them back then they (dogs) came back. They rushed against the thing again; I couldn't see it, but they rushed against it barking wildly and it will push them back. So, I realized that there was something evil that wanted to harm me there. I was able to enter the farm after." (Greater Accra, Urban, Male)

"The dog even protects the house spiritually because it sees things in spirit which human beings could not see." (Upper East, Urban, Male)

Transportation

Several donkeys were observed in the UER communities. Participants noted that they were mainly used for ploughing and for carrying loads.

"Donkey is used to carry our goods, it serves as a means of transportation." (Upper East, Rural, Male)

"I use my donkey as a means of transport to carry farm products and water to build houses. My donkey carries my farm produce to the house and serves other transport services." (Upper East, Urban, Male)

Companionship

Few participants from either region mentioned that animals served as a source of companionship for individuals.

"Dogs, cats, sheep, and goats especially: They usually get close to their owners such that they relate with them just like human beings." (Greater Accra, Urban, Female)

"I love my dogs so much. Even if I slap or boot [kick] them for misbehaving they still come to make me happy by playing with me or sleeping beside me. Dogs are better off than human beings." (Greater Accra, Rural, Male)

Care of animals

Participants noted that men, women, and children care for animals, however dogs are usually cared for by men. Participants noted that there was no education given to community members about how to appropriately care for animals. Nonetheless, children showed remarkable insights about caring for animals which they reported they learned from their family members.

"It is good to keep animals, because they are beneficial to us though it comes with challenges such as feeding them, cost of treating them when they are ill, and difficult to find money and send the affected persons for treatment, when they are attacked by other animal's [for] example dogs". (Upper East, Urban, Child)

"Our grandparents advise us on how to take care of our animals and the animal doctors also advise us when they come to treat our animals. Some of the advice they give us includes giving the food frequently, giving them good food, and keeping their sleeping places clean at all times." (Upper East, Urban, Child)

The majority of participants mentioned that even though dogs belong to a household, they are largely left to fend for themselves, regardless of the season. Few participants described specific responsibilities to provide basic needs for their dogs and many said dogs would be fed scraps only if household members had a meal to eat themselves.

"For dogs, they do not have their own rooms to sleep in. The only time our dogs get food to eat is when a family member is eating where we cut and throw small of the food on the floor for them to eat. If you don't eat, the dog doesn't eat." (Upper East, Urban, Male)

"People don't really care about the feeding of their animals.... A few will give them food and water, and also clean their pens before allowing them to go out but most others don't really care." (Upper East, Urban, Female)

"Most of the people here in this community don't do proper keeping, they are only interested in their profit rather than caring for animals, even the dog." (Greater Accra, Urban, Male)

A few participants described their dogs as being part of their family.

"I have a dog which I gave it name and everybody in the house called it by the name. It understands the name when they call it. My dog is very close with us in the family because myself, my wife and children feed it all the time. I treat my dogs and cats differently from the other animals because they are more or less like human beings. These animals eat the food we eat in the house." (Upper East, Urban, Male)

Care of sick animals

Perceptions of what to do for sick animals varied among individuals. The general sentiment was animals needed specialized care when they were sick. Some participants noted that local or veterinary care was sought for sick animals, while others noted that sick animals were killed to prevent infection of other animals, or they were sold at the meat market.

"Some animal owners sell out some of their animals to treat the sick ones while in other times we sell out sick ones in the market to other people." (Upper East, Rural, Female)

"People don't have an interest in treating dogs. People dispose of the dog selling it off because it's costly to raise money for health service for the dog. The best option for an animal with rabies is to sell them." (Greater Accra, Urban, Female)

Use of local remedies to treat sick animals was common in both regions primarily due to the absence of veterinary services and/or the cost of such services. Many participants described the actions they took for sick animals including isolation, seeking veterinary help, and treating their animals themselves with local herbal preparations or with conventional medicine bought from pharmacists or the market. Local preparations include the stem of the nim tree, pepper, palm oil, and kerosene. Others reported using medication such as amoxicillin and paracetamol, and Dettol antiseptic.

"I use amoxicillin and paracetamol I get from my Muslim friend as medicine to cease diarrhea for my dog." (Greater Accra, Rural, Male)

"For dododo (four legged animals) and even dogs, we smear palm oil on their feet to treat worms infestation." (Greater Accra, Rural, Male)

"I apply kerosene and Dettol (antiseptic) on the fur of the cat and dogs to treat ticks. Sometimes we search on Google on how to treat our sick animals." (Greater Accra, Rural, Male)

Several participants reported they learned how to vaccinate their dogs by observing veterinary officers and others who had provided vaccination and injection treatments in the past.

Unconfined animals

Participants had different opinions about animals that roamed free in the community. Some participants believed animals roamed communities *“when you don’t feed them well,”* while others stated they allowed their animals to roam outside to look for food. An individual’s decision to allow their animals to roam free or not differed by season. In the dry season, animals were allowed to roam outside to look for food; but, in the rainy season, when farming and planting was in progress, animals were kept confined so they did not destroy farms and crops.

“We think in the dry season animals such as goats, sheep, cows, pigs, donkeys, and dogs are allowed to roam freely which seems normal for everyone. These animals that roam freely are in search for food, water, or to find a resting place such as under trees to enjoy some fresh air. We feel animals roaming freely is normal in the dry season, but this is not allowed in the rainy season when planting and sowing of crops begin.” (Upper East, Urban, Child)

Many participants noted that in the dry season, there were little resources for the household and this meant less food for animals. Perceived advantages of allowing animals to roam freely included finding their own food to eat, exercise, and fertilizing farms through their droppings.

“I think animals roaming freely have some benefits for everyone in the community. Some of them include feeding on their own where the owner won’t struggle to find food for them, exercising their bodies, and their droppings serve as fertilizer on our farms.” (Upper East, Urban, Child)

“My animals roam freely in the dry season to search for their own food but when it rains, I peg them to graze. It is difficult feeding animals in the dry season if you do not have money to buy their feed, that is why I allow them to roam freely.” (Upper East, Urban, Male)

One female from rural GAR stated that in her community *“we benefit from them [roaming dogs] a lot because they serve as food for us. We just catch them, kill and eat.”*

On the other hand, a female from rural GAR believed that *“animals that roam do not bring anything good except trouble from biting people.”* Most participants from GAR believed that dogs that roam do not have owners or have owners who cannot care for them. Other participants reported that if an animal roaming freely was caught and disposed of by someone in the community, the ‘missing’ owner would appear and hold you responsible for the loss of their animal. Perceived disadvantages of animals left to roam freely included theft, destruction of property, fights and bites among animals, animal bites to people, community disputes, sickness, and lost animals.

“Animals that roam freely has some disadvantages such as: thieves stealing them, causing accidents on the roads, being bitten by other animals such as dogs and snakes, entering into our

compounds to eat cereals when we are not around and littering the compounds as well.” (Upper East, Urban, Child)

“During the dry season, these animals are allowed to roam freely to look for their own food and water. Some people do not care for their animals’ health especially during the rainy season, they are allowed to defecate all over the place, making the environment filthy and dirty.” (Upper East, Rural, Female)

“The roaming animals cause havoc in the community. The cats in the community steal fried fishes from people. They also bring about dispute amongst people living in the community when they destroy their properties.” (Greater Accra, Rural, Male)

In summary, participants identified a variety of animals that live in their communities. These include farm and domestic animals. Animals are primarily valued for providing families with income, security, and food, however they are also used for traditional rites, transportation, and for a few, companionship. While participants believe they take good care of their animals and provide them with food, water, and shelter, these behaviors shift with the seasons and economic circumstances, and there is no clear description of what responsible ownership is. In the dry season, more animals, including dogs, are allowed to roam to forage for food compared to during the planting season. There were mixed feelings about freely roaming animals in communities with some participants considering it to be neglectful, and others characterizing it as a way to ease the burden on owners when resources are limited.

The different values, uses and practices around animals, including dogs, are linked to some key risk behaviors with implications for risk of ill health and spread of rabies to humans and other animals. These include the movement, sale, and eating of sick animals (suspected rabies or other ailments), widespread reliance on local treatments for sick animals, self-treatment of sick animals, and community norms around freely roaming animals.

Awareness and Knowledge of Rabies

Participant discussions on what they knew about rabies were mixed, containing some accuracies as well as misinformation and myths. An overview of the main themes is summarized below.

PRIMARY INSIGHTS: AWARENESS & KNOWLEDGE OF RABIES

- There is high awareness of an illness in dogs that manifests as ‘madness’
- There are substantial knowledge deficits regarding the cause of rabies
- Participants are knowledgeable of symptoms of rabies in dogs but lack comprehensive knowledge about transmission
- A few participants associate rabies with stray and roaming animals
- Rabies is frequently associated with hunger in dogs
- Any aggressive behavior in dogs is considered a symptom of rabies

Awareness of rabies

The majority of participants were aware of an illness in dogs that caused them to behave differently but did not know the English name for the illness. They all characterized this illness as “madness”. One participant from the UER referred to it as “bazoligo baah” [mad dog] and stated it was “very common” in their communities. A few participants from GAR stated that rabies was also a disease in cats and bats.

Cause of rabies

Participants demonstrated poor knowledge of the cause of rabies and the general view was “we don’t have much information about the topic.” One participant from each region stated specifically that rabies was caused by a virus. While many participants described rabies as “madness in dogs,” only one participant from the UER stated that the disease affects the brain of the dog. Participants knew that an infected dog could transfer rabies to another dog or a person through a bite and perceived that this was usually the cause of disease among stray and unconfined dogs. Children believed that hitting dogs on the head could also cause them to get rabies.

“I know that when a mad dog bites you it transmits a disease to you, but I don’t know the name in English. I know that it is called mad dog or ‘bazoligo baah.’ We do not know the actual cause of this dog madness.” (Upper East, Urban, Child)

“Our domestic dogs sometimes move with other stray dogs who might be infected, so they also get infected.” (Greater Accra, Rural, Female)

Misinformation about rabies was evident among participants from both regions. Some participants believed that all dogs had rabies in an inactive form from birth or were prone to getting rabies during their lifetime, and many participants believed that the trigger for rabies was hunger.

“We have heard from elderly people that the cause is from starving the dog, severely hitting the head of the dog and when another mad dog bites it.” (Upper East, Urban, Children)

“I know that rabies is in dogs but it is triggered by hunger. When you refuse to give your dog food just for a day, the rabies gene in it will go high and the dog will start showing symptoms of rabies.” (Upper East, Urban, Male)

“For a dog to be mad, the dog would have been hungry over a long period of time. You have to be feeding the dog because it becomes mad when it is hungry.” (Greater Accra, Urban, Female)

Other misinformation about the cause of rabies included not cleaning the sleeping place and food bowls used by dogs and allowing them to visit dirty places like refuse dumps. A few participants believed that rabies was found in the teeth and fur of animals.

Symptoms of rabies

Overall, participants had good knowledge of symptoms of rabies in dogs including unprovoked aggression towards familiar and unfamiliar individuals, biting, drooling and foaming at the mouth, barking, red eyes, fear of water and light, pacing, and inability to eat and drink.

"I just know that when my animal is infected with rabies, their eyes turn red, they become very aggressive even to its owner and everyone, and saliva comes out of their mouth uncontrollably. Immediately the animals start showing these signs and symptoms, there is no cure again."

(Upper East, Rural, Male)

"The dog becomes restless and aggressive; runs around barking and want[s] to bite everyone, animals and humans, and even those who feed it." (Greater Accra, Urban, Female)

Participants reported that dogs could transfer rabies to humans through bites and believed that people infected with rabies exhibited similar symptoms as a rabid dog. Few individuals knew of other animals that could have rabies or that rabies could be transferred through scratches when the saliva, neural or brain tissue of an infected animal is introduced into fresh, open cuts.

"Knowledge about the mode of transmission of dog rabies is very low." (Greater Accra, Urban, Female)

"One will not know that you are infected with rabies until you begin to behave like a dog, feeling a severe headache and barking like a dog." (Upper East, Rural, Male)

"If a dog that is mad bites you, then you will get the rabies and behave like a dog." (Greater Accra, Rural, Female)

In summary, participants demonstrated awareness and knowledge of rabies and its symptoms, however the cause and prevention of rabies were less familiar concepts that need to be highlighted. Some myths persist about the cause of rabies including that it is inherent in all dogs and triggered by hunger, perhaps creating a false sense of security that adequate feeding of dogs may be an appropriate preventive strategy. Transmission pathways and the risk of death from rabies were also not clearly understood. Limited understanding of the cause of rabies and how it affects animals has potential to undermine risk mitigation interventions and rabies prevention efforts.

Risk Perception and Behaviors

Participants discussed their perceptions of rabies and behaviors that increased risk of the disease. Overall, the perceived risk of rabies was high but tempered by beliefs.

PRIMARY INSIGHTS: RISK OF RABIES

- Dogs that roam unchecked are perceived to be a threat to community members
- Groups perceived to have to have heightened risk of rabies include children, dog meat butchers, food vendors and unconfined dogs
- Heightened risk perception is tempered by beliefs that rabies is managed well by herbalists
- Poor knowledge of transmission pathways limits ability to identify risky behaviors
- Sale and consumption of infected meat is common for some, and considered safe to eat

In general, while participants reported that there was a high prevalence of *mad dogs* (and rabies) in their communities, they did not think this was problematic because they believed bites and rabies cases in humans were effectively managed by traditional remedies.

"As for biting, they occur. Most of us don't see rabies as a problem because the herbalists are able to deal with it." (Upper East, Urban, Male)

For almost all participants, perceived personal risk for rabies was limited to being bitten by a dog. There was no discussion of risk incurred through exposure from handling the meat and fluids of an infected animal.

Risk Groups and Factors

Participants discussed groups of individuals and situations in the community that increase the risk of dog bites and rabies. They identified children and butchers as having an increased risk for dog bites, and roaming dogs and dogs with puppies as being prone to biting individuals. Other groups of individuals perceived to have increased interactions with dogs and exposure to dog meat were food vendors, specifically chop bar operators and kebab sellers, and individuals from the Northern part of the country. Participants reported several negative encounters with dogs that they had had or had heard of from other people.

Children

"Everyone of us in this community interacts with all kinds of animals, but it's the children who interact more especially when it comes to puppies and cats because they are seen as their playmates and mostly share their food with them (puppies and cats)." (Upper East, Urban, Child)

"A dog even bit a child of ten years. The dog attacked the boy and bit him. The child was taken to a herbalist for treatment and later recovered. Fortunately, the dog was not having rabies." (Upper East, Urban, Female)

"Children can also get injured if the dog has a sickness or madness and they play with it." (Greater Accra, Urban, Male)

Unlike in UER, some participants from GAR believed that dogs observed roaming in communities were a threat, and they regarded them with suspicion and treated them badly when they encountered them.

"The owners of roaming animals need to have a confined place to keep their animals, I will hit any animal if it should come to my house to destroy anything." (Greater Accra, Urban, Female)

"I personally think that dogs that roam are "touched" (mad), so I throw stones at them when I see them." (Greater Accra, Rural, Male)

Dog market staff

Butchers and staff at dog meat markets in both regions were considered prone to dog bites and at risk

of death from rabies. While some vendors bought dog meat from the dog meat market, many bought dogs and killed them themselves. The following quotations capture the risk incurred by dog market staff and food vendors:

“My friend, are you trying to tell me those who sell dogs in the market inject anti-rabies after every dog bite? I know very well that they use the local treatment and they are still safe.” (Upper East, Urban, Male)

“This reminds me of how [name] died. [Name] sold dog meat in Bolgatanga market and was bitten by a dog. He started with the local treatment but on the third day all the symptoms (barking, aggressive, eyes turn red) of rabies manifested. He was rushed to the hospital but died while still on orthodox medication. I also know of another dog meat seller who died three days after he was bitten by a dog. It was so pathetic because he was on the local treatment, yet he died through the bite. I think if they had gone to the hospital first, they would have lived.” (Upper East, Urban, Male)

“There used to be a woman here called [name] who was selling dog meat, she killed the dogs herself. They used to make fun of her saying that because she’s had several dog bites no dog disease could be transmitted to her. She’s no more, she died from dog bite. But we still have people selling dog meat in the neighboring communities.” (Greater Accra, Urban, Male)

Participants also believed that dogs were aggressive towards those who killed and sold dog meat at the meat market. They believed dogs could smell the scent of dead dogs on these individuals.

“In this community, those who sell dog meat have a poor relationship with dogs because the dogs always feel the smell of dogs on them. I have a friend who sells dog meat in Bolga market. Because of this, when he is moving, dogs always bark at him and even try to bite him.” (Upper East, Urban, Male)

Unvaccinated dogs

Some participants stated that failing to vaccinate a dog increased the risk of it getting rabies. However, they explained that most individuals could not afford the cost of the vaccine to protect their animals.

“Dogs that are not vaccinated are easily prone to rabies and people here do not normally vaccinate their dogs, due to the high cost of the vaccine.” (Upper East, Rural, Male)

Anyone in the community

Some participants reported that unprovoked negative interactions with animals were common in the community. They relayed unprovoked negative encounters resulting in dog bites when they visited family and friends or while walking in the community.

“I was going somewhere with my mother in the evening around six in the evening when a strange dog without any provocation pounced on me and bit me. They poured a local gin called

akpeteshie on the affected area till the following morning when I was taken to a herbalist by my father." (Upper East, Urban, Female)

"My sister has even had a dog bite before. The dog bit her without any provocation. She went to the hospital for treatment, she was given injections and she recovered. The dog was killed and buried." (Upper East , Rural, Female)

"I once witnessed a person being bitten by a dog. The person was just passing [by] and the dog came to bite the person." The person was taken to the hospital and treated but later died when discharged. The dog was killed but I don't know how." (Greater Accra, Rural, Male)

According to participants, most dogs that bite individuals are considered to be mad or to have rabies, and are immediately killed and buried. A few are confined and observed for some days and if they do not deteriorate they are assumed to not have rabies. In this context, few participants regarded it necessary or appropriate to confirm through testing that an animal had rabies.

Risk behaviors

Behaviors described by participants with potential to increase risk of rabies included consumption of sick animals, including those suspected to be infected with rabies, and allowing animals to roam freely in communities.

Consumption of meat from sick animals

There were varying perspectives concerning consumption of meat of a sick animal. In UER, dog meat markets and the sale of sick animals for consumption appeared to be widely known, accepted, and considered safe for consumption after cooking among community members.

"As soon as I realize that my dog or any other animal is infected with diseases, I kill it for meat and do not always wait for it to become very aggressive. I know that there is no treatment for rabies, so the solution is to kill infected dogs or sell them to those who process meat and for sale at the market." (Upper East, Rural, Male)

"Others sell the sick animals to butchers to kill and sell, while some kill and bury. The butchers are always invited by the dog owner to come and buy a dog that is sick." (Upper East, Urban, Female)

"We kill dogs that have rabies, cook it and eat it." (Upper East, Rural, Female)

In general, participants perceived a low risk of rabies associated with eating potentially infected meat. Several participants described their beliefs that cooking the meat of a rabid animal rendered it safe for consumption.

"When I detect that a dog is affected with any sickness especially with rabies and grows mad, I announce in the community for it to be killed. After killing it we hang it on the tree for some time

but if no owner shows up, we prepare the meat and cook it very well with much care." (Upper East, Rural, Male)

In contrast some participants from GAR questioned the health risk incurred by unsuspecting consumers who eat the meat of a diseased dog purchased from unregulated dog meat markets. They also wondered whether deaths among consumers had occurred that they were unaware of.

"We chew dog meat in this area paaa [a lot] so these veterinary people should come and check this meat. And I'm even sure some deaths have occurred as a result of dog meat eaten from rabies infected dogs." (Greater Accra, Rural, Male)

"Infected animals that die in the community, their meat is sold in the market to humans. Anyone who eats that meat will be infected. So the government should check." (Greater Accra, Urban, Male)

While participants acknowledged that workers at dog meat markets and food vendors had heightened risk for bites and consequently rabies, none of them discussed the risk of rabies within the context of touching the neural and / or brain tissue of infected animals during butchering or processing of dog meat without the use of protective clothing (gloves, aprons, goggles etc.). This supports the presence of knowledge gaps related to transmission pathways for rabies.

Unconfined and roaming dogs

Several participants reported that dogs that roamed freely evoked fear in them, were a threat to community members, and were at risk of getting rabies because they usually had contact with stray dogs and also got into fights with these animals.

"Dogs that are allowed to roam anyhow and eat anything it comes across can make the dog to get rabies. I had a dog that roamed freely and came back to eat in the evening and one day the dog came back with saliva all over its mouth and the behavior was not normal, the following day the dog started killing fowls which shows that it is infected with rabies." (Upper East, Rural, Male)

"When my dogs roam freely, they can end up being infected with rabies through their interaction or bites from dogs with rabies. This is because dogs with rabies fight dogs and other animals or anything that comes their way." (Upper East, Rural, Male)

"We think animals that roam are dangerous. For me, I hide when I see animals roaming, they are dangerous because they can easily harm you and no-one can save you." (Greater Accra, Urban, Female)

In summary, participants perceived the risk of rabies to be high among dogs in their community but not among individuals. Perceived personal risk for rabies was frequently in the context of a dog bite, which aligns with the most prevalent cause of rabies in humans in the country. In both regions, dog meat

markets and the sale of sick animals for consumption appeared to be widely known and accepted, providing opportunities to focus on safe interactions with animals and rabies risk reduction.

Children and individuals who worked at dog meat markets such as butchers and food vendors were identified as high-risk groups for dog bites; they represent a target group for risk reduction interventions. Although participants relayed several stories about butchers and dog meat vendors from their communities who had succumbed to complications from dog bites, there was little discussion of potential risk incurred through handling the neural and brain tissue of possibly infected dogs at these markets. This may relate in part to a limited understanding of the cause and presentation of rabies in animals. Further, depending on how dogs are killed at these markets, it may increase the risk of bites and transmission of disease, warranting prioritizing behavior change interventions for safer market practices. Eating the cooked meat of sick or rabid animals is a common practice that was not considered to be a high-risk activity. While doing so is strongly discouraged, eating the cooked meat of a rabid animal is not considered exposure in current guidelines.

The general perception that most biting dogs had rabies can be considered a good thing and it provides opportunity to promote next steps of immediate care, reporting procedures, and education about the need for testing of suspect cases by animal services. The perception among some that roaming dogs were a threat to the community at-large also provides a basis for leveraging community engagement around this topic and interventions about responsible animal ownership and care,

Risk Prevention

Participants discussed ways in which they believed rabies could be prevented in animals and humans. The main themes for prevention are summarized below.

PRIMARY INSIGHTS: PREVENTION OF RABIES

- Some knowledge of appropriate ways to prevent rabies exists among community members
- Herbal remedies are considered effective for prevention of rabies and highly utilized
- Many participants believe that killing the culprit animal eliminates any risk of rabies

Several rabies prevention strategies were identified through the discussions including herbal remedies, medical assistance, and vaccination. Killing infected dogs and keeping dogs well fed were also considered to be effective rabies prevention strategies.

Local remedies

Local remedies were used for prevention (as well as treatment) of rabies and some participants opined that herbal remedies were used to protect puppies from rabies infection.

"I also protect my dog in the local way from rabies using herbs when they are puppies. I give them the herbs recommended by the herbalist and this works perfectly for my dogs." (Upper East, Rural, Male)

Early medical intervention

A few participants, especially from GAR, suggested that prevention was best accomplished by immediately seeking medical help from the health facility for the person that was bitten as well as the culprit dog.

"Prevention is better than cure. You should visit the clinic if you have a dog bite and then also treat the infected dog." (Greater Accra, Rural, Female)

Rabies vaccination

While many participants acknowledged the rabies vaccine was helpful in preventing illness, there were a few participants who believed that the rabies vaccine did not eliminate, but only minimized, risk. Very few participants from either region identified vaccination as the only effective way to prevent rabies in dogs and humans.

"I vaccinate my dog to minimize the chance of it getting rabies. The veterinary officers have a medicine which costs GHS 20.00 and I always buy to vaccinate my dog every year or I call them to come and vaccinate it for me. After that, they give me a certificate to show that it has been vaccinated against rabies." (Upper East, Rural, Male)

"Rabies can only be prevented through regular vaccination of the dogs and this is what should be done and we do it." (Greater Accra, Rural, Female)

From the above examples, some participants reported that they purchase the rabies vaccination from veterinarians or the market and administer the injection themselves to their animals. Participants had little knowledge of rabies vaccination schedules and many mentioned they had their dogs vaccinated "regularly," "every three months," "once in a while," and "yearly."

Providing food for dogs

Consistent with beliefs that rabies was triggered by hunger in dogs, some participants believed that the best way to prevent the illness was to keep dogs well fed. This would perhaps prevent them from going out to forage for food and secondarily decrease contact with other stray animals with or at risk of rabies.

"I also try to protect myself from getting rabies by not making my dog go very hungry. Hunger can raise the dormant rabies gene in every dog so I feed it very well." (Upper East, Rural, Male)

"I think feeding dogs all the time will help to prevent them from getting rabies. I feed my dog very well in the morning and evening." (Greater Accra, Urban, Male)

Killing infected dogs

Participants perceived that one of the best ways to prevent the spread of rabies and risk of dog bites

was to immediately “kill it and bury” any dog that was aggressive and that had bitten an animal or person. Community decisions that an animal was rabid was often based on the animal’s aggressive behavior, and not on laboratory confirmation of disease. On some occasions dogs were considered to have rabies and disposed of because they “looked sick” or had “had skin issues.” Animals were also killed because community members considered it a quicker and easier solution to the problem caused by bites.

“When they bite the other dogs, those dogs are also infected, so to avoid it from spreading we make things easy by just killing it. Finish!” (Upper East, Rural, Male)

“We know the dog is sick but we don’t know which medicine to administer so we will kill it. That’s what we do for quick action rather than wasting time with asking questions. Is sharp sharp [quickly].” (Greater Accra, Rural, Male)

Other strategies employed by community members from both regions to prevent rabies included “avoid eating infected dogs and bats,” “cook the meat of an infected animal very well before eating,” and “limit interaction with affected dogs.”

In summary, most participants agreed that the primary strategy for preventing rabies in dogs was through vaccination. However, there was limited understanding of vaccination schedules and timelines for treatment of bites or possible exposure. Use of local treatments, especially herbs, to treat bites and suspected rabies in dogs and humans was widespread and preferred for a variety of reasons, including cost of medical treatment, lack of access to animal health services in communities, and strong belief in the response efficacy of traditional treatment.

Most dogs that bite are considered to be rabid. In both regions the community norm is to immediately kill and dispose of, or consume, a dog that bites, however depending on how this is done it may actually increase the risk of bites and rabies. Placing dogs that bite in isolation for observation, and reporting of bites to animal health services for follow-up, occurred rarely, creating missed opportunities and challenges for accurate surveillance and quantification of the disease, and for prevention of further transmission.

Treatment for Rabies

PRIMARY INSIGHTS: TREATMENT FOR RABIES

- There is a heavy reliance on, and belief in, the efficacy of herbal treatments
 - Individuals are beginning to question the use of herbal treatments and pairing use with medical treatment
 - Influenced by high cost of medical treatment and limited access to veterinary services
- Few individuals believe there was no cure for rabies once symptoms appeared

There was strong belief in and common use of herbs for the treatment of dog bites and rabies in particular. Many participants noted that use of herbs was customary practice and preferred over hospital treatment. Individuals with a dog bite who went to the hospital for care would also go to the herbalist for treatment when they returned to their community. Local herbalists are revered by community members for their ability to prevent and treat rabies. Herbalists were not perceived by community members to be ‘fake doctors’ but rather experienced individuals, usually seasoned animal farmers or older community members, who over the course of many years had learned about animal illness and ways to treat them. Herbalists were also considered to be a valuable and accessible resource in communities in the absence of veterinary services. Children reported that they were taught how to use local treatments for rabies by elders in their family and community.

Herbal interventions for dog bites and rabies varied and included the use of chewed cola and what participants described as a local “black substance” provided by local herbalists.

“When a person is taken to the herbalist, they first of all boil some herbs for the person to bath with every morning and evening for three days. Then they request for the teeth of the dog which they believe has some poison in it. The teeth are ground into powder and applied to the affected part. When they go through all this process, the dog will die while the person bitten will live. These herbalists are well recognized and within three days after treatment, the victim will be well.” (Upper East, Urban, Male)

“In this community, we have two ways of treating persons with rabies, that is the medical treatment in the hospital and traditional treatment. When rabies dog bites you, we immediately take you to the hospital for the vaccine and after that, we still go for the herbalist to remove the teeth of the dog in your body.” (Upper East, Rural, Male)

It appeared that there was growing sentiment among participants from UER that local treatment of dog bites and rabies may not be ideal, opening the door for behavior change interventions and new norms. Several participants questioned the response efficacy and safety of local treatments, and reported that those who support local treatments for rabies are now pairing the practice with appropriate medical treatment.

“I feel a local treatment has lost its potency and people also lost trust in the local treatment.” (Upper East, Urban, Male)

“I heard that when a dog bites you, the first aid is to put the local black substance on it, then look for money to go and inject anti-rabies. I also think the local treatment is not safe and one still needs to inject the anti-rabies.” (Upper East, Urban, Male)

“My first aid in treating rabies is to chew cola to form a paste and apply it on the sore before I proceed for further treatments to reduce the poison.” (Upper East, Urban, Male)

Per participants from both regions, treating sick animals personally was in part influenced by a lack of

qualified personnel to provide advice and correct treatment and also by the cost of treatment from a veterinarian. They noted that difficulties and the resulting delays in reaching veterinary officers located in other communities often resulted in decisions to not report sick animals or dog bites, and to seek alternative treatment options from herbalists and self-treatment.

"There are no veterinary officers or veterinary offices in this community. We go to the veterinary shops owned by private individuals to buy what we want from them. We do our own vaccination for our animals. The ones we call from outside charge too much or don't come quick." (Greater Accra, Rural, Male)

A few participants demonstrated good knowledge of rabies risk and stated unequivocally that they believed treatment at a health facility was the best way to prevent rabies. Nonetheless, they would still include local remedies in treatment.

"I have advised my family to always seek medical attention in addition to the local treatment when bitten by a dog on the same day. No, there is no treatment when a rabid dog bites you and these kinds of symptoms show up." (Upper East, Urban, Male)

In summary, reliance on local treatments is strongly entrenched in community norms and behaviors, requiring prioritized community engagement interventions to influence new beliefs. The elements of time and appropriate first aid for bites were notably absent from most responses to treatment of bites and warrants prioritizing in rabies prevention programming. The time window for survival did not appear to be well known and was mentioned by only two individuals (one from each region).

Shifting perceptions about the safety and appropriateness of local remedies provides opportunities to promote new behavioral norms around correct first aid for bites, use of medical services to treat bites and prevent rabies, and to decrease delays in seeking post exposure prophylaxis.

Use of traditional remedies for rabies was also passed down generationally, suggesting that older community members and leaders may be influencers of current community norms for rabies prevention and treatment, and a target group for prevention interventions.

Reporting

Participants discussed what they knew about reporting dog bites and sick animals in their community. The main themes are summarized below.

PRIMARY INSIGHTS: REPORTING DOG BITES AND SICK ANIMALS

- There is some reporting of sick animals to veterinarians
- Very little reporting of dog bites occurs due to lack of knowledge of who to report cases to
- There is little knowledge of the reasoning behind reporting rabies and bites

Participants confirmed more reporting occurred for animals that are reared that get sick than for sick pets and dog bites. Reporting of bites, when they occurred, was not to formal authorities (animal and human health workers, surveillance entities, etc.) but to community leaders, and usually to settle disputes.

“The community has seen it all happen so we try to settle it ourselves. The owner must be taken to task for letting their dog bite me. Once they agree and pay, all is okay. If it kills my chicken, or the goat, that too must be compensated to me. Otherwise we go to the chief. This is how we do it.” (Greater Accra, Urban, Female)

“As for here, all you need is the money for the anti-rabies injection and for the hospital. That is what is needed or you can't get relief. The dog is dead so no more matter. If they don't agree [to pay] it is reported to our leaders who take it from there.” (Upper East, Rural, Male)

The few individuals who did follow-through on reporting to health authorities had a better understanding of the process, however safety is an issue as risk of bites increases during efforts to corral aggressive animals.

“Those who don't know normally kill the dog, but the right thing to do is to report to the health facility. You will be asked to chain it and observe it for some days to know whether it has rabies. A dog with rabies should not be killed. Let the veterinary treat it and if not possible you then kill it.” (Upper East, Urban, Female)

Reasons for not reporting aggressive dogs and dog bites included the animal was killed, desire to maintain community relationships, limited knowledge about reporting, no animal health officers in the community to report to, and unwillingness to seek medical care and forgo the opportunity to eat the meat of the sick animal. More participants from UER believed that individuals fail to report dog bites because of lack of knowledge about reporting requirements, including who specifically they should notify, or a preference to settle the situation within their community structures. In addition, some participants who were aware of reporting requirements stated that the lack of animal health workers in their communities impeded their ability to report bites and sick animals promptly.

“We have never reported rabies or dog bites because we don't even know where to go and report. Some of us don't see rabies as a reason to go and report.” (Upper East, Urban, Male)

“We don't have any place or person where we can report such cases.” (Upper East, Rural, Female)

For most participants, the key element was to be financially compensated for their treatment. Once this was settled with the dog's owner, participants believed there was no need to pursue the matter further or jeopardize relationships with a community member by reporting to authorities.

“We are able to settle it ourselves and the dog is immediately killed and gone. Nothing is left to

do except if the owner [of the dog] is giving us problems then we go to the chief.” (Upper East, Rural, Female)

Participants from both regions cited the high cost of veterinary and medical services as a deterrent to reporting dog bites, and some believed that reducing the cost may motivate others to report bites and use medical services.

“I believe that people fear going to the hospital for the anti-rabies injection because of the price. I heard it cost almost GH¢1000 to get the injection if you are bitten by a dog. I wonder the number of people who can afford to pay GH¢1000 for the injection. I feel if the price of the anti-rabies injection is reduced, people will go to the hospital when a dog bites them.” (Upper East, Urban, Male)

“Medicine used in injecting the animals can be bought in drugstores. It is GH¢100.00. It is expensive. Cost of vet service is expensive so why go that way.” (Greater Accra, Urban, Female)

“We do not report rabies cases to the veterinary officers because they will advise you to go to hospital for the vaccine which I cannot afford.” (Upper East, Rural, Male)

In summary, in both regions, the purpose for reporting sick animals and animals that bite was poorly understood. The community norm was to settle dog bite incidents among themselves primarily by focusing on compensation for treatment and financial losses as indicated. In some cases community leadership helped to broker disputes, however, there was a general reluctance to involve formal authorities (health officers, police etc.) in managing incidents. These behaviors suggest a need for community engagement related to regulation, community action plans, and by-laws to support how animal bites should be handled in communities. The fact that some individuals use animal health services for livestock animals to report sick and biting dogs could potentially be leveraged to strengthen norms around reporting.

Community Needs

Participants identified the following community needs to increase their understanding of rabies and help them to live safely with animals, including dogs.

PRIMARY INSIGHTS: NEEDS RELATED TO RABIES

- Information resources on rabies and other zoonoses
- Community-level education about responsible animal ownership, including health care
- Access to veterinary services and affordable rabies vaccinations and treatment
- By-laws for animal ownership and care, including health care
- Regulation of dog meat markets

Education

Many participants identified a need for education, sensitization and information resources on rabies. In addition to education on what rabies is, more information about symptoms of rabies and how to identify infected dogs, transmission and prevention of the disease, what makes dogs aggressive, and how people can live safely with animals.

"We want education on animal attacks and its effects. What attacks from dogs and cats can bring to you. We want a lot of education on the symptoms of illnesses that animals can give to people." (Greater Accra, Urban, Male)

"There should be more education on how to keep these animals among humans so that we will know how to manage them. When we do good management we won't fall sick." (Greater Accra, Urban, Female)

A few participants suggested that education activities using interpersonal approaches would be more effective and interesting to community members than mass media channels.

"The education [on rabies] needs to go down to the people. The best way to educate people in Ghana and Africa is one-on-one basis with the people. Not that they will be doing commercials. People are interested in watching telenovelas on TV and not the commercials. There should be an intense one-on-one education on this very subject to help everyone know ways to handle animals." (Greater Accra, Rural, Male)

Veterinary officers and services

Almost all participants perceived a need for veterinary officers who were located in their communities to increase access to trained animal health personnel. These officers were needed not simply to respond to sick animals and dog bite incidents, but to counsel and educate the community about rabies and other illnesses in animals.

"We need veterinary officers in this community, the nearest veterinary office is too far." (Greater Accra, Urban, Female)

"They [veterinary officers] should come into the community to educate us on how to care, feed and manage our animals." (Upper East, Urban, Female)

"We want veterinary officers or offices in every metropolitan, municipal, district to help all of us." (Greater Accra, Urban, Male)

A female participant in GAR suggested that mobile veterinary clinics might facilitate access to needed animal health services.

Access to personnel, treatment services and resources

Participants verbalized a need to be able to get vaccines and anti-rabies injections from local health facilities. Suggestions included free or subsidized treatment.

“Anti-rabies drugs should be provided for all hospitals in Ghana to help proper treatment. I even doubt if Korle Bu Hospital has anti-rabies drugs.” (Greater Accra, Rural, Male)

“The price of the anti-rabies should be reduced.” (Greater Accra, Urban, Female)

By-laws with consequences

Participants identified the need for enforceable laws that hold animal owners accountable for the behavior of their animals. Of note, little was said about consequences for animal owners who do not provide good care for their animals. A suggestion was also to make vaccination against rabies mandatory for dog owners.

“The law should be enforced very well. The by-laws should work. There is a unit that deals with it, I think it’s veterinary service or public health service. In Ghana the by-laws are not enforced. The animals are not in seclusion, they live with us. The owners of the animals should be surcharged to respond to damages their animals cause.” (Greater Accra, Rural, Male)

“The vaccination of dogs should be made compulsory and checked. If you want a dog, you must vaccinate.” (Greater Accra, Urban, Female)

Recommendations

Awareness and Knowledge

Awareness of rabies was high, but there were substantial knowledge gaps in cause and transmission of the disease. There also was limited knowledge about how to live safely with animals in the home and community. Specific areas of knowledge that need improvement among community members and health workers included: responsible dog ownership, specifically in the areas of basic needs, vaccinations, and health needs; child education about safe play with animals to reduce risk of bites; appropriate care of animal bites; care-seeking for medical treatment for animal bites; and correct reporting of sick animals, biting animals and animal bites.

Recommendations

Community members may benefit from strategic rabies SBC campaigns with targeted health messaging that addresses causes and transmission pathways, appropriate first aid responses, and the need for prompt treatment from health workers and facilities. Such campaigns may help facilitate a shift from awareness to knowledge building, and should also aim to influence other behavioral determinants and ideational factors underlying dog bites and rabies risk.

Interpersonal and community dialogue approaches may provide an opportunity to understand deep-seated cultural norms and prevailing myths and misconceptions about rabies, and the conflict between risk perceptions and engagement in risk behaviors. These approaches afford individuals the opportunity to share experiences and discuss the issues that influence their current beliefs, perceptions, and behaviors.

Community and healthcare educators may benefit from continued education and resources for rabies education. Training and development of information resources for community champions and groups (social groups, youth groups, leadership councils, teachers, etc.) for standardizing the education and information provided to community members about rabies and living safely with animals may be useful. These interventions may be more effective when they are integrated into regional and district rabies prevention strategies, are harmonized among different community programs, mobilize community members to action and are monitored for effectiveness.

Raising the level of awareness about rabies and dog bite prevention among school-age children (which includes child hunters) is a vital part of building the foundation to encourage responsible pet ownership among community members. The curriculum may include fundamentals of responsible pet ownership, including proper diet, appropriate housing, and exercise, and how to live with and handle animals in a safe and respectful manner. School-based interventions provide an opportunity to engage with the public on the importance of animals to the larger ecosystem. When included in a school's extracurricular activities, students may learn about how to prevent bites and injuries from animals, and what to do when they have a dog bite. Students will also have the opportunity to ask questions about animals and

veterinary medicine. Through interpersonal and community-level communication, a generation of young people with the knowledge and skills to care for animals responsibly and safely may be created.

Risk Perception and Behaviors

Overall, there was much concern among community members about the risk of getting rabies. Children were perceived to be particularly vulnerable to rabies because they often play with animals. Abattoir workers, staff at dog meat markets, and food vendors who prepare food with dog meat were identified as groups with heightened risk for rabies but primarily through dog bites as they handled dogs to be killed for the market (and not through exposure to infected animal neural and brain tissue). Poor understanding of transmission pathways for rabies may be associated with failure to recognize other risks and ways that one can contract the illness.

On the other hand, there were substantial reports of unprovoked dog attacks among lay community members, indicating that the larger community also faces some risk due to many unconfined and uncontrolled dogs roaming public areas of communities. Animal bites are the main source of rabies cases in Ghana; however, the majority of participants perceive that their risk of getting rabies is narrowly linked to preventing dog bites. While there was general agreement that the free roaming of animals in the community amplifies risk of dog bites and rabies, the practice of not confining animals continues to be an issue in communities. Some participants from UER considered it necessary to allow animals to roam during the dry season when food for animals, and in some cases, for people, was scarce.

Risk of illness from eating the meat of animals sick from, or that died from rabies, had mixed reviews. While some participants considered it a health hazard, others believed that cooking meat of an infected animal eliminated the risk of contracting rabies and rendered the meat safe for consumption.

Recommendations

Community-level engagement about transmission pathways for rabies, and insights about behavioral risk identified through the daily activities and needs of community practices may be helpful for defining the context of risk for community members. Community-based interventions that directly engage community members in dialogue, and SBC activities that support the realities of community life may support the acceptance and adoption of new behaviors.

Considering the development of Animal Health Clubs could facilitate the interpersonal approach to engaging communities in rabies prevention programs. These clubs also could be a way to support and reinforce other large-scale communication approaches that provide education and information to the general public.

Rabies-related communication and resource materials used in rural areas require careful adaptation to ensure they are presented in easy-to-understand formats, with general information and illustrative responses to frequently asked questions. To be effective among this sub-group, it is important that SBC

materials are low literacy, highly visual, and user-friendly, and are tested among the population. Materials should include links to a free information hotline where correct answers to questions about rabies, responding to a dog bite, and reporting dog bites are provided.

Community leaders, such as chiefs, opinion leaders, traditional healers, influential community members, youth leaders, teachers and others should be encouraged to work with animal health authorities to prioritize and engage in activities that encourage a participatory approach and harmonize the separate rabies prevention efforts of different activities and groups within communities.

Reporting

There was low reporting of pets or stray animals that were sick or involved in bite incidents in the study area. Some informants were unaware of how to make a report and to whom. Many tended to report to either community leaders or health workers at the health facility. Limited access to veterinarians may have contributed to poor reporting and not wanting to cause tensions with neighbors who own dogs.

Recommendations

A centralized mechanism of reporting may foster coordinated inter-sectoral collaboration and communication between human and animal health professionals to strengthen surveillance and disease monitoring. Furthermore, all participating stakeholders and community members should receive clear and accessible communication that explains the reporting structure. Strengthening surveillance mechanisms with the inclusion of district codes for dog bites that can be easily reported via texting channels may ease the burden of reporting, and help to support a comprehensive database that more accurately reflects the scale of the problem. In addition, framing reporting of sick animals and dogs that bite around the need to track cases to support actions to make the area rabies free rather than on punitive responses may motivate community members to report incidents.

Developing the capacity for reporting diseases at the community level using community leaders, community-based animal health workers or respected members of the community as focal points may improve reporting at the community level. Community members should be encouraged to participate more actively in epidemic control and surveillance by reporting suspected cases early and to the correct channels. A focus on conveying the importance of accurate and prompt reporting so that treatment can start early may motivate individuals to adopt this behavior.

Community members could benefit from information about when to report sick or suspected rabid animals and to whom. Effective SBC messaging about reporting should communicate the 'why,' 'how,' 'when,' and 'to' of reporting. In addition, health messages should contain explicit information about the purpose and effect of reporting, and about what to expect after reporting so community members can see the value and be motivated to continue reporting incidents appropriately.

Campaigns that incorporate the benefits of reporting into messages to encourage community members to participate in reporting guidelines may be useful.

Community Needs

Community needs included diverse issues including access to affordable medicines and vaccines for rabies, trained and accessible animal health personnel, education (about rabies, risk factors, symptoms, and reporting), managing the stray dog population, and enforced regulations for animal ownership.

Recommendations

Interventions that include a focus on methods to manage dog populations humanely by advocating for responsible dog ownership, mass vaccinations, and basic dog health care would be beneficial in the study area. Collaboration between authorities and local experts who understand the local dog population, the dynamics around animal ownership, local demographics, and attitudes of community members towards dogs may provide contextual information as an important basis for a tailored package of interventions for long-term management of the dog population and rabies.

Increasing visibility of and access to animal health workers may facilitate reporting of sick animals and animal bites. Training a new cadre of locally resident, community-based assisting animal health workers may improve access to animal health services and provide continuity in delivery of routine SBC activities regarding animal care. Involving veterinarians and medical personnel in the delivery of SBC interventions may help increase credibility and acceptance of these workers within the community.

Rabies prevention and treatment messages that are rooted in history and experiences, rather than solely based on knowledge and scientific content, may be more appealing to informants. The use of storytelling to share experiences and pass on codes of behavior is an integral part of traditional African culture and may be well received as an SBC tool. For example, Animal Health Clubs use storytelling and dramas to convey rabies-related information and facilitate dialogue in communities.

High cost of the rabies vaccine was a major deterrent to vaccinating dogs. Stakeholders such as government agencies, veterinarians, public health professionals, and local community organizations and members should prioritize strategies that increase access (supply and reduced cost) to rabies vaccine so it is affordable to community members. SBC campaigns to emphasize the importance of vaccinating animals are also needed.

Development of community-focused information and expectations for responsible dog ownership, including rabies vaccinations, should include regulatory mechanisms and consequences for non-compliance. Success of these interventions may be influenced by an improved supply chain for rabies vaccines to support access associated with the increased demand creation.

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