

## Research



# Magnitude and trends of ruminants, Pigs and poultry diseases in Taraba State, Nigeria, 2013- 2017: implications for public health

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## Magnitude and trends of ruminants, Pigs and poultry diseases in Taraba State, Nigeria, 2013-2017: implications for public health

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## Abstract

**Introduction:** livestock diseases could pose a threat to public health through zoonoses and exacerbation of antimicrobial resistance with indiscriminate drug use. Understanding and managing public health threats at the human-animal-environment interface is key to global health security. We determined the magnitude and trends of zoonotic and Transboundary animal diseases (TADs) among livestock in Taraba State, a nexus for livestock activities in Nigeria. **Methods:** we reviewed records of clinical cases between 2013 and 2017 at the Veterinary Services Department, Ministry of Agriculture and Natural Resources, Taraba State. Data on livestock species, clinical diagnosis and sex were extracted and analyzed using descriptive statistics. **Results:** of the total 1,535,267 cases in ruminants and pigs, top zoonotic diseases were Helminthoses (43.0 %), Trypanosomosis (21.2%) and ectoparasitism (14.9%); while TADs were Peste des Petits Ruminants (2.1%), Contagious Bovine Pleuropneumonia (1.4%) and Foot and mouth disease (1.3%). Cumulatively, 87.3% of the cases in ruminants and pigs in Taraba State were zoonotic diseases. Of the total 237,671 cases in poultry, the most reported was coccidiosis (71.4%); disease of zoonotic importance was enteric salmonellosis (3.1%), and the most TAD was Newcastle Disease (8.4 %). More than half (53.9 %) of the ruminant and pig cases were females. The frequency of occurrence of most cases was regular across the years. **Conclusion:** the magnitude and pattern of animal diseases of zoonotic and public Health importance in Taraba State is high and endemic. Public education and One-Health approach involving veterinary services; public and environmental health is advocated towards the prevention and control of these diseases.

## Introduction

Zoonoses are diseases naturally transmitted between animals and humans, posing a great threat to the health and life of people all over the world [1]. World Bank estimate of zoonotic disease

outbreaks worldwide for a decade cost 200 billion USD as a result of losses due to trade, tourism and tax revenues [2]. Presently, over 200 pathogens are regarded as zoonoses. The WHO in 2015 indicated that almost 600 million cases of diseases were caused by contaminated food in 2010 and about 350 million caused by pathogenic bacteria [3]. In the EU, there are over 200,000 cases of bacterial zoonoses noted annually with presumably much higher numbers of real cases. According to the European Food Safety Authority (EFSA) and the European Centre for Disease Prevention and Control (ECDC), the most common causes of food-borne zoonotic diseases were *Campylobacter* and *Salmonella* bacteria [4]. The occurrence of these pathogens is more likely where there is poor surveillance, low level of biosecurity and hygiene in production and processing. Developing countries, particularly those in sub-Saharan Africa, are enormously challenged by infectious diseases of animals that are, in most instances, transboundary and or zoonotic in nature. The presence of these diseases further exacerbates the endemic poor productivity of livestock, food insecurity and low food safety standards. Zoonotic diseases also add to health care burden further reducing the benefits derivable from animal companionship and production.

The food and Agricultural Organization of the United Nations postulated that the livestock subsector is expected to grow significantly and transform in the next 30 to 40 years [5]. Tendencies are increase in zoonoses if proactive measures are not taken to prevent and control these diseases in animal population. In 2050, the population of Nigeria will reach about 400 million, from 180 million people today; 280 million people will live in urban areas compared to the current 90 million people [5]. This will lead to increase interaction between the animal-human-environment interface, hence the need to protect public health, increase food safety and food security of the nation with regards to the FAO goal towards a sustainable livestock [5]. Part of the response to increased demand for food is intensification of agriculture

including livestock and poultry production. This will likely necessitate use of extra chemical inputs including antibiotics, that are already overused particularly in the management of infectious diseases such as Peste des Petit Ruminants (PPR) Contagious Bovine Pleuropneumonia (CBPP), Food and Mouth Disease (FMD) and New Castle Disease. Antimicrobial resistance is a priority threat to global public health.

Taraba state is a border state located in the North-Eastern part of Nigeria and one of the important entry points into the country. Three out of the seven international control posts in the eastern part of the country are located in Taraba. It is a hub for livestock activities with a significant number of nomadic settlements. Taraba state projected livestock population for the 2018 was 23,549,584 million; 5,577,980 cattle, 3,061,666 sheep, 3,686,973 goats, 3,212,979 pigs and 8,009,986 poultry. The huge presence of livestock activities in the state and the potential spillover of zoonotic diseases and antimicrobial resistance in human population necessitated the need to intensify animal disease surveillance in the state. The National Animal Disease Information System (NADIS) captures data from routine passive disease reports, these reports are hardly utilized for the control of zoonotic diseases in the country, because, while NADIS is resident in the Federal Ministry of Agriculture and Rural Development, human diseases are captured by the Integrated Disease Surveillance and Response (IDSR) system in the Federal Ministry of Health. The two systems are functionally unconnected. Thus, data on zoonotic diseases remain under-utilized for control and prevention purposes. This study aimed at determining the magnitude and trend of animal diseases; proportions of the diseases that are zoonotic and TADs based on species and sex as well as discuss their public health implications in Taraba State.

## Methods

**Study area:** Taraba State is situated in the north eastern part of Nigeria between latitude 6° 30' and 8° 30' north of the equator and between longitude 9° 00' and 12° 00' east of the Greenwich meridian. Taraba State shares border with six states in Nigeria; in the west by Nasarawa and Benue States, northwest by Plateau State, north by Bauchi and Gombe States, Adamawa State on the north-eastern part and Cameroon on the east and southern part of the State (Figure 1). The state has a land area of 60,291km<sup>2</sup> with a population of about 2.5 million people projected from the 2006 National Population Census [6]. Occupation of the Taraba State people is mainly agriculture. The Mambilla Plateau is a unique agricultural site where large numbers of ruminants are reared. Other common sites where livestock are reared in the state include the Benue and Taraba valleys. Aside ruminants, other livestock production activity in the state includes poultry production, rabbit breeding and pig farming [7].

**Data collation and analyses:** a retrospective study was carried out on clinical cases of animal diseases reported to the Taraba State Ministry of Agriculture between 2013 and 2017. A total of 10 veterinary health facilities (eight clinics and two hospitals) report on monthly basis to the State Epidemiology Officer, Department of Veterinary Services, Ministry of Agriculture and Natural Resources, Taraba State. Out of the eight clinics, six were public while two were private. The collated veterinary records (N = 1,772,938) were reviewed and data on species of animal affected, sex and clinical diagnosis were extracted. Diagnosis were based on signs, symptoms and postmortem examination where applicable. Data were imputed into Microsoft Excel version 2010 and analyzed using descriptive statistics.

## Results

A total of 1,535,267 cases in ruminants and pigs were reported for the five-year period under

review. Of the total cases in ruminants and pigs, 1,239,677 (80.4%), 171,295 (11.1%), 119,154 (7.7%), and 12,306 (0.8%) were reported in cattle, goats, sheep and pigs, respectively. Overall, more of the reported cases were in female (53.9%) (Table 1). In general, the most reported case was helminthoses (43.0%), while the least was cowdriosis (0.04%). The most reported case with zoonotic potential was also helminthoses (43.0%), then trypanosomosis (21.2%); the least reported being salmonellosis (0.4%). The number of cases of fasciolosis reported was 4.8% (31837/659999) compared to the entire cases of helminthoses. TADs were PPR (2.1%), while the least reported was FMD (1.3%); Table 2. Of the total 237,671 cases in poultry within the five-year period, the most reported case was coccidiosis (71.4%), while the least reported case was Gumboro disease (1.6%); disease of zoonotic importance was enteric salmonellosis (3.1%), and the most TAD was Newcastle Disease (8.4%) (Table 3). The number of cases reported in the five-year period under review seem to oscillate, but regular in occurrence (Figure 2).

## Discussion

Food borne zoonoses that were identified from this study were helminthoses and Salmonellosis. Helminthoses ranked the highest among zoonotic cases for the period of five years. Helminthoses is a disease of public health importance with transmission potential from ruminants and pigs to humans through the consumption of improperly cooked meat. This stresses the need for genuine sensitization of livestock farmers on routine deworming of their animals to guarantee the supply of hygienic meat to the public. Data obtained also highlights the relevance of taking the health of the food animals seriously to secure the health of the public. The study indicates cattle constituting great proportion of reported cases of helminthoses. Which is a pointer that more effort need to be targeted toward this species in the prevention and control programme that should be implemented. Also, most of our cattle in the

country are under extensive management system and the cattle end up with rivers and streams as their major source of drinking water [5] culminating in infection with helminths during grazing on contaminated pasture by other animals that are the definitive hosts especially during the rainy season. The management system of our cattle need to be modified in such a way that clean drinking water is made available for the animals. Cases of fasciolosis constituted 4.8% of the cases of helminth infection. *Fasciola hepatica* and *Fasciola gigantica* are the major causative agents of liver fluke disease (fasciolosis) in domestic animals in temperate and tropical climates [8]. Fasciolosis is an important emerging zoonotic disease of humans and is endemic in Nigeria [9]. Transmission occurs where rural farming communities share the same water source with their animals or consume water-based vegetation growing in endemic areas [9]. *Fasciola hepatica* can survive for up to 13 years in humans, producing large numbers of eggs (up to 5000 per gram of faeces) that are infective to other hosts, humans are also likely to play an important role in transmission of the disease [10]. Hyperendemic human fasciolosis has also been reported in the Nile Delta region between Cairo and Alexandria [11].

A number of studies in Nigeria have demonstrated the presence of zoonotic helminths, one of which revealed high prevalence of zoonotic helminth infection among humans (7.8%) and animals (18.1%) in Jos, Plateau state [12]. In another study, the prevalence and geographical distribution of zoonotic helminths in food animals slaughtered in Nigerian abattoirs between 1970 and 2016 across 19 Nigerian states was 7.48% (ranging from 1.90% to 60.98% across strata) with highest prevalence estimates in the north-central region of Nigeria [13] where Taraba State is located. This report is in agreement with our findings in this study, with helminthoses having the highest occurrence among the clinical cases in the state, emphasizing the threat of zoonotic helminthoses to both animal and human populations in the state. Globally, the risk of zoonotic helminthoses is increasing [14,15] in Africa and Asia. Cysticercosis is fast-becoming an

emerging zoonosis in some developed countries, notably the United States of America (USA) [16] despite the fact that it is considered to be an eradicable disease [17] by means of early diagnosis [18,19] and treatment. Salmonellosis (0.41 %) was clinically diagnosed in ruminants and pigs. Studies by [20], in Maiduguri indicated the presence of *Salmonella* specie in fresh meat of cattle, goat, sheep and camel (beef, chevon, mutton and jaziir) in samples that were obtained from the abattoir, market (meat retailers) and meat shops with a recorded prevalence of 26.7%. Report indicate the presence of *Salmonella* from stool samples of humans and cattle in Lagos state, Nigeria [21]. Study by [22], from Ethiopia indicated the presence of *Salmonella* in the samples collected from apparently healthy sheep and goats with a prevalence of 1.04% from the 384 animals that were tested. Vector borne diseases obtained from this study were Trypanosomosis, Babesiosis and Anaplasmosis. Trypanosomosis which is transmitted by Tsetse flies which covers approximately 80% of the landmass in Nigeria [23]. Hence, the continuous thriving of African Animal Trypanosomosis (AAT) and incurred losses. This study revealed trypanosomosis as a problem in the livestock subsector in Taraba state constituting about (21.2%) of the total cases that were reported thereby making the human populace vulnerable to the disease. A study in Nigeria reported a high overall prevalence of 16.1% of AAT [24]. Another study conducted in Plateau state revealed a high prevalence (46.8 %) of bovine trypanosomiasis (*Trypanosoma brucei brucei*, *Trypanosoma congolense savannah*, *Trypanosoma vivax*) [25]. The high prevalence (46.8 %) of bovine trypanosomosis detected in Plateau should be a source of concern to Taraba state as it shares border with Plateau state couple with the already high proportion of cases of trypanosomosis in the state. There are high chances of transmission AAT to the human populace in Taraba state.

Ectoparasites were also among the major problems that ruminants face in Taraba state based on this study. Ranking third among the clinical cases in the

state and remained constantly high through the years examined except for year 2014 where the prevalence was 2.78%. An extensive review of reports tagged “tick, flea, and louse-borne diseases of public health and veterinary significance in Nigeria” [26], conducted across the nation revealed the presence of diverse species of ectoparasites in the country. This further explains the diagnosis of Babesiosis and Anaplasmosis in animals in the state due to the presence of ticks. Quite a number of reports around the nation has demonstrated numbers of species of ticks and implicated them in a lot of disease conditions [27-32]. Ectoparasites are among the major problems that ruminants face in Taraba State based on information obtained. This further explains the diagnosis of Babesiosis and Anaplasmosis as tick borne diseases of animals in the state. An extensive review of reports tagged “tick, flea, and louse-borne diseases of public health and veterinary significance in Nigeria” [26], conducted across the nation demonstrated quite a number of species of ticks and implicated them in a lot of disease conditions [27-29,31,32]. The presence of these ticks is also a threat for transmission of diseases to the human populace. Perhaps, Babesiosis and Anaplasmosis are currently circulating within the human population without being diagnosed. There is need for research to be conducted in humans to confirm the presence of Babesiosis and Anaplasmosis in Taraba state. A study in Bangladesh [33] determined the prevalence of ectoparasites infestation of cattle in and around the Bhawal forest area in Gazipur district found 132 (64.07%) of 206 cattle to be infested with several species of ticks and lice. The study also revealed significantly higher prevalence of ectoparasites infestation in cattle reared under free range system than that of semi-intensive system [33]. Reasons for high tick infestation includes free range management system, malnourished cattle with poor health status [33]. The endemicity of ectoparasites and its high ranking among cases presented in the state indicates the need for strategic prevention and control of ectoparasites in the environment where animals are kept and treatment of animals infested

with the parasites bearing in mind their potential in the transmission of zoonotic diseases between humans and animals.

Anaplasmosis constituted 4.2% of the total cases that were reported. High seroprevalence of anaplasma antibodies have been detected in the wildlife and livestock's in Kenya demonstrating that wildlife could serve as reservoirs of infection to domestic animals [34]. Human granulocytic anaplasmosis (HGA), a deer tick transmitted rickettsial infection caused by *Anaplasma phagocytophilum*, is a common cause of undifferentiated fever in the Northeast and Upper Midwest United States. Patients are often initially diagnosed with a mild viral infection, and illness readily resolves in most cases. However, as many as 3% may develop life threatening complications and nearly 1% die from the infection [35]. Two cases of human anaplasmosis through the process of blood transfusion was reported by [36]. Cases of babesiosis were reported in Taraba State for a period of five years with an average percentage of 1.9%. Bovine babesiosis is a tick-borne parasitic disease with significant morbidity and mortality in cattle. The economic losses can be considerable, especially when animals with no immunity are moved into an endemic area. Three species of *Babesia* cause most clinical cases in cattle [37]; *Babesia bovis* and *B. bigemina* are widespread in tropical and subtropical regions, while *B. divergens* circulates in parts of Europe and possibly in North Africa. The major vectors for *B. bigemina* and *B. bovis* are *Rhipicephalus microplus* and *R. annulatus* in some areas while *Ixodes ricinus* is the major vector for *B. divergens* [37]. Cattle that have recovered from acute babesiosis can remain asymptotically infected, and recurrence of parasitemia can occur at irregular intervals. Humans are thought to become infected with *B. divergens* in tick bites [37]. The overall mortality rate for bovine babesiosis is reported to be 5-10%, even with treatment. Mortality can reach 50-100% in untreated animals infected with this organism [37]. The prognosis is guarded once hemoglobinuria develops, and CNS signs suggest a

poor prognosis. In humans, infection by *B. divergens* has a case fatality rate of approximately 40% [37]. Dermatophilosis a disease of zoonotic importance was also indicated among the clinical cases in this study. Several studies have demonstrated the presence of dermatophilosis caused by *dermatophilus congolensis* in ruminants in Nigeria [38,39]. The disease can spread to the human populace through contact with infected animals.

Result obtained from our analysis indicated that among the diseases that affect poultry, Salmonellosis (enteric) in poultry is endemic in Taraba state. This indicates that Salmonellosis can be a source of infection to the public in the state based on documented evidence from numerous large outbreak investigations which demonstrated the transmission of human salmonellosis through contact with live chicks and ducklings [21,40,41]. Studies conducted on commercial chicken layer farms in Nigeria [30] on *Salmonella* serovars and their distribution indicated a farm prevalence of 43.6%. *Salmonella* specie may be present in about 65% of a flock with variable serotypes colonizing the gastrointestinal tract of poultry depending on the geographic location and time of the year for example *S. enteritidis* and *S. typhimurium* [42-44]. Many strains isolated from poultry that are responsible for food poisoning in humans' demonstrated resistance to selected antibiotics. For this reason, much attention is drawn to eggs and poultry meat as sources of *Salmonella* [43]. Salmonellosis infection in birds is the primary source of infection in production environment [44,45] and in environmental contamination of poultry farms which plays a role in the transmission of *Salmonella* from live poultry to people since birds may shed *Salmonella* for long periods [46]. Egg content may be infected at the stage of forming due to bacterial colonization of the hen's genital system leading to the production of infected eggs. Also, there may be environmental contamination of eggs with *salmonella* pathogen and possible penetration of the egg shell [47]. In humans, *Salmonella* specie was estimated to cause

over 90 million diarrhea-associated diseases worldwide yearly with 85% of those cases associated with food poisoning [48]. Also, other reports estimated the annual number of cases of salmonellosis globally ranging from 200 million to over 1 billion [47,49] with an expected world fatality rate associated with salmonellosis is over 150 thousand [50]. Human salmonellosis from contact with live poultry is a challenging, yet largely preventable, public health problem [46]. Prevention requires an integrated One Health approach including public and animal health officials collaborating with hatchery industry, feed store industry, healthcare providers, veterinarians, and backyard flock owners [46].

Some of the diseases of economic and public health importance reported in this study were CBPP, PPR, FMD and Newcastle which are transboundary in nature and are trade limiting [51]. Financial estimates of the burden of PPR, CBPP, trypanosomosis, NCD and ASF (TADs) in Nigeria amounted to NGN29.2 billion (182.3 million USD) [52]. This cost of inaction against the diseases were NGN 8.9 billion due to NCD in local chicken, PPR in sheep and goats (NGN 6.9 billion) and CBPP (NGN 2.2 billion) while the highest direct cost of inaction amounting to NGN 8.9 billion is due to NCD. All the TADs recorded in this study are vaccine preventable which indicates the low level of sensitization of farmers in disease prevention resulting in the use of antibiotics in the treatment of these food animals and they end up as meat on our tables. Food-producing animals are linked to humans via the food chain and the shared environment thus a one health approach to understanding how to control the AMR Situation Analysis and Recommendations threat becomes apparent [53,54]. The misuse of antimicrobials in the treatment of these diseases possess danger to the public health. The presence of veterinary drug residues in food products are a global health problem [51], which needs to be curtailed for the safety and security food in order to protect the health of the public. Drugs are the most frequently detected chemical residues in food of animal origin,

and majority of these are antimicrobials commonly used in veterinary practice in Nigeria [55]. The occurrence of contamination of edible animal products by antimicrobial and pesticide residues beyond the FAO/WHO permissible level is high in developing countries [51]. Lack of appropriate legislation to controlling the quality and distribution of veterinary pharmaceuticals and phytosanitary products in Nigeria market, will aggravate the health risk posed by drug residues if liberalization of the veterinary profession is allowed [51]. The nature, quantity and timing of antimicrobial administration determines the possible existence of antimicrobial residues in meats at the time of sale or consumption and potentially allows resistance selection from and through the food chain [51]. Analysis from 48 studies that tested resistance of a wide range of isolates using 55 antimicrobials belonging to different classes and generations showed resistant organisms were recovered from livestock (cattle, goats, pigs, sheep, camels and chickens) and from foods (dairy, vegetables and meats).

## Conclusion

The presence of zoonoses and TADs among clinical cases in Taraba state is evident. Trends of these diseases have indicated that they are endemic in the state. Food borne zoonoses (helminthoses and Salmonellosis), vector borne zoonoses (Trypanosomosis, Babesiosis, Anaplasmosis), Dermatophilosis and ectoparasites in the state are treats to the health of the public. The high proportion of ectoparasites in the state points to the presence of anaplasmosis and babesiosis. In general, the welfare of the food animals in Taraba State needs to be taken care of in terms of treatment, prevention and control of these diseases so as to protect the health of the public. Development of antimicrobial resistance as a result of antibiotic abuse in veterinary services is a possible factor that cannot be ignored because of the extensive use of antibiotics in the treatment of TADs. This can further translate to treat to the public health through the food chain mechanism.

Taraba state is strategically situated in Nigeria, with high population of livestock, sharing an international border with the republic of Cameroon and six states in the federation. This makes the influx of animals in and out of the state very easy due to the porosity of the inter and intra-national borders in Nigeria. The laxity in implementing the animal movement control act across the Control Posts nationwide is likely to play a great role in the transmission of zoonoses in the animals in the state with possible high risk of transmission to the public if the problem is not contained. The present information provided can aid the state in the promotion of disease-control policies, encourage on-farm good agricultural practices through proper training of farmers and adequate hygiene and sanitation in abattoirs and meat-processing plants, with the aim of protecting public health.

### What is known about this topic

- *Zoonotic diseases are major challenge to the public health sector globally;*
- *Majority of animal diseases are zoonotic in nature;*
- *Misuse of antimicrobials in animals has adverse effect on the health of the public.*

### What this study adds

- *Majority of the animal diseases documented in this study were zoonotic, increasing the risk of transmission to humans;*
- *The extensive system of animal husbandry coupled with High proportion of Transboundary Animal Diseases (TADs) portends economic and public health challenges to Taraba State, destination States and countries;*
- *The indiscriminate use of antibiotic in the treatment of these animal infections by farmers contribute significantly to the global burden of antimicrobial resistance.*

## Competing interests

The authors declare no competing interests.

## Authors' contributions

Emmanuel Yarai collected and collated data from the Taraba State Ministry of Agriculture. Ayi Vandi Kwaghe and Daniel Egom Okomah performed data analysis. Ayi Vandi Kwaghe drafted the manuscript. Mabel Kamweli Aworh, Emmanuel Awosanya, Chukwuma Umeokonkwo, Celestine Ameh and Junaid Kabir edited the manuscript. Chukwuma Umeokonkwo created the map of Nigeria. All authors read and accepted the final draft of these manuscript.

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## Tables and figures

**Table 1:** sex and species distribution of diseases of ruminants and pigs in Taraba State, Nigeria, 2013 to 2017 (N=1,535,267)

**Table 2:** diseases of ruminants and pigs obtained from veterinary clinics/hospitals in Taraba State, Nigeria, 2013 to 2017 (N=1,535,267)

**Table 3:** diseases of poultry treated in Taraba State, Nigeria, 2013 to 2017 (N=237,671)

**Figure 1:** map of Taraba state (green colour) showing border states

**Figure 2:** total number of clinical cases reported per year from 2014 to 2017 in Taraba State

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**Table 1:** sex and species distribution of diseases of ruminants and pigs in Taraba State, Nigeria, 2013 to 2017 (N=1,535,267)

Diseases	Species	Male Frequency (%)	Female Frequency (%)	Total
Trypanosomoses	Cattle	142697 (43.8)	182900 (56.2)	325597
Anaplasmosis	Cattle	27769 (43.5)	36131 (56.5)	63900
Babesiosis	Cattle	11767 (40.2)	17502 (59.8)	29269
Helminthoses	Cattle	218570 (43.7)	281141 (56.3)	499711
	Goat	47658 (51.0)	45779 (49.0)	93437
	Sheep	34614 (54.3)	29169 (45.7)	63783
	Pigs	1828 (59.6)	1240 (40.4)	3068
Dermatophilosis	Cattle	11939 (44.8)	14726 (55.2)	26665
	Goat	2519 (62.4)	1517 (37.6)	4036
	Sheep	1920 (60.8)	1239 (39.2)	3159
FMD	Cattle	8309 (42.9)	11070 (57.1)	19379
Ectoparasitism	Cattle	69413 (47.2)	77596 (52.8)	147009
	Goat	23131 (58.0)	16785 (42.1)	39916
	Sheep	18497 (53.6)	16017 (46.4)	34514
	pigs	3262 (46.6)	3742 (53.4)	7004
PPR	Goat	11005 (52.7)	9875 (47.3)	20880
	Sheep	6491 (59.6)	4405 (40.4)	10896
CBPP	Cattle	8779 (41.0)	12652 (59.0)	21431
Cowdriosis	Cattle	216 (40.6)	316 (59.4)	532
	Sheep	3 (75.0)	1 (25.0)	4
	Goat	0 (0.0)	2 (100.0)	2
Coccidiosis	Cattle	46202 (46.5)	53234 (53.5)	99436
	Goat	7056 (55.0)	5766 (45.0)	12822
	Sheep	3674 (56.1)	2873 (43.9)	6547
	Pigs	1106 (57.5)	816 (42.5)	1922
Salmonellosis	Cattle	2269 (41.2)	3242 (58.8)	5511
	Sheep	154 (61.4)	97 (38.6)	251
	Goat	76 (32.8)	126 (62.4)	202
	Pigs	187 (59.9)	125 (40.1)	312
Black quarter	Cattle	451 (36.5)	786 (63.5)	1237

**Table 2:** diseases of ruminants and pigs obtained from veterinary clinics/hospitals in Taraba state, Nigeria, 2013 to 2017 (N=1,535,267)

Diseases	2013 Frequency (%)	2014 Frequency (%)	2015 Frequency (%)	2016 Frequency (%)	2017 Frequency (%)	Total Frequency (%)
Trypanosomoses	68791(21.6)	53671(22.6)	92454(24.8)	70936(22.0)	39745(14.1)	325597(21.2)
Anaplasmosis	4539 (1.4)	8096(3.4)	41334(11.1)	6359(2.0)	3572(1.3)	63900(4.2)
Babesiosis	4554 (1.4)	6172(2.6)	8055(2.2)	4967(1.5)	5521(2.0)	29269(1.9)
Ectoparasitism	44473(13.9)	6608(2.8)	57536(15.4)	68025(21.1)	51801(18.4)	228443(14.9)
Dermatophilosis	17831(5.6)	3270(1.4)	1789(0.5)	2972 (0.9)	803(0.3)	26665(1.7)
Helminthoses	136039(42.6)	125843(52.9)	137124 (36.7)	116737(36.1)	144256(51.1)	659999(43.0)
Salmonellosis	923(0.3)	2701(1.1)	0(0.0)	2145(0.7)	537(0.2)	6306(0.4)
PPR	7407(2.3)	6048(2.5)	5384(1.4)	7092(2.2)	5845(2.1)	31776(2.1)
CBPP	1824(0.6)	2569(1.1)	4079(1.1)	5348(1.7)	7611(2.7)	21431(1.4)
FMD	3286(1.0)	2659(1.1)	1924(0.5)	11413(3.5)	97(0.0)	19379(1.3)
Cowdriosis	33(0.0)	89(0.0)	0 (0.0)	184(0.1)	232(0.1)	538(0.0)
Coccidiosis	29377(9.2)	19870(8.4)	23094(6.2)	26805(8.3)	21581(7.7)	120727(7.9)
Black Quarter	0(0.0)	157(0.1)	478(0.1)	0(0.0)	602(0.2)	1237(0.1)
Total	319077(100.0)	237753(100.0)	373251(100.0)	322983(100.0)	282203 (100.00)	1535267(100.0)

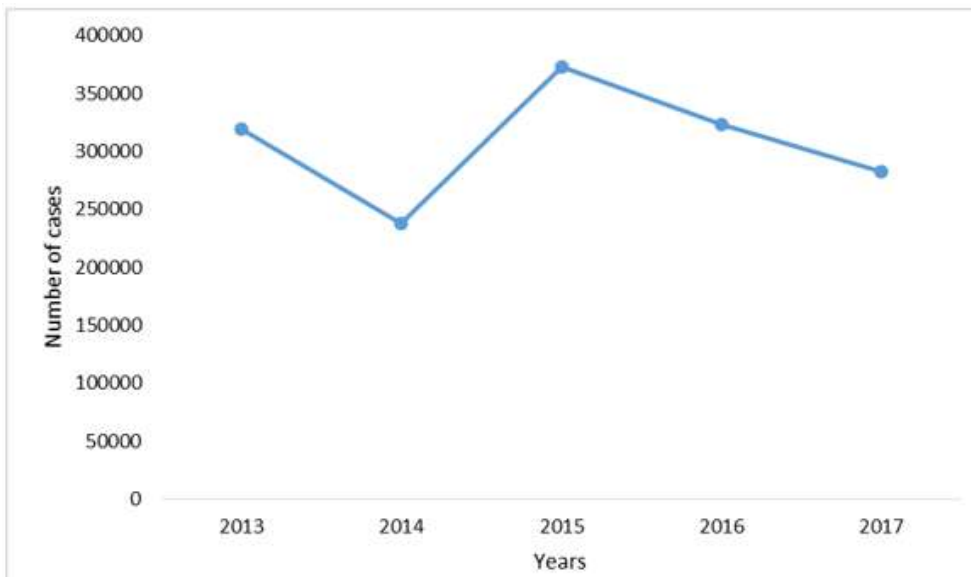
\*Foot and Mouth Disease (FMD), Contagious Bovine Pleuro Pneumonia (CBPP), Peste des Petits Ruminants (PPR)

**Table 3:** diseases of poultry treated in Taraba state, Nigeria, 2013 to 2017 (N=237,671)

DISEASES	2013	2013 (%)	2014	2014 (%)	2015	2015 (%)	2016	2016 (%)	2017	2017 (%)	TOTAL	TOTAL (%)
Coccidiosis	48043	80.15	35147	72.55	29319	69.42	32482	72.30	24698	58.62	169689	71.40
Newcastle Disease	5092	8.50	4379	9.04	3172	7.51	2560	5.70	4761	11.30	19964	8.40
Gumboro Disease	601	1.00	420	0.87	897	2.12	1718	3.82	220	0.52	3856	1.62
Salmonellosis	1534	2.56	3114	6.43	0	0.00	2145	4.77	537	1.27	7330	3.08
Fowl Typhoid	1968	3.28	3257	6.72	4873	11.54	2173	4.84	6895	16.36	19166	8.06
Fowl Cholera	0	0.00	153	0.32	892	2.11	0	0.00	3649	8.66	4694	1.97
Fowl pox	2701	4.51	1972	4.07	3079	7.29	3847	8.56	1373	3.26	12972	5.46
Total	59939	100.00	48442	100.00	42232	100.00	44925	100.00	42133	100.00	237671	100.00



**Figure 1:** map of Taraba state (green colour) showing border states



**Figure 2:** total number of clinical cases reported per year from 2014 to 2017 in Taraba State