Descriptive human health risk assessment of informal slaughter by small-scale farmers of Gauteng, focussing on *Brucella abortus*

By

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SUMMARY

Descriptive human health risk assessment of informal slaughter by small-scale farmers of Gauteng, focussing on *Brucella abortus*

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This study is a questionnaire-based, descriptive assessment of informal livestock slaughter practices by small scale farmers in Gauteng. This study aims to assess if the practice of informal slaughter poses a potential risk to public health specifically to brucellosis exposure, a disease of high seroprevalence in Gauteng and South Africa. Informal livestock slaughter from antemortem selection to carcass dressing, butchering and product preparation were descriptively assessed for potential disease exposure and resultant public health risk. This study assessed the frequency of brucellosis testing and the occurrence of livestock abortions as a possible disease indicator. Farmers were asked on the particulars of informal slaughter to ascertain if disease exposure could occur through this practice.

The study made use of a questionnaire where 109 study participants were interviewed individually. Questionnaire results were compiled in Microsoft® Excel where data was analysed through descriptive statistics to identify trends and frequency data from the results. The study found that the majority of small-scale farmers participating in the study were older individuals, the majority of whom were not earning an income. It was found that study participants would slaughter livestock informally themselves or with a family member. This would occur only once or twice a year, usually for cultural or religious purposes or for a special occasion.

Livestock most commonly owned and slaughtered by small-scale farmers were cattle, carriers of *Brucella abortus*. Participants rarely made use of adequate protective personal protective equipment (PPE) when slaughtering informally. The use of PPE and the adequacy thereof was however found to

increase in frequency with participant age group. Older individuals, elders in their communities were often given the responsibility of livestock slaughter, thus providing some risk mitigation to disease exposure during the process. High risk structures such as lymph nodes and reproductive organs were handled during slaughter, the former frequently consumed with the tripe due to lack of recognition. While some organs previously found to harbour *Brucella* organisms were consumed raw or only exposed to short cooking times, the majority of slaughter products were exposed to prolonged cooking times, sufficient to reduce bacterial loads, reducing risk through consumption. While many participants recognised brucellosis as a zoonotic disease, the routes of transmission were poorly recognised.

Exposure to *Brucella* spp. through informal slaughter is likely in the current environment of high brucellosis seroprevalence, poor disease control and the unreliable disease history of animals sourced for slaughter, posing a risk to public health. Should a brucella infected animal be slaughtered informally, exposure of those performing the slaughter, dressing the carcass and those involved in food preparation is likely and may lead to brucellosis.

1. GENERAL INTRODUCTION

This study makes use of interviews with small scale farmers in Gauteng, to descriptively assess if exposure to *Brucella abortus* can occur through the process of informal livestock slaughter.

Through the use of a questionnaire completed through an interview, the study investigates the practice of informal slaughter by small scale farmers in Gauteng. For the purposes of this study small scale farmers are those who own livestock, usually making use of communal grazing land or small plots of land of less than twenty-five hectares. The purpose of the livestock owned by these farmers is usually for subsistence or cultural right rather than for profit or productivity. The study area chosen was specifically southern and eastern Gauteng under the Germiston state veterinary area.

For background purposes, the study briefly looked at the socioeconomic background of participants as well as the livestock species owned and farmed with, and how often participants personally handle livestock. Direct contact with infected livestock is a common means of infection, a potential means of infection with *Brucella abortus* in small scale farmers, as evaluated in this study.

Participants who own and work with cattle were asked on the occurrence of controlled disease testing of their herds, namely for brucellosis and tuberculosis (TB). These diseases are of significant public health importance and named neglected zoonotic diseases (NZD) by the World Health Organization (WHO) under the banner of neglected tropical diseases (NTD) (Mabelson *et al*, 2014). The WHO highlighted that brucellosis is a zoonosis of great public health concern due to the reduced working ability and physical suffering of those affected by this disease (Mabelson *et al*, 2014). South Africa and Gauteng specifically have an exceptionally high brucella seroprevalence. In 2016 the Gauteng brucellosis seroprevalence in the provincial cattle herd was found to be 13.6% (Govindasamy, Geertsma, & Abernathy, 2016). The 2017/2018 herd seroprevalence for Gauteng was 26.91%, while that for the Germiston state veterinary area was 30.41%, higher than the provincial average. These results were based on the CA5, brucellosis laboratory serological survey for Gauteng (Pers. comm. Dr K Govindasamy, 5 June 2018).

One of the most significant clinical indications of the presence of *Brucella abortus* in a cattle herd is the occurrence of abortions between the fifth and final months of gestation (Department of Agriculture, Forestry and Fisheries, 2016; Godfroid *et al*, 2017). To complement the previous enquiry, the study investigates the occurrence of abortions in participant cattle herds. The estimation of the size of the abortus as well as assessment of hair growth allowed the researcher to gain a clearer view on stage of abortion and gestational age of abortus. This information may suggest the presence of abortigenic diseases in the herd, namely brucellosis.

As the public health risk associated with informal slaughter was the main concern of the study, participants were asked about their experience with the practice. Informal slaughter is a constitutionally protected cultural right in South Africa (Act 108 of 1996) (CRL, 2009). Provision is made for the practice even in the Meat Safety Act (Act 40 of 2000) where is it is specified for use in cultural, religious or own consumption purposes (McCrindle, 2008). Informal slaughter occurs outside of an abattoir where there is no formal means of meat inspection and no control in food safety and hygiene. The occasion for slaughter usually determines the animal selected. When intended for cultural or religious purposes, the animal chosen is usually indicated by a spiritual healer or religious leader (Manganyi & Buitendag 2013). Participants are asked which animals are most commonly used for slaughter as well as frequency of occurrence. The study also looks at who performs the slaughter and if any biosafety precautions are taken for the event. The spread of zoonotic disease through contact with bodily fluids via the mucous membranes or broken skin are well recorded routes of infection (Galinska & Zagorski, 2013, Cantaly *et al*, 2017; CDC, 2009). The use of personal protective equipment (PPE) at the slaughter of a brucellosis positive animal is advocated by the South African Department of Agriculture, Forestry and Fisheries (DAFF). The inadequate use of PPE during the slaughter of such an animal exponentially increases the risk of infection through aerosolization and mucous membrane exposure to the brucellosis bacterium (Department of Agriculture, Forestry and Fisheries, 2016).

Brucellosis organisms have been isolated from various bodily fluids, namely blood, cerebrospinal fluid as well as pleural and abdominal fluid. The same was found of several organs from an infected bovine carcass. Organs implicated were the reproductive organs, liver, lungs and lymphatic structures in the carcass (Sola *et al*, 2014; CDC, 2009). For this reason, the consumption and preparation of offal and tripe were investigated. The consumption, inadequate preparation and handling of potentially infected organs and structures may pose a risk of zoonotic infections to those in direct contact with them (Sola *et al*, 2014). Participants were specifically asked about common lymph nodes found in a carcass. Colour images and descriptions were given of various lymph nodes while participants were asked if they recognised the structures, and if so, were they consumed? This was highlighted as a specific risk factor as brucella bacteria are known to accumulate in high numbers in lymphoid organs in an infected animal (Department of Agriculture, Forestry and Fisheries, 2016).

The possibility was raised of visually notable lesions in various organs. With the assistance of a pair of images of segmentally and wholly diseased organs, participants were asked how they would respond to the presence of diseased or damaged tissue or organs. The handling of visually diseased organs implies a high level of pathogen presence within the animal carcass, and a very high risk of disease spread to those handling these organs. This may highlight the importance of other zoonotic diseases

that may spread through contact or consumption of infected animal tissue. Brucellosis rarely shows visible evidence of infection.

The final section of the study concentrated on participant knowledge of zoonotic disease, how it is spread and which diseases were of concern to them. This serves as an estimate of community awareness of the risk of zoonotic disease, whether it be from living or dead animals. South Africa is a country of regrettably high levels of human immunodeficiency virus (HIV) infection as well as TB infection (StatsSA, 2016). Both diseases lead to immune suppression in their hosts, which in turn leads to an increased susceptibility to zoonotic infection, especially to those who handle or consume infectious animal products (Michel *et al*, 2003; Qekwana, McCrindle & Oguttu, 2014).

As informal slaughter is a frequently occurring practice amongst small scale farmers in Gauteng, and possibly throughout South Africa, the risk of zoonotic infection through this practice should be evaluated as a possible public health risk. Where immunosuppression effects a large proportion of the country's population, the often fatal consequences of concurrent zoonotic disease should not be neglected but rather focussed on as a threat to community health. Community education on zoonotic disease, routes of transmission and prevention of exposure can be used as a cost-effective means of protecting the public.

The objectives of this study were to determine if there was a risk of exposure to brucellosis through informal slaughter This was accomplished using descriptive and inferential statistical methods from questionnaires completed through interviews with small scale farmers in Gauteng. The study results may be used to educate the communities practicing informal slaughter on means to prevent disease exposure in order to protect themselves from zoonotic disease.

2 LITERATURE REVIEW

2.1 THE HISTORY OF ANIMAL SLAUGHTER IN SOUTH AFRICA

South Africa is a country made up of a plethora of cultures, ethnicities, religions and races, a so called 'Rainbow Nation'; a term coined by Archbishop Emeritus Desmond Tutu in 1994, used to describe the colourful diversity of the nation. It is in diversity that the country has its strengths but it is also in diversity that the greatest challenges in One Health emerge.

Animal slaughter has a historically important role to play in many cultures and religions. Aside from the use of animals as a source of animal-derived protein, animal slaughter has played an important role as means of sacrifice and of atonement in many religions. This is seen in all the major religions of the world and a common practice since biblical times.

The Constitution of South Africa (Section 15(1)) allows for the expression and practice of a person's religion and beliefs (Act 108 of 1996). This constitutional right extends to the traditional and/or religious slaughter of animals. Across the many different cultures and religions in South Africa, the majority that require animal slaughter, whether for ceremonial, traditional or ritualistic purposes, require that the animal be alive and conscious during slaughter. Both Halaal and Kosher slaughter practices allow for the use of stunning in livestock slaughter. The Muslims allow for the use of non-penetrating concussion as stunning prior to bleeding while the Jews only allow stunning within twenty seconds of the initial throat cut (McCrindle, 2008).

The Meat Safety Act (Act 40 of 2000) Section 7 (2), allows for slaughter outside of an abattoir if the purpose is "for own consumption, for cultural purposes and/or for religious purposes" (McCrindle, 2008). According to McCrindle (2008), there are currently three recognized classes of ritual slaughter in South Africa, namely Kosher, Halaal and traditional slaughter. These ritual slaughter practices are not regulated by veterinary public health officials or food safety controls to prevent unsanitary meat handling or meat inspection. The slaughter process in ritual slaughter is however governed by SPCA legislation, to prevent unnecessary cruelty when an animal is slaughtered (McCrindle, 2008).

2.2 ANIMAL SLAUGHTER IN AFRICAN CULTURE

Animal slaughter in African culture is a tradition that has been passed down verbally through many generations, believed to have begun even before the African ancestors came to South Africa. One of the beliefs across many African religions and traditions is that in order to communicate with God, one must pray and bring sacrifice to ancestral spirits, who then act as intercessor and take the request to God. It is believed that the ancestors communicate through dreams which are interpreted by

traditional healers. The interpretation and communication can only be done through the spilling of blood, often that of an animal (CRL, 2009). The animal species, its sex and size used for the sacrifice will depend on the nature of the ceremony or celebration or may be influenced by economic circumstances. The animal for slaughter is specified by the ancestors, or an animal that is considered spiritually acceptable, communicated by the traditional healer (Manganyi & Buitendag, 2013). The reasons for the ritual may be to ask for blessing and good fortune or it may also be used to request healing for a family member, for wisdom, rain or protection as well as thanksgiving for good harvest or prosperity (CRL, 2009). Although traditional and cultural slaughter still occurs in SA, it is believed that it is often done in secret, limiting the information available regarding different slaughter methods (Qekwana, McCrindle & Oguttu, 2014).

Despite the many similar reasons for animal sacrifice and slaughter, each culture has very different nuances and means of performing the ritual. For example, the Pedi culture will only slaughter cattle on special occasions. The chosen animal will be slaughtered at dawn within the kraal, either in the presence or absence of other cattle, depending on the tribe (Phalafala, n.d.). A ceremonial assegai is used to pierce the heart behind the left shoulder. The throat is then cut to exsanguinate the animal before the carcass is flayed and dressed. An important part of the ceremony is that the other animals in the kraal must walk through the blood of their fallen companion to honour its sacrifice (McCrindle, 2008). Similarly, the Zulu culture will also slaughter an animal on special occasions and for ancestral communication and will also use an assegai to pierce the heart. In Zulu tradition, a cow will be sacrificed to honour female ancestors and a bull to honour male ancestors. In other cultures, a ceremonial knife or spear may be used to sever the spinal cord just behind the skull, rendering the animal immobile before exsanguination. The severance point is either between the base of the skull and the first cervical vertebrae, the atlas (C1) (K. Masikhala pers. comm. on 23 June 2017), or between the atlas and the second cervical vertebrae, the axis (C2) (CRL, 2009). Thereafter the throat is cut and animal exsanguinated (CRL, 2009). Only a person with a high standing within the family or clan may perform the slaughter and must be skilled in slaughter technique. According to Manganyi and Buitendag (2013), the animal is slaughtered by the eldest man of the family and the portioning of the carcass after slaughter is specific and symbolic, an integral part of the ritual. The man performing the ceremonial slaughter must have remained spiritually and behaviourally ‘clean’; having abstained from intimate or disgraceful behaviour for several days prior to the event (CRL, 2009).

In most African cultures, the animal must bellow at the time of slaughter to indicate that the sacrifice has been accepted by the ancestors. According to Chidester (1992) ‘the bellowing of the sacrificial animal is crucial to the ritual because the cry opens up communication with the ancestors. It is for this reason that goats are most often used in ceremonial slaughter as they will bleat when handled, as

opposed to sheep or cattle (CRL, 2009). The reason for the ceremony will determine the animal type and species to be sacrificed, the most commonly used are goats, thereafter cattle, chickens or sheep (Qekwana, McCrindle & Oguttu, 2014). Sheep, due to their silence at slaughter are mostly kept for consumption purposes rather than for ceremonial slaughter (K. Masikhala pers. comm. on 23 June 2017). This is in contrast to Jhatka bali slaughter used by the Hindus where instant death is required when slaughtering an animal. Any sound made by the animal during slaughter is seen as a bad omen. During this ritual the animal is decapitated by the use of a sword or axe, causing instant death of the animal (Allen, 2016).

In African culture, the slaughter of the animal usually occurs within the family kraal, or in the cities a temporary kraal must be erected for the occasion. As livestock slaughter had in the past been performed in rural homesteads, that right is now expected to be carried over into the backyards of residential areas, as part of a constitutionally protected cultural and traditional right. The location of the slaughter is important to the sacredness of the ceremony (CRL, 2009). When traditional and ceremonial livestock slaughter is performed at people's homes, there is rarely formal public health ante mortem or meat inspection. As the purpose of ante mortem health evaluation and meat inspection is public health protection and food safety, the lack of such luxuries may increase the risk of food-borne and zoonotic disease. This risk not only applies to the consumer but also to those who handle and slaughter the animal, as well as those working with the unused waste products, if any (Qekwana, McCrindle & Oguttu, 2014).

Multiple reported cases of food-borne disease that occurred due to African ceremonial feasts which prompted the drafting and development of municipal by-laws and policies for urban backyard traditional slaughter (CRL, 2009). These allowances require a permit from the local municipality or city council (McCrindle, 2008). The Johannesburg Metropolitan Municipality Public Health by-law (No 830 of 21 May 2004) for example, allows for animal slaughter outside of an abattoir in the cities, on condition that they receive a permit from the local municipality (JHB municipality Public Health by-law No 830 of 21 May 2004). Most of the municipalities in Gauteng have drafted similar by-laws and policies. The permit is issued with stipulations and conditions, namely that the intent to slaughter must be made in writing to municipality fourteen days prior to the event and ensure that slaughter takes place out of the public eye. The meat must be used solely for the religious ceremonial feast and cannot be kept or sold. Hygienic meat handling must occur during carcass dressing and food preparation and proper waste disposal must occur after the event. The animal to be slaughtered may not be kept on the premises more than 24h prior to the event without adequate stabling as outlined by the by-laws. There is however no municipal supervision or control over these procedures, with no guarantee of implementation. Despite the public health risk, the right to practice traditional and

ceremonial animal slaughter is a constitutionally protected right. The legalities are supported by the Commission for the Promotion and Protection of the Rights of Cultural, Religious and Linguistic Communities (CRL) (2009) which stated; 'Practitioners may continue to slaughter animals for ritual purposes in the course of practising their religion, but they are obliged to carry out the ritual within the limits of the law' (CRL, 2009).

2.3 BRUCELLA THE ORGANISM

Brucella species are gram negative coccobacilli bacteria, they are slow growing aerobic organisms (Galinska & Zagorski, 2013) whose natural host range are mammals. Internationally there are twelve recognized species of Brucella, namely *Brucella abortus*, *B. canis*, *B. ceti*, *B. inopinata*, *B. melitensis*, *B. microti*, *B. neotomae*, *B. ovis*, *B. papionis*, *B. pinnipedialis*, *B. suis* and *B. vulpis* (Scholz, 2016; LPSN, n.d.). Brucella species can be classed based on colony morphology during culture as either smooth or rough forms. Smooth brucella species are usually considered pathogenic such as *B. melitensis, B. abortus* and *B. suis*, while rough forms such as *B. canis* and *B. ovis* are less so (Godfroid *et al,* 2017; Corbel, 2006). According to the Centre for Disease Control and Prevention (CDC) Brucellosis reference guide: Exposures, Testing and Prevention (2017), three of the brucella species have been designated select agents, namely *B. abortus, B. melitensis and B. suis.* Select agents are a subset of biological agents which 'may pose a severe threat to public health' (CDC, 2017). Aside from these three Brucella species, an additional three are recognised as potentially zoonotic, namely *B. canis, B.ceti and B. pinnipedialis* (CDC, 2017).

The two main organisms of concern are *Brucella abortus*, which most commonly occurs in cattle, and *Brucella melitensis* which is most often found in small stock such as sheep and goats. Brucellosis is a disease of worldwide occurrence, most commonly found in countries with poor Veterinary Public Health and Animal Health programmes in place (Galinska & Zagorski, 2013). Brucellosis impacts human and animal health, economic development as well as agricultural trade and tourism (Mangalgi *et al*, 2016). According to the World Health Organization (WHO), brucellosis has always been considered a disease of 'major public health importance' (Mableson *et al,* 2014), due in part to the reduced productivity of affected livestock but also due to the physical incapacitation and diminished work ability caused by chronic brucellosis in humans. It has been acknowledged that brucellosis, along with anthrax are 'tool-deficient' diseases which would benefit from the development of better methods of control (Mableson *et al,* 2014).

Immune response and sequelae

Brucella species bacteria are intracellular bacteria that stimulate both cellular and humoral immune system responses in an infected person or animal. The organism typically enters the body through the

mucous membranes, is phagocytosed by neutrophils and macrophages where the reticulo-endothelial system drains it to local lymph nodes. In regional lymph nodes the organism multiplies causing lymphadenitis which may persist for months. This usually progresses to a bacteraemia which lasts for several weeks, and which may recur after initial infection; usually around partus (Godfroid *et al*, 2017; Department of Agriculture, Forestry and Fisheries, 2016). The target organs are typically the udder and gravid uterus which results in abortion, the testes and seminal vesicles, causing orchitis as well as the joint synoviae, leading to hygromas in chronically infected animals. In the gravid uterus the bacteria are attracted to erythitol, an alcohol sugar produced by the foeto-placental unit. When in the uterus the organism causes a placentitis, leading to disturbed gas exchange across the placenta causing death of the foetus, which is then aborted (Godfroid *et al*, 2017; Corbel, 2006). Abortion in cattle usually occurs from 5th month of gestation till full term. During abortion, brucella bacteria are excreted and spread through the lochia and milk of infected cows. Generally, an infected cow will only abort once, thereafter giving birth to weak or even healthy infected calves and will continue to excrete pathogenic organisms in foetal fluids and lochia (Godfroid *et al*, 2017). In males brucella affects the testes, seminal vesicles and epididymis where large numbers of the bacteria are excreted in the semen (Corbel, 2006). This however does not represent a significant means of disease spread unless the semen is used for artificial insemination, as the sample is then deposited directly in the uterus and bypasses the innate uterine defences (Godfroid *et al*, 2017; DAFF, 2016).

Exposure and transmission

Brucellosis is a zoonotic disease that can be transmitted from infected animals to humans. The most common routes of exposure are direct contact with infected animal tissue such as aborted material, through the flaying of and contact with infected tissues of slaughtered animals or through gynaecological procedures of infected animals (Godfroid *et al*, 2017; DAFF, 2016). The majority of exposures to infective material occur through the mucous membranes, aerosolized particles that are inhaled or through breaks in the skin (CDC, 2009). Instances of exposure through manure handling and the consumption of infected, unpasteurized dairy products have also occurred (DAFF, 2016). The highest rate of occupational exposure has been found to be with veterinarians, veterinary technicians, artificial insemination technicians, zoo keepers, and livestock farmers (Galinska & Zagorski, 2013). Brucellosis has also been found to be one of the most frequently reported laboratory acquired infections (LAI) (CDC, 2009). This most commonly arises from airborne and mucocutaneous exposure of brucella cultures and aerosols during bacterial isolation techniques (CDC, 2009). The factors that determine if infection is established in both humans and animals are; dose of exposure, bacterial virulence and host resistance; such as age, sex and reproductive status (DAFF, 2016).

Spread

After exposure, bacteria proliferate in the lymphatic system as an intracellular organism (DAFF, 2016), before penetrating into other organ systems travelling through the haemal and lymphatic channels (Galinska & Zagorski, 2013). When bacteria are present in the blood during and after bacteraemia, brucella organisms can be isolated directly from the blood and other body fluids such as cerebrospinal fluid, semen, pleural fluids, the placenta and from urine (CDC, 2009). Bacteria have also been isolated from the lungs, liver and the lymph nodes of a bovine carcass after slaughter, indicating a possible public health risk, both to consumers and meat handlers (Sola *et al*, 2014).

Brucella species are able to gain entrance to and infect all body systems and organs, there are however very few characteristic brucellosis lesions to be found in infected animals (Sola *et al*, 2014). The lack of a characteristic changes however does not preclude the presence of the organism, proven by finding brucella DNA in visually unaffected organs (Sola *et al*, 2014). It is for this reason that it has been recommended that high risk organs should not be incised in slaughtered animals but rather avoided to prevent the formation of aerosols and the risk of infection through inhalation (DAFF, 2016). These organs include the gravid uterus, udder and supramammary, retropharyngeal, Iliac, prescapular and parotid lymph nodes (DAFF, 2016). Furthermore, abattoir workers working with brucellosis positive cattle should wear full personal protective equipment (PPE) such as overalls, gumboots, masks and goggles, to prevent the most common means of exposure (DAFF, 2016). The seriousness of the disease is exemplified by the requirement of Biosecurity Level 2(BSL-2) practices for routine clinical specimens. BSL-3 is however required for all products of conception (foeto-placental unit) where a high concentration of organisms per gram of tissue is found. BSL-3 biosecurity is also required for all brucella cultures (CDC, 2009).

Diagnosis

For brucellosis diagnosis agglutination and complement fixation tests are routinely used for both human and animal serology samples (Galinska & Zagorski, 2013). Serological testing for brucellosis is based on the humoral immune response to the smooth portion of the lipopolysaccharide (LPS) on the external surface of the bacterial cell (Godfroid *et al*, 2017). Antibody classes (IgM and IgG) are detected by both agglutination and complement-fixation tests which are produced after disease exposure. Agglutination and complement fixation tests detect anti-brucella antibodies of both the IgM and IgG lines. IgM antibodies are detectable six days after initial exposure, while IgG antibodies only rise to detectable levels twenty days after exposure (Galinska & Zagorski, 2013). For the purposes of international trade and disease control, the World Organization for Disease Control's, OIE terrestrial manual (2016) prescribes recommended livestock serological screening tests for brucellosis testing

(OIE, 2016). These include the Rose Bengal test (RBT), the buffered plate agglutination test (BPAT), enzyme linked immunosorbent assays (ELISA), complement fixation test (CFT) as well as the fluorescence polarisation assay (OIE, 2016). It is recommended however that any positive results be confirmed by additional complementary testing.

The tests recommended by the OIE for use in monitoring dairy herds on bulk milk samples, are the milk ring test or the indirect-ELISA (OIE, 2016). The serological test recommended for herd screening in South Africa is the Rose Bengal test (RBT) which detects the IgM antibody line. All positive reactors to the RBT are confirmed with either a compliment fixation test (CFT) or slow (tube) agglutination test (SAT) (Godfroid *et al*, 2017; Corbel, 2006). The drawback of serological testing is that it cannot differentiate between the different smooth brucella species (*B. abortus, B. suis* and *B. melitensis*) (Godfroid *et al*, 2017). Bacterial culture is the gold standard of brucellosis diagnosis, which is more time consuming and poses a higher risk for lab staff, requiring BSL-3 hazard prevention (Sola *et al*, 2014). It is through bacterial culture that smooth and rough brucella forms can be distinguished, after which specific brucella species may be typed in subculture through standard taxonomic tests (Corbel, 2006). Biotyping of brucella strains may be performed on bacterial isolation samples where *Brucella* species identification may be based on growth characteristics such as metabolic profiles on urease, catalase and oxidase (Godfroid *et al*, 2010). Bacterial growth affinity in different mediums and the need or tolerance of carbon dioxide in culture growth may also be used in *Brucella* biotyping (Godfroid *et al*, 2010). Species identification may also be assisted by staining and culture morphology as well as advancements in molecular identification methods and PCR-based techniques (Godfroid *et al*, 2010).

Control of brucellosis is difficult, expensive and must be multipronged. Effective control requires co-operation from the livestock farming community; both small scale and commercial, the local veterinarians, state veterinary services and veterinary laboratories. The best means of control is through producing effective immunity in host species through vaccination and the removal of infected animals in order to prevent further disease spread (DAFF, 2016).

2.4 BRUCELLOSIS IN LIVESTOCK AND OTHER ANIMAL SPECIES

Brucellosis is most important in the ruminant livestock industry where the organisms having greatest effect in the industry are *Brucella abortus* in cattle and *Brucella melitensis* in small stock. The economic effects of the disease in these species is centred around the reproductive losses through abortion, reduced fertility and even sterility of livestock, as well as production losses that occur in the dairy industry with reduced milk yield (Godfroid *et al*, 2017).

Brucellosis is spread in the livestock industry through the movement of infected animals from one farm or location to another. Infection occurs between animals through contact with infected placental or aborted material or through insemination with infected semen (DAFF, 2016).

Brucella abortus has been documented in a wealth of terrestrial and aquatic mammal species internationally. In South Africa it has been isolated from African Buffalo (*Syncerus caffer)*, Hippopotamus (*Hippopotamus amphibious*), Burchell's Zebra (*Equus quagga* ssp. *burchellii*), Sable antelope (*Hippotragus niger*), Eland (*Taurotragus oryx)*, Waterbuck (*Kobus ellipsiprymnus*) and Impala (*Aepyceros melampus*). This is of concern in a country such as South Africa where wildlife tourism had flourished, leading to an increased number of wildlife farms with high rate of contact across the wildlife-livestock interface, potentially allowing for backflow of disease from wildlife back in livestock.

2.5 BRUCELLOSIS AND LIVESTOCK FARMING IN SOUTH AFRICA

Brucellosis is thought to have been introduced into Southern Africa through the importation of European cattle during the time of European exploration and settlement in the area. Another theory is that the disease drifted south with the nomadic African herds during their migration from other countries. The bacterium was first isolated in South Africa after an abortion storm in cattle in Johannesburg, by Gray in 1906 (Godfroid *et al*, 2017). The disease and its causative agent was confirmed in 1913 by Hall through isolating it from the abomasal contents of a bovine foetus that had been aborted. It was Bevan in Zimbabwe who reportedly confirmed the zoonotic potential of the disease in 1957 (Godfroid *et al*, 2017).

In South Africa, brucellosis is controlled in livestock in terms of Animal Diseases Act (Act 35 of 1984) as the disease is of concern to public health as a zoonosis and has major economic impacts in the livestock industry. The economic impact stems from the effects of livestock abortion, loss of milk production, increased inter-calving period and decreased value of breeding stock of the animals within the industry (DAFF, 2016). In an attempt to reduce disease burden and stem the economic effect of the disease, the bovine tuberculosis (BTB) and brucellosis eradication scheme was introduced in 1969 in RSA and is still running (DAFF, 2016). The eradication scheme focuses on vaccinating heifer calves against the disease as well as test and slaughter policy of all cattle which test positive for the disease. The initial effect of the scheme greatly reduced the prevalence of the disease from 10.5% in 1976 to 6% in 1979. This had been further reduced to 1.9% by 1985 (Godfroid *et al*, 2017). With time however, the livestock industry began to favour the development of larger livestock enterprises, increasing the use of intensive livestock farming procedures and thus favouring the spread of the disease (DAFF, 2016). Unfortunately, participation in the scheme is voluntary, greatly reducing its effectivity in the country.

By 1990, 14.7% of the national South African cattle herd was seropositive for brucellosis, costing the livestock industry more than three hundred million Rands a year at that time. A recent study by Govindasamy, Geertsma, & Abernathy (2016), looked at the seroprevalence of brucella in the national herd over time. In 2009, the provincial herd prevalence in Gauteng was 17%, over the course of four years this percentage rose to 21% by 2013, representative of both beef and dairy cattle. In 2016 the provincial herd seroprevalence was 13.6%. The use of the information is however limited as according to Govindasamy *et al* (2016) as the "provincial baseline herd and cattle prevalence of bovine brucellosis is unknown" (Govindasamy *et al*, 2016).

Only 15.1% of livestock farmers in Gauteng are commercial, while small scale farmers account for just less than 21% of the livestock farmers in Gauteng. The remainder being those who hold livestock as a hobby or for recreation purposes (14%) and the remaining 50% were undefined (Govindasamy & Geerstma, 2016). Small scale farmers are described as those with twenty or less reproductive females in a herd, or those living off the produce of their animals without making a profit (Govindasamy & Geertsma, 2016). Many of these farmers own less than 15 head of livestock, meaning that although the greatest number of cattle are owned commercially, there are far more farmers farming communally or in small scale that each own smaller livestock units. This means that there is a large fraction of the population that is at greater risk of zoonotic disease through animal contact than those that simply own more animals. Small scale and communal farmers tend to have a higher incidence of contact with their animals than commercial farmers with their larger herds. Subsistence farmers such as those that farm communally on government land, or small scale tend to slaughter and milk their own animals rather than sending them to an abattoir or using mechanical milking equipment.

If the highest incidence of animal contact occurs in one of the largest sectors of our farming community in Gauteng, are they aware of the risks and implications for zoonotic disease transfer from livestock and other animals? A study is currently underway to estimate the seroprevalence of brucellosis in farmers, farm workers and animal health technicians in Gauteng (Govindasamy, K, pers. comm., May 2017).

2.6 BRUCELLOSIS IN PEOPLE

Brucellosis has a worldwide occurrence in animals and so it has been transmitted to humans in a similar pattern. It is known as Undulant fever, Malta Fever or Mediterranean fever (Galinska & Zagorski, 2013). Infected mammals, commonly livestock, act as reservoirs and a source of infection to humans (CDC, 2009). In sub-Saharan Africa the incidence of human brucellosis is unknown. Of the two species most commonly found in South Africa, *Brucella abortus* and *Brucella melitensis*, the latter is more pathogenic presenting with more severe symptoms in people than the former (Godfroid *et al*,

2017). It is interesting to note however, that although brucellosis is a controlled disease in South Africa, there is no formal surveillance for *B. melitensis,* only *B. abortus* (Wojno *et al*, 2016). Serological testing of livestock does not however distinguish between the smooth brucella species. Follow-up cultures of positive serological results are not routinely done and as such, it may be that the brucella surveillance currently being done in South Africa may represent both brucella species, or another altogether. It is to be noted that in South Africa, small stock, the preferred host of *B. melitensis* are not routinely tested serologically unless they are known to be producing milk or dairy products for public sale and consumption.

In 2016 there was an outbreak of *Brucella melitensis* in a herd of goats in Gauteng. This outbreak resulted in at least two known human infections (Strydom, 2017). The animals in question which tested positive for the disease were destined for live sale at the township market for use in ritual slaughter (GDARD, 2017). This is of concern as brucellosis is known to cause infection in humans through contact with contaminated tissues and body fluids of infected animals through slaughter (CDC, 2009)

Brucellosis is a disease most commonly found in areas with poorly developed or implemented public and animal health programmes, Africa is considered one such area (Wojno *et al*. 2016). In sub-Saharan Africa the incidence of human disease is unknown and reported cases of the disease are minimal (Godfroid *et al*, 2017). Although South Africa has well developed animal disease control and public health policies in place, the implementation thereof is however lacking.

Throughout the world human brucellosis is thought to be considerably under diagnosed and likely under-reported (Wojno *et al*. 2016). This is thought to be due to its varied clinical picture and poor recognition by medical practitioners; both medical doctors and veterinarians. As infection is spread through contact with infected animals and contact and ingestion of infected animal products, those at highest risk for infection are livestock farmers, veterinarians, abattoir workers, meat handlers and laboratory workers (Wojno *et al*. 2016).

Infection:

The most common routes of human infection are direct contact with infective animal tissues or products, ingestion of contaminated milk and airborne exposure. According to Mangalgi *et al*, (2016) conditions that are conducive to spread of the disease are; close contact with animals, poor sanitary support, poverty, illiteracy and lack of public and medical awareness. Aside from lab workers and veterinarians, studies found that public awareness of the disease, how it is spread and knowledge of prevention was very poor amongst high risk groups such as farmers and abattoir workers (Mangalgi *et al*, 2016 and Godfroid *et al*, 2017.).

Livestock farmers, animal handlers and veterinarians are usually exposed through infected excretions, aborted material or infected carcass material (DAFF, 2016). Abattoir workers and those involved with animal slaughter and carcass dressing are exposed through infected animal tissue such as raw meat, infected viscera as well as blood splashes and aerosolised body fluids (Mangalgi *et al*, 2016 and Sola *et al*, 2014). People involved in informal slaughter where no preventative measures are taken, are at higher risk for brucella infection than those that work in a more controlled abattoir environment (DAFF, 2016). Laboratory workers are usually exposed through contact with clinical specimens such as blood, body fluids as well as laboratory cultures and aerosols produced during bacterial isolation (CDC, 2009).

In Israel studies have found the *B. melitensis* was spread through ceremonial sheep slaughter (Fuchs *et al*, 2016). Those infected had no historical exposure to unpasteurized dairy products or direct animal contact. Case studies indicated that the primary symptoms were those of chronic cough, pyrexia and night sweats, all also common symptoms of tuberculosis (TB) which is common in the region (Fuchs *et al*, 2016). The common problem of prolonged diagnosis to treatment interval lends itself to trends of high rates of relapse and secondary disease complications in brucellosis cases (Fuchs *et al*, 2016), misdiagnosis has long term consequences not often considered when considering zoonotic diseases such as brucellosis.

A study in Israel revealed a high rate of pulmonary-related clinical signs in brucellosis patients, believed to be due to aerosol exposure of the bacterium (Fuchs *et al*, 2012). It is a theory that has been previously proven in animal models where lungs showed perivascular inflammation and microgranulomas after aesolised brucellosis exposure, similar to those seen in tuberculosis patients (Henning *et al*, 2012). According to Fuchs *et al* (2016), severe respiratory clinical signs that resulted from aerosol exposure, thought to be through animal blood or secretions suggest that pulmonary brucellosis 'might be more common than previously documented' (Fuchs *et al*, 2016). This is confirmed by European studies of hunters exposed to *B. suis* who showed a similar pattern of respiratory symptoms (Fuchs *et al*, 2016). The lack of protective gear when working with infected animal tissues has been shown to increase risk of disease through direct and aerosol contact (Fuchs *et al*, 2016The frequency of false positive reactions to brucellosis serological tests, namely ELISA and tube agglutination tests in TB patients, is not statistically significant (Nouh *et al*, 2015).

Prevention is the best means of disease control for human infection. People at risk of brucella disease contraction through slaughter should wear full PPE such as overalls, plastic apron, mask, gloves, boots and eye protection (DAFF, 2016). Human brucella vaccines have been developed but with limited success and are not widely available (CDC, 2009).

Symptoms:

Early symptoms in acute brucellosis are typically flu-like in nature but may also include arthromyalgia, rash, testicular pain, splenomegaly and hepatomegaly. Some individuals experience gastrointestinal symptoms of abdominal pain, diarrhoea, nausea, vomiting, constipation and anorexia (Galinska & Zagorski, 2013; Wojno *et al*. 2016). Cases of subacute brucellosis tend to show similar symptoms as those above, but with reduced severity (Galinska & Zagorski, 2013). Chronic brucellosis has a varied presentation and may even be asymptomatic. Complications in brucellosis cases usually involve the musculoskeletal system but may also involve the central nervous and cardiovascular systems. (Galinska & Zagorski, 2013, DAFF, 2016; Mangalgi *et al*, 2016; Wojno *et al*. 2016).

Due to the nonspecific clinical signs of brucellosis and the high prevalence of HIV and TB in South Africa, it is suspected that many patients have been misdiagnosed and subsequently mistreated. It is thought that due to the perceived low prevalence of human brucellosis cases there is a deficiency in medical staff awareness, delaying diagnosis and effective treatment (Wojno *et al*. 2016). Human cases of brucellosis were found in Germany where high fatality rates were reported, blamed solely on low physician awareness of the disease which resulted in misdiagnosis and incorrect treatment regimens (Fuchs *et al*, 2016).

Treatment:

The most important elements of treating human brucellosis are the administration of effective antibiotic treatment, as early as possible, for a sufficient length of time (Corbel, 2006). The use of beta-lactam and macrolide antibiotics are often complicated by relapse with incidence ranging from 4.6-25% (WHO, 2016; Corbel, 2006).

Antibiotic therapy is most commonly based on the use of tetracyclines, specifically doxycycline at 100mg every twelve hours for 6 weeks, often combined with an injectable aminoglycoside such as streptomycin (1g/day), for two to three weeks to improve effectivity and reduce disease relapse (Corbel, 2006; WHO 2004). An alternative regimen is the combination of doxycycline (200mg/day) and rifampicin (600-900mg/day) for 6 weeks, where both are administered orally (Corbel, 2006). The latter is however only recommended for use in uncomplicated brucellosis cases, the former found to be more effective in cases of complicated infection (Corbel, 2006). There is unfortunately a poor response to treatment of chronic forms of the disease. Long term organ damage may occur in such cases, which is irreversible. The only means to prevent further systemic damage is through long term antibiotic treatment (Galinska & Zagorski, 2013).

Diagnosis

It is due to its varied clinical image that brucellosis diagnosis must be supported by both serological and bacteriological diagnostics (Galinska & Zagorski, 2017; Corbel, 2006). The Rose Bengal serological test is a sensitive screening tests often used in human brucellosis screening, but diagnosis must be supported by confirmatory serological testing and/or bacterial culture (Corbel, 2006). Although several serological tests are available, the gold standard is bacterial isolation. Brucella can be isolated from blood, bone marrow, cerebrospinal fluid, infected tissue or even the exudate of infected wounds (Wojno *et al*. 2016). Recommended confirmatory serological tests include the serum-agglutination test (SAT), enzyme-linked immunosorbent assay (ELISA) or the Coombs test. The Coombs test is most commonly used to detect cases of chronic brucellosis as it detects IgG antibody levels and as such will test positive for longer in comparison to other serological tests (Godfroid *et al*, 2017; Corbel 2006)

As with livestock testing, serological tests rely on detecting a humoral immune response of the IgM and IgG antibody classes. It is to the immunodominant smooth lipopolysaccharide (S-LPS) antigen to which testing of humoral response is centred (Corbel, 2006). The S-LPS is however also found in several other gram-negative bacteria which may lead to false positive reactions. Cross reactions with *Yersinia entericolitica* are the most commonly encountered and widely known (Godfroid *et al*, 2017). There are several other organisms that will cross react with brucella serological tests, namely gram-negative bacteria such as *Francisella tularensis*, *Salmonella enterica typhi* or *Vibrio cholerae* and even typhus vaccination antibodies (Galinska & Zagorski, 2013). False negative reactions may occur in individuals with a compromised immune response such as those with Human Immunodeficiency Virus (HIV), those using chemotherapy and transplant patients. False negative reactions have also been found in chronic brucellosis cases (Galinska & Zagorski, 2013).

Prevention:

Control of brucellosis is difficult, expensive and must be multipronged. Effective control requires co-operation from the livestock farming community; both small scale and commercial, local veterinarians, state veterinary services and veterinary laboratories. According to Ducrotoy *et al* (2017), 'when the resources and capacity for control are limited, interventions must be tailored to the impact of the disease in terms of magnitude of burden in potential animal and human hosts' (Ducrotoy *et al*, 2017). The best means of control is through producing effective immunity in host species through livestock vaccination and the removal of infected animals in order to prevent further disease spread (DAFF, 2016). Where brucellosis prevalence is low in animals, the effects of the disease can be minimised in both animal and human populations by community engagement

through education on basic hygiene in animal management and milk pasteurization (Ducrotoy *et al*, 2017).

At this time there is no safe, efficacious vaccine available for brucellosis prevention in occupationally at-risk people. Key control focus areas in disease prevention should be limiting contact with infected animals as well as prevention of food-borne disease from contaminated food products, unpasteurized dairy products and undercooked infected meat (Wojno *et al*. 2016). Prevention should also include community education programmes, especially those of informal farming communities who are at greatest risk. We should aim to improve the methods of human case diagnosis as well as patient management and disease treatment strategies (Wojno *et al*. 2016).

Wojno *et al* (2016) stated "a multidisciplinary brucella control programme can be effective in preventing human infections with an approach that integrates three key elements: Veterinary service, public health, and the medical healthcare system' (Mangalgi *et al*, 2016).

2.7 BRUCELLOSIS LEVELS IN OTHER COUNTRIES

Although brucellosis is a disease of worldwide occurrence, affecting both developed and developing countries, very few developing countries have any data to determine the prevalence of brucella in its livestock or people (Galinska & Zagorski, 2013).

Livestock incidence in neighbouring countries

Brucellosis is a notifiable disease in South Africa, Lesotho, Botswana and Namibia where surveillance programmes and movement controls are used to monitor and limit spread of the disease in livestock populations, namely cattle and small stock in each country (Ducrotoy *et al*, 2017). These countries make use of stamping out and vaccination control measures in an active effort to reduce the prevalence of the disease in the country (Ducrotoy *et al*, 2017). Specific cattle production systems are targeted for brucellosis control in Zimbabwe, rather than across the board as in surrounding nations (Ducrotoy *et al*, 2017). Despite the control measures in place, effectivity appears to be limited as disease prevalence continues to grow in many countries (Ducrotoy *et al*, 2017). It appears that countries in Sub-Saharan Africa simply lack the resources to properly determine accurate disease prevalence as findings reported in academic literature and those officially reported are incomparable (Ducrotoy *et al*, 2017; McDermott & Arimi, 2002).

A seroprevalence for brucellosis of 8.3 - 9.9% was found in communal cattle in south eastern Zimbabwe, around the edges of the Great Limpopo Transfrontier Conservation Area in a study by Gomo *et al* in 2012. In 2017 a study by Ndengu *et al* (2017) in the same geographical area revealed a brucellosis seroprevalence of 16.7% in communal cattle tested.

According to a study done by Manhica (2010) on brucellosis seroprevalence in the Maputo province of Mozambique, a 14% seroprevalence in beef and dairy cattle was found within the province. A study later done by Tanner *et al* (2015) found a seroprevalence of 9.77% in cattle along the borders of the Limpopo National Park in Mozambique.

Brucellosis seroprevalence in Namibia is less well documented. Amuthenu & Gummow (2009) found a seroprevalence of 1.3-2.6% in cattle in the different areas within the Northern Communal Area of Namibia. A survey examining prevalence of brucellosis in sheep found an overall seroprevalence of 0.14% between 2008 and 2010 in the dry Karas region of Namibia (Madzingira & McCrindle, 2015). In this study it was not differentiated which *Brucella* species was identified as the tests used in the survey were the Rose Bengal test used for serological screening, confirmed with compliment fixation test (Madzingira & McCrindle, 2015). Neither test differentiates between *Brucella abortus* and *B. mellitensis.* For this reason, the study may reveal the seroprevalence of either brucellosis species within the small stock population of the area. Like South Africa, Namibia makes use of a voluntary testing programme as part of their disease control protocol (Madzingira & McCrindle, 2015). For this reason, the seroprevalence indicated in these studies might be unreliable.

According to the OIE WAHIS Interface, Namibia and Botswana are currently free of the disease as can be seen below in figure 2.1 (OIE, 2018b).

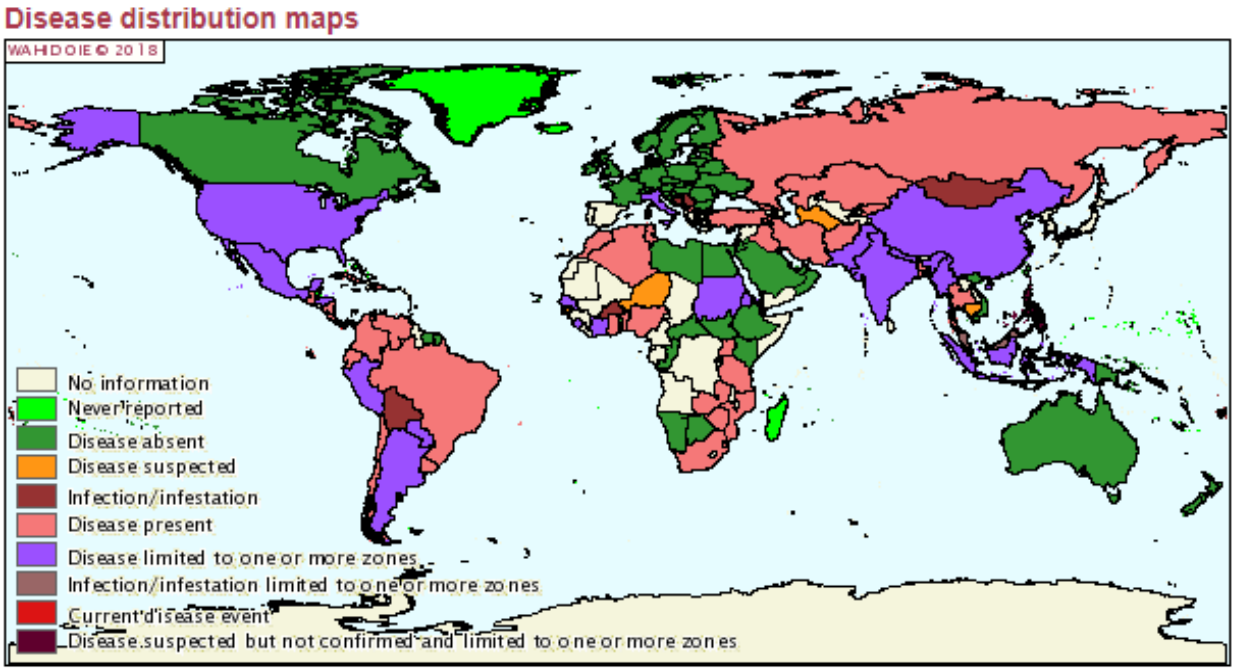


Figure 2.1 OIE WAHIS Interface Brucellosis disease distribution map, July-December 2017 report (OIE, 2018b).

According to the OIE (2018), countries in southwest and central Asia have had a rising incidence of the disease in recent years. However historically high disease incidence was and still currently is, in the Mediterranean, the Middle East, Peru, Mexico, China and sub-Saharan Africa (OIE, 2018a). In Brazil, brucellosis in livestock is widespread, albeit heterogeneously throughout different parts of the country, but it is particularly prevalent in the beef producing sections of the country (Sola *et al*, 2014). Countries in western and northern Europe are believed to be free of brucella as well as Canada, Australia, New Zealand and Japan (OIE, 2018a).

2.8 BRUCELLA AS ZOONOSIS

Brucellosis is part of a group of endemic, neglected zoonotic diseases, so named by the World Health Organization (WHO, 2017). These diseases all have a common foothold in the countries in which they occur through poverty and a pastoralist reliance on livestock; where close contact between people and animals favours disease transmission (Mableson *et* al, 2014; WHO, 2017). Unlike other emerging diseases this group of diseases have poor financial and political programmes for support (Mableson *et al*, 2014). This greatly increases the challenge of their control. The reason for their neglected status is often blamed on poor availability and access to disease diagnostics which results in the underreporting of disease incidence in the country. As a result, there is very little data on the magnitude of the disease burden in an area and on its people, reducing the amount of evidence available for policy development and political support (Mableson *et al*, 2014). In rural communities, where livestock play an integral role in the socio-economic situation of the majority of households, zoonotic disease represents a significant negative health risk. It is through direct contact with infected animals, consumption of unpasteurized dairy products and meat from informal slaughter that facilitates the transmission of a number of diseases such as bovine TB, brucellosis, anthrax, listeriosis, leptospirosis, cysticercosis, hydatidosis, larval migrans and rabies (Michel *et al*, 2003). Of these, brucellosis, bovine TB and anthrax are considered to be the most important zoonotic diseases in Southern Africa. (Michel *et al*, 2003)

2.9 ZOONOSES FROM UNCONTROLLED SLAUGHTER

An estimated 61% of infectious diseases are zoonotic, being transmitted from animals to humans, a proportion of which are also food-borne (Qekwana, McCrindle & Oguttu, 2014). Zoonotic and food borne illnesses that may be transmitted from uncontrolled slaughter due to a lack of formal meat inspection include: salmonellosis, anthrax, Rift Valley fever and toxoplasmosis. *Escherichia coli*, brucellosis and *Campylobacter*, *Taenia saginata, T. solium*, and *Mycobacterium* also fall into the same

group (Qekwana, McCrindle & Oguttu, 2014; Michel *et al*, 2003). Fortunately, most ceremonial meats in African culture are cooked for long periods of time, significantly reducing the risk of food-borne disease. There have however been several documented cases of food-borne disease outbreaks related to ceremonial feasts (Michel *et al*, 2003).

Hygiene management of slaughter differs from one culture, tribe or family to another, resulting in differing risk profiles and risk exposures during the slaughter process (Qekwana, McCrindle & Oguttu, 2014). According to Michel *et al* (2003), there is a generalized lack of understanding of basic meat hygiene in informal slaughter, most likely due to lack of exposure and training. The absence of meat safety and hygiene standards in informal slaughter increases the risk of food-borne and zoonotic disease transmission. The increased risk is not only for the consumer but also for those involved in the preparation of meat and viscera from informal slaughter (Michel *et al*, 2003).

2.10 THE ROLE OF IMMUNOSUPPRESSION IN ZOONOSES AND FOOD-BORNE DISEASE

Immunosuppression severely limits the body's ability to fight infection and disease. The causes and origins or immune deficiency or immunosuppression are diverse and numerous. Immunosuppression may be roughly classified as primary or secondary in origin. Primary immunosuppression originates as a defect of the host immune system, while secondary immunosuppression is defined as a condition originating from outside of, or not directly part of the hosts immune system (Heise, 1982). Secondary immunosuppression is far more common than primary. Secondary immunosuppression may be caused by immunosuppression therapy as used in oncological chemotherapy, for organ transplant recipients as well as those with autoimmune disorders (Heise, 1982). Another important cause of immunosuppression is infectious disease, namely viral diseases that disrupt lymphocytic function (Heise, 1982), such as the Human Immunodeficiency Virus (HIV) causing Acquired Immunodeficiency Syndrome (AIDS).

According to Statistics South Africa, the HIV prevalence in South Africa in 2016 was 12.7% of the total South African population. That is an estimated seven million people infected with the virus. For adults between the ages of 15 and 49, the HIV prevalence is 18.9% (StatsSA, 2017).

HIV significantly increases an infected person's susceptibility to disease due to their compromised immune system, especially zoonotic disease. This is of concern in people who handle animals or their products regularly (Qekwana, McCrindle & Oguttu, 2014; Michel *et al*, 2003). In developing countries, it was found that the route of the majority of zoonotic infections was through direct contact with livestock or wildlife. This contrasts with those from developed countries where the main route of infection for zoonotic disease was through direct contact with companion animals or consumption of contaminated food (Pasquali, 2002). Food-borne opportunistic pathogens that are of concern to

immunocompromised individuals include *Campylobacter jejuni, Listeria monocytogenes,* and *Toxoplasms gondii* (Pasquali, 2002).

2.11 CONCLUSION

In both rural and urban consumers, poverty is a recognized risk factor for zoonotic and food-borne illness (Mangalgi *et* al, 2016; Randolf *et al*, 2007). As livestock represents a significant contributor to the livelihoods of this demographic, they also represent a risk to human health and well-being (Randolf *et al*, 2007; FAO, 2003). This is especially true and of great concern in a country where the prevalence of HIV and TB are so high. As a developing country, South Africa also has limited funding available for public and rural health systems which lead to poor rates of diagnosis of food-borne and zoonotic disease in rural clinics (Michel *et al*, 2003).

Control of zoonotic diseases require an integrated response from both human and animal health sectors as well as other key role players that would provide support in response to a disease outbreak (Mableson *et al*, 2014). A multidisciplinary, one health approach should aim to improve both animal health and production as well as human health. Through this approach we can assist in country development through food safety and security (Mableson *et al,* 2014).

2.12 QUESTIONNAIRE AS A RESEARCH TOOL

A survey is a research tool used to gather data of the views and opinions of a selected group of people representing a larger target population. Participants are often selected by random sampling in order to limit bias (Sincero, 2012). There are two broad types of survey; the questionnaire and the interview. A questionnaire is historically paper-based, usually with short closed-ended questions. An interview in comparison is a one-on-one conversation which typically include longer, more in-depth questions with the benefit of expanding on and following through on particular answers (Sincero, 2012). Interviews are however time consuming and resource intensive, where the interviewer is considered part of the survey instrument and must be trained to respond appropriately to different question contingencies (Trochim, 2006, Krosnick & Presser, 2010). Questionnaires may be administered in a variety of ways and means tend to change with technological trends. For example, mail surveys used to be popular in the past, now surpassed by computerized online surveys. Other means of questionnaire administration are telephonic, face-to-face interviews and paper-based surveys (Sincero, 2012).

Questionnaires are the ideal research tool to receive feedback from a large number of respondents with relatively low inputs and costs (Krosnick & Presser, 2010). Questionnaires have the benefit of anonymity if required. Data collected from structured questionnaires may reveal patterns and trends

that assist in qualitative research studies. Unstructured questionnaires allow for more in-depth responses which may bring to light trends that were previously unknown by the researcher, prompting a more intensive additional study (Krosnick & Presser, 2010; University of Sheffield, 2014).

A major limitation of questionnaires is that the questions may have numerous interpretations by respondents, a difficulty which may be challenging to minimise (University of Sheffield, 2014). Questionnaires have the advantage that the samples collected may be representative of the target population, depending on the sampling method employed (Sincero, 2012). Bias is an important consideration in survey research. Social desirability is a bias of concern when group or single personal questionnaires or interviews are administered. The respondent may want to please the 'public image' of themselves or the interviewer. Respondents may feel obliged to give a more socially acceptable response, which may not be a true answer (Krosnick & Presser, 2010; Sincero, 2012). Bias produced by interviewer subversion and distortion may also occur based on question phrasing or voice tone that leans toward a more desired answer (Trochim, 2006). Questions should be phrased in such a way as to avoid leading the respondent (Krosnick & Presser, 2010; Sincero, 2012).

2.13 METHODOLOGY:

Survey methodology follows the following basic structure for all surveys:

- Deciding on the purpose and goal of the survey,
- Selecting the survey method based on data to be extracted,
- Deciding on sampling pool and sample size needed based on target population
- Deciding which questions will be asked and using which format
- Pilot study is then performed as a trial run and adjusted as needed
- Survey is administered to selected sample population
- Data are then collected, processed and stored
- Results are analysed and interpreted, finalized by a conclusion.
- The results may then be reported and presented as needed (Sincero, 2012).

Survey methodology is based on statistical principles. One needs to select an appropriate sample, able to represent the target population. The result analysis and interpretation will depend on the data requested through the survey. Surveys can produce either qualitative or quantitative research data (Sincero, 2012).

The survey method chosen will depend on several factors, the most important of which is your targeted demographic where literacy and language skill are important (Sincero, 2012). Other important considerations are geographical access and participant co-operation (Trochim, 2006). A

paper-based questionnaire would be inappropriate to an illiterate target audience whereas an online survey may receive a better response than mail surveys in college students. The number of responses needed will also determine the survey method as personal interviews take more time and resources than online methods (Sincero, 2012). Based on the time frame available and the research data one aims to extract from the survey, there are two main time methodologies. The first is a cross-sectional study, collecting responses from a single period in time. In contrast, a longitudinal study collects data over a longer period of time, usually to study the changes in the responses received. Longitudinal surveys are used for trend studies, panel or cohort studies (Sincero, 2012). Additional factors to consider when deciding on survey method used, are the available resources. The financial budget, equipment, facilities, time, training and man power available will have a significant influence on the survey method employed (Trochim, 2006; Sincero, 2012).

2.14 Types of Questionnaires:

Questions may be posed in many ways such as multiple-choice, scaled or open-ended questions. They can be self-administered, group-administered or dropped off at different households, similar to mail surveys. Each method has its own pros and cons, used for different purposes (Krosnick & Presser, 2010; Sincero, 2012).

There are several different means of survey administrations, each with their own pros and cons, including varying response rates and data results obtained therefrom (Sincero, 2012).

Face-to-face structured interview: questions can be directed personally to the respondent, giving high response rates but the personal interaction may lead to bias from interviewer or respondent. Personal interviews take large amounts of time and man-power and are thus less efficient (Sincero, 2012).

Telephone survey: this method increases the number of respondents one can interview per unit time but is less appropriate for longer, open-ended questions. It is better than personal interviews in that anonymity can be maintained (Sincero, 2012).

Paper-based survey: can be used in cases of poor language or literacy skills or where internet access is poor. It is a more traditional survey method that requires large amounts of resources through survey reproduction and manual respondent assistance. This can be done individually or in groups (Trochim, 2006; Sincero, 2012). Group surveys are usually done for convenience, enabling the researcher to have multiple questionnaires completed at once and generally ensures a high response rate (Trochim, 2006; Sincero, 2012).

Mail survey: may be delivered to the house personally or sent directly through the mail. If delivered in person it has the advantages of both group and mail surveys in simplicity and higher response rate

(Trochim, 2006). Mail surveys have shown poor response rates due to modern technological trends in comparison to online surveys but has the advantage that it is fairly inexpensive to utilize (Trochim, 2006). It is however easy to administer and anonymity of respondents can be maintained (Sincero, 2012).

Online survey: ideal where large number of respondents are required and the target population is computer literate and has online access. Limited manpower and time resources are required and physical distance or location is irrelevant in terms of respondent access (Sincero, 2012).

Questions may be either open-ended or closed ended:

Close-ended questions provide options for the answer and may be classified as either multiple choice, dichotomous or scaled questions (Krosnick & Presser, 2010). Close-ended questions are both easy for the researcher and the respondent but limit the amount of information that can be obtained to the options given. If options given are poorly constructed or poorly representative of possible responses, the data obtained may be incorrect or skewed. Closed-ended questions are ideal for quantitative research.

Open-ended questions allow the respondent to supply their own written answer to the question, these may be unstructured questions where an opinion or viewpoint is given (Krosnick & Presser, 2010). Alternatively, one can use a word or picture (thematic apperception) associated question where the response is based on what a respondent thinks or feels when exposed to a particular word or image. Another method of open-ended questions is where a respondent is asked to complete a sentence or story line as part of the questionnaire. Data extraction from open-ended questions is more difficult and are thus more suited to qualitative research (Sincero, 2012).

Contingency questions are those that require a response based on the answer to a prior question. The use of contingency questions assists in preventing respondents from answering questions that are not applicable to them (Krosnick & Presser, 2010; Sincero, 2012).

Response rates may differ depending on survey type and method of administration. A popular means of increasing response rates is the use of an incentive, either financial or by means of a small gift. Higher response rates have been obtained where questionnaires look neat, professional, compact and simple. In personal interviews, the external impression of the interviewer may also influence survey response as people are more likely to assist someone who appears professional, polite and courteous (Sincero, 2012).

2.15 QUESTIONNAIRE COMPOSITION AND QUESTION STRUCTURE

The information that can be gained from a questionnaire is limited by the question used as well as the format it was presented in. Ultimately, the best type of question to use is one that allows the respondent to understand the question and answer it with ease as well as allow the researcher to interpret and collate the answers (Sincero, 2012). If you view a questionnaire as a survey instrument then the questions thereof may be regarded as individual mechanical parts that make up the instrument. The selection of the correct questions will allow for efficacious use of the questionnaire and aid in the extraction of the correct data required. The way a question is phrased and the format given for answering will determine the type and amount of data produced by the question (Sincero, 2012).

2.16 DATA MANAGEMENT

To verify the validity of the survey content, one must consider the 'face validity' where one looks at how applicable the question is to the research and if data can be collected from the question types. One also needs to consider the internal validity; is the question biased to a particular answer, and external validity; can the answers be generalized to the target population (Sincero, 2012)?

Once all the data has been collected, the data needs to be organized and 'cleaned' for analysis through data preparation. The data must be checked for accuracy and converted into useful information. The basic features of the data are grouped and analysed through data statistics. Data statistics summarize the data sample, describing the trends or results. Once the information is assembled, the data can be used to test the research hypothesis through inferential statistics. Lastly the study results must be extrapolated to be generalized to the wider target population which the sample represented (Trochim, 2006).

3 MATERIALS AND METHODS

3.1 INTRODUCTION

Informal livestock slaughter is a commonly practised but poorly recorded practice within South Africa with very little written records of methods of practice and specifics regarded therewith (CRL, 2009). Informal livestock slaughter is a practice made provision for by the South African constitution with very few limitations on the practice as the methods and techniques thereof vary widely between and even within different African cultures (CRL 2009). It was this variety that influenced the use of a questionnaire survey to be completed through personal, face-to-face interviews with willing participants.

3.2 STUDY AREA

Gauteng is the 'melting pot' province where the highest multitude of people from different cultures collect in the hopes of financial gain. Gauteng is split into three state veterinary areas by Gauteng Veterinary Services for easier area description for the purposes of this study. Southern and eastern Gauteng is the geographical area used in the study, defined as the Germiston state veterinary area, as illustrated in figure 3.1. Gauteng covers an area of 18 176km^2, southern Gauteng comprising 7793 km^2 (42.9%) of this region (Municipalities of Gauteng, 2012).

Figure 3.1 Gauteng state veterinary areas. Viewed on 30 July 2018 from http://www.daff.gov.za/daffweb3/Branches/Agricultural-Production-Health-Food-Safety/Animal-Health/contacts/provincialveterinary/Gauteng

3.3 STUDY POPULATION

Gauteng has the highest population density of all South African provinces with 14.3 million people, comprising 25.3% of the population according to StatsSA mid-year population estimates (StatsSA, 2017). In the 2011 South African census it was found that a high percentage (44%) of people living in Gauteng are not originally from the province but rather from other South African provinces or even from outside the country (StatsSA Census 2011, 2012). For this reason, no specification was made as to cultural background of participants for the purpose of this study. The aim of the study is to examine the process of informal slaughter across cultural boundaries, focussing on the practice itself, rather than cultural variety that may stem therefrom.

Through cultural diversity comes associated language diversity. According to the 2011 Census, the majority of the Gauteng population speak Zulu (19.8%), followed by English (13.3%), Afrikaans (12.4%) and Sotho (11.6%) (StatsSA, 2012). For the purpose of this study, interviewers used a questionnaire written in English but made use of one of the above-mentioned languages for translation purposes during the interview, in order to facilitate adequate understanding of the questions asked and appropriate answers thereof. All interviewers were trained by the researcher in method and language to be used during the interview in order to limit bias where ever possible. If interviewers were not fluent in the appropriate language for the participant, the use of a translator was made to relay the questions and answers for the questionnaire.

The target population of this study is the livestock farming community of Gauteng, specifically the small-scale farmers within Gauteng. Small-scale farmers are defined as owners of livestock that either make use of the animals for subsistence or production but without producing a profit; either using communal grazing land or private plots of land less than 25 Ha (Govindasamy & Geertsma 2016). According to the 2016 Gauteng farm census small scale farmers comprise 30% of the livestock farmers in Gauteng (Govindasamy & Geertsma 2016).

3.4 PARTICIPANT SELECTION

For this study, small scale farmers from southern Gauteng were selected as representative of small-scale farmers of South Africa. As Gauteng attracts people from all other provinces, the sample population is believed to be representative of the subset of small-scale farmers of South Africa. Interviews were conducted during primary animal healthcare visits provided by veterinary officials from the division of Gauteng Veterinary Services (GVS) of the Gauteng Department of Agriculture and Rural Development (GDARD). As the sample collected are from those making use of GVS services, convenience sampling may induce selection bias as this sample may only represent a portion of small-scale farmers in Gauteng. These visits are initiated by the farmers themselves for herd health

interventions or the need for veterinary clinical services. Farmers used as interview participants initiated the request for veterinary services, rather than initiated by interviewers in an attempt to limit selection bias of study participants. An appointment would be made by a farmer requesting veterinary assistance in whatever capacity. GVS staff who assisted in the study would then visit the farm where the farmer would be invited to participate in the study. The questionnaire interview was then conducted with those farmers who agreed to participate. No prior selection of farmers for study participation was done. Farmer selection was thus random and determined by farmer need and request for GVS services, rather than by a formal selection process. Those who make use of GVS do so usually for one of four reasons. These include animal production and management, mentorship and training or those participating in testing for controlled animal diseases, specifically brucellosis and tuberculosis testing. They may be receiving government sponsored clinical veterinary services or simply vaccination, dipping and deworming of select livestock species by GVS staff. Southern Gauteng was chosen for ease of access through veterinary services already in place in these areas, where GVS veterinarians and animal health technicians assisted as interviewers for the study. Geographical access and participant participation play a vital role in the success of questionnaire completion in a research study (Trochim 2006).

3.5 ETHICAL CONSIDERATIONS

As ethical consideration is an important aspect of ethical approval in a research study, the use of a letter of informed consent was used (see Appendix 8.1). Participants were first verbally informed that study participation was voluntary and participants were free to stop the interview at any point. Interview withdrawal or unwillingness to answer a question would not affect future service to the participant by GDARD or GVS officials. The letter of informed consent repeated that participation was not compulsory in writing (see Appendix 8.1). If participants were willing to assist with the study, a signature of consent was required on the letter. For the purposes of anonymity, participants were requested to only provide a signature rather than a name on these letters. In the case of illiteracy, the consent form was explained verbally, if the participant could not sign, the interviewer was to sign as proxy and the participant mark an 'X' on the form to indicate consent.

3.6 MATERIALS

A questionnaire survey was selected as the research tool for this study as it is a highly flexible means of data collection. A questionnaire requires low input costs (University of Sheffield, 2014) and when presented through an interview minimises the challenge of misinterpretation of written questions or language disparities. Question mis-interpretations are common limitations in cases where

questionnaires are used in isolation (UoS, 2014), or where the questionnaire is presented in a language with which the participant is not fluent (Sincero, 2012).

The questionnaire survey was used to investigate the views and actions regarding the informal slaughter of livestock, carcass handling as well as evaluating background knowledge of zoonotic disease transmission. Questionnaires are used as flexible research tools with results being shown to be highly representative of the target population (Sincero 2012). The data collected from both the open-ended as well as the closed ended questions, is mainly qualitative and descriptive in nature for the purpose of this study. However, multiple choice questions used in the questionnaire provided quantitative data used to reveal trends and frequency data. Questionnaires were only completed with signed informed consent of the participant. Participant anonymity was maintained as no details of the participant was collected.

3.7 METHODOLOGY

For the purposes of this study questionnaires were completed by interviewers on behalf of participants. The questionnaire was completed by the interviewer, who completed the participants response on the questionnaire after asking the question as written. Bias was minimised by ensuring the written questions were phrased in such a way as to not be leading. Interviewers were trained to limit bias in the same way, even when a question was requested by participants, to be expanded upon, or presented in an alternative language.

All interviewers were trained by the researcher and instructions related to the presentation of the questionnaire and interview were given. Interviewers were to explain the purpose of the study and invite farmers to participate. Those interested were given a letter of consent form which was explained and signed by participant and interviewer. Questionnaire questions were then proposed to the participant where the interview answers were completed on the questionnaire by the interviewer. All questions to be read as written on the questionnaire to minimise bias. Should additional explanation or elaboration be required to facilitate understanding of a question, explanation was to be given without leading the participant to a particular answer, maintaining question neutrality and reducing possible bias in the participant's answer.

The phrasing of the question determined the type, amount and value of the data that could be extracted from the question (Sincero, 2012). Both open and close-ended questions were used to maximise the qualitative and quantitative data that could be extracted for the purposes of the study. The open-ended questions allowed participants to provide answers unique to them. These answers allowed the interviewer to explore additional descriptive data for use in the study. The closed ended questions within the questionnaire allowed for both qualitative and quantitative data extraction.

Printed, laminated images were provided to interviewers for selected questions where visual aid was beneficial to question understanding. These images were of internal organs with pathology (liver with cholestasis and petechial haemorrhages, and clostridial haemorrhagic bowel) and of both diseased and healthy lymph nodes (see appendix 8.3 and 8.4 for questionnaire images).

3.8 PILOT STUDY

A pilot study was performed with ten small scale farmers through questionnaire interview in the same method prescribed for the full research study. Questions in the pilot study were evaluated for their user friendliness and ease of understanding by participants.

Questions adjusted through the pilot study:

- Financial status; the addition of a 'self-employed' option was added as some small-scale farmers received income from personal enterprises and were not necessarily either employed, unemployed or on social grant.
- Frequency of working with livestock; 'More than once a week' replaced with 'Daily or almost daily'.
- Slaughter of injured or sick animals; addition of 'for consumption' to added questions

Questionnaire was adjusted and changes implemented in questionnaire for full research study.

3.9 DATA ANALYSIS

Questionnaires were collected by the author and data from questionnaires input into Microsoft Excel®. Data capture was structured in a table format, each respondent was dedicated a single row, with one question per column (see Appendix 8.9). The data was then analysed and grouped, the results then used to investigate data patterns and frequency analysis, described by descriptive and inferential statistics. Data collected was used to reveal trends and patterns of response, as well as compiled as frequency and stratification tables and graphs.

4 RESULTS

4.1 DEMOGRAPHIC AND SOCIO-ECONOMIC INFORMATION

4.1.1 Age structure

Ninety participants completed the age structure section of the questionnaire. Of those that completed this section, the majority were of the 36-55 year age group, while the second most frequent age group were those older than 56 years as shown in figure 4.1.

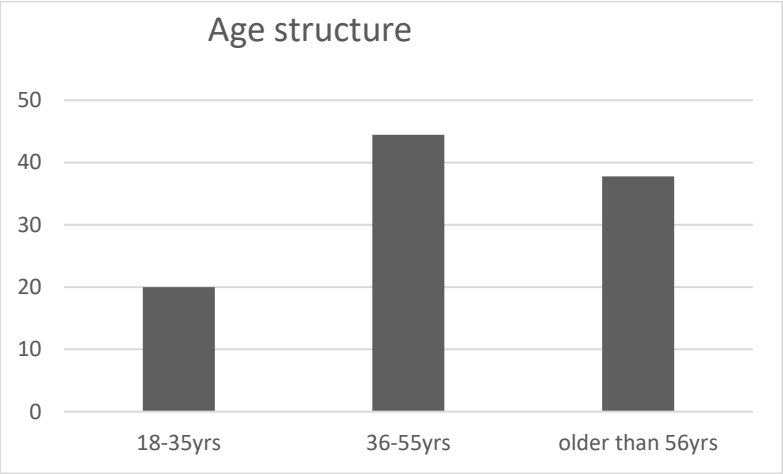


Figure 4.1: Participant age structure

4.1.2 Employment status

Ninety-two participants completed the section on financial status. Of those that completed the section, the majority were unemployed as seen in table 4.1.

Table 4.1: Financial status of participants

Financial status	**Number of responses**	**Percentage (%)**
Currently Employed	17	18
Unemployed	29	32
Self employed	14	15
SASSA grant	12	13
Pensioner	20	22
Total	**92**	

Study participants can be grouped as either non-income earners (social grants, pensioners and unemployed) or income earners (currently employed' or self-employed. Non-income earners outweigh those who earn an income as can be seen in table 4.2. Non-income earners make up 66% of participants in the study

Table 4.2: Income status of participants

Income status	Collective number of responses	Percentage (%)
Non-income earners	61	66
Income earners	31	34

If one compares the age structure to those who were or were not earning an income, a pattern within the data arises. As shown in figure 4.2, the majority of younger small-scale farmers were earning an income compared to those in older age groups where the majority were non-income earners. Interestingly the percentages of those earning an income but who were at retirement age, were similar to those of the younger, 36-55 year age class.

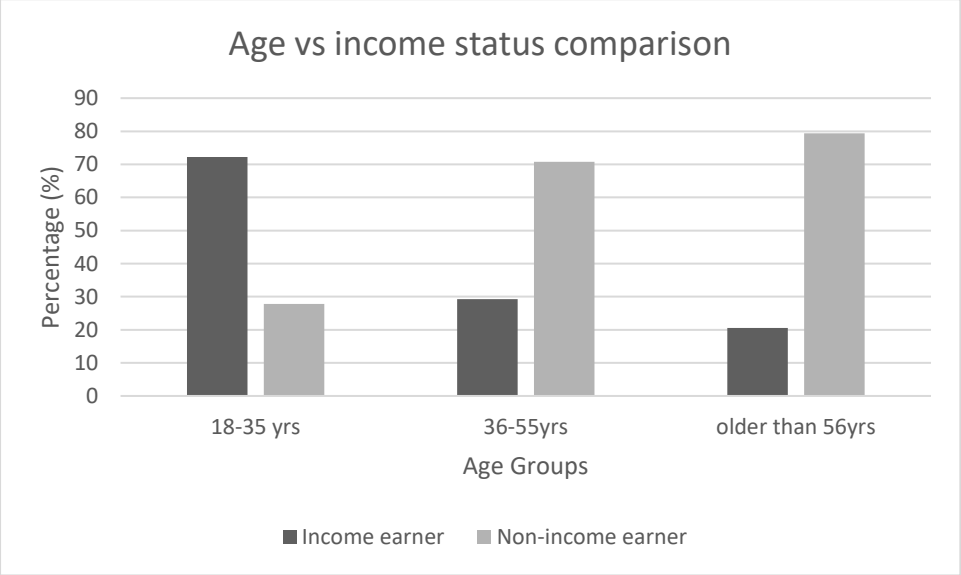


Figure 4.2 Age vs Income status comparison

4.1.3 Household size

Participants were asked how many other people lived in the same household as themselves. This was used in order to determine how many participants lived in multi-person households. A small percentage of respondents lived on their own while most lived in households of two or more individuals. Of the 81 participants who completed this section, the majority (81%) lived in a household where three or more individuals lived.

Table 4.3: Participant household population size

Household population size	Number of responses	Percentage (%)
1	5	6
2	10	12
3	11	14
4	13	16
5	11	14
6	16	20
7+	14	18

4.2 LIVESTOCK OWNERSHIP AND HANDLING

Individuals selected to participate in this study were recruited into this study based on direct livestock ownership or involvement in livestock handling. The majority (87%) of participants who answered the question on livestock ownership did directly own livestock, while the remaining 13% were livestock handlers or farm managers.

Those that did not own livestock were asked if they handled livestock with a frequency of more than once a week. Only one individual who did not own livestock reported that he handled livestock infrequently.

Comparison of which age groups were livestock owners rather than those who worked with livestock, revealed that livestock ownership frequency increased with age. All of those in the 56 years and older group owned livestock while approximately half of those in the youngest age group of 18-35 years owned livestock directly as represented visually in figure 4.3.

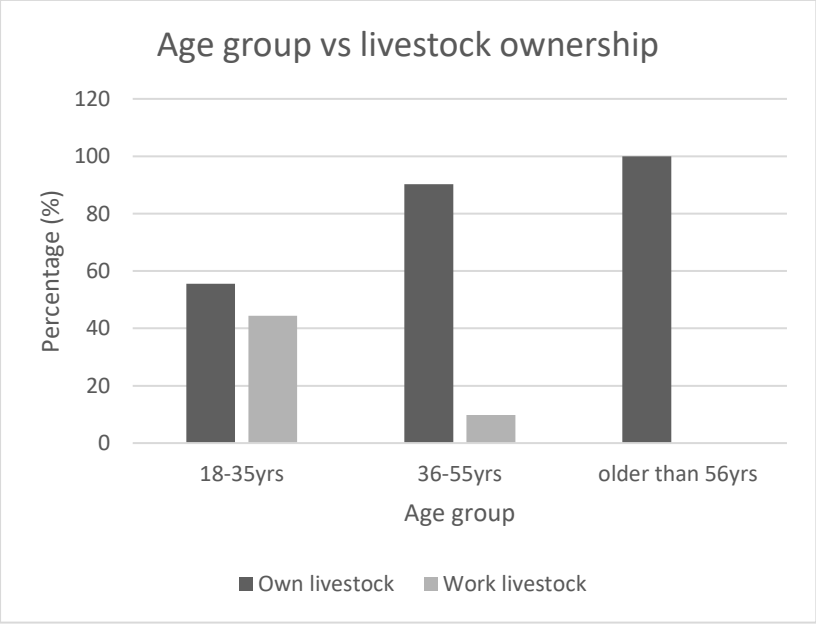


Figure 4.3 Age group vs livestock ownership comparison

4.2.1 Livestock handling frequency by livestock owners

Those that owned livestock were asked how often they handled their own animals. Majority of livestock owners handled their animals on a daily basis as illustrated in table 4.4.

Table 4.4: Livestock handling frequency

Handling frequency	Number of responses	Percentage (%)
Daily	56	70
Once a week	10	13
Once a month	14	17
Once or twice a year	0	0

4.2.2 Livestock species composition

Participants who owned livestock were requested to indicate which livestock species they owned. Table 4.5 highlights livestock species composition of small-scale farmers that participated in the study. The most common species owned were cattle followed by goats and sheep. Where 'other' species were selected, participants were requested to expand and elaborate on which other species were owned. Poultry were the most common 'other' species mentioned; mostly backyard chickens with some small-scale broilers or layer hens. Some other species mentioned were ducks, geese and turkeys.

Table 4.5: Comparison of livestock species owned

Livestock Species	Number of participants who owned specific livestock species	Percentage
Cattle	67	84
Goats	41	51
Sheep	36	45
Pigs	20	25
Other	9	11
Horses/Donkey	2	3
Total answered	**80**	

4.3 CONTROLLED DISEASE SURVEILLANCE

4.3.1 Bovine brucellosis testing history

Participants who owned or worked with cattle were asked about the testing of bovine brucellosis through coccygeal blood collection of their cattle herds. Participants were first asked if the herd had ever been tested for brucellosis through blood collection by a veterinarian or animal health technician.

Of those that either owned or worked with cattle, most (58%) were aware that their animals had previously been tested, while a small number (8%) were unsure.

Participants whose cattle had been previously tested were then asked if they were aware of the test results. The majority (72%) were aware of negative brucella test results, two individuals (5%) reported that the tests had come back positive while a small number (23%) where unaware of the test results.

Those that were aware of their animals being tested for brucellosis were asked when the last testing had occurred. Most herds were tested more than six months previously, while less than half were tested less than six months previously as demonstrated in table 4.6.

Table 4.6: Brucellosis testing interval

Brucellosis testing interval	**Number of responses**	**Percentage (%)**
Less than 6 weeks ago	9	20
Less than 6 months ago	9	20
More than 6 months ago	21	48
I can't remember	5	11
Total	**44**	

The relationship between livestock abortions and brucellosis serological results were examined, it was found that all those with seropositive cattle herds had previously experienced abortion as seen in table.

Table 4.7 Relationship between incidence of livestock abortions and brucellosis testing results

		Incidence of abortions			
		Yes	No	I don't know	**TOTAL**
Brucellosis testing results	Positive	2	0	0	**2**
	Negative	6	25	0	**31**
	I don't know	4	6	0	**10**
	TOTAL	**12**	**31**	**0**	

Table 4.8 Incidence of abortions in livestock herds not tested for brucellosis, or with unknown testing history

		Incidence of abortions			
		Yes	No	I don't know	**TOTAL**
Herd tested for Brucellosis	No	6	16	5	**27**
	I don't know	3	3	0	**6**
	TOTAL	**9**	**19**	**5**	

4.3.2 Bovine tuberculosis testing history

Participants working with or owning cattle herds were also asked of their knowledge of testing for bovine tuberculosis in their animals through intradermal testing; the method most commonly employed by Gauteng state veterinarians and animal health technicians.

The majority (49%) of participants working with cattle were aware that their animals had been tested, while only a small number (7%) were unsure.

Like with the brucellosis testing, participants who were aware of their animals being tested for tuberculosis were asked if they knew the test results. The vast majority (92%) reported receiving negative test results, while a small number (8%) had not received test results. No tests reported to have come back positive for bovine tuberculosis.

4.3.3 Comparative occurrence between testing for tuberculosis and brucellosis in cattle herds

The researcher compared the relative occurrence of testing between brucellosis (CA) and tuberculosis (TB) in the small-scale cattle herds of farmers who participated in the study. Both brucellosis and tuberculosis are state controlled zoonotic diseases of importance in South Africa. The comparison revealed that the cattle herds had not been equally tested for both diseases. More herds had been tested for brucellosis compared to tuberculosis as reported in figure 4.4. The number of farmers that were unsure if their animals had been tested was relatively similar for brucellosis and tuberculosis.

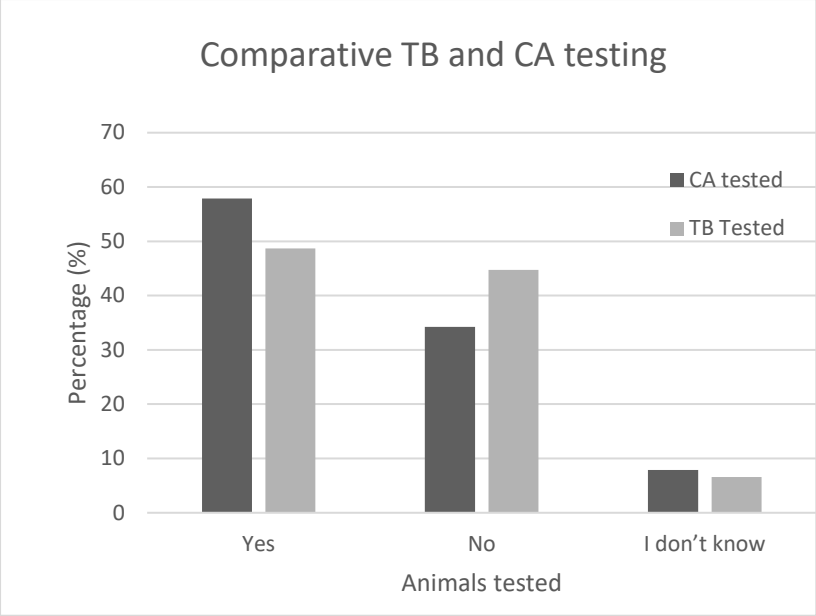


Figure 4.4: Comparative bovine TB vs CA testing

4.3.4 Livestock abortions

Cattle owning participants were asked if their cattle had experienced abortions in the last six months. The majority (66%) answered that they had not, while a little more than a quarter (26%) of participants responded that they had experienced abortions.

Participants were questioned on the characteristics of the aborted foetus, asking about the size relative to that of a rat, cat, dog or full-term calf. Only 19 of the 22 respondents who were aware of abortions in their cattle expanded on the details of the abortus. The results showed that the majority of described aborted foetuses were late term abortions the size of a calf.

Table 4.9: Size of aborted bovine foetus

Abortus size	**Number of responses**	**Percentage (%)**
Rat	1	5
Cat	3	16
Dog	7	37
Calf	8	42
Total	**19**	

Those that had seen the abortus were asked if the aborted foetus had hair coverage or not, in order to establish an estimation of foetal age at time of abortion. Results concluded that 42% of the aborted foetuses had hair present, correlating with the same percentage that reported late term aborted foetuses.

4.4 INFORMAL LIVESTOCK SLAUGHTER AND RELATED PRACTICES

4.4.1 Frequency of occurrence

Half of the participants indicated their involvement in informal slaughter only occurred 'once or twice a year', while a smaller percentage indicated that they slaughtered livestock more frequently at 'once or twice a month'.

Table 4.10: Frequency of informal slaughter

Slaughter Frequency	**Number of responses**	**Percentage (%)**
Daily	0	0
Once or twice a week	0	0
Once or twice a month	13	15
Once or twice a year	44	50
Never	31	35
Total	**88**	

Comparison of slaughter frequency across the different respondent age groups revealed that yearly slaughter frequency was the most common response across all age groups. Monthly slaughter frequency however, decreased with age group where the youngest age group was more likely to slaughter more frequently, on a monthly basis, than the older age groups. The data also revealed that there was a large number of participants across all age groups who stated that they were never personally involved in informal livestock slaughter.

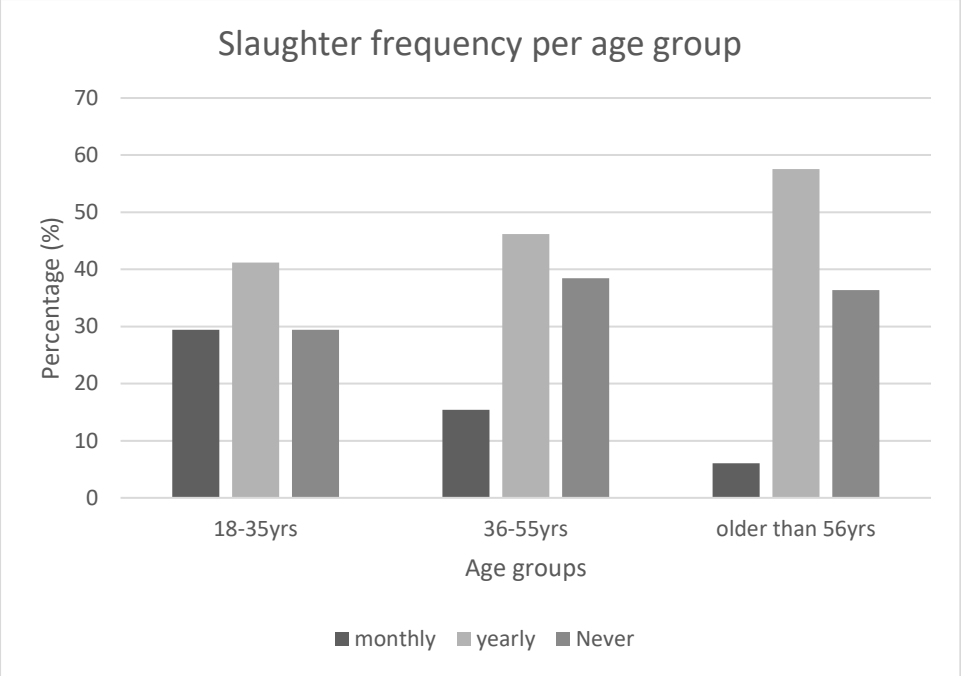


Figure 4.5 Slaughter frequency across respondent age groups

4.4.2 Purpose of slaughter

Those involved in informal livestock slaughtered were asked the purpose for the slaughter. The most commonly indicated was cultural or religious purposes, while a smaller number indicated home consumption. Special occasions, such as weddings or funerals were also mentioned, followed by sale of animal products in order of frequency of occurrence as can be seen in table 4.11. More than one option may have been selected by participants. The question addresses the most common purposes for informal slaughter. Some participants indicated more than one selection.

Table 4.11: Purpose of slaughter

Slaughter purpose	**Number of responses**
Home consumption	20
Cultural/religious	35
Special occasion	15
For sale	7

4.4.3 Livestock species most often slaughtered

Participants who contributed to their experience of informal slaughter were asked which species of livestock were most commonly slaughtered informally. As seen below in figure 4.6, cattle were indicated to be the most common livestock species slaughtered. This was followed by goats, sheep and pigs in order of decreasing frequency. Participants were given the option of 'other' species

slaughtered and were asked to specify. All participants that indicated 'other' elaborated that poultry was the species slaughtered.

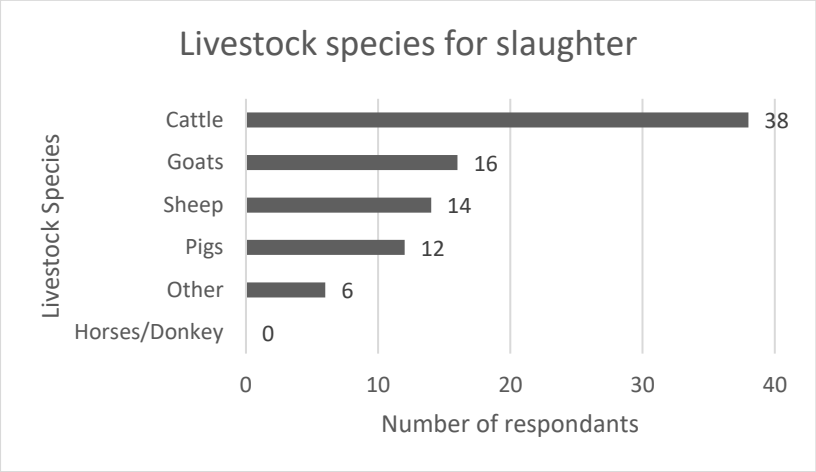


Figure 4.6 Livestock species most commonly slaughtered

4.4.4 Comparison of species owned vs species slaughtered

The relative percentage of livestock species owned was compared to the percentage of livestock species slaughtered. It can be seen in figure 4.7 that the species composition of those owned and those slaughtered are similar in trend pattern.

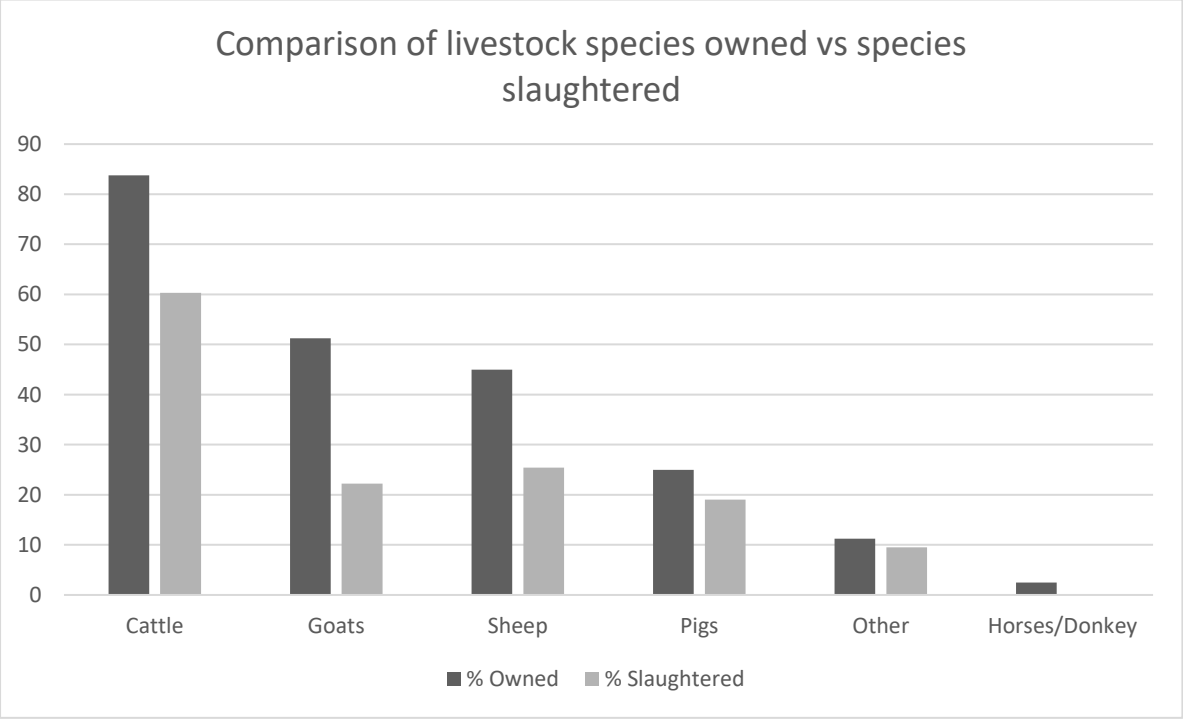


Figure 4.7 Comparison between livestock species owned vs those slaughtered informally

4.4.5 Importance of sex of animal for slaughter

Participants who indicated contribution and knowledge of informal slaughter were questioned on the importance of the sex of the animal for slaughter. Most participants (44%) indicated that both sexes were used, while 42% indicated that a specific sex, either male (29%) or female (14%) was chosen. Few participants (14%) indicated that the sex of the animal for slaughter was 'not important'.

The number of respondents who contributed to the importance of the sex of the animal for slaughter did not directly mirror the number of respondents who indicated that they participated in the practice.

4.4.6 Selection of animals for slaughter

Through the questionnaire, participants were asked on the origin of the animals for informal slaughter. They were asked if they would slaughter their own livestock or prefer to purchase animals for slaughter. If animals were purchased, from where were they obtained, another farmer, livestock auction, roadside sales or 'other'.

Most participants (59%) indicated that they would slaughter their own animals, while a similarly high percentage (55%) indicated that they would also purchase animals for slaughter. The two options were not mutually exclusive. Many participants indicated that they both purchased animals for slaughter as well as used their own animals.

Those that purchased animals for slaughter indicated that they preferred to purchase animals from other farmers (52%), while many opted to purchase from livestock auctions (39%) compared to roadside sales (9%).

4.4.6.1 Slaughter of ill or injured animals for consumption

Participants were asked if they would slaughter an ill or injured animal for consumption. The majority (66%) stated that they would slaughter and consume the products of an injured animal but would not consume the products of an ill animal that was slaughtered (87%).

4.4.7 Person responsible for livestock slaughter and carcass dressing

The questionnaire raised the question of who was responsible for the slaughter and dressing of the carcass when informal slaughter occurred. Most participants indicated that it was either they themselves (48%) who slaughtered the animal, or a family member (39%). Others indicated they hired others to slaughter for them (14%), a friend (8%) or a neighbour (2%).

The question of the gender of the slaughterer; all but one stated that it was a man responsible for slaughter. The gender of the slaughterer was indicated to be a limitation due to physical body strength of a man compared to a woman. The physical restraint of the animal required in informal slaughter due to the lack of stunning prior to bleeding was indicated to be the reason behind the sex selection.

Comparison of the slaughterer designation across the different age groups revealed that across all age groups, the small-scale farmers who participated in the study preferred to slaughter livestock themselves, followed by slaughter performed by a family member. The data revealed that the 36-55 year old age group made use of a family member or slaughtered themselves with equal frequency. The youngest 18-35 year age group and the oldest group of those over 56 years in comparison, would slaughter an animal themselves more frequently than make use of other alternatives. The use of a friend as slaughterer showed equally low frequency across all age groups, while the use of hired personal was more frequently employed by the two younger groups compared to the eldest group of those over 56 years.

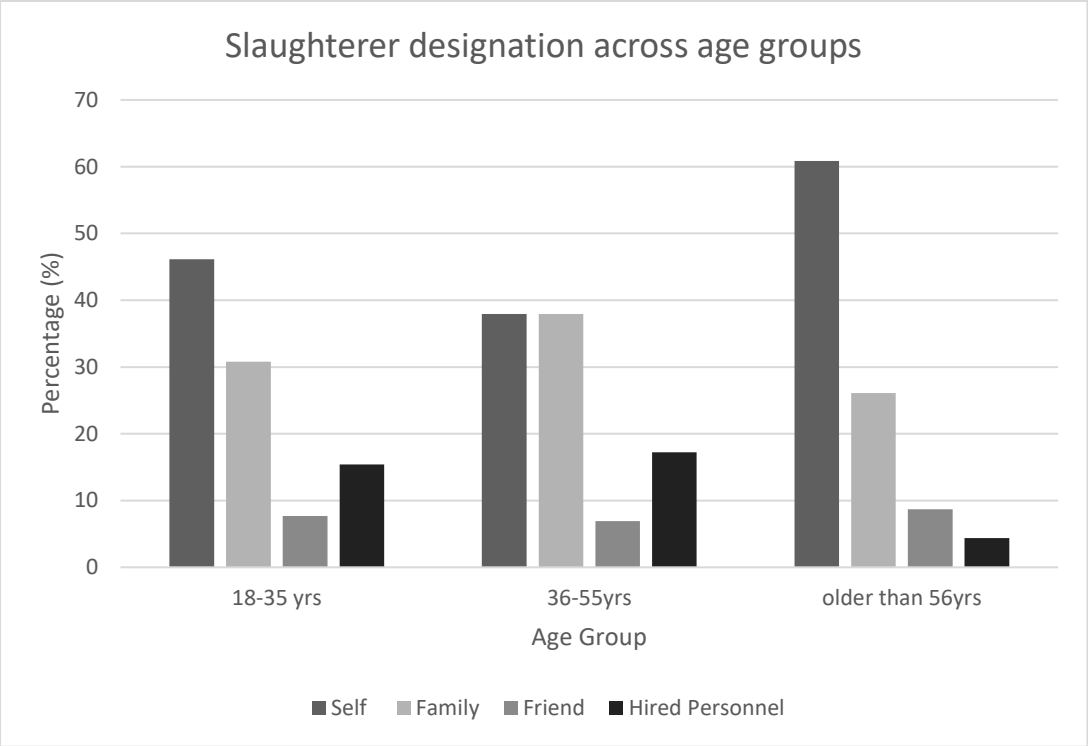


Figure 4.8 Slaughterer designation across age groups

4.4.7.1 Use of personal protective equipment when slaughtering and carcass dressing

The use of personal protective equipment (PPE) was queried of those involved with the slaughter and carcass dressing. PPE was defined as the use of any protective clothing or equipment, namely overalls, gumboots, gloves, mask or eye protection. Those that indicated that PPE was worn, were asked to specify which PPE was used from a list provided.

Many participants (59%) indicated that PPE was worn for slaughter and carcass dressing.

Of those participants that indicated that PPE was worn for slaughter. Most indicated that overalls (74%) and gumboots (59%) were the most commonly used PPE. A smaller number of others indicated the use of gloves (31%), mask (8%) and eye protection (3%) such as goggles.

One can compare the use of PPE across the different respondent age groups. The use of adequately protective PPE such as gloves, masks or eye protection was also considered in the comparison across age groups. The data revealed that the use and adequacy of PPE used increased in frequency with age, the highest frequency with those older than 56 years. As shown in figure 4.9 below, the youngest age group of 18-35 years were the least likely to use PPE and showed the lowest frequency of adequate PPE use across all age groups. This is in contrast to the oldest age category of 56 years and older, who more often than not made use of PPE for slaughter, and were more likely to use adequate PPE when slaughtering informally.

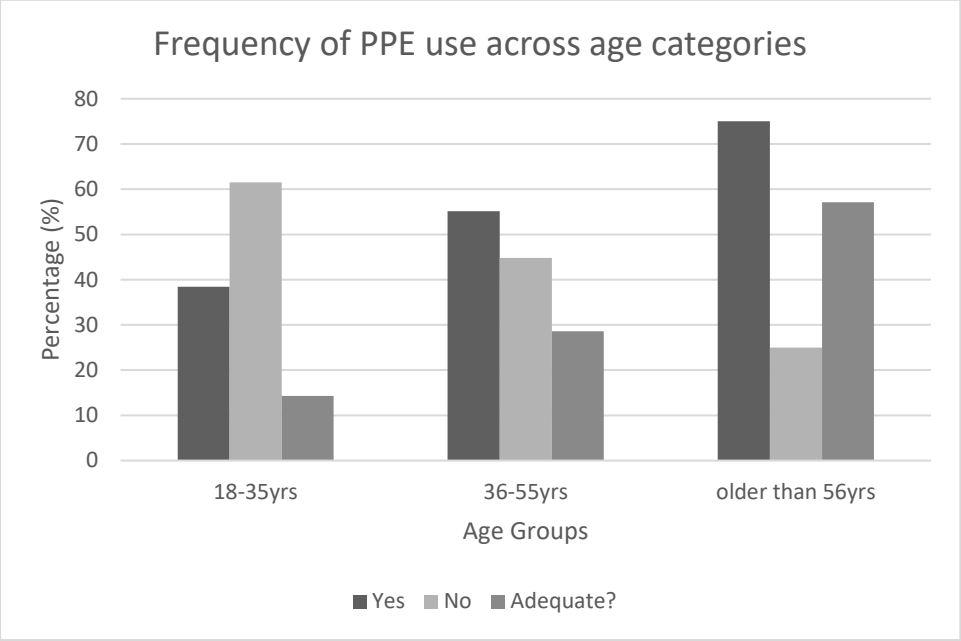


Figure 4.9 Frequency and adequacy of PPE used across participant age groups

4.4.8 Offal selection and preparation

Participants were asked if they consumed offal, either red offal; the heart, lungs and liver as well rough offal; rumen, tripe/intestines and kidneys as well as any other organs or internal structures such as the reproductive organs.

Of those participants that answered the question, 94% indicated that they did consume offal, while only 4 individuals indicated that they did not.

Of those that indicated offal and organs consumption, the most commonly consumed organ was the liver at 87%, followed by intestines (67%), heart (63%), lungs (57%) and rumen (52%). At slightly lower indicated levels of consumption are the kidneys (45%) and diaphragm (42%). Reproductive organs such as the uterus were rarely consumed at only 3%.

Individuals who indicated that they consumed offal were asked if they consumed the offal raw, cooked or preserved. The majority indicated that the offal was prepared cooked (96%), while few indicated that under certain circumstances, certain organs were consumed raw (4%). Organs consumed without cooking were the liver, the heart and small sections of the rumen. Offal was not reported to be preserved at any time.

Participants were asked regarding cooking times for the offal consumed. Most indicated that all organs were exposed to long cooking times of longer than thirty minutes, while other organs, specifically the liver, kidneys and heart are cooked for between 10-15 minutes or 15-30 minutes.

4.4.9 Utilisation of damaged or diseased organs and tissue

4.4.9.1 Action taken for offal presenting with a lesion or damage:

Participants were shown a colour image of organs with lesions (see appendix 8.3 and 8.4) that may indicate damage or disease and were then asked what action they would take if confronted with something similar. Examples of entire infected organs to segmental damage were shown.

Most participants (47%) indicated that they would discard the whole affected organ, while others indicated they would avoid the use of any of the organs from the relevant animal should one be affected (29%). Some responded that they would remove the offending section (23%) while a single participant responded that they would use the organ even with the lesion or damage present.

4.4.9.2 Methods of disposal of damaged or diseased tissue

Options were presented to participants as to their action for discarding whole organs or segments thereof, if removed when found. Less than half (47%) of participants indicated that they buried offending organs and tissues, while others fed the removed sections or organs to their dogs (30%). A smaller number (21%) responded that they preferred to burn them in fire, while a single individual responded that they threw the portions into the veld as means of disposal.

4.4.10 Tissue preservation

The questionnaire included a section on animal tissue preservation, directed mainly at offal but also including all animal tissues including muscle tissue or meat. Participants were asked if they employed any method of animal tissue preservation, given the options of freezing, drying, smoking, salting, smoking, pickling or any others, requesting elaboration if ‘other’ was selected. The main means of

preservation reported was freezing, followed by salting and drying. A smaller number employed the use of meat smoking and pickling. A single participant indicated other, where they responded that any excess or unused meat or organs were given to farm staff.

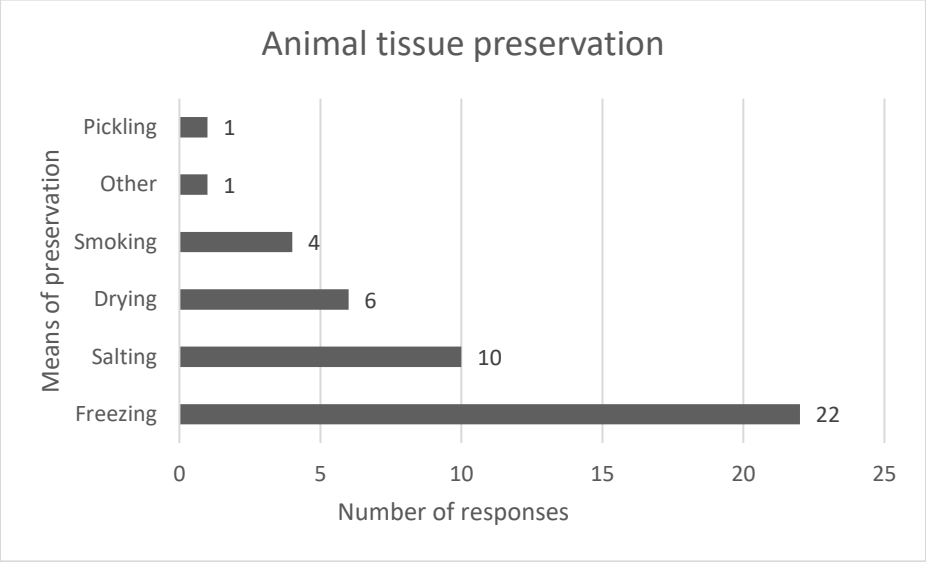


Figure 4.10 Means of animal tissue preservation

4.4.11 Lymph node recognition and consumption

4.4.11.1 Lymph node recognition

The knowledge and recognition of lymph nodes may be of importance in informal slaughter as no regulated means of meat inspection is done. During formal meat inspection targeted lymph nodes are incised and inspected for evidence of infection or disease, specifically tuberculosis. The lymph nodes requiring primary inspection include the retropharyngeal, parotid and mandibular lymph nodes of the head, the hepatic lymph nodes and the mediastinal and bronchial lymph nodes in the thorax. Any animal which is suspect for systemic disease or tuberculosis will require additional inspection of the main carcass lymph nodes where evidence of infection may be visualized. These include the superficial inguinal, internal and external iliac, renal, popliteal, ischiatic, precrural, sternal and pre-pectoral lymph nodes as can be seen in appendix 8.5, as well as the lymph nodes of the head and viscera should be incised and inspected for signs of disease. The depth and extent of lymph node examination will be determined by other signs of disease noted in various parts of the carcass during primary meat inspection (Herenda, 2000). The results of this examination will determine the wholesomeness of the carcass in question. Unwholesome carcasses, those suspected of being diseased and unsuitable for human consumption are destroyed and removed from the human food chain. This is a step of

significant importance for public health in that this prevents the sale of diseased animal products into the public market. A significant step that is not present during informal livestock slaughter.

A short section of the questionnaire dealt with asking participants if they recognised various lymph nodes throughout the carcass through the use of a colour image of mesenteric and subscapular lymph nodes (see appendix 8.4) as well as using the example of the lymph nodes found around the head (retropharyngeal, parotid and submandibular lymph nodes).

4.4.11.2 Lymph node consumption

After an explanation of lymph node structures were given, participants were asked if they routinely recognised lymph nodes, and if so, if they were consumed. The author found that not all cultures had a name for lymph nodes, and even those that did, not all recognised it. Even after the use of images (see appendix 8.4) and explanation there were a significant number of participants who did not recognise the structures. Some participants even preferred not to complete the question as a result.

The results showed that the majority (46%) of participants revealed that they consciously removed and discarded the lymph nodes that were recognised. A large percentage (37%) of participants claimed that they did not recognise the structures, while a smaller percentage (15%) stated that they consumed the lymph nodes with surrounding associated tissue. The minority of 3% recognised the structures, removed them and consumed them separately, usually cooking them with the other offal.

All participants who acknowledged that they consumed the lymph nodes stated that the structures were always consumed cooked and never raw.

4.4.11.3 Frequency of skin usage from informal slaughter

The use of the skin of the slaughtered animal was questioned during the interview, the largest percentage (46%) of participants responded that they never used the skin. Twenty seven percent of respondents stated that they always used the skin, while another 28% responded that they only used the skin occasionally.

4.4.11.4 Skin purpose

Those respondents that indicated use of the hide of the animal after slaughter were asked for the use of the skin. They were presented with options of selling the hide to a tannery for leather making, cure themselves, cure as a mat for household use, use for isiphandla (rawhide bangles) or other traditional clothing. Respondents were also given the option of 'other', where expansion on the topic was required. The majority (60%) made use of the animal skin for use as a household mat, followed in frequency by use for making isiphandla (27%) or other traditional garb. In Zulu culture traditional clothing made of animal skin worn by men is known as 'ibheshu' while that worn by married women

was known as ‘isidwaba’ (Study Participant Pers. comm., 10 July 2018). Twenty-four percent responded that they cured the skin themselves while only 8% indicated that they sold the skin to a tannery. Eighteen percent indicated that they used the skin for ‘other’ functions. This was elaborated on for use in drum making, rope making, for sale locally or the skin was either dried and salted for cultural use, or dried and burnt.

4.4.12 Remains after slaughter

Participants were asked if any parts of the carcass remained after slaughter and if so which parts, as well as means of disposal.

Most respondents (61%) indicated that parts of the carcass were left after slaughter that were not used. A moderate number of individuals (22%) indicated that they were unsure, while a small percentage (17%) responded that the entire carcass was used with nothing left over.

Participants that indicated that parts of the carcass remained after slaughter were asked to specify which structures and tissues were unused. As seen in figure 4.11, many indicated that the horns and reproductive organs were left unused after carcass harvesting. Several individuals also indicated that the bones, hooves, kidneys and skin of the animal remained after slaughter. Other tissues mentioned were the tail, feet, soiled animal tissues previously removed, intestinal content, neck and head of the animal.

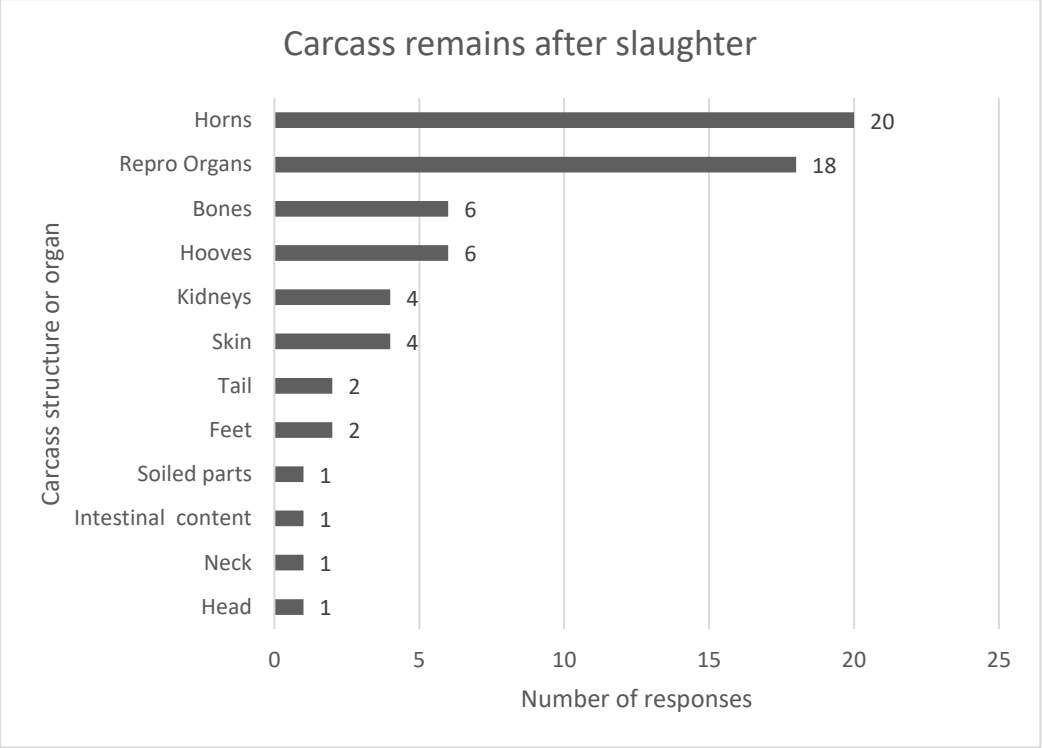


Figure 4.11 Carcass remains after slaughter

4.4.12.1 Means of disposal of post-slaughter remains

Respondents who indicated the presence of animal products left over after slaughter were requested to indicate the means of disposal of these structures. Most respondents (40%) indicated that the left overs were buried. A smaller portion of respondents indicated that the left overs were given to their dogs (27%), burnt in fire (22%) or simply thrown or left in the veld (12%).

4.5 ZOONOSES:

4.5.1 Historical knowledge of zoonotic disease:

The majority (82%) of participants recognised that disease could be spread from animals to humans.

A comparison was conducted of zoonotic knowledge across the different age groups of respondents in the study. The data revealed a similar trend across all age groups where approximately eighty percent of respondents were aware of zoonotic disease; where transmission of disease between animals and humans was recognised.

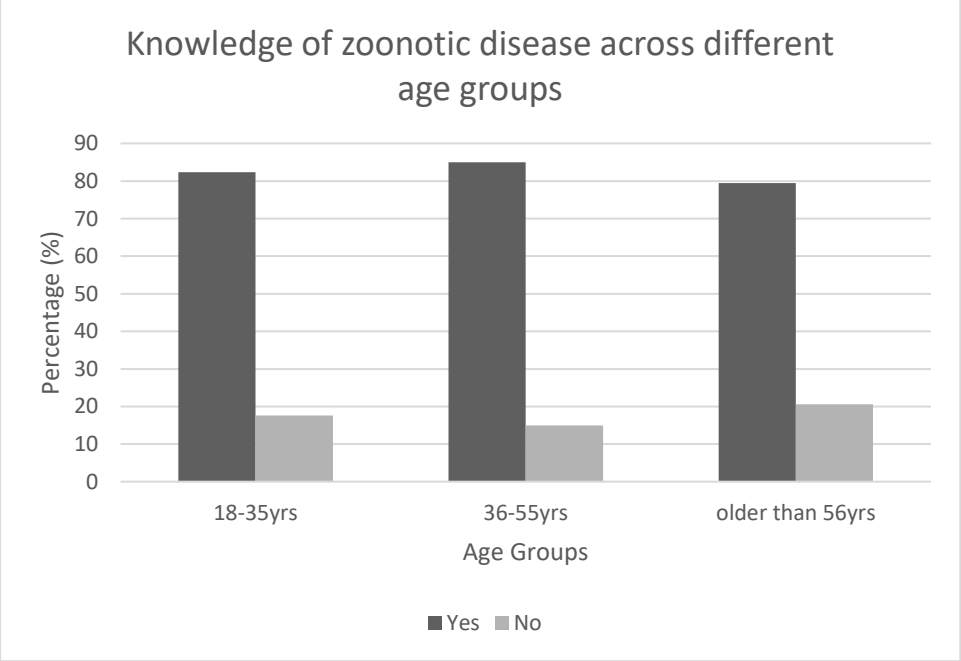


Figure 4.12 Age group comparison of historical knowledge of zoonotic disease

4.5.2 Source of zoonotic disease

Participants that indicated that they were aware of the potential of zoonotic disease spread from animals to humans, were asked to indicate if they thought zoonotic disease originated from live animals, dead animals or through slaughter. Most responded that they thought disease could be contracted from live animals (45%), a few less believed that dead animals (40%) were the source of

disease. A small number (16%) of individuals indicated that disease spread during animal slaughter was possible.

4.5.3 Zoonotic diseases of concern

Respondents who indicated that they thought zoonotic disease contraction from animals were possible, were asked to elaborate on which diseases they thought were transmissible. This was presented as an open-ended question where participants were asked to name the diseases they thought to be of zoonotic concern. Many were specific, while some could only generalize. The results are visualized in figure 4.13.

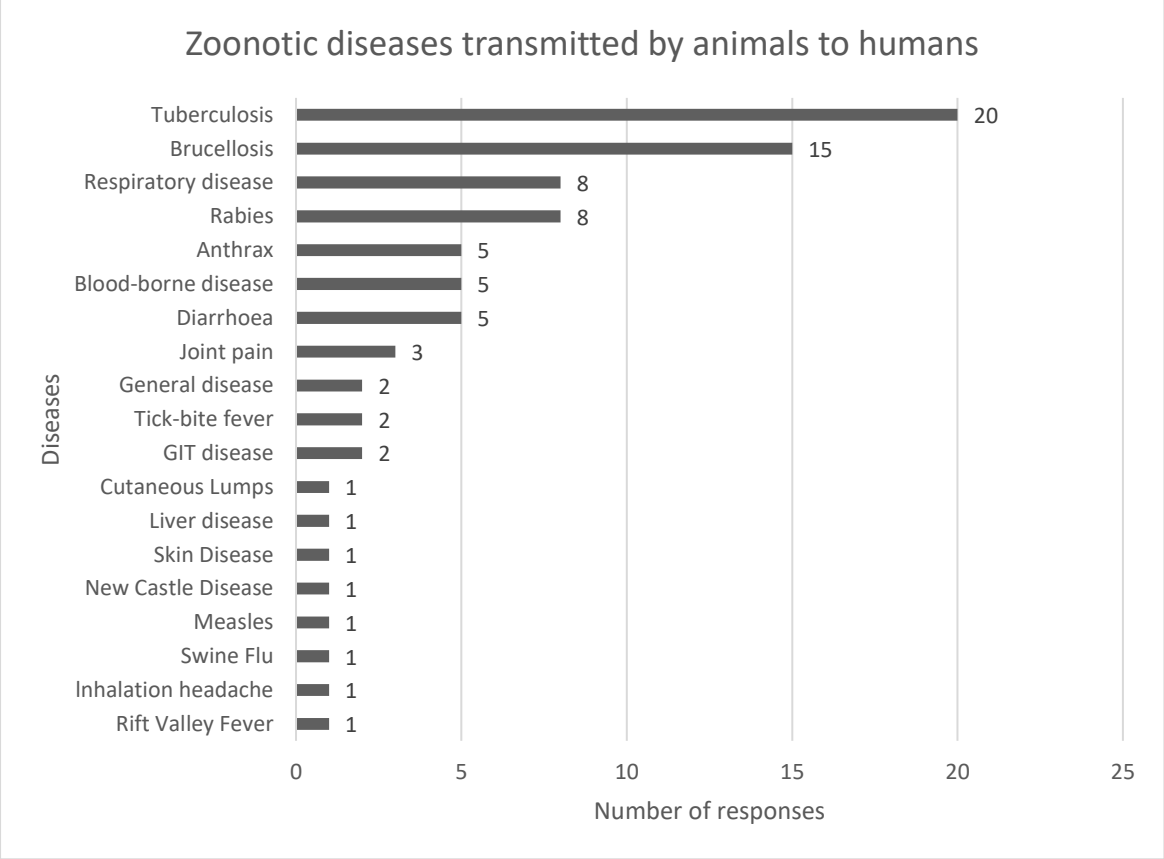


Figure 4.13 Zoonotic diseases reported to be transmitted from animals to humans

5 DISCUSSION

5.1 BACKGROUND:

The aim of this study was to descriptively assess the potential human health risk associated with informal slaughter, specifically the risk of infection with brucellosis through informal slaughter. The study made use of a questionnaire as a research tool, where questionnaires were completed through personal interview by interviewers trained by the researcher.

This study targeted small scale farmers in the Germiston State Veterinary area in southern Gauteng, the smallest province in South Africa with the highest population density and considered the cultural melting pot of the country. Small scale farmers in Gauteng represent only a small proportion of the province's population, but may be considered representative of the myriad of cultures and religions of small-scale farmers within the country. Farmers were chosen as the targeted demographic as they have been shown to experience a high rate of occupational exposure to zoonotic disease through their frequent contact with animals (Galinska & Zagorski, 2013). Small scale farmers in Gauteng were thus considered suitable candidates for disease exposure education and as questionnaire participants in this study.

Informal slaughter is a constitutionally protected practise in South Africa that plays an important role in many cultures and religions. Informal slaughter of an animal, usually livestock, is carried out outside of an abattoir where the purpose, according to the Meat Safety Act (Act 40 of 2000) Section 7 (2), is "for own consumption, for cultural purposes and/or for religious purposes". These ritual slaughter practices are not regulated by veterinary public health officials or food safety controls to prevent unsanitary meat handling, nor does it allow for formal meat inspection.

Farmers who participated in the study were interviewed and asked a series of questions from the study questionnaire in order to assess if informal slaughter contains elements which pose a potential risk to human health, through the transmission of zoonotic disease. This was achieved by posing a series of questions to the participant that ranged from establishing their socioeconomic status, livestock ownership and handling frequency, to questions of livestock slaughter; how often this occurred, which parts of the carcass were used and how they were prepared, to their knowledge of zoonotic disease and its origin.

5.2 SOCIOECONOMIC AND FINANCIAL BACKGROUND OF STUDY PARTICIPANTS

The majority of study participants fell within the 36-55 years category, followed closely by older individuals of retirement age. This concurs with research by Qekwana *et al* (2014) which found that

most informal farmers are older individuals who were investing in livestock farming as a retirement plan or to supplement their income; a means of supporting themselves and their families when they can no longer work.

With regard to the employment status, the study showed that at seventy percent of participants were non-income earners where almost a third of participants were unemployed. Comparing income status across the different age groups, an interesting finding was uncovered. Those considered to be of working age, i.e. those older than 36 years but before the retirement age of 56 years showed the highest level of unemployment. This may be seen as evidence that small scale farmers may be using livestock farming for subsistence purposes, where these animals provide an essential source of animal-based protein in supporting themselves and their families.

Household population size was also considered in the study. Across all age groups it was found that the targeted demographic group of small-scale farmers tend to be gregarious where more than eighty percent of participants lived in households of three or more individuals. According to Amoateng *et al* (2007), Africans are more likely to live in multiperson households comprising of extended family members. Africans are a communalistic culture where extended family living is an important component. Lack of education and those of limited economic resources have been found to be more likely to live in extended family households, where resources are pooled and shared (Amoateng, *et al*, 2007). The high level of non-income earners combined with the incidence of multi-person households in this study potentially supports this finding. It may be that small-scale farming is a means to support a household of extended family members where financial resources are limited.

When slaughterer designation was examined it was found that the farmers themselves or a family member were frequently tasked with the responsibility of livestock slaughter, possibly confirming that informal slaughter is a family orientated occasion. Household population size is an important consideration when looking at informal slaughter for household consumption with regards to level of impact for public health risk. Consumption of products from an infected carcass may potentially affect more individuals where the resulting products are shared, usually amongst family members in a multi-person household. This is an important consideration when looking at disease transmission through food preparation or transmissible diseases.

5.3 LIVESTOCK FARMING: OWNERSHIP AND ANIMAL HANDLING FREQUENCY

Farmers were selected as the chosen demographic in this study due to their frequency of animal contact which consequently increases their risk of contact and infection with zoonotic disease. As bovine brucellosis is the disease of concern for this study, assessing the frequency of contact with potentially infected cattle was prudent.

The study revealed that the majority of participants were livestock owners who had frequent contact with their animals, usually on a daily basis. Frequent, close contact with infected animals and livestock increases the risk of disease transmission, of zoonotic pathogens (Cantalay *et al*, 2017). It is for this reason that livestock farmers are considered a high-risk group for zoonoses, bovine tuberculosis and brucellosis in particular (Wojno *et al*. 2016; Mangalgi *et al*, 2016). Brucellosis, bovine TB and anthrax are considered to be the most important zoonotic diseases in Southern Africa (Michel *et al,* 2003), especially so in that dependant on livestock for subsistence purposes. We also found that livestock ownership and thus handling frequency increased linearly with participant age. The highest frequency of livestock ownership was with those of the oldest participant age group of 56 years and older, followed closely by the 36-55 year age group, which were previously found to have the highest levels of unemployment. Altogether, we can reflect that older small-scale farmers are more likely to own and work with livestock on a daily basis. Correlating the increased level of livestock contact with advancing age is concerning when zoonotic disease exposure is considered. Studies have revealed that the efficacy of immune function declines with age, increasing susceptibility to infection (Hirokawa *et al*, 1992; Shaw *et al*, 2013). This is notwithstanding the high levels of immunosuppression and secondary disease in South African communities which may further decrease resistance to zoonotic disease.

When considering livestock composition owned and worked with by study participants, it was found that the most frequently owned livestock species were cattle, followed by goats and sheep. These species are of particular importance in this study as they are the carriers of brucellosis, whether *Brucella abortus* from cattle, or *Brucella melitensis* from small stock. Recent research in Gauteng revealed a significant association between the presence of goats on brucella positive cattle farms and seropositive results in human brucellosis testing (GDARD, 2017). As bacterial culture is not done routinely on bovine brucella serology in Gauteng or South Africa, it is not yet known if the cause of infection is *B. melitensis* or *B. abortus*. The former organism prefers small stock as a host but has been known to infect cattle and humans.

5.4 BRUCELLOSIS SURVEILLANCE IN SMALL SCALE LIVESTOCK HERDS

Brucellosis is a controlled disease in South Africa, as such the questionnaire included questions regarding the two most commonly encountered controlled livestock diseases present in Gauteng livestock, namely bovine brucellosis and tuberculosis. The study examined if participants' livestock were previously tested for the diseases; when last the testing was done and what the results were, if received. The Gauteng Veterinary Services make use of serological testing for brucellosis by indirect serological testing. In order to improve question understanding, explanation of coccygeal blood

collection was given during the questionnaire interview, the method most commonly used by Gauteng veterinary services for brucellosis testing.

It was found that almost two thirds of participants were aware of brucellosis testing having been done on their livestock, a possible reflection of the extent of disease testing in small scale farmers in Gauteng by state veterinary services. Of concern was the remaining one third of participant herds which appear to have never been tested for the disease. As a serious zoonotic disease with severe impacts on our livestock sector, South Africa's brucellosis eradication scheme relies on vaccination as well as test and slaughter programmes in order to control the disease (DAFF, 2016). The 2017/2018 Gauteng veterinary services (GVS) annual report reveals that there are currently a number of brucellosis positive cattle herds in Gauteng. More than half (51.7%) of these herds are within the Germiston state veterinary area, the target area for this study (GDARD, 2018). According to the 2017/2018 brucellosis CA5 laboratory serological survey, the Germiston state veterinary area hosts the highest seroprevalence in the province (Dr K Govindasamy [GDARD Epidemiology] pers. comm., 5 June 2018).

When participants were questioned on the brucellosis testing results of their livestock herds, more than seventy percent were aware of negative test results. There were, however a small number of participants who knew of positive brucellosis tests in their herds. In Gauteng, only 30.8% of cattle that tested positive for brucellosis were removed and slaughtered in accordance with the Brucellosis eradication scheme. Of these, no communal cattle which tested positive were removed (GDARD, 2018). The deficiency in effective removal and disease control within small scale and communal livestock herds places a greater risk on those working with and handling these animals on a daily basis, such as farmers and livestock handlers. Especially so in the case of informal slaughter where infection and spread of the disease through slaughter, carcass dressing or consumption of products from these animals occurs when no means of protection or prevention are implemented.

In addition to looking at testing for brucellosis in the herds of participants cattle, the questionnaire requested additional information on the incidence of abortions as a possible reflection of brucellosis presence in these herds. One of the most significant and visually apparent clinical manifestations of brucellosis infection in cattle is the occurrence of livestock abortions (Godfroid *et al*, 2017). Studies in Africa have shown that the incidence of livestock abortions correlates with brucellosis seroprevalence in the livestock of the area (McDermott & Arimi, 2002). The study found that more than a quarter of participants were aware of the occurrence of abortions in their cattle. Those that were aware of abortions described the size of the foetus and presence of hair coverage which gave the researcher the ability to determine if brucellosis was possibly a disease of concern. An abortus the size of a rat is estimated to have the approximate gestational age of 90 days (3 months), while that matching a cat-

size may be 120-150 days (4-5months), a dog 180 days (6 months), while a calf sized abortus can be anything from 210 to 270 days (7-9 months) old (Roberts, 1971). According to Roberts (1971), there may be fine short hair growth on a developing bovine foetus from approximately 240 days gestation, while a full hair coat is only present from approximately 270 days onward. As brucellosis is known to cause abortions from the 5th month (150 days) of gestation onward, any abortions from a dog to a calf sized abortus are of concern for the purposes of this study.

Figure 5.1 Aborted bovine foetus, approximate gestational age of 5 months. Note the lack of hair coverage. Photo by L. Senakhomo, August 2018

Of those participants who were aware of abortions in their herds, more than forty percent were reported as late term abortions the size of a full-term calf or slightly smaller, all of which were reported with hair growth. These correspond to abortions occurring at approximately 7-9 months gestational age. An additional third of responding participants reported dog-sized aborted foetuses. Cumulatively the study shows that almost eighty percent of known cattle abortions occurred within the gestational age corresponding to the clinical manifestation of a brucellosis infected pregnant bovine. It is important to consider however, that the size of the abortus may also influence the recognition of an abortion by farmers and livestock handlers. Small aborted foetuses may not be recognised or noticed and thus may be underreported. The study does not dismiss that there are multiple causes for abortion in cattle, both infectious and non-infectious. The occurrence of an abortion in no way equates to the presence of brucellosis in the herd or in the aborting animal, however multiple studies have shown a close correlation (Ducrotoy *et* al, 2017; McDermott and Arimi, 2002).

In this study, all participants who reported brucella seropositive cattle also reported abortions in their herds, however there were also seronegative herds which also reported the occurrence of abortions. Due to the small sample size and the number of participants who reported seropositive cattle herds, the relationship is inconclusive. The incidence of abortion may however be used to reflect on the frequency of obstetrical and/or gynaecological intervention performed by small scale farmers and

livestock handlers. Obstetrical interventions of seropositive cattle are known to be one of the more common means of zoonotic brucellosis transmission to both farmers and veterinary officials (Galinska & Zagorski 2013).

5.5 SELECTION OF ANIMALS FOR SLAUGHTER

Comparison of the livestock species owned to those species most frequently used for informal slaughter revealed a similar pattern of results. One may assume that small scale farmers prefer to farm with livestock they are most likely to make use of and possibly slaughter. While considering the livestock species selected for slaughter the study results revealed that most animals selected for slaughter were the farmers own animals. However, an almost equally high number of participants stated that they also purchased animals for slaughter, possibly explaining the study finding where the percentage of cattle slaughtered exceeded those owned, unlike the trend seen in other livestock species owned and slaughtered.

Farmers are more likely to know the health and disease status of their own animals over those purchased, theoretically allowing the farmer to select healthy animals for slaughter. However, this comfort proves moot when considering brucellosis as a clinically inapparent disease outside of livestock abortions. According to study results, more than half of purchased animals originated from another farmer, while almost forty percent originated from livestock auctions. Livestock movement and herd contact are important risk factors for disease spread and introduction into a herd (Matope, 2008; Njeru *et al*, 2016), an important consideration when sourcing livestock as many small-scale farmers in South Africa make use of communal grazing. The source of the animal is of importance when considering meat safety with regards to the animal's health history (Corbel, 2006). As veterinary health certificates are not compulsory when selling an animal, one is reliant on the word of those selling the animals that they are indeed healthy. Verbal assurance that the animal is without a history of abortion, either of the animal itself or in the herd from which it originated. This is especially true for animals purchased from auction, where disease history is difficult to establish. This is a concern where the animal is purchased when building a herd or when purchasing animals for slaughter. With the high seroprevalence of brucellosis in Gauteng's livestock herds, the risk of obtaining a diseased animal without knowledge thereof is considerable.

5.6 INFORMAL LIVESTOCK SLAUGHTER

In African culture livestock slaughter is not an insignificant event; the life of a bovine represents the life of man (Sundermeier, 1998). For this reason, livestock slaughter does not usually occur on a daily basis. The study found that half of participants stated a slaughter frequency of once or twice a year, a

reflection on the significance of the practice. A smaller number of respondents indicated a higher frequency of once or twice a month, which may indicate a different purpose for slaughter, such as home consumption or sale, rather than the less frequent religious events or special occasion.

Slaughter frequency was compared across all participant age groups and found that slaughter on a yearly basis was most frequent across all age groups, however, a higher monthly slaughter frequency occurred more often with younger participants compared to older. This may be young men who do not own livestock themselves, but in managing them have the responsibility of slaughtering livestock for whatever purpose. Alternatively, it may be that these young people are hiring out their skills as slaughterers and thus perform informal slaughter more often (Mabandu *et al* 2014).

Those involved in informal livestock slaughtered were asked the purpose for the slaughter. The most commonly indicated purpose was for cultural or religious reasons. In African communities, culture and religion are deeply intertwined and cannot be separated as culture is often expressed through religious customs and rituals (Shange, 2013). Weddings and funerals were offered as an option separate from cultural or religious reasons as they were considered by the author as community-based gatherings or celebrations. Special occasions represent a large gathering of family and community members which may differ in population volume to religious gatherings. Religious events may be attended by church members from a village or area in question but may include group members of other villages or towns. These may not be strictly community events depending on the community and event. The purpose for slaughter may be an indication of the extent of community exposure should an infected animal be slaughtered. If for home consumption, one can expect that those living in the same household may be at risk, perhaps with an additional guest or two. It is in these circumstances where household population becomes a consideration. Whereas if an animal is slaughtered for cultural, spiritual purposes or for a special occasion, the level of community exposure increases exponentially with the number of people involved. A gathering at this level often includes the majority of the local community including extended family members.

According to interviews with participants in the study, the person who slaughters is almost always a man, and often a community elder. This is of importance to the ceremony as each act and process of the slaughter has significance. The individual who performs the slaughter of the animal is one skilled in the process and must have the strength to restrain the animal (Study participant, pers. comm., July 2018). Across all age groups, participants consistently indicated that they themselves performed the act of slaughter most frequently, most of whom were older individuals or community elders. Where the participant was not personally performing the slaughter, they often indicated a family member confirming that informal slaughter is likely a family orientated affair, often for cultural purposes or a special occasion.

5.7 USE OF BIOSAFETY MEASURES

The most common routes of brucella infection in humans is through direct contact with infective animal products such as contaminated milk, raw meat and infected organ tissue as well as blood splashes and aerosolised body fluids during slaughter (Mangalgi *et al*, 2016; Sola *et al*, 2014). It is for this reason that those working in abattoirs are required to wear full PPE when slaughtering a brucella infected animal. The lack of PPE may then be construed as a significant risk of brucella infection for Gauteng farmers performing informal slaughter.

The majority of respondents indicated that PPE was worn for the slaughter and carcass dressing. When this was elaborated on however, it was found that the majority of those involved with the slaughter wore only basic PPE such as overalls or gumboots. A small number of people reported the use of gloves, while very few indicated the use of a mask or eye protection. No other forms of PPE were reported. This is of importance as brucella infection occurs through the exposure of mucous membranes, open wounds or the respiratory tract with infected material (Galinska & Zagorski 2013), such as contaminated body fluids or blood splashes (Mangalgi *et al*, 2016; Sola *et al* 2014). In order to protect against exposure through these routes one would need to make use of a mask and eye protection and open wounds on the hands to be covered with gloves. The use of overalls and gumboots only serves to protect one's personal clothing that may be worn underneath. The Department of Agriculture, Forestry and Fisheries of South Africa recommends that those at risk of brucellosis infection through slaughter, such as abattoir workers, should wear full PPE such as overalls, plastic apron, mask, gloves, boots and eye protection to prevent exposure (DAFF, 2016).

The use and adequacy of PPE used during informal slaughter was compared across participant age groups. The study revealed that the use and adequacy of PPE used increased with age. The effectivity and adequacy of the PPE used was examined. The eldest age group used PPE that allowed for oronasal and ocular protection more often than the younger age groups. It may be wisdom that comes with age or previously taught patterns associated with informal slaughter that lead to this pattern of behaviour. As elders are usually given the responsibility of slaughter it may be a pattern of behaviour passed down with the skill of slaughter.

When zoonotic disease knowledge was examined across the different age groups it was found to be almost consistent. However, while we found that while older study participants were more likely to perform livestock slaughter themselves, they were also more likely to use adequate PPE during slaughter. The age group of potentially greatest exposure has also provided some risk mitigation through the use of bioprotective equipment for themselves. Thus, one may surmise that it is not the knowledge of zoonotic disease that prompts the use of PPE during slaughter. While we cannot state

that older individuals are more aware of the potential of disease transmission, it may be that older farmers have greater knowledge of hygienic meat management. This in itself may stem from a more rural domicile history before the luxury of electrical cold storage was available, which required stricter hygienic meat management to prolong meat keeping quality. Storage and methods of preservation of animal products after slaughter was however not a significant finding in this study. Participants stated that more often than not, all products of slaughter were consumed within the same day, nothing remained.

5.8 CARCASS HARVESTING: EDIBLE TISSUES AND PRODUCTS USED FOR CONSUMPTION

When an animal is slaughtered informally, the entire carcass is used. According to Phalafala (n.d.), nothing is wasted, all that is edible is consumed. Organ meat is commonly consumed in African culture as confirmed by the majority participants who stated that they consumed both red and rough offal. Rough offal consists mainly of structures of the gastrointestinal tract such as the rumen and intestines, while red offal are large, blood-rich internal organs such as the heart, liver, spleen and the lungs. Specific attention was given to the reproductive organs as well as the lymph nodes of the carcass. *Brucella* organisms spread systemically after initial infection, initially through the reticuloendothelial system before spreading throughout the body haematogenously during the bacteraemic stage of infection, to all systemic body organs. *Brucella* bacteria have been isolated from several internal organs and body fluids of infected animals (Galinska & Zagorski, 2013; Sola *et al*, 2014). Herein lies the concern of organ consumption from brucella infected livestock. In Sepedi culture the blood of the slaughtered bovine is collected and allowed to congeal before being consumed. This is known as bobete (Phalafala n.d.). Theoretically the consumption of bobete from a bacteraemic, brucellosis infected animal will lead to direct oral and ingestion exposure to brucellosis, and highly likely lead to zoonotic infection as a result.

Research has shown that brucella organisms tend to accumulate in high concentrations in the lymphatic organs, specifically the supramammary, retropharyngeal, parotid and mandibular lymph nodes as well as the iliac and prescapular lymph nodes in an infected animal (Godfroid *et al*, 2017; Sola *et al*, 2014). Brucella organisms are known to multiply therein, leading to lymphadenitis that can last for months after initial infection (DAFF, 2016). This may be expanded upon and considered to be of relevance in cases of other systemic, zoonotic diseases where the causative agent may also accumulate in the lymphatic organs (DAFF, 2016; Herenda 2000). As with infected organs theoretical risk of infection exists where an infected lymph node is consumed, or incised and the contaminated implement used to butcher the remainder of the carcass. In the case of consumption of these contaminated structures, especially without adequate cooking time or heat treatment, they may

represent a source of disease for consumers (Vieira-Pinto *et al,* 2005). This poses a risk both to those slaughtering and dressing the carcass as well to those consuming these structures.

The study revealed that more than thirty six percent of participants did not recognize lymph nodes, even with the aid of images and explanation. Of those that did recognise the structures, a significant number stated that they consumed the lymph nodes, usually cooked with surrounding structures. Together these two groups make up more than half of respondents consuming lymph nodes in informal slaughter. With a high frequency of consumption, it is of some comfort to learn that these structures, where recognised, were exposed to prolonged cooking times with the offal, effectively reducing bacterial loads and reducing risk of exposure and infection through consumption thereof (Heddelson & Doores, 1993).

The majority of participants who consumed offal consumed the liver and the lungs from slaughtered livestock, two organs known to have had brucella organisms isolated therefrom (Sola *et al*, 2014). Although brucella organisms have been isolated from these organs in the past, offal is often cooked for prolonged periods of time of more than thirty minutes, as reflected in this study. Shorter cooking times were afforded to the heart and the liver. The use of cooking heat to reduce bacterial load is an age-old method, one extended in African culture where prolonged cooking is thought to remove all diseases and chemical residues, as reported by multiple farmers and study participants. The efficacy of reducing bacterial load in muscle tissue and organs will depend on the temperatures achieved within the structure, the duration of heat treatment and tissue density in the tissue of concern (van der Merwe *et al,* 2009). The isolation of viable bacteria from infected meat, even after cooking for 10 or 20 minutes is of concern when animal products are inadequately cooked (Heddelson & Doores, 1993: van der Merwe *et al,* 2009). This is without considering the risk of infection through consumption of raw animal products. Such is the case for several zoonotic animal diseases such as Rift Valley fever, bovine cysticercosis, tuberculosis, trichinellosis as well as brucellosis (Cantlay *et al* 2017).

By reducing bacterial load on animal products, one reduces the risk of food borne illness. Reducing bacterial load has also been used for centuries as a means of food, specifically animal product preservation (Heddleson & Doores 1993). The most common means of preservation include cooking, drying and salting. All of these techniques either directly destroy microorganisms or remove essential elements for microbial growth and survival allowing food products to last longer (Heddleson & Doores 1993). Ensuring that all edible animal tissues are adequately heat treated will reduce the risk of food borne infection. Heat treatment through cooking of animal tissues causes protein and enzymatic denaturation within bacteria leading to cell death, thereby reducing bacterial load in the treated tissue (Heddleson & Doores 1993). According to The Food Marketing Institute, recommended cooking temperatures required to prevent the most common food borne diseases range between 60-74°C,

while cooking for ten to fifteen minutes at these temperatures reduces bacterial spore viability of *Clostridium botulinum*, a food borne pathogen of concern (Collins, 1997). These recommendations are specified for food borne pathogens such as *Campylobacter, Salmonella* and *Escherichia coli* (Collins, 1997). While specific cooking temperatures required to reduce brucellosis, bacterial loads have not been determined to the author's knowledge, an extension of recommendations for common food borne pathogens to brucellosis should prevent food borne infection. A study by Collins (1997) found that microbial contamination leading to food borne illness more often originated from unhygienic food handling and cross contamination from food preparation implements rather than simply poor temperature management (Collins, 1997). This may be of concern where organs and animal tissues are adequately cooked but implements used to butcher and section the carcass are contaminated and may transfer pathogens to already prepared food products.

A lack of formal ante mortal and meat inspection may increase the risk of exposure to zoonotic and food-borne diseases. Zoonotic diseases of importance known to be transmitted through food include salmonellosis, anthrax, Rift Valley fever, toxoplasmosis, *Taenia saginata, T. solium*, and *Mycobacterium* (Qekwana, McCrindle & Oguttu 2014; Michel *et al* 2003). While brucellosis does not change the outward appearance of organs and structures with high bacterial loads during infection (Sola *et al*, 2014), other zoonotic diseases may reveal themselves visually at slaughter. Participants were shown an image of visually affected organs from ill animals and asked if they would consume damaged or diseased organs or tissues. This was done to highlight the risk of other food-borne zoonotic pathogens to consumers. Food-borne disease outbreaks in South Africa where the source was found to be food provided at ceremonial feasts, are not uncommon (Michel *et al* 2003). The study revealed that just less than half of participants removed and discarded any suspect organs, a small number only cut out and removed the suspect part and consumed the rest of the organ. One participant explained that the action taken when anything suspect was found was left to the decision of the elders. The community relied on their experience with slaughter and the visual inspection of the carcass and its organs to determine its fitness for consumption.

5.9 ZOONOSES: PREVIOUS KNOWLEDGE, SOURCES AND OUTCOMES

Zoonotic diseases are of concern for those in contact with animals on a daily basis such as farmers. This is especially true for brucellosis as a zoonotic disease where farmers and abattoir workers are considered high risk occupations for disease exposure. In developing countries, it was found that the route of the majority of zoonotic infections was through direct contact with livestock or wildlife (Pasquali, 2002). Abattoir workers and those performing informal slaughter are exposed to potentially infective body fluids and tissues during the procedure. Zoonotic diseases are of particular importance

in South Africa where the level of immunosuppression and immunocompromised individuals such as those infected with Human Immunodeficiency Virus or tuberculosis (TB) is so high. In 2016, an estimated seven million people were infected with HIV according to South African Statistics. HIV significantly increases a person's susceptibility to disease due to their compromised immune system, especially zoonotic disease. This is of concern in people who handle animals or their products regularly (McCrindle & Oguttu 2014; Michel *et al* 2003; Pasquali, 2002).

Knowledge of zoonotic diseases was consistent across participant age groups and surprisingly high. When asked which diseases were of concern to these farmers, it is interesting to find that the two most frequently indicated diseases were tuberculosis and brucellosis. This may be due to extension activities and controlled disease programmes where animals are routinely tested for brucellosis and TB by provincial veterinary services. Farmer education is an important part of controlled disease testing programmes in order to have farmers agree to participation as they are voluntary (Ducrotoy *et al*, 2017). Community and health education programmes were found to be essential in encouraging community-based zoonotic disease prevention programmes in Morocco, where success was determined by community involvement in echinococcal disease control (El Berbri *et al*, 2015; Ducrotoy *et al*, 2015)

In order to gauge the level of knowledge of zoonotic diseases, participants were asked where they thought zoonotic diseases originated from. The most frequent selections were transmission through live and dead animals, while this was not incorrect, only a small number believed that zoonotic disease transmission was possible through animal slaughter. This may speak to previous education and awareness programmes, as disease transmission through animal slaughter has so far been a rarely discussed risk. This may be seen as an opportunity for future health extension services, where community education and exposure of the risks of informal slaughter may be highlighted.

While many farmers were able to be specific to zoonotic diseases of concern to them, some were only able to generalize, such as respiratory or blood-borne diseases. Other specific diseases of interest mentioned in high frequency were rabies and anthrax. Interestingly these are also diseases targeted by state veterinary services, possibly reflecting the depth of awareness campaigns and education penetration in these communities. Rabies vaccination campaigns are held on a monthly basis in informal communities where dogs and cats in these areas are vaccinated against the disease. Part of this programme includes school education programmes and educating animal owners when they bring their animals for vaccination. Anthrax is a disease targeted in livestock vaccination programmes in Gauteng, where South Africa is considered endemic for the disease. In recent years state veterinary and agricultural services have shown dedication in providing disease control support in areas and to peoples where veterinary support was previously unavailable. Zoonotic disease risk education has

been a natural consequence of this, and one that should be continually expanded upon. Small scale farmer training should be a focus point, especially the risks related to animal contact and slaughter exposure risks in zoonotic disease transmission. In spite of these evidently successful education and vaccination programmes we find that there is still a fifth of small-scale farmers across the various age groups who are unaware of the risk of zoonotic disease transmission.

In order to prevent infection, knowledge of the means of disease transmission is essential. Knowledge of disease control and prevention is especially important in South Africa where disease control measures are voluntary. It is through education and awareness programmes that those at greatest risk of zoonotic disease transmission, namely our farmers, can be targeted in order to prevent disease. According to Ducrotoy *et al* (2017), the effects of zoonotic brucellosis can be minimised in both animal and human populations by community engagement through education on basic hygiene in animal management and milk pasteurization (Ducrotoy *et al*, 2017). Where knowledge of means of transmission are known, steps can be taken to prevent it by the farmers and community members themselves. This extends to selection of animals for slaughter and participation in animal health and disease control programmes, to biosafety precautions taken during slaughter and the preparation of high-risk carcass structures for consumption.

5.10 Study Limitations

5.10.1 Number of respondents for the study

During the study planning phase, the author aimed to collect a total of two hundred complete questionnaires in order to obtain representative frequency data of the target population. This estimate was based on the number of small-scale farmers receiving state veterinary services in the Germiston state veterinary area over the past two years. Through the course of data collection, it was found that only half of this estimate was actively receiving state veterinary support during the data collection period of February to July 2018. The researcher found that while many small-scale farmers were utilizing state veterinary services, the same farmers tended toward requesting repeat farm visits rather than new or old clients requesting services. This limited the number of new questionnaires that were completed over the study period. It was also found that some farmers recorded within the existing client data base, had discontinued livestock farming or moved to outside of the study target area and so were not utilized as study participants.

5.10.2 Number of responses per question or section

It was found through the study that the number of participants answering the different sections and questions in the questionnaire were not consistent. While some questions are conditional 'if…then…'

type questions, it was found that aside from this some questions were answered while others were neglected. Participation in the study was voluntary and participants were not obligated to answer and complete the questionnaire, the result was that there were some inconsistencies in the number of responses per question. It may be that the participant did not know the answer and chose to refrain from providing an answer to the interviewer, or it may be that the information requested was considered privileged and thus not provided. In some cases, a participant would provide information to a section of the questionnaire where they stated they did not participate in the specified activity. For example, while a participant would state that they 'never' participated in informal slaughter, they would still describe the specifics of informal slaughter, such as species slaughtered, those who performed the slaughter etc. In these cases, the information provided was included in the study results. It may be that while participants may not directly participate in informal slaughter, they were still present for the occasion and were witness to the procedure.

5.10.3 Age group size inconsistencies

In the questionnaire four age group categories were provided to the participants, namely '18-25 years', '26-35 years', '36-55 years' and '56 years and older'. While the age groups cover different age spans, the age classification was based on 'adult life phases' such as young, working class, middle aged and retirement age.

The number of responses for these age groups was found to be skewed however, in favour of older individuals as represented in the results section. It was found that the lowest number of responses were in the two youngest age classes. The data skewed was such to provide with unreliable frequency data to represent the different age groups. The age data bias was unavoidable as participant selection was based on small-scale farming activity and geographical region, age composition of participants could not be controlled.

The skewing of data in favour of older participants lead to biased and unreliable age comparison. For this reason, it was decided to combine the '18-25 years' and '26-35 years' age groups into a single age group of '18-35 years'. The frequency data was then more uniformly spread as the age distribution widths were also more comparable.

5.10.4 Language misinterpretation

Gauteng is the smallest yet most highly populated province in South Africa. While this provides greater variety and representativity across the various cultures present within the country for this study, there was the concern of language compatibility for the study questionnaire. The questionnaire was provided in English where the interviewer could interpret the question in the language most suitable to the participant. Colour images were provided in order to overcome possible concept or bias of

structure recognition. However, in spite of this, challenges arose in interpreting technical terms where either a term was unknown or did not exist in the language being used. For example, when asking a participant on the recognition of lymph nodes seen in a carcass, in some languages, no technical term is known to exist for the lymphatic structures illustrated and described by the interviewer. If a participant had not been exposed to recognise the structure as independent from other carcass structures, they were unlikely to recognise them as separate.

5.10.5 Concept misinterpretation

As with language misinterpretation, it was found that while some terms are considered colloquial, it was found that the understood concept behind the term differed substantially between participant and interviewer. An example of this is the question asking if a participant would slaughter and consume the products of an ill animal (Question 9.3 – see Appendix 8.2). The understanding of the term 'ill' or 'sick' was found to differ between participants and interviewers. The author found that while a veterinarian or veterinary technician who performed the interviews may consider a wider range of physiological disruption to fit the term 'sick', to most participants the concept more accurately fit that of a moribund, chronically ill animal. It was found that mild diseases or physiological disruptions such as diarrhoea or nasal discharge were not considered to fit the criteria of 'sick' as understood by the participant. For this type of question, the participants view of 'ill' or 'sick' animal was used for the questionnaire answers. This may provide a conceptual bias in data interpretation of this question in the results.

5.10.6 Questions excluded from questionnaire

The author noted after completion of the study that there was a deficiency of information on the use and consumption of reproductive organs as potential edible tissues in informal slaughter. The inclusion of a question related to this should have been included in the study questionnaire. This included the uterus, testicles and udder. The inclusion of udder consumption should also have been included in the study, as brucella organisms are known to localize in mammary tissue and the supramammary lymph nodes.

6 CONCLUSION

Brucellosis is a controlled disease with detrimental human health as well as livestock production costs. The disease has a high seroprevalence in South African and Gauteng livestock herds, according to Govindasamy and Geertsma (2016) it was found that the highest level of seropositivity in Gauteng was in the study area of the Germiston State Veterinary area. The disease is of concern in informal slaughter as the disease may not be visually apparent, an important consideration when purchasing animals for inclusion in a herd or when selecting an animal for slaughter. The most common livestock species owned and slaughtered by small-scale farmers were cattle, the recognised carrier of *Brucella abortus*, the causal organism for brucellosis in both livestock and people. A quarter of participants reported the occurrence of abortions in their cattle herds, the most apparent clinical sign of brucellosis. In addition to this, while two thirds of participant livestock herds had been tested for brucellosis, there were positive test results in these herds for the disease.

As a zoonotic disease known to spread through animal slaughter, abattoir workers are recommended to don additional biosafety gear in order to minimize the risk of disease exposure during slaughter; through blood splashes and aerosolized bodily fluids. The use of personal protective equipment (PPE) such as gloves, aprons, gumboots, masks and goggles are recommended to limit disease exposure through the mucous membranes and exposed open wounds. The use thereof was found to be lacking in informal slaughter, posing a significant risk of exposure to those performing the slaughter and dressing the carcass. The study revealed however that the use and adequacy of PPE used increased with participant age group. This is important as older individuals, possibly the elders of their communities, were most often given the responsibility of slaughter for a family or community-based occasion. These elders were found to be more likely to wear adequately protective PPE compared to the younger participant age groups.

Livestock slaughter, while performed infrequently, usually on an annual basis for cultural or religious purposes, was a family affair. It was either the farmer themselves or a family member responsible for slaughtering the animal, while other family members were involved in carcass dressing, portioning, and meat and offal preparation. Assuming an infected carcass was butchered, the level of pathogen exposure would be shared amongst multiple family members rather than a single individual. The study revealed that high risk structures such as lymph nodes and reproductive organs were frequently encountered, although the former was not often recognised. These high-risk structures, specifically the lymph nodes, were consumed by participants with varying cooking times and methods of preparation. Some organs, previously found to show presence of *Brucella* organisms, were consumed raw or exposed to short cooking times, adding to level of disease exposure. One must note however

that most meat and organs were exposed to prolonged cooking times, sufficient to reduce, if not eliminate bacterial loads; reducing the risk of disease exposure to those consuming these products.

The study revealed surprisingly high levels of historical knowledge of zoonotic diseases by participants across all age groups. While brucellosis was one of the most frequently indicated zoonotic diseases of concern to participants, the routes of disease exposure were not well known. Many were aware that the disease could be transmitted from live animals, however the concept of disease exposure for any zoonotic disease through livestock slaughter was considered foreign. Through the study it was found that knowledge and exposure of zoonotic disease transmission seemed to coincide with state veterinary and agricultural extension awareness and disease control campaigns. Community education is the best means of defence in order to limit disease transmission, especially in the case of zoonotic diseases where the stakes are greatest for human health. Standing on the shoulders of already existing community education and awareness campaigns may provide small scale farmers a defence against zoonotic disease transmission. Where knowledge is power and the best cure is prevention, community education and awareness is the easiest and most effective means of disease control in a country where brucellosis is rampant.

Educating small scale farmers on the importance of brucellosis disease testing of newly purchased animals, coupled with brucellosis vaccination is the foundation of disease prevention. This provides the groundwork for healthy herds for farming which in turn delivers a safe source of animal-based protein supplementation in subsistence farming environments. The addition of the use of adequate PPE, specifically the use of masks, goggles and gloves when slaughtering livestock will provide an essential supplement to limit disease exposure. Avoiding the incision or consumption of high-risk structures such as lymph nodes and reproductive organs add to the provision of public health protection. Lastly, the adequate preparation of animal-based products, where all meat and organs are to be exposed to high cooking temperatures, and milk adequately boiled or pasteurized will reduce or eliminate pathogenic bacteria, including *Brucella abortus*.

These simple measures may act as safeguards in public health defence, specifically in the case of informal slaughter where the luxury of ante mortal and meat inspection are absent. This is applicable not just for *Brucella* but also other food borne pathogens and zoonotic diseases spread in a similar manner.

7 REFERENCES

Allen, B., 2016, *Animals in Religion: Devotion, Symbol and Ritual*, Reaktion Books, London.

Amoateng, A.Y., Heaton, T.B., Kalule-Sabiti, I.K., 2007, 'Living arrangements in South Africa', in *Families ad households in post-apartheid South Africa: socio-demographic perspectives*, Human and social development, HSRC, viewed on 14 October 2018, from www.hsrc.ac.za/uploads/pageContent/1656/LivingarrangmentsinSouthAfrica.pdf

Amuthenu, N. & Gummow, B., 2009, 'A seroprevalence study of foot-and-mouth disease and brucellosis in the Northern Communal Area of Namibia', International Symposia on Veterinary Epidemiology and Economics (ISVEE) proceedings, ISVEE 12. Proceedings of the 12th Symposium of the International Society for Veterinary Epidemiology and Economics, Durban, South Africa, Theme 1 – Surveillance and disease control: FMD, Disease monitoring & control, Evaluation of animal disease. http://www.sciquest.org.nz/node/68287

Cantlay, J.C., Ingram, D.J., Meredith, A.L., 2017, 'A review of zoonotic infection risks associated with the wild meat trade in Malaysia', *EcoHealth* 14: 361-388

Chidester, D., 1992, 'Religions of South Africa', Routledge, London.

CDC, 2009, 'Section VIII- Agent Summary Statements: Bacterial Agents' in *Biosafety in Microbiological and Biomedical Laboratories*, 5th ed, pp.126-128, Centres for Disease Control, Atlanta, viewed on 18 April 2017 from http://www.cdc.gov/biosafety/publications/bmbl5/

CDC, 2017, 'Brucellosis Reference Guide: Exposures, Testing, and Prevention', Centres for Disease Control and Prevention, Atlanta, USA, viewed on 17 December 2018 from https://www.cdc.gov/brucellosis/pdf/brucellosi-reference -guide.pdf

Collins, J.E., 1997, 'Impact of changing consumer lifestyles on the emergence/reemergency of foodborne pathogens', *Emerging infectious diseases* 3(4), 475

Constitution of the Republic of South Africa, Act 108 of 1996, available at http://www.justice.gov.za/legislation/constitution/SAConstitution-web-eng.pdf [Accessed 07 May 2017]

Corbel, M.J., 2006, 'Brucellosis in humans and animals', *WHO Press, Switzerland*. Viewed on 26 December 2018, at https://www.who.int/csr/resources/publications/Brucellosis.pdf

CRL, 2009, *Guidelines report on the African ritual of animal slaughter*, Commission for the Promotion and Protection of the Rights of Cultural, Religious and Linguistic Communities, South African Heritage Resource Agency, South Africa

DAFF (Department of Agriculture, Forestry and Fisheries), 2016, *Bovine Brucellosis Manual*, Government Printer, Pretoria

Ducrotoy, M.J., Yahyaoui Azami, H., El Berbri, I., Bouslikkhane, M., Fassi Fihri, O., Boue, F., Petavy, A.F., Dakkak, A., Welburn, S., Bardosh, K.L., 2015, 'Integrated health messaging for multiple negelected zoonoses: Approaches, challenges and opportunities in Morocco', *Acta Tropica* 152: 17-25

Ducrotoy, M., Bertu, W.J., Matope, G., Cadmus, S., Conde-Alverez, R., Gusi, A.M., Welbrn, S., Ocholi, R., Blasco, J.M. & Moriton, I., 2017, 'Brucellosis in Sub-Saharan Africa: Current challenges for management, diagnosis and control', *Acta Tropica 165: 179-193*

El Berbri, I., Ducrotoy, M.J., Petavy, A., Fassifihri, O., Shaw, A.P., Bouslikhane, M., Boue, F., Welburn, S.C. & Dakkak, A., 2015, 'Knowledge, attitudes and practices with regard to the presence, transmission,

impact, and control of cystic echinococcosis in Sidi Kacem Province, Morocco', *Infectious diseases of Poverty* 4:48

FAO Final report: Expert consultation on community based veterinary public health (VPH) systems, 2003, viewed on 18 April 2017, at http://www.fao.org/ag/againfo/resources/en/publications/agapubs/expert_consult_report.pdf

Fuchs, I., Osyntsov, L., Refaely, Y., Ciobotaro, P. & Zimhony, O., 2016, 'Ritual Slaughter as Overlooked Risk Factor for Brucellosis.', *Emerging infectious diseases* 22(4), 746-748.

Galinska, E.M. & Zagorski, J., 2013, 'Brucellosis in humans--etiology, diagnostics, clinical forms.', *Annals of Agricultural and Environmental Medicine* 20(2), 233-238.

Gauteng Department of Agriculture and Rural Development, 2017, GVS annual report 2016-2017.

Gauteng Department of Agriculture and Rural Development, 2018, GVS annual report 2017-2018

Godfroid, J., Nielsen, K. & Saegerman, C., 2010, 'Diagnosis of Brucellosis in Animals', *Croatian Medical Journal* 51:296-305

Godfroid, J., Bosman, P., Herr, S. & Bishop, G.C., 2017, 'Brucellosis', in Coetzer, J.A.W. & Tustin R.C. eds., 2004, *Infectious diseases of livestock*, Oxford University Press, Cape Town

Gomo, C., de Garine-Wichatitsky, M., Caron, A., Pfukenyi, D.M., 2012, 'Survey of brucellosis at the wildlife-livestock interface on the Zimbabwean side of the Great Limpopo Transfrontier Conservation Area', *Tropical Animal Health and Production, 44(1): 77-85*

Goode, R., n.d., *Slaughtering an ox for the Xhosa umkhopho ritual*, viewed on 18 April 2017 from http://www.southafrica.net/za/en/articles/entry/article-SouthAfrica.net-xhosa-umkhopho-ritual/

Govindasamy, K., Geertsma, P.J. & Abernathy, D.A., 2016, 'Gauteng Brucellosis herd and cattle prevalence survey, Nov 15- Mar 16', Presentation for 14th SASVEPM annual congress, Kempton Park, Gauteng, South Africa, 24-26 August 2016.

Govindasamy, K., Geertsma, P.J, 2016, 'Gauteng farm census April 16 – October 16', *Veterinary Services Annual Strategy Review*, Gauteng Department of Agriculture and Rural Development

Heddleson, R.A. & Doores, S., 1993, 'Factors affecting microwave heatiing of foods amd microwave induced destruction of foodborne pathogens - a review', *Journal of Food Protection* 57, 1027

Heise, E.R., 1982, Diseases Associated with Immunosuppression, *Environmental Health Perspectives* 43: 9-19

Henning LN, Miller SM, Pak DH, Lindsay A, Fisher DA, Barnewall R, et al., 2012, Pathophysiology of the rhesus macaque model for inhalational brucellosis. Infect Immun. 80:298–310. http://dx.doi.org/10.1128/IAI.05878-11

Herenda, D, 2000, 'Manual on meat inspection for developing countries', in *Guidelines for minimum post mortem inspection requirements (cattle, horses, sheep & goats, pigs and game)*, Food and Agriculture Organization of the United Nations, viewed on 21 May 2018, from http://www.fao.org/docrep/003/t0756e/t0756e01.htm,.

Hirokawa, K., Utsuyama, M., Kasai, M., Kurashima, C., 1992, 'Aging and immunity', *Acta Pathol Jpn.* 42 (8): 537-548

Joburg Department Value Statement, n.d., viewed on 30 June 2018, from https://www.joburg.org.za/departments_/Pages/City%20directorates%20including%20departmental%20sub-directorates/economic%20dev/Value-statement.aspx

Krosnick, J.A. & Presser, S., 2010, 'Question and Questionnaire design', in Marsden, P.V. & Wright, J.D. (eds.), *Handbook of Survey Research*, 2nd edn., pp. 263-313, Emerald Group publishing LTD, Bingley

LPSN-List of prokaryotic names with standing in nomenclature (bacterio.net), 'Genus Brucella', viewed 17 December 2018 from www.bacterio.net/brucella.html

Mabandu, P., Bongela, M., Sosibo, K. & Mkhwanazi, K., 08 April 2016, 'Cows: The sacred and the profane', Mail and Guardian, viewed on 30 August 2018 from https://mg.co.za/article/2016-04-07-cows-the-sacred-and-the-profane

Mableson, H.E., Okello, A., Picozzi, K. & Welburn, S.C., 2014, 'Neglected Zoonotic Diseases—The Long and Winding Road to Advocacy', Public Library of Science.

Madzingira, O., McCrindle, C.M.E., 2015, 'Retrospective analysis of the prevalence of *Brucella* antibodies in sheep in the Karas Region of Namibia', *Trop Anim Health Prod 47:1117-1120*

Manhica, A.P., 2010, 'The prevalence of brucellosis in cattle, sheep and goats in Maputo province, Mozambique. MSC thesis, University of Pretoria, South Africa

Mangalgi, S.S., Sajjan, A.G., Mohite, S.T. & Gajul, S., 2016, 'Brucellosis in Occupationally Exposed Groups.', *Journal of clinical and diagnostic research* 10(4), 24-27.

Manganyi, J.S. & Buitendag, J., 2013, 'A Critical analysis on African Traditional Religion and the Trinity', *Theological Studies* 69(1), 13

Matope, G., 2008, 'The impact of restocking communal cattle on the spread of brucellosis in Zimbabwe', DPhil thesis, Faculty of Veterinary Science, University of Zimbabwe, Harare, Zimbabwe.

McCrindle, C.M.E., 2008, *Ritual slaughter in South Africa*, Lecture notes distributed for Veterinary Public Health lectures, University of Pretoria on 10 June 2008.

McDermott, J.J., Arimi, S.M., 2002, 'Brucellosis in sub-Saharan Africa: epidemiology, control and impact', *Vet. Microbiol*. 90: 111–134, http://dx.doi.org/10.1016/ s0378-1135(02) 00249-3

Michel, A.L., Meyer, S., McCrindle, C.M.E., Veary, C.M., 2003, 'Community based Veterinary Public Health Systems in South Africa- Current Situation, Future Trends and Recommendations', FAO Final report: Expert consultation on community based veterinary public health (VPH) systems, pp64-70

Municipalities of South Africa, Gauteng Municipalities, 2012, viewed on 30 June 2018, from https://municipalities.co.za/provinces/view/3/gauteng

Nouh, M.A., El Bassuoni, M.A., Anis S.E., Masoud, B.M., Albakrawy, W.M., 2015, 'Incidence of false-positive seroreactivity to brucellosis in tuberculosis patients', *Menoufia Medical Journal* 28:453-456

Ndengu, M., Matope, G., de Garine-Wichatitsky, M., Tivapasi, M., Scacchia, M., Bonfini, B., Pfukenyi, D.M., 2017, 'Seroprevalence of brucellosis in cattle and selected wildlife species at the selected livestock/wildlife interface areas of the Gonarezhou National Park, Zimbabwe', *Preventative Veterinary Medicine 146: 158-165*

OIE, 2016, 'Brucellosis (Brucella abortus, B. melitensis and B. suis) (infection with B. abortus, B. melitensis and B. suis)', in *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals 2018*, viewed 22 December 2018, from http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/2.01.04_BRUCELLOSIS.pdf

OIE, 2018a, *General disease information sheets; Brucellosis*, viewed on 30 May 2018, from http://www.oie.int/doc/ged/D13938.PDF

OIE, 2018b, '*Brucella abortus* world distribution map', World Animal Health information database (WAHIS Interface), viewed on 27 December 2018, from http://www.oie.int/wahis_2/public/wahid.php/Diseaseinformation/Diseasedistributionmap/index/newlang/en?disease_type_hidden=&disease_id_hidden=&selected_disease_name_hidden=&disease_type=0&disease_id_terrestrial=182&species_t=0&disease_id_aquatic=-999&species_a=0&sta_method=semesterly&selected_start_year=2017&selected_report_period=2&selected_start_month=1&date_submit=OK

Pasquali, P., 2002, 'VPH problems of immunodepressed persons', UNAIDS/WHO Joint United Nations Programme on HIV/AIDS. AIDS Epidemic Update: December 2002. United Nations, Geneva, Switzerland, www.unaids.org

Phalafala, U., n.d, *The Cow: A bridge between the living and the dead*, viewed on 18 April 2017 from http://archivalplatform.org/blog/entry/the_cow_a_bridge_between_the_living_and_the_dead

Provincial veterinary services, n.d., viewed on 30 June 2018, from http://www.daff.gov.za/daffweb3/Branches/Agricultural-Production-Health-Food-Safety/Animal-Health/contacts/provincialveterinary/Gauteng

Qekwana, D.N., McCrindle, C.M.E. & Oguttu, J.W., 2014, 'Designing a risk communication strategy for health hazards posed by traditional slaughter of goats in Tshwane, South Africa', *Journal of the South African Veterinary Association* 85(1), 1-4.

Randolph, T.F., Schelling, E., Grace, D., Nicholson, C.F., Leroy, J.L., Cole, D.C., Demment, M.W., Omore, A., Zinsstag, J., Ruel, M., 2007, 'Role of livestock in human nutrition and health for poverty reduction in developing countries', *J. Anim. Sci.* 85:2788-2800

Roberts, S.J. (ed.), 1986, *Veterinary Obstetrics and genital diseases (Theriogenology)*, 3rd edn. Woodstock Publishers, VT.

Scholz, H. C., Revilla-Fernandez, S., A; Dahouk, S., Hammerl, J. A., Zygmunt, M. S., Cloeckaert, A., Koylass, M., Whatmore, A. M., Blom, J., Verhnaud, G., Witte, A., Aistleitner, K. and Hofer, E., 2016. *Brucella vulpis* sp. nov., isolated from mandibular lymph nodes of red foxes (*Vulpes vulpes*). *Int. J. Syst. Evol. Microbiol.*, **66**, 2090-2098.

Shaw, A.C., Goldstein, D.R., Montgomery, R.R., 2013, 'Age-dependent dysregulation of innate immunity', *Nat Rev Immunol.* 13(12): 875-887

Sincero, S.M., 2012, Surveys and Questionnaires - Guide. Accessed Jun 21, 2017 from https://explorable.com/surveys-and-questionnaires

Sola, M.C., da Veiga Jardim, E.A.G., de Freitas, M.R. & de Mesquita, A.J., 2014, 'Real-time PCR detection of *Brucella spp*. DNA in lesions and viscera of bovine carcasses.', *Journal of microbiological methods* 104, 87-91.

South Africa, 1984, Animal Diseases Act 35 of 1984, available at: https://www.nda.agric.za/doaDev/sideMenu/APIS/doc/ANIMAL%20DISEASES%20ACT.htm

South Africa, 2000, Meat Safety Act 40 of 2000, available at:

www.nda.agric.za/doaDev/sidemenu/APIS/doc/MEATSAFETY.pdf [Accessed on: 18 April 2017]

Statistics South Africa, 2012, 2011 Census; Census in brief, viewed on 30 June 2018, from http://www.statssa.gov.za/census/census_2011/census_products/Census_2011_Census_in_brief.pdf

Statistics South Africa, 2014, *Causes of death 2013*, viewed on 18 April 2017 from http://www.statssa.gov.za/?page_id=737&id=3

Statistics South Africa, 2016a, *Mortality and causes of death in South Africa 2015: Findings from death notification*, pp.27-40, StatsSA, Pretoria

Statistics South Africa, 2016b, *Mid-year population estimates 2016*, pp.1, StatsSA, Pretoria accessed 20 June 2017, from https://www.statssa.gov.za/publications/P0302/P03022016.pdf

Statistics South Africa, 2017, 'Mid-year population estimates', Statistical release P0302, viewed on 30 June 2018, from http://www.statssa.gov.za/publications/P0302/P03022017.pdf

Shange, N., 2013, 'Shembe religion's integration of African Traditional Religion and Christianity: A sociological case study', M.A. thesis, Dept. Sociology, Rhodes University.

Strydom, S., 2016, Brucella melitensis – a forgotten disease?, *Epidemiology, Directorate Animal Health, Department of Agriculture, Forestry and Fisheries*, Departmental press release, viewed on 28 May 2018, from http://www.savc.org.za/pdf_docs/Brucella_melitensis.pdf

Sundermeier,T., 1998, 'Attachment to Animals', in *The individual and community in African traditional religions*, pp.108-110, Transaction Publishers, New Brunswick.

Tanner, M., Inlameia, O., Michel, A., Maxlhuza, G., Pondja, A., Fafetine, j., Macucule, B., Zacarias M., Manguele, J., Moiane, I.C., Marranangumbe, A.S., Mulandane, F., Schonfeld, C., Moser, I., van Helden, P., Machado, A., 2015, 'Bovine Tuberculosis and Brucellosis in Cattle and African Buffalo in the Limpopo National Park, Mozambique', *Transboundary and Emerging Diseases 62:632-638*

Trochim, W.M.K., 2006, Research Methods Knowledge Base, accessed on 22 June 2017 at https://www.socialresearchmethods.net/kb/survtype.php

University of Sheffield, 2014, *Questionnaires*, viewed 22 June 2017 from https://www.sheffield.ac.uk/lets/strategy/resources/evaluate/general/methods-collection/questionnaire

van der Merwe M., Bekker J. L., van der Merwe P., Michel A., 2009, 'Cooking and drying as effective mechanisms in limiting the zoonotic effect of *Mycobacterium bovis* in beef', *Journal of the South African Veterinary Association* 80(3), 142-145

Vieira-Pinto, M., Temudo, P. and Martins, C., 2005, 'Occurrence of *Salmonella* in the Ileum, Ileocolic Lymph Nodes, Tonsils, Mandibular Lymph Nodes and Carcasses of Pigs Slaughtered for Consumption', *Journal of Veterinary Medicine*, Series B (52), 476-481

WHO, 2004, 'Brucellosis' in *Control of Communicable Diseases Manual*, 18th edn, pp. 82-85, World Health Organisation.

WHO, 2017, *Neglected Tropical Diseases*, viewed on 18 April 2017 from http://who.int/neglected_diseases/diseases/zoonoses_figures/en/

Wojno, J., Moodley, C., Pienaar, J., Beylis, N., Jacobsz, L., Nicol, M., Rossouw, J., Bamford, C., 2016, 'Human brucellosis in South Africa: Public health and diagnostic pitfalls', *South African Medical Journal* 106(9).

8 APPENDICES

8.1 PARTICIPANT'S INFORMATION & INFORMED CONSENT DOCUMENT

STUDY TITLE: Human health risk assessment of informal slaughter, focusing on *Brucella abortus*, in small scale farmers of Gauteng.

SPONSOR: University of Pretoria, University of Antwerp and Gauteng Department of Agriculture and Rural Development

Principal Investigator: Dr G Declercq, BVSc, Community State Veterinarian

DATE AND TIME OF INFORMED CONSENT DISCUSSION:

Date: …….

INTRODUCTION

You are invited to volunteer for a research study. This information leaflet is to help you to decide if you would like to participate. Before you agree to take part in this study you should fully understand what is involved. If you have any questions, which are not fully explained in this leaflet, do not hesitate to ask the investigator. You should not agree to take part unless you are completely happy about all the procedures involved.

THE NATURE AND PURPOSE OF THIS STUDY

You are invited to take part in a research study. The aim of this study is to evaluate if people are at risk of disease through informal livestock slaughter, specifically brucellosis, also known as contagious abortion. By doing so we wish to learn more about *Brucella abortus,* the cause of brucellosis. Some problems could be serious and if identified early could save you from having problems later on.

EXPLANATION OF PROCEDURES TO BE FOLLOWED

This study involves answering some questions with regard to your previous experience, either direct or indirect, with informal slaughter. We will be asking questions about which animals are slaughtered, how the carcass is handled and how the edible animal products are prepared. The interviewer will ask you the questions and complete the questionnaire on your behalf.

POSSIBLE BENEFITS OF THIS STUDY.

This study aims to assess if there is a risk of disease through informal slaughter, and if so, teach people involved how to reduce or eliminate this risk through protective clothing and preventative action.

I understand that if I choose not to participate in this study, it will have no effect on the services I receive from the department of agriculture or its employees.

I may at any time withdraw from this study.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This Protocol was submitted to the Faculty of Health Sciences Research Ethics Committee, University of Pretoria, telephone numbers 012 356 3084 / 012 356 3085 and written approval has been granted by that committee. The study has been structured in accordance with the Declaration of Helsinki (last update: October 2013), which deals with the recommendations guiding doctors in biomedical research involving human/subjects. A copy of the Declaration may be obtained from the investigator should you wish to review it.

INFORMATION

If I have any questions concerning this study, I should contact:

Dr. Gillian Declercq. tel : 076 733 9886

CONFIDENTIALITY

All records obtained whilst in this study will be regarded as confidential. Results will be published or presented in such a fashion that patients remain unidentifiable.

CONSENT TO PARTICIPATE IN THIS STUDY.

I have read or had read to me in a language that I understand the above information before signing this consent form. The content and meaning of this information have been explained to me. I have been given opportunity to ask questions and am satisfied that they have been answered satisfactorily. I understand that if I do not participate it will not alter my management in any way. I hereby volunteer to take part in this study.

.....	.....
Participant signature	Date
.....	.....
Interviewer name	Date
.....	.....
Interviewer signature	Date
.....	.....
Witness name and signature	Date

8.2 STUDY QUESTIONNAIRE

Human health risk assessment associated with informal slaughter

A questionnaire-based risk assessment

Demographics

Please tick where appropriate:

1. Your Age:

18-25yrs	26-35 yrs	36-55 yrs	Older than 55yrs

2. Number of people in household:

Please specify:

3. Financial status:

Currently Employed	Self Employed	Unemployed	SASSA grant	Pensioner

Livestock composition:

4. Do you personally own livestock such as cattle, sheep, goats, pigs?

YES	NO

4.1 If No; do you handle live animals such as livestock more than once a week?

YES	NO

4.2 If Yes, how often do you work with livestock?

Daily	Once a week	Once a Month	Less than once a month

5. If you personally own livestock, please indicate how many animals are directly owned?

Cattle	
Sheep	
Goats	
Pigs	
Horses/Donkeys	
Other: Please Specify	

5.1 Have your animals ever been tested for CA/Brucellosis?

Yes	No	I don't know

5.1.1 If Yes, when were they tested?

Less than 6 weeks ago	Less than 6 months ago	More than 6 months ago	I can't remember

5.2 Do you know if your animals tested positive or negative?

I do not know	Positive	Negative

6 Have your animals ever been tested for Tuberculosis?

YES	NO	I don't know

6.1 If Yes; do you know if your animals tested positive or negative?

I do not know	Positive	Negative

7 Have any of your cattle aborted in last 6 months?

YES	NO	I don't know

7.1 If yes: How big was the aborted calf?

As big as a rat	As big as a cat	As big as dog	As big as a new born calf

7.2 Was the aborted calf covered in hair?

Yes	No	I don't know

7.3 If yes: What did you do with the aborted calf?

Left it in veld	Buried it	Burnt it	Gave it to dogs
Other (Please specify)			

Slaughter characteristics:

8 How often are animals slaughtered? (Excluding poultry)
Please tick appropriate box:

Daily	Once or twice a week	Once or twice a month	Once or twice a year	Never

8.1 Which animals are most often slaughtered?

Cattle	Sheep	Goats	Pigs	Horses/Donkeys
Other (Specify):				

9 Sex of animal most often slaughtered

Male	Female	Both	Not important

9.1 Do you have your own animals slaughtered? YES | NO

9.2 Will you slaughter an injured animal and use the meat? YES | NO

9.3 Will you slaughter a sick animal and use the meat? YES | NO

9.4 Do you purchase animals specifically to be slaughtered? YES | NO

9.4.1 If yes, where do you purchase the animals from?

Farmer	Auction	Roadside sales	Other (Specify):

10 For what purpose do you slaughter?

Home consumption	Cultural /religious	Special occasion	To Sell
Other (Specify):			

11 Who slaughters the animal?

Self	Family Member	Friend	Neighbour	Hired personnel

11.1 Is the person who usually slaughters the animal a man or a woman?

Man	Woman

12 When you slaughter, does the person dressing the carcass wear any protective equipment such as overalls, gumboots, gloves, mask or goggles?

YES	NO

12.1 If Yes, which:

Overalls	Gumboots	Gloves	Mask	Eye protection
Other(Specify):				

13 Do you consume the offal (any of the following: Heart, lungs, liver, Stomach/Rumen, intestines)

YES	NO

13.1 If Yes, which offal do you consume?

Heart	Lungs	Liver	Kidneys
Rumen/Stomach	Intestines	Uterus	Diaphragm

13.2 If Offal consumed, how is it prepared?

Raw (Specify Organ):	
Cooked:	Less than 5min
	5-10 min
	10-15 min
	15-30 min
	More than 30min
Preserved:	Drying
	Smoking
	Salting
	Pickling
	Freezing
	Other (Specify):

14 If an organ looks abnormal (Colour, smell, presence of lesions/haemorrhage)
Please see images on last page for examples.

Do nothing and use organ	Cut out abnormal part	Throw away whole organ	Do not use any of the organs of that animal
Other (Specify):			

15 If you throw away an abnormal organ (piece or whole); what do you do with it?

Throw in veld	Give to dogs	Burn in fire	Bury
Other (Specify):			

16 Do you consume or use the lymphnodes?
See images on page titled 'Images of lymphnodes'

Yes, they are used/ with the meat	Yes, they are removed and used separately	No, they are removed and not used	I don't know, I don't recognise them
Other (Specify):			

16.1 If yes, are the lymph nodes used/consumed raw or cooked?

Consumed raw	Consumed cooked
Used Raw *Please specify use:*	Used cooked *Please specify use:*

17 Do you use the skin of a slaughtered animal?

Yes, always	No, never	Only occasionally

17.1 If you keep the animal skin, what do you do with it?

Sell to Tannery	Cure myself for leather/hide	Cure as mat for household use	Use for Isiphandla
Other (Specify):			

18 Are any parts of the carcass not used after slaughter?

Yes	No	I don't know

18.1 If Yes, which parts of the carcass are not used after slaughter?

Please specify:

18.2 If parts of the carcass remain, what is done with the remains?

Throw in trash bin	Give to dogs	Burn in Fire	Bury
Other (Specify):			

19 In your opinion, can humans get diseases from animals?

Yes	No

19.1 If Yes, from where?

Live animals	Dead animals	Through slaughtered animals

19.2 If yes, which diseases?

Please specify:

The End

Thank you for your participation

Comments:

8.3 QUESTIONNAIRE IMAGES: DISEASED ORGANS

Images of diseased livestock organs:

Figure 8.1: Liver.

http://repository.up.ac.za/bitstream/handle/2263/32685/rvf-017.jpg?sequence=1&isAllowed=y

Figure 8.2: Intestines.

http://www.afrivet.co.za/veld_talk/article10/article%2010.1.jpg

Figure 8.3: Bovine Kidney.
http://www.ecvpath.org/wp-content/uploads/2012/10/10_12.jpg

8.4 QUESTIONNAIRE IMAGES: LYMPH NODES

Images of lymph nodes

Figure 8.4: Mesenteric lymph nodes http://www.angoras.co.za/article/how-to-conduct-a-basic-post-mortem-on-an-angora-goat

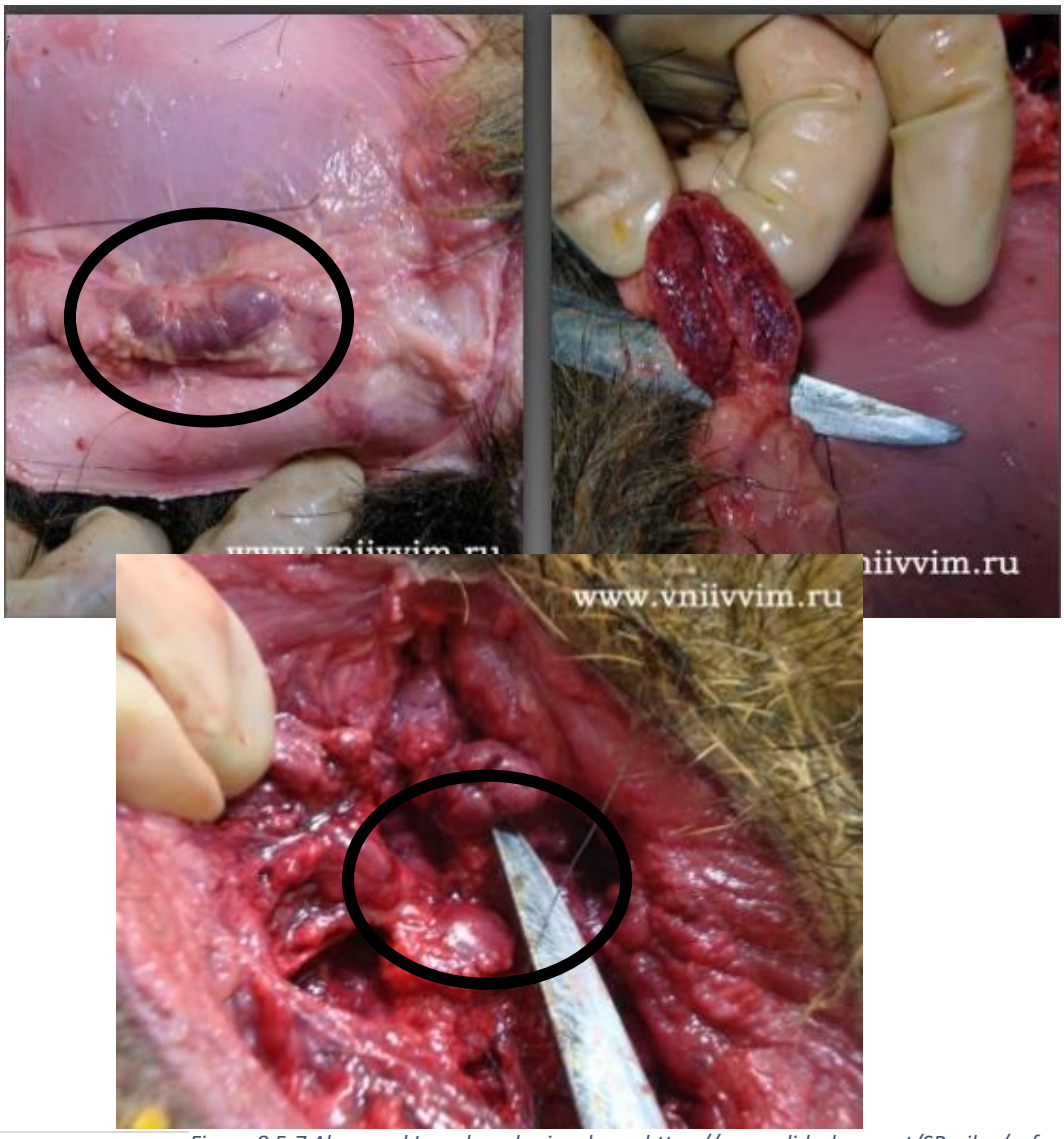
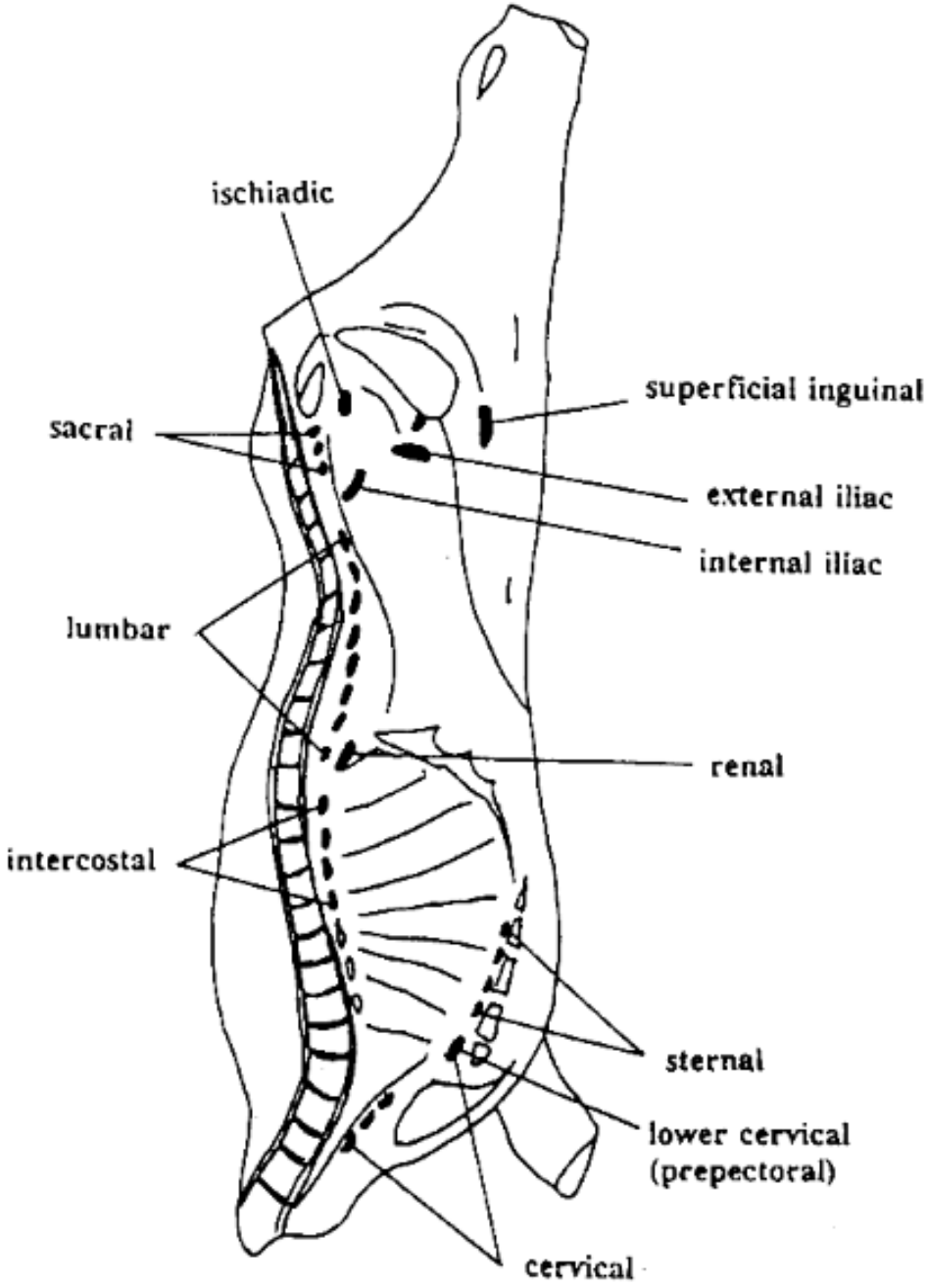


Figure 8.5-7 Abnormal Lymph nodes in a boar. https://www.slideshare.net/SParilov/asf-on-wild-boars-in-russia

8.5 COMMON CARCASS LYMPH NODES EXAMINED DURING MEAT INSPECTION

Figure 8.6 Lymph nodes for meat inspection in carcass (Herenda, 2000)



8.6 ETHICS APPROVAL – FACULTY OF HUMANITIES RESEARCH ETHICS COMMITTEE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Research Ethics Committee

31 August 2017

Dear Ms Declerq

Project:	**Human health risk factors of informal slaughter, focusing on Brucella abortus, in small scale farmers of Gauteng**
Researcher:	**G Declerq**
Supervisor:	**Prof A Michel**
Department:	**Veterinary Tropical Diseases**
Reference number:	**28024525 (GW20170813HS)**

Thank you for the application that was submitted for ethical consideration.

I am pleased to inform you that the above application was **approved** by the **Research Ethics Committee** at a meeting held on 31 August 2017. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

Sincerely

Prof Maxi Schoeman
Deputy Dean: Postgraduate Studies and Ethics
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail:tracey.andrew@up.ac.za

CC: Prof AL Michel (Supervisor)

8.7 ETHICS APPROVAL – FACULTY OF HEALTH SCIENCES RESEARCH ETHICS COMMITTEE

The Research Ethics Committee, Faculty Health Sciences, University of Pretoria complies with ICH-GCP guidelines and has US Federal wide Assurance.
- FWA 00002567, Approved dd 22 May 2002 and Expires 03/20/2022.
- IRB 0000 2235 IORG0001762 Approved dd 22/04/2014 and Expires 03/14/2020.

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences Research Ethics Committee

12/10/2017

Approval Certificate
New Application

Ethics Reference No: GW20170813HS

Title: Human health risk assessment of informal slaughter, focusing on Brucella abortus, in small scale farmers of Gauteng

Dear Dr Gillian Declercq

The **New Application** as supported by documents specified in your cover letter dated 5/10/2017 for your research received on the 5/10/2017, was approved by the Faculty of Health Sciences Research Ethics Committee on its quorate meeting of 11/10/2017.

Please note the following about your ethics approval:
- Ethics Approval is valid for 2 years
- Please remember to use your protocol number (**GW20170813HS**) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, or monitor the conduct of your research.

Ethics approval is subject to the following:
- The ethics approval is conditional on the receipt of **6 monthly written Progress Reports**, and
- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

*** Kindly collect your original signed approval certificate from our offices, Faculty of Health Sciences, Research Ethics Committee, Tswelopele Building, Room 4.69 / 4.60.*

Dr R Sommers; MBChB; MMed (Int); MPharMed,PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes, Second Edition 2016 (Department of Health).

☎ 012 356 3084 ✉ deepeka.behari@up.ac.za / fhsethics@up.ac.za 🖳 http://www.up.ac.za/healthethics
Private Bag X323, Arcadia, 0007 - Tswelopele Building, Level 4, Room 60, Gezina, Pretoria

8.8 ETHICS APPROVAL – FACULTY OF VETERINARY SCIENCE ANIMAL ETHICS COMMITTEE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Veterinary Science
Animal Ethics Committee

Ref: V100-17

27 September 2017

Prof A Michel
Department of Veterinary Tropical Diseases
Faculty of Veterinary Science
(anita.michel@up.ac.za)

Dear Prof Michel

Project V100-17 : Human health factors associated with informal slaughter, focusing on *Brucella abortus* (G Declercq)

The following protocol was evaluated and approved at the September 2017 meeting of the Animal Ethics Committee of the University of Pretoria.

Since it is only a questionnaire is involved the panel indicated that the application should be submitted to the Humanities/Human Ethics Committee

If you have any question, please feel free to contact the committee.

Yours sincerely

Prof V Naidoo
CHAIRMAN: UP-Animal Ethics Committee

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Fakulteit Veeartsenykunde
Lefapha la Disaense tSa Bongakadiruiwa

8.9 RAW DATA

PILOT STUDY	Question nr:	1.	2.	3.	4.	4.1	4.2	5.	5.	5.1	5.1.1	5.2	6.	6.1	7.
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
1	2017/11/08	>56yrs		2 Pensioner	Yes		Daily	Cattle	63	Yes	Less than 6m ago	Negative	Yes	Negative	No
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other							
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
2	2017/11/13	36-55yrs		7 Unemployed	Yes		Daily	Cattle	43	Yes	More than 6m ago	Negative	Yes	Negative	Yes
								Sheep	104						
								Goats	79						
								Pigs	35						
								Horses/Donkey	0						
								Other	Dogs 19						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
3	2017/11/13	>56yrs		4 Unemployed	No	No	Once a month	Cattle							
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other							
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
4	2017/11/13	26-35yrs		8 Unemployed	Yes			Cattle	3	No			I don't know		No
								Sheep	2						
								Goats							
								Pigs							
								Horses/Donkey							
								Other	Broilers 50						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
5	2017/11/15	>56yrs		6	No	No		Cattle							
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other	Layers 3000						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
6	2017/11/15	26-35yrs		4 Currently Employed	Yes		Once or twice a year	Cattle	5	Yes	I cant remember	Negative	I don't know	I don't know	I don't kno
								Sheep	0						
								Goats	100						
								Pigs							
								Horses/Donkey							
								Other	poultry 500						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
7	2017/11/15	36-55yrs		5 Unemployed	No	Yes	Daily	Cattle		No		I don't know	No	I don't know	No
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other	Poultry						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
8	2017/11/15	36-55yrs		5 Unemployed	No	Yes		Cattle		No		I don't know	No	I don't know	
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other	Broilers 1000						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
9	2017/11/15	36-55yrs		5 Currently Employed	No	Yes	Once a month	Cattle		I don't know			I don't know		I don't kno
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other	Poultry						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
10	2017/11/15	36-55yrs		4 Unemployed	Yes	Yes	Daily	Cattle	yes	I don't know			I don't know		No
								Sheep	yes						
								Goats							
								Pigs							
								Horses/Donkey							
								Other							
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
11	2017/11/15	>56yrs		4 Currently Employed	No	No		Cattle		I don't know			I don't know		
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
12	2017/11/15	36-55yrs		6 Unemployed	Yes			Cattle	10	Yes	Less than 6w ago	I don't know	No		No
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other							
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
13	2017/11/15	36-55yrs		4 Currently Employed	No	Yes	Daily	Cattle		No			No		No
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other	Poultry						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
14	2017/11/15	36-55yrs		6 Unemployed	Yes		Daily	Cattle	48	No			No		No
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other	Layers 4800						
Respondent nr	Date	Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
15	2017/11/15	36-55yrs		7 Unemployed	No	No	Once a month	Cattle		I don't know			I don't know		I don't kno
								Sheep							
								Goats							
								Pigs							
								Horses/Donkey							
								Other							
Respondent nr		Age:	Nr ppl in household:	Financial Status	Own Livestock	Handle livestock often?	How often	Livestock owned	Nr owned:	CA tested:	CA tested when	CA test result	TB tested	TB test result	Aborted?
15 Total		26-35yrs	5	Unemployed	Yes	Yes	Daily	Cattle	7	Yes	Less than 6w ago	Positive	Yes	Positive	Yes
		2	Btw 2-8	9	7	5	6	Sheep	3	4	1	0	2	0	2
		36-55yrs		Currently Employed	No	No	Once a week	Goats	2	No	Less than 6m ago	Negative	No	Negative	No
		9		4	8	4	0	Pigs	1	5	1	3	5	2	7
		>56yrs		Pensioner			Once a month	Horses/Donkey	0	I don't know	More than 6m ago	I don't know	I don't know	I don't know	I don't kno
		4		1			3	Poultry	8	4	1	3	6	5	3
							Once or twice a year				I cant remember				
							1				1				

PILOT STUDY	7.1	7.2	7.3	8.	8.1	9.	9.1	9.2	9.3	9.4	9.4.1	10	11
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
1				Once-or Twice a month	Sheep	Both	No	Yes	Yes	Yes	Farmer	Special occasion	Family Member
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
2	as big as a dog	No	Fed to dogs	Once-or Twice a month	Pigs	Male	Yes	Yes	Yes	No		Home consumption	Self
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
3					Cattle Sheep Goats	Both	No	No	No	Yes	Farmer	Cultural/Religious	Family Member
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
4		Yes	Other Consumed	Once-or Twice a month	Other Poultry	female	Yes	Yes	Yes	No		Home consumption	Self
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
5				Never	Cattle Sheep	Male	No			Yes	Farmer Auction Roadside sales	Special occasion	Friend
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
6	x			Once-or Twice a month	Goats	Both	Yes	Yes		Yes	Farmer Auction Roadside sales	Home consumption Cultural/Religious Special occasion To sell meat	Family Member Friend
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
7				Once-ot twice a year	Goats	Not Important	No	Yes	Yes	Yes	Farmer Auction Roadside sales	Cultural/Religious Special occasion	Family Member Friend Neighbor
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
8				Once-ot twice a year	Cattle	Both	No	No	No			Cultural/Religious	Family Member
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
9	x					Not Important	No	No	No	Yes	Farmer	Cultural/Religious	Family Member
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
10				Once-or Twice a week	Sheep	Both	No	No	No	No		Cultural/Religious	Self
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
11				Once-or Twice a month	Cattle Sheep Goats Pigs Other	Both	Yes	Yes	Yes	No		Home consumption	Self Family Member
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
12				Never	Cattle	Male	Yes	No	No	No		Home consumption Cultural/Religious	Family Member
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
13							No	No	No	No			
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
14				Once-ot twice a year	Cattle	Male	Yes	Yes	Yes	Yes	Farmer Auction	Home consumption Cultural/Religious	Self Family Member
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
15	x				Sheep Goats	Both	Yes	No	No	No		Cultural/Religious	Self
Respondent nr	Abortus size	Abortus hair?	Abortus action	Slaughter freq	Slaughter sp.	Sex of slaughtered	slaughter own animals	slaughter injured	slaughter sick	purchase slaughtered	Purchase origin	slaughter purpose	who slaughters
15 Total	as big as a dog 1 x	No 1 Yes 1	Fed to dogs 1 Other Consumed 1	Daily 0 Once-or Twice a week 1 Once-or Twice a month 5 Once-ot twice a year 3 Never 2	Cattle 6 Sheep 6 Goats 5 Pigs 2 Other Poultry 2	Both 7 Male 4 female 1 Not Important 2	Yes 7 No 8	Yes 7 No 7	Yes 6 No 7	Yes 7 No 7	Farmer 7 Auction 4 Roadside sales 3	Home consumption 6 Cultural/Religious 9 Special occasion 3 To sell meat 1	Self 6 Family Member 9 Friend 3 Neighbor 1 Hired Personnel 0

PILOT STUDY	11.1	12.	12.1	13.	13.1	13.2			14.	15.	16.
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
1	Man	Yes	Overalls Gloves	Yes	Heart Lungs Liver Kidneys Rumen/Intestines Uterus	Cooked Preserved	>30min	Freezing	Throw away whole organ	Burn Bury	Yes consumed
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
2	Man	No		Yes	Heart Lungs Liver Kidneys Rumen/Intestines Diaphragm	Cooked Preserved	>30min	Freezing	Cut out abnormal part	Fed to dogs	No, removed & not consumed
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
3	Man	No		Yes	Heart Lungs Liver Kidneys Rumen/Intestines Diaphragm	Cooked Preserved	>30min	Salting	Do not use any of the organs	Bury	No, removed & not consumed
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
4	Man	No		Yes	Heart	Cooked	15-30min		Throw away whole organ	Bury	I don't recognise them
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
5	Man	No	Overalls	Yes	Heart Lungs Liver Kidneys Rumen/Intestines Diaphragm	Cooked Preserved	>30min	Freezing	Cut out abnormal part	Bury	I don't recognise them
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
6	Man	No		Yes	Heart Lungs Liver Kidneys Diaphragm Intestines	Cooked	>30min		Cut out abnormal part	Bury	I don't recognise them
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
7	Man	No		Yes	Heart Lungs Liver Kidneys Rumen	Cooked Preserved	15-30min >30min	Smoking Salting Pickling	Cut out abnormal part	Veld Fed to dogs	Yes consumed
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
8	Man	No				Cooked Preserved	>30min	Freezing	Do nothing and use organ	Bury	I don't recognise them
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
9	Man	No		Yes	Liver	Cooked	>30min		Do nothing and use organ		
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
10	Man	Yes	Overalls	Yes	Lungs	Cooked	>30min		Do nothing and use organ	Veld	No, removed & not consumed
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
11	Man	Yes	Overalls Gumboots	Yes	Heart Lungs Liver Kidneys Rumen	Cooked Preserved	>30min	Freezing	Cut out abnormal part	Bury	I don't recognise them
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
12	Man	No		Yes	Heart Lungs Liver Rumen	Cooked Preserved	>30min	Freezing	Cut out abnormal part	Fed to dogs	No, removed & not consumed
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
13				Yes	Liver Intestines	Cooked Preserved	>30min	Freezing	Do not use any of the organs	Burn	I don't recognise them
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
14	Man	Yes	Overalls Gumboots	Yes	Heart Lungs Liver Kidneys	Cooked	>30min		Do nothing and use organ	Bury	I don't recognise them
Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
15	Man	No		Yes	Liver	Cooked	>30min		Do nothing and use organ	Bury	No, removed & not consumed

Respondent nr	sex of slaughterer	PPE?	PPE select	Consume offal?	Offal select	Offal consumed TYPE	Offal consumed COOKED	Offal consumed PRESERVED	Abnormal offal action	Offal discard options	Lymphnodes used
15 Total	Man 14 Woman 0	Yes 5 No 10	Overalls 5 Gumboots 2 Gloves 1	Yes 14 No 0	Heart 10 Lungs 10 Liver 12 Kidneys 8 Rumen 7 Intestines 7 Diaphragm 4 Uterus 1	Raw 0 Cooked 15 Preserved 9	15-30min 2 >30min 15	Freezing 7 Smoking 1 Salting 2 Pickling 1	Do nothing and use organ 5 Cut out abnormal part 6 Throw away whole organ 2 Do not use any of the organs 2	Veld 2 Bury 9 Burn 2 Fed to dogs 3	Yes consumed 2 Yes, removed & consumed separat 0 No, removed & not consumed 4 I don't recognise them 7

PILOT STUDY	16.1	17.	17.1	18.	18.1	18.2	19.	19.1	19.2
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
1	Consumed cooked	No, never		Yes	Bones and Skin	Burn	Yes	Live animals Dead animals Slaughter	TB Bloodborne-diseases
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
2		Only Occasionally	Cure as mat for household use	Yes	Skin	Other Shade cover for animals Bedding for animals	Yes	Live animals Dead animals Slaughter	Brucellosis Lumpy Skin Pink Eye
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
3		Only Occasionally	Cure as mat for household use	No		Bury	No		
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
4		Only Occasionally	Cure as mat for household use	No		Bury	Yes	Dead animals	
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
5		No, never				Burn	Yes	Dead animals	TB
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
6		Only Occasionally	Cure as mat for household use	I don't know		Bury	Yes	Slaughter	Bird Flu Blood borne disease
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
7	Consumed raw Consumed cooked	Only Occasionally	Tannery Isiphandla	I don't know		Fed to dogs Bury	Yes		Flu
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
8	Consumed cooked		Isiphandla	Yes	Bones	Burn Fed to dogs	Yes	Live animals Dead animals Slaughter	
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
9		No, never	Cure myself for leather/hide	No		Veld	No		
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
10		Only Occasionally	Cure myself for leather/hide Isiphandla	No			Yes	Dead animals	
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
11		No, never	Other Discard	No		Bury Burn	Yes	Dead animals	
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
12		Only Occasionally	Cure as mat for household use	No			Yes	Live animals Dead animals Slaughter	
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
13		Only Occasionally	Cure as mat for household use	I don't know		Burn	Yes	Live animals Dead animals Slaughter	E.Coli Round worms
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
14		No, never		Yes	Feet Brain Stomach Intestines	Fed to dogs Bury	Yes	Live animals Dead animals Slaughter	
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
15		Only Occasionally	Cure myself for leather/hide	No		Bury	Yes	Live animals Slaughter	
Respondent nr	Lion consumed	Skin slaughtered	Skin action	Left owers	Which left owers	Left owers action	Zoonosis	Zoonosis origin	Zoonosis describe
15 Total	Consumed raw 1 Consumed cooked 2	Yes, always 0 No, never 5 Only Occasionally 9	Tannery 1 Cure myself for leather/hide 3 Cure as mat for household use 6 Isiphandla 3 Other Discard 1	Yes 4 No 7 I don't know 3	Bones 2 Skin 2 Feet 1 Brain 1 Stomach 1 Intestines 1	Veld 1 Bury 7 Burn 5 Fed to dogs 2 Other Shade cover for animals 1 Bedding for animals 1	Yes 13 No 2	Live animals 7 Dead animals 10 Slaughter 8	E.Coli Round worms Bird Flu Blood borne disease 2 Flu Brucellosis Lumpy Skin Pink Eye TB 2

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
16	26/02/2018	older than	8	SASSA gran	Yes		Less than c	Cattle	48	No			Yes	Negative	Yes	as big as a	No
								Sheep	53								
								Goats	78								
								Pigs	32								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
18	02/03/2018	36-55yrs	2	Currently E	Yes		Once a mo	Cattle	51	Yes	More than	Negative	No		No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
19	02/03/2018	older than	5	Pensioner	Yes		Less than c	Cattle	22	Yes	I cant reme	I don't kno	Yes	I don't kno	Yes	as big as a	Yes
								Sheep	1								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
20	02/03/2018	older than	2	SASSA gran	Yes		Less than c	Cattle	28	I don't know			No		Yes	as big as a	Yes
								Sheep	4								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
21	12/02/2018	older than 56yrs		SASSA gran	Yes					No			No		Yes	as big as a	No

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
22	12/02/2018	36-55yrs		Unemployr	Yes					No			No		Yes	as big as a	No

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
23	07/02/2018	older than	4	Pensioner	Yes		Once a mo	Cattle	144	Yes	I cant reme	I don't kno	No		No		
								Sheep	11								
								Goats	7								
								Horses/Do	5								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
24	09/02/2018	26-35yrs		Currently E	Yes		Once a mo	Cattle	110	No			Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
25	05/02/2018	36-55yrs	6	Unemployr	Yes		Daily	Cattle	198	Yes	More than	Negative	No		No		
								Sheep	120								
								Goats	62								
								Horses/Do	13								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
26	05/02/2018	36-55yrs	6	Unemployr	Yes			Cattle	33	Yes	More than	I don't kno	No		No		
								Sheep	7								
								Goats	27								
								Pigs	12								

Respondant nr		Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
10 Total		18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	8	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
		0	3	2	10	0	1	Sheep	6	5	0	0	3	0	5	0	3
		26-35yrs	>5	Unemployr	No	No	Once a wee	Goats	4	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
		1	4	3	0	0	0	Pigs	2	4	0	2	7	2	5	0	2
		36-55yrs		Self employed			Once a mo	Horses/Do	2	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a	dog
		4		0			3	Other	0	1	3	3	0	1	0	3	
		older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a	calf
		5		3			0				2					2	
Nr ppl in household				Pensioner													
1	0			2													
2	2																
3	0																
4	1																
5	1																
6	2																
7+	1																
Number answered Q		10	7	10	10	0	4			10	5	5	10	3	10	5	5

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
16	Fed to dog	Once ot tw	Sheep	Male	Yes	Yes	No	Yes	Farmer	Special occ	Family Mer	Man	Yes	Overalls Gumboots	Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
18		Once ot tw	Cattle	Both	Yes	Yes	No	Yes	Roadside s	Cultural/Re	Family Mer	Man	Yes	Overalls Gumboots	Yes	Heart Liver Lungs Kidneys Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
19	Bury	Never			No	Yes	No	No									
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
20	Bury	Once ot tw	Cattle	Male	Yes	Yes	Yes	No	Home core	Friend	Man				Yes	Heart Liver Kidneys Rumen Diaphragm Intestines Lungs	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
21		Never			No	Yes	No	No									
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
22		Never			No	Yes	No	No									
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
23		Once ot tw	Cattle	Both	Yes	No	No	No			Self	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
24		Never	Sheep	Male	Yes	No	No	No		Home core	Hired Pers	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
25		Never			No	No	No	Yes	Farmer Auction								
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
26		Never			No	Yes	No	No							Yes	Rumen Intestines	Cooked

Respondan	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
10 Total	Veld 0 Bury 2 Burn 0 Fed to dog 1	Daily 0 Once or Tw 0 Once or Tw 0 Once ot tw 4 Never 6	Cattle 3 Sheep 2 Goats 0 Pigs 0 Other 0	Both 2 Male 3 Female 0 Not Important 0	Yes 5 No 5	Yes 7 No 3	Yes 1 No 9	Yes 3 No 7	Farmer 2 Auction 1 Roadside s 1	Home core 2 Cultural/Re 1 Special occ 1 To sell mec 0	Self 1 Family Mer 2 Friend 1 Neighbor 0 Hired Personnel 1	Man 5 Woman 0	Yes 2 No 2	Overalls 2 Gumboots 2 Gloves 0 Mask 0 Eye protection 0 Other 0	Yes 6 No 0	Heart 5 Lungs 5 Liver 5 Kidneys 5 Rumen 6 Intestines 6 Diaphragm 5 Uterus 0	Raw 0 Cooked 6 Preserved 0
Number an	3	10	5	5	10	10	10	10	4	4	5	5	4	4	6	37	6

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
16	>30min	Freezing	Throw awa	Bury	No, removed & not co		No, never		No			No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
18	>30min		Throw awa	Fed to dog	No, removed & not co		No, never		Yes	Intestinal c Horns	Bury	Yes		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
19												Yes	Slaughter	Diarrhoea

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
20	>30min	Freezing	Throw awa	Fed to dog	Yes consun	Consumed	No, never		No			No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
21												No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
22												No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
23	>30min	Freezing	Throw awa	Bury	No, removed & not co		No, never		Yes	Horns Hooves	Burn	No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
24	>30min	Freezing	Throw awa	Bury	Yes consun	Consumed	Yes, always	Tannery	Yes	Horns		Yes	Dead anim Slaughter	Rotten Meat

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
25							No, never					Yes	Dead anim	TB

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
26	>30min		Do not use	Bury			No, never					Yes	Live anima Dead animals	Ticks

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis describe
10 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, always	Tannery	Yes	Horns	Veld	Yes	Live anima	Ticks
	0	0	0	0	2	0	1	1	3	3	0	5	1	1
	10-15min	Smoking	Cut out ab	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Hooves	Bury	No	Dead anim	TB
	0	0	0	4	0	2	6	0	2	1	1	5	3	1
	15-30min	Salting	Throw awa	Burn	No, removed & not co		Only Occas	Cure as ma	I don't kno	Intestinal c	Burn		Slaughter	Rotten Meat
	0	0	5	0	3	0	0	0	0	1	1		2	1
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla			Fed to dogs			Diarrhoea
	6	0	1	2	0			0			0			1
		Freezing	Other					Other			Other			
		4	0					0						
		Other												
		0												
Number an		6	4	6	6	5	2	7	1	5		2	10	6

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
27	05/04/2018	36-55yrs	7	Self employ	Yes		Less than c	Cattle	2	No			No		No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
28	05/04/2018	older than	2	Self employ	Yes		Less than c	Cattle	100	No			No		No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
29		36-55yrs	7	Currently E	Yes		Daily	Cattle	27	Yes	More than	Negative	Yes	Negative	Yes	as big as a	Yes

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
30		36-55yrs	5	Unemploye	No	Yes	Once a week			No			No		No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
31	28/04/2018	36-55yrs	9	Currently E	Yes			Cattle	9	Yes	More than	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
32	28/04/2018	older than	3	SASSA gran	Yes		Daily	Cattle	7	Yes	Less than 6	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
33	28/04/2018	26-35yrs	6	Currently E	Yes		Once a mo	Cattle	3	Yes	More than	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
34	28/04/2018	36-55yrs	5	Pensioner	Yes		Daily	Cattle	12	Yes	More than	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
35	28/04/2018	older than	2	SASSA gran	Yes		Daily	Cattle	4	Yes	Less than 6	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
36	30/04/2018	older than	7	Self employ	Yes		Daily	Cattle	100	No			No		I don't know		
								Goats	7								

Respondant nr		Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus sii	Abortus ha
10 Total		18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	8	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
		0	3	3	8	1	5	Sheep	0	6	2	0	6	0	1	0	0
		26-35yrs	>5	Unemploye	No	No	Once a wee	Goats	1	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
		1	6	1	1	0	1	Pigs	0	3	0	6	3	6	7	0	1
		36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a	dog
		4		2			1	Other	0	0	4	0	0	0	1	0	
		older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a	calf
		4		2			0				0					1	
				Pensioner													

Nr ppl in household	
1	0
2	2
3	1
4	0
5	2
6	1
7+	4

Number answered Q	9	9	9	9	1	7				9	6	6	9	6	9	1	1

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
27		Never															

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
28		Never															

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
29	Bury	Once ot tw	Cattle	Not Import	No	No	No	No		Cultural/Re	Self	Man	Yes	Gumboots	Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
30		Never			No	Yes	Yes	Yes	Roadside s	Cultural/Re	Family Mer	Man	Yes	Overalls	Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
31		Once ot tw	Cattle	Male	Yes	Yes	No	No		Cultural/Re	Family Mer	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
32		Once ot tw	Cattle	Both	Yes	No	No	Yes	Farmer	Cultural/Re	Self Family Member	Man	Yes	Gumboots Mask	Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked Cooked
33		Once ot tw	Cattle	Female	No	No	No	No		Special occ	Family Mer	Man	No		Yes	Heart Intestines	Cooked Cooked
34		Once ot tw	Cattle	Female	Yes	No	No	Yes	Farmer	Cultural/Re	Self	Man	Yes	Gloves	Yes	Heart Lungs Liver Rumen Intestines	Cooked Cooked Cooked
35		Once ot tw	Cattle	Both	Yes	No	No	Yes		Cultural/Re	Self Family Member	Man	Yes	Overalls Gloves Eye protection	Yes	Heart Lungs Liver Kidneys Rumen	Cooked
36		Once ot tw	Cattle	Both	Yes	No	No	Yes	Farmer	Cultural/Re	Self	Man	Yes	Gumboots Gloves	Yes	Liver Intestines	Cooked

Respondan	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
10 Total	Veld 0 Bury 1 Burn 0 Fed to dog 0	Daily 0 Once or Tw 0 Once or Tw 0 Once ot tw 7 Never 2	Cattle 7 Sheep 0 Goats 0 Pigs 0 Other 0	Both 3 Male 1 Female 2 Not Important 1	Yes 5 No 3	Yes 2 No 6	Yes 1 No 7	Yes 5 No 3	Farmer 3 Auction 0 Roadside s 1	Home cons 0 Cultural/Re 7 Special occ 1 To sell mea 0	Self 5 Family Mer 5 Friend 0 Neighbor 0 Hired Personnel 0	Man 8 Woman 0	Yes 6 No 2	Overalls 2 Gumboots 3 Gloves 3 Mask 1 Eye protection 1 Other 0	Yes 8 No 0	Heart 7 Lungs 6 Liver 7 Kidneys 5 Rumen 6 Intestines 7 Diaphragm 4 Uterus 0	Raw 0 Cooked 12 Preserved 0
Number an	1	9	7	7	8	8	8	8	4	8	10	8	8	10	8	42	12

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
27												Yes	Live animals Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
28												Yes	Live animal	Lumps

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
29	>30min	Freezing	Throw awa	Bury	No, removed & not co		Only Occas	Cure mysel	Yes	Horns	Bury	Yes	Dead animals	
								Cure as mat for housel		Repro organs				
								Isiphandla						

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
30	>30min	Freezing	Cut out ab	Bury	No, removed & not co		Only Occas	Cure as ma	Yes	Tail	Bury	No		
				Fed to dogs				Isiphandla		Repro orga	Burn			
											Fed to dogs			

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
31	>30min		Do not use	Burn	No, removed & not co		Yes, always	Other	Yes	Repro orga	Burn	Yes	Dead anim	Diarrhoea
								make ropes						

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
32	>30min		Throw awa	Burn	No, removed & not co		No, never		Yes	Skin	Burn	Yes	Live anima	Cattle gene
										Bones			Slaughter	
	15-30min									Horns			Dead animals	
										Repro organs				

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
33	15-30min		Do not use	Bury	No, removed & not co		No, never		Yes	Skin	Bury	Yes	Dead anim	The smell c
	>30min									Horns				

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
34	15-30min		Do not use	Bury	No, removed & not co		No, never		Yes	skin	Bury	Yes	Dead animals	
	10-15min													
	>30min													

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
35	>30min	Smoking	Throw awa	Burn	I don't recognise them		No, never		Yes		Bury	Yes	Live anima	All disease
		Freezing									Burn		Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
36	10-15min	Salting	Do not use	Bury	I don't recognise them		Yes, always	Cure as ma	I don't know		Bury	Yes	Dead animals	

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
10 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, always	Tannery	Yes	Bones	Veld	Yes	Live anima	Diarrhoea
	0	0	0	0	0	0	2	0	7	1	0	9	4	1
	10-15min	Smoking	Cut out ab	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Horns	Bury	No	Dead anim	The smell c
	2	1	1	5	0	0	4	1	0	3	6	1	8	1
	15-30min	Salting	Throw awa	Burn	No, removed & not co		Only Occas	Cure as ma	I don't kno	Repro orga	Burn		Slaughter	Cattle gene
	3	1	3	3	6	0	2	3	1	4	4		1	1
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla		Skin	Fed to dogs			Lumps
	7	0	4	1	2			2		3	1			1
		Freezing	Other					Other		Tail	Other			All disease
		3	0					1		1				1
		Other												
		0												
Number an		12	5	8	9	8	0	8	7	8		11	10	13

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
37	01/05/201	older than older than 56yrs	6	Self emplo	Yes		Daily	Cattle	100	No			No		I don't know		
38	29/04/201	older than older than 56yrs	4	Unemploy	Yes		Daily			Yes	Less than 6	I don't kno	No		No		
								Goats	40								
39	29/04/201	36-55yrs	5	Currently E	Yes		Daily	Cattle	3	No			No		No		
40	30/04/201	older than	5	Pensioner	Yes		Daily	Cattle		No			No		No		
								Goats	6								
41	01/05/201	older than older than 56yrs	6	Pensioner	Yes		Daily	Cattle	100	No			No		No		
								Goats	5								
42	01/05/201	older than 56yrs older than 56yrs		Pensioner	Yes		Daily	Cattle	5	No			No		I don't know		
43	01/05/201	18-25yrs	6	Currently E	Yes		Daily	Cattle	14	Yes	Less than 6	Negative	Yes	Negative	No		
								Goats	7								
44	01/05/201	26-35yrs	5	Currently E	Yes		Daily	Cattle	12	Yes	Less than 6	Negative	Yes	Negative	No		
								Sheep	7								
								Pigs	4								
45	01/05/201	36-55yrs	4	SASSA gran	Yes		Once a mo	Cattle	9	Yes	Less than 6	Negative	Yes	Negative	No		
								Sheep	4								
								Goats	7								
46	01/05/201	36-55yrs	5	Unemploy	Yes		Once a mo	Cattle	10	Yes	Less than 6	Negative	Yes	Negative	No		
								Sheep	6								

Respondant nr	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
10 Total	18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	9	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
	1	2	3	10	0	8	Sheep	3	5	3	0	4	0	0	0	0
	26-35yrs	>5	Unemploy	No	No	Once a we	Goats	5	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
	1	7	2	0	0	0	Pigs	1	5	2	4	6	4	8	0	0
	36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a	dog
	3		1			2	Other	0	0	0	1	0	0	2	0	
	older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a	calf
	9		1			0				0					0	
			Pensioner													
			3													

Nr ppl in household	
1	0
2	0
3	0
4	2
5	4
6	3
7+	0

Number answered Q	14	9	10	10	0	10				10	5	5	10	4	10	0	0

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
37		Once ot tw	Cattle	Both	Yes	No	No	Yes	Farmer	Cultural/Religious		Man	Yes	Gumboots Gloves	Yes	Liver Intestines	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
38		Once ot tw	Cattle	Both	Yes	Yes	No	Yes	Farmer	Cultural/Re	Self	Man	Yes	Gumboots Gloves	Yes	Liver Intestines	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
39		Once ot tw	Cattle	Both	No	No	No	Yes	Farmer	Cultural/Re	Family Mer	Man	Yes	Overalls	Yes	Heart Liver Intestines	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
40		Once ot tw	Cattle	Both	No	No	No	Yes	Farmer	Cultural/Re	Self	Man	No		Yes	Liver Intestines	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
41		Once ot tw	Cattle	Both	Yes	Yes	No	Yes	Farmer	Cultural/Re	Self	Man	Yes	Gumboots Gloves	Yes	Liver Intestines	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
42		Once ot tw	Cattle		Yes	No	No	Yes	Farmer	Cultural/Religious		Man	Yes	Gumboots Gloves	Yes	Intestines	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
43		Never															
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
44		Never															
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
45		Never															
Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
46		Never															
Respondan	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter g	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
10 Total	Veld 0 Bury 0 Burn 0 Fed to dog 0	Daily 0 Once or Tw 0 Once or Tw 0 Once ot tw 6 Never 4	Cattle 6 Sheep 0 Goats 0 Pigs 0 Other	Both 5 Male 0 Female 0 Not Important 0	Yes 4 No 2	Yes 2 No 4	Yes 0 No 6	Yes 6 No 0	Farmer 6 Auction 0 Roadside s 0	Home cons 0 Cultural/Re 6 Special occ 0 To sell mea 0	Self 3 Family Mer 1 Friend 0 Neighbor 0 Hired Personnel 0	Man 6 Woman 0	Yes 5 No 1	Overalls 1 Gumboots 4 Gloves 4 Mask 0 Eye protection 0 Other 0	Yes 6 No 0	Heart 1 Lungs 0 Liver 5 Kidneys 0 Rumen 0 Intestines 6 Diaphragm 0 Uterus 0	Raw 0 Cooked 6 Preserved 0
Number an	0	10	6	5	6	6	6	6	6	6	4	6	6	9	6	12	6

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
37	10-15min		Do not use	Bury	I don't recognise them		Yes, alway	Cure as ma	No		Bury	Yes	Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
38	10-15min	Salting	Do not use	Bury	I don't recognise them		Yes, alway	Cure as ma	I don't know		Bury	No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
39	10-15min	Drying	Throw awa	Veld	No, removed &	not cor	Yes, alway	Cure mysel	No		Veld	Yes	Slaughter	Diarrhoea
		Salting		Bury							Bury			Gastrointe

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
40	10-15min	Salting	Do not use	Bury	I don't recognise them		Yes, alway	Cure as ma	No		Bury	Yes	Dead anim	Gastrointe

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
41	10-15min	Salting	Do not use	Bury	I don't recognise them		Yes, alway	Cure as ma	I don't know		Bury	Yes	Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
42	15-30min		Do not use	Bury	I don't recognise them		Yes, alway	Cure as ma	I don't know		Bury	Yes	Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
43												Yes	Live anima	Brucellosis

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
44												Yes	Dead anim	Anthrax

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
45												Yes	Live anima	TB

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
46												Yes	Live anima	Brucellosis

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
10 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, alway	Tannery	Yes		Veld	Yes	Live anima	Brucellosis
	0	1	0	1	0	0	6	0	0		1	9	3	2
	10-15min	Smoking	Cut out abr	Bury	Yes, remov	Consumed	No, never	Cure mysel	No		Bury	No	Dead anim	Anthrax
	5	0	0	6	0	0	0	1	3		6	1	5	1
	15-30min	Salting	Throw awa	Burn	No, removed &	not cor	Only Occas	Cure as ma	I don't know		Burn		Slaughter	Diarrhoea
	1	4	1	0	1	0	0	5	3		0		1	1
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla			Fed to dogs			TB
	0	0	5	0	5			0			0			1
		Freezing	Other					Other			Other			Gastrointe
		0	0					0						2
		Other												
		0												
Number an		6	5	6	7	6	0	6	6	6		7	10	9

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
47	01/05/201	36-55yrs	4	Unemployı	Yes		Once a wee	Cattle	11	Yes	Less than €	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
48	01/05/201	26-35yrs	3	Currently E	Yes		Daily	Cattle	29	Yes	Less than €	Negative	Yes	Negative	No		
								Pigs	7								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
49	01/05/201	36-55yrs	3	SASSA grar	Yes		Once a month								No		
								Sheep	10								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
50	01/05/201	26-35yrs	4	Unemployı	Yes		Once a wee	Cattle	12	Yes	Less than €	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
51	01/05/201	36-55yrs	5	Unemployı	Yes			Cattle	16	Yes	Less than €	Negative	Yes	Negative	No		
								Goats	3								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
52	02/05/201	36-55yrs	6	SASSA grar	Yes		Once a mo	Cattle	7	Yes	Less than €	Negative	Yes	Negative	Yes	as big as a ı	Yes
								Goats	3								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
53	01/05/201	36-55yrs	8	Unemployı	Yes		Once a mo	Cattle	13	Yes	Less than €	Negative	Yes	Negative	No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
54	21/03/201	36-55yrs	4	Self emplo	No	Yes	Once a month										

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
55	15/02/201	18-25yrs		Currently E	No	Yes	Daily								No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
56	15/02/201	18-25yrs		Currently E	No	Yes	Daily								No		

Respondant nr	Age:	Nr ppl in h	Financial S	Own Lives	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus siz	Abortus ha
10 Total	18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	6	Yes	Less than €	Positive	Yes	Positive	Yes	as big as a ı	No
	2	5	3	7	3	3	Sheep	1	6	0	0	6	0	1	0	0
	26-35yrs	>5	Unemployı	No	No	Once a wee	Goats	2	No	Less than €	Negative	No	Negative	No	as big as a ı	Yes
	2	3	4	3	0	2	Pigs	1	0	6	6	0	6	8	0	1
	36-55yrs		Self employed			Once a mo	Horses/Dor	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a dog	
	6		1			4	Other	0	0	0	0	0	0	0	0	
	older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a calf	
	0		2			0				0					1	
			Pensioner													
			0													

Nr ppl in household	
1	0
2	0
3	2
4	3
5	1
6	1
7+	1

Number answered Q	10	8	10	10	3	9			6	6	6	6	6	9	1	1

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
47		Never															
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
48		Once ot tw	Pigs	Both	Yes	Yes	No	No		Home cons	Friend	Man	No		No		Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
49		Never															
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
50		Never															
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
51		Once ot tw	Goats	Female	No	Yes	No	Yes	Farmer	Cultural/Re	Family Mer	Man	No		Yes	Heart	Cooked
																Liver	Cooked
																Rumen	
																Diaphragm	
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
52	Bury	Once ot tw	Cattle	Male	No	Yes	No	Yes	Farmer	Special occ	Hired Pers	Man	No		No		
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
53		Once ot tw	Cattle	Male	Yes	Yes	No	No		Cultural/Re	Self	Man	No		Yes	Heart	Cooked
																Lungs	
																Rumen	
																Intestines	
																Diaphragm	
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
54		Once or Tw	Pigs	Male	Yes	Yes	No	Yes	Farmer	Special occ	Family Mer	Man	Yes	Overalls	Yes	Liver	Cooked
									Other		Hired Personnel			Gumboots		Rumen	
									Abattoir that sells live and slaughters					Mask		Intestines	
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
55		Once or Tw	Pigs	Both	Yes	Yes	No	No		Home cons	Self	Man	No		Yes	Heart	Cooked
																Lungs	
																Liver	
																Kidneys	
																Rumen	
																Intestines	
																Diaphragm	
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
56		Once or Tw	Pigs	Both	Yes	Yes	No	No		Home cons	Self	Man	No		Yes	Heart	Cooked
																Lungs	
																Liver	
																Kidneys	
																Rumen	
																Intestines	
																Diaphragm	
Respondan	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaug	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
10 Total	Veld	Daily	Cattle	Both	Yes	Yes	Yes	Yes	Farmer	Home cons	Self	Man	Yes	Overalls	Yes	Heart	Raw
	0	0	2	3	5	7	0	3	3	3	3	7	1	1	5	4	0
	Bury	Once or Tw	Sheep	Male	No	No	No	No	Auction	Cultural/Re	Family Mer	Woman	No	Gumboots	No	Lungs	Cooked
	1	0	0	3	2	0	7	4	0	2	0	0	6	1	2	3	7
	Burn	Once or Tw	Goats	Female					Roadside s	Special occ	Friend			Gloves		Liver	Preserved
	0	3	1	1					0	2	1			0		4	0
	Fed to dog	Once ot tw	Pigs	Not important						To sell mea	Neighbor			Mask		Kidneys	
	0	4	4	0						0	0			1		2	
		Never	Other								Hired Personnel			Eye protection		Rumen	
		3	0								2			0		5	
														Other		Intestines	
														0		4	
																Diaphragm	
																4	
																Uterus	
																0	
Number an	1	10	7	7	7	7	7	7	3	7	8	7	7	3	7	26	7

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
47												Yes	Live animal	Tick Fever

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
48	>30min		Throw awa	Bury	I don't recognise them							Yes	Slaughter	Measles

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
49												Yes	Dead anim	Diarrhoea

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
50												Yes	Live animal	TB

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
51	>30min		Throw awa	Burn	No, removed & not co	Yes, alway	Isiphandla	Yes	Repro orga	Burn	No			
	10-15min								Bones					

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
52					I don't recognise them	No, never			I don't know		Bury	Yes	Live animal	TB

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
53	>30min		Throw awa	Burn	I don't recognise them	No, never			I don't know		Bury	Yes	Dead anim	Diarrhoea

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
54	>30min	Other	Do not use	Bury	No, removed & not co	No, never	Cure mysel	Yes	Head	Fed to dog	Yes	Live animal	New Castle	
		given to staff		Burn					Feet	given to staff		Dead anim	Swine Flu	
									Tail					
									Neck					

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
55	>30min		Cut out ab	Fed to dog	No, removed & not co	No, never	Tannery	Yes	Repro orga	Fed to dog	No			

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
56	>30min		Cut out ab	Fed to dog	No, removed & not co	No, never			Yes	Repro orga	Fed to dog	Yes	Live animal	TB
														Respirator

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
10 Total	5-10min	Drying	Do nothing	Veld	Yes consur	Consumed	Yes, alway	Tannery	Yes	Repro orga	Veld	Yes	Live animal	TB
	0	0	0	0	0	0	1	1	4	3	0	8	5	3
	10-15min	Smoking	Cut out ab	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Head	Bury	No	Dead anim	New Castle
	1	0	2	2	0	0	5	1	0	1	2	2	3	1
	15-30min	Salting	Throw awa	Burn	No, removed & not co	Only Occas		Cure as ma	I don't kno	Feet	Burn		Slaughter	Diarrhoea
	0	0	3	3	4	0	0	0	2	1	1		1	2
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla		Bones	Fed to dogs			Tick Fever
	6	0	1	2	3			1		1	3			1
		Freezing	Other					Other		Neck	Other			Respirator
		0	0					0		1				1
		Other								Tail				Swine Flu
		1								1				1
														Measles
														1
Number an		7	1	6	7	7	0	6	3	6		6	10	9

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
57	15/02/201	18-25yrs	1	Currently E	No	Yes	Daily								No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
58	15/02/201	18-25yrs	1	Currently E	No	Yes	Daily								No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
59	14/02/201	older than	9	Pensioner	Yes		Daily	Cattle	3	Yes	More than	Negative	Yes	Negative	Yes		
		older than 56yrs						Sheep	2								
								Goats	38								
								Pigs	3								
								Other	Chickens, Geese, ducks								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
60	14/02/201	26-35yrs	9	Unemployi	No	Yes	Daily			Yes	More than	Negative	Yes	Negative	Yes		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
61	14/02/201	26-35yrs	9	Self emplo	No	Yes	Daily			Yes	More than	Negative	Yes	Negative	Yes		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
62	09/02/201	26-35yrs	2	Self emplo	No	Yes	Daily			Yes	I cant remember		No		Yes	as big as a	No

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
63	11/03/201	18-25yrs	6	Self emplo	Yes		Daily	Cattle	17	No			No		No		
								Goats	6								
								Other	3 dogs								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
64	19/04/201	older than	7	Pensioner	Yes		Daily	Cattle	6	I don't know			No		No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
65	19/04/201	older than	1	SASSA gran	Yes		Daily								No		
								Goats	4								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
66	19/04/201	36-55yrs	3	Unemployi	Yes		Once a wei	Cattle	27	No			No		No		

Respondant nr	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
10 Total	18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	4	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
	3	5	2	5	5	9	Sheep	1	4	0	0	3	0	4	1	1
	26-35yrs	>5	Unemployi	No	No	Once a wei	Goats	3	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
	3	5	2	5	0	1	Pigs	1	2	0	3	4	3	6	0	0
	36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a dog	
	1		3			0	Other	2	1	3	0	0	0	0	0	
	older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a calf	
	4		1			0				1					0	
			Pensioner													
			2													

Nr ppl in household	
1	3
2	1
3	1
4	0
5	0
6	1
7+	3

Number answered Q	11	10	10	10	5	10			7	4	3	7	3	10	1	1

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
57		Once or Tw	Pigs	Both	Yes	Yes	No	No		Home cons	Self	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
58		Once or Tw	Pigs	Both	Yes	Yes	No	No		Home cons	Self	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
59	Bury	Once ot tw	Goats Other Chickens	Both	Yes	Yes	No	No		Home cons	Self	Man	Yes	Overalls Gumboots	Yes	Heart Lungs Liver Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
60	Bury	Once ot tw	Goats Other Chickens	Both	Yes	Yes	No	No		Home cons	Self	Man	Yes	Overalls Gumboots	Yes	Heart Lungs Liver Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
61	Bury	Once ot tw	Goats Other Chickens	Both	Yes	Yes	No	No		Home cons	Self	Man	Yes	Overalls Gumboots	Yes	Heart Lungs Liver Rumen Intestines Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
62	Bury	Once ot tw	Sheep	Male	Yes	No	No	No		To sell mea	Hired Pers	Man	Yes	Overalls	Yes	Liver	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
63		Once or Tw	Cattle	Male	Yes	Yes	No	No		Cultural/Re	Family Mer	Man Woman	No		Yes	Heart Lungs Liver Kidneys Rumen Diaphragm Intestines	Cooked Raw
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
64		Once ot twice a year		Male	No			Yes	Farmer	Cultural/Re	Family Mer	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Intestines	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
65		Once ot tw	Goats	Female	Yes	Yes	No	Yes	Auction	Cultural/Re	Friend	Man	Yes	Overalls Gloves	Yes	Lungs Liver Diaphragm	Cooked
Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
66		Never			No	Yes	Yes	Yes	Auction	Cultural/Re	Friend	Man	Yes	Overalls	Yes	Heart	Cooked

Respondan	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
10 Total	Veld 0 Bury 4 Burn 0 Fed to dog 0	Daily 0 Once or Tw 0 Once or Tw 3 Once ot tw 6 Never 1	Cattle 1 Sheep 1 Goats 4 Pigs 2 Other 3	Both 5 Male 3 Female 1 Not Important 0	Yes 8 No 2	Yes 8 No 1	Yes 1 No 8	Yes 3 No 7	Farmer 1 Auction 2 Roadside s 0	Home cons 5 Cultural/Re 4 Special occ 0 To sell mea 1	Self 5 Family Mer 2 Friend 2 Neighbor 0 Hired Personnel 1	Man 10 Woman 1	Yes 6 No 4	Overalls 6 Gumboots 3 Gloves 1 Mask 0 Eye protection 0 Other 0	Yes 10 No 0	Heart 8 Lungs 8 Liver 9 Kidneys 4 Rumen 7 Intestines 7 Diaphragm 7 Uterus 0	Raw 1 Cooked 10 Preserved 0
Number an	4	10	11	9	10	9	9	10	3	10	10	11	10	10	10	50	11

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
57	>30min		Cut out ab	Fed to dog	No, removed & not co		No, never		Yes	Repro orgs	Fed to dog	No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
58	>30min		Cut out ab	Fed to dog	No, removed & not co		No, never		Yes	Repro orgs	Fed to dog	No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
59	>30min	Freezing	Throw awa	Fed to dog	Yes consun	Consumed	Yes, always	Other	Yes	Repro orgs	Fed to dog	Yes	Live animal	Respirator
								Drums		Kidneys			Dead animals	
								Dry out and burn						Skin diseas

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
60	>30min	Freezing	Throw awa	Fed to dog	Yes consun	Consumed	Yes, always	Other	Yes	Repro orgs	Fed to dog	Yes	Live animals	
								Drums		Kidneys			Dead anim	Respirator

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
61	>30min	Freezing	Throw awa	Fed to dog	Yes consun	Consumed	Yes, always	Other	Yes	Repro orgs	Fed to dog	Yes	Live animal	Skin diseas
								Drums		Kidneys			Dead anim	Respirator

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
62	>30min		Cut out ab	Burn	No, removed & not co		No, never	Cure as ma	No		Bury	Yes	Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
63	>30min	Freezing	Cut out ab	Fed to dog	No, removed & not co		Yes, always	Other	Yes	Horns	Other	Yes	Live animal	Blood born
								Dried and salted for cu		Hooves	Decoration		Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
64	>30min		Cut out ab	Burn	Yes, remov	Consumed	Yes, always	Isiphandla	No	Horns	Burn	Yes	Live animal	Blood born
										Bones			Dead anim	TB
													Slaughter	Respirator

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
65	15-30min	Pickling	Throw awa	Bury	I don't recognise them		Only Occas	Cure as ma	I don't know			Yes		Rabies
														Respirator
														Joint pain

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
66	>30min	Drying	Throw awa	Burn	I don't recognise them		No, never	Cure as ma	Yes	Bones	Veld	Yes	Live animal	TB
		Freezing												Joint pain

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
10 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, always	Tannery	Yes	Bones	Veld	Yes	Live animal	Rabies
	0	1	0	0	3	0	5	0	7	2	1	8	6	1
	10-15min	Smoking	Cut out ab	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Repro orgs	Bury	No	Dead anim	Joint pain
	0	0	5	1	1	4	4	0	2	5	1	2	6	2
	15-30min	Salting	Throw awa	Burn	No, removed & not co		Only Occas	Cure as ma	I don't kno	Hooves	Burn		Slaughter	Blood born
	1	0	5	3	4	0	1	3	1	1	1		1	2
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla		Horns	Fed to dogs			Respirator
	9	1	0	6	2			1		2	5			4
		Freezing	Other					Other		Kidneys	Other			TB
		5	0					4		3				2
		Other												Skin diseas
		0												1
Number an		10	7	10	10	10	4	10	8	10		8	10	13

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
67	19/04/201	36-55yrs	7	Unemploy	Yes		Daily								I don't know		
								Sheep	2								
								Pigs	38								
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
68	19/04/201	older than	6	Pensioner	Yes		Daily								I don't know		
								Sheep	2								
								Goats	2								
								Pigs	9								
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
69	19/04/201	26-35yrs	8	Unemploy	Yes		Daily	Cattle	7	No			No		No		
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
70	19/04/201	26-35yrs	3	Self emplo	Yes		Daily										
								Pigs	4								
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
71	19/04/201	older than	4	Pensioner	Yes		Daily	Cattle	3	No			No		No		
								Goats	6								
								Pigs	25								
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
72	19/04/201	36-55yrs	1	Unemploy	No	Yes	Once a week										
								Pigs	1								
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
73	19/04/201	36-55yrs	8	Unemploy	Yes		Daily	Cattle	21	No			No		Yes	as big as a	Yes
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
74	19/04/201	older than	3	Pensioner	Yes		Once a week										
								Sheep	3								
								Pigs	12								
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
75	19/04/201	older than	4	Currently E	Yes		Daily	Cattle	14	I don't know			I don't know		No		
								Goats	20								
Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
76	19/04/201	older than	5	Pensioner	Yes		Daily			No			No		I don't know		
								Sheep	5								
								Goats	3								
								Pigs	10								
								Other	chickens								

Respondant nr	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
10 Total	18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	4	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
	0	5	1	9	1	8	Sheep	4	0	0	0	0	0	1	0	0
	26-35yrs	>5	Unemploy	No	No	Once a we	Goats	4	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
	2	5	4	1	0	2	Pigs	7	4	0	0	4	0	3	0	1
	36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a	dog
	3		1			0	Other	1	1	0	0	1	0	3	0	
	older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a	calf
	5		0			0				0					1	

Nr ppl in household	
1	1
2	0
3	2
4	2
5	1
6	1
7+	2

Pensioner																
4																
Number answered Q	10	10	10	10	1	10				5	0	0	5	0	7	1	1

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
67					No	No	No	No									

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
68		Never	Other Chicken														

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
69		Once ot tw	Other	Not Import	No	No	No	Yes	Auction	To sell mea	Family Mer	Man	Yes	Gloves	Yes	Liver	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
70		Never													Yes	Lungs Liver Kidneys Intestines	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
71		Once ot tw	Goats	Both	Yes	No	No	Yes	Auction	Cultural/Re	Self	Man	No		No		

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
72		Never															

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
73	Bury	Never			No	No	Yes	Yes		Cultural/Re	Friend	Man	Yes	Overalls Gumboots	Yes	Heart Rumen Liver Uterus Diaphragm	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
74					No	No	No	No							Yes		Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
75		Never	Cattle Sheep Goats Pigs	Male	No	No	No	No		Other	Family Mer	Man	Yes	Overalls	Yes	Heart Lungs Liver Kidneys	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
76		Never			No	No	No	No									

Respondan	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
10 Total	Veld 0 Bury 1 Burn 0 Fed to dog 0	Daily 0 Once or Tw 0 Once or Tw 0 Once ot tw 2 Never 6	Cattle 1 Sheep 1 Goats 2 Pigs 1 Other 2	Both 1 Male 1 Female 0 Not Important 1	Yes 1 No 6	Yes 0 No 7	Yes 1 No 6	Yes 3 No 4	Farmer 0 Auction 2 Roadside s 0	Home cons 0 Cultural/Re 2 Special occ 0 To sell mea 1	Self 1 Family Mer 2 Friend 1 Neighbor 0 Hired Personnel 0	Man 4 Woman 0	Yes 3 No 1	Overalls 2 Gumboots 1 Gloves 1 Mask 0 Eye protection 0 Other 0	Yes 5 No 1	Heart 2 Lungs 2 Liver 4 Kidneys 2 Rumen 1 Intestines 1 Diaphragm 1 Uterus 1	Raw 0 Cooked 5 Preserved 0
Number an	1	8	7	3	7	7	7	7	2	3	4	4	4	4	6	14	5

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
67												Yes	Live anima	Brucellosis
													Dead anim	TB

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
68												Yes	Live anima	TB
													Dead animals	
													Slaughter	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
69	15-30min	Smoking	Do not use	Bury	I don't recognise them		Only Occas	Cure as ma	No		Bury	Yes	Live anima	TB
													Slaughter	Blood born
													Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
70	>30min	Smoking												

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
71			Throw awa	Fed to dog	No, removed &	not cor	Only Occas	Cure as ma	Yes		Bury	Yes		Brucellosis
													Slaughter	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
72					I don't recognise them							Yes	Live animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
73	15-30min	Drying	Throw awa	Bury	I don't recognise them		No, never		Yes		Bury	Yes	Live anima	Liver disea
													Slaughter	
													Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
74	>30min		Do not use	Bury	I don't recognise them		No, never	Cure mysel	Yes	Horns		Yes	Live anima	TB
										Bones			Dead anim	Respirator
														Blood born

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
75	>30min		Throw awa	Bury	I don't recognise them		No, never		I don't know		Bury	No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
76												Yes	Live anima	TB
														Respirator

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
10 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, alway:	Tannery	Yes	Horns	Veld	Yes	Live anima	TB
	0	1	0	0	0	0	0	0	3	1	0	8	7	5
	10-15min	Smoking	Cut out abr	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Bones	Bury	No	Dead anim	Blood born
	0	2	0	4	0	0	3	1	1	1	4	1	5	1
	15-30min	Salting	Throw awa	Burn	No, removed	& not cor	Only Occas	Cure as ma	I don't know		Burn		Slaughter	Brucellosis
	2	0	3	0	1	0	2	2	1		0		4	2
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla			Fed to dogs			Respirator
	3	0	2	1	5			0			0			2
		Freezing	Other					Other			Other			Liver disea
		0	0					0						1
		Other												
		0												
Number an		5	3	5	5	6	0	5	3	5		4	9	16

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
77	19/04/201	older than	6	SASSA grar	Yes		Daily	Cattle	26	Yes	Less than 6	I don't kno	No		No		
								Sheep	8								
								Goats	35								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
78	19/04/201	36-55yrs	4	Unemploye	Yes		Daily								No		
								Sheep									
								Goats									
								Pigs	40								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
79	19/04/201	36-55yrs	3	Unemploye	Yes		Daily	Cattle	22	No			No		Yes	as big as a	Yes
								Goats	6								
								Pigs	6								
								Other	Chickens								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
80	19/04/201	older than	3	Pensioner	Yes		Once a we	Cattle	10	I don't know			Yes	I don't kno	No		
								Sheep	5								
								Goats	14								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
81	19/04/201	older than	3	Pensioner	Yes		Daily										
								Sheep	3								
								Pigs	21								
								Other	Chickens, Ducks, Turkeys								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
82	19/04/201	18-25yrs	5	Unemploye	Yes		Daily										
								Pigs	35								
								Other	Chickens and ducks								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
83	19/04/201	36-55yrs	6	Pensioner	Yes		Daily	Cattle	4	No			No		No		

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
84	19/04/201	26-35yrs	6	Unemploye	No	No											

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
85	19/04/201	older than	10	Pensioner	Yes		Daily	Cattle	28	Yes	Less than 6	I don't kno	No		No		
								Goats	4								
								Pigs	2								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha

Respondant nr	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
9 Total	18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	5	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
	1	4	0	8	0	7	Sheep	4	2	2	0	1	0	1	0	0
	26-35yrs	>5	Unemploye	No	No	Once a we	Goats	5	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
	1	5	4	1	1	1	Pigs	5	2	0	0	4	0	5	0	1
	36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a	dog
	3		0			0	Other	3	1	0	2	0	1	0	0	
	older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a	calf
	4		1			0				0					1	

Nr ppl in household	
1	0
2	0
3	3
4	1
5	1
6	3
7+	1

Pensioner																
4																
Number answered Q	9	9	9	9	1	8			5	2	2	5	1	6	1	1

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
77		Never	Sheep	Male	Yes	Yes	No	No		Special occ	Hired Persc	Man	Yes	Overalls Gloves	Yes	Liver	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
78		Never															

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
79	Bury	Never			No	Yes	No	No	Auction	Cultural/Re	Family Member		Yes	Gloves	Yes	Lungs Liver	

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
80		Once ot tw	Sheep	Male	Yes	No	No	Yes	Farmer		Self	Man	Yes	Overalls Mask	Yes	Heart Lungs Liver Kidneys	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
81		Never			No	Yes	No	No		Special occ	Family Mer	Man	Yes	Overalls	Yes	Liver Lungs	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
82		Once ot tw	Cattle	Female	No	Yes	No	No		Home cons	Family Mer	Man	Yes	Overalls	Yes	Heart Lungs Liver Kidneys Intestines	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
83		Never													Yes	Liver	

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
84			Other Chicken														

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
85		Never															

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondan	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
9 Total	Veld 0 Bury 1 Burn 0 Fed to dog 0	Daily 0 Once or Tw 0 Once or Tw 0 Once ot tw 2 Never 6	Cattle 1 Sheep 2 Goats 0 Pigs 0 Other 1	Both 0 Male 2 Female 1 Not Important 0	Yes 2 No 3	Yes 4 No 1	Yes 0 No 5	Yes 1 No 4	Farmer 1 Auction 1 Roadside s 0	Home cons 1 Cultural/Re 1 Special occ 2 To sell mea 0	Self 1 Family Mer 3 Friend 0 Neighbor 0 Hired Personnel 1	Man 4 Woman 0	Yes 5 No 0	Overalls 4 Gumboots 0 Gloves 2 Mask 1 Eye protection 0 Other 0	Yes 6 No 0	Heart 2 Lungs 4 Liver 6 Kidneys 2 Rumen 0 Intestines 1 Diaphragm 0 Uterus 0	Raw 0 Cooked 4 Preserved 0
Number an	1	8	4	3	5	5	5	5	2	4	5	4	5	7	6	15	4

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
77	10-15min	Smoking	Do nothing	Burn	Yes, remov	Consumed	No, never		I don't know		Burn	Yes	Live anima	TB

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
78												Yes	Live anima	TB
														Brucellosis
														Rabies

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
79		Freezing	Throw awa	Bury	I don't recognise them	Only Occas	Cure as ma	I don't know			Burn	Yes		Respirator
														Rabies
														Joint pain

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
80	>30min				I don't recognise them	Yes, alway	Cure as ma	I don't know			Bury	No		

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
81	>30min		Throw awa	Bury	I don't recognise them	No, never			No			Yes	Live anima	TB

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
82	>30min		Cut out abr	Bury	No, removed & not cor	Yes, alway	Cure as ma	Yes		Soiled sect	Fed to dog	Yes	Live anima	Vibriosis
										Feet			Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
83			Cut out abr	Bury	I don't recognise them	No, never	Cure mysel	No			Bury	Yes	Live animals	
													Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
84												Yes	Live anima	TB
													Dead anim	Blood born
													Dead animals	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
85												Yes	Live anima	Blood born
													Dead animals	
													Slaughter	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
9 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, alway	Tannery	Yes	Soiled sect	Veld	Yes	Live anima	TB
	0	0	1	0	0	0	2	0	1	1	0	8	7	4
	10-15min	Smoking	Cut out abr	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Feet	Bury	No	Dead anim	Respirator
	1	1	2	4	1	1	3	1	2	1	2	1	5	1
	15-30min	Salting	Throw awa	Burn	No, removed & not cor		Only Occas	Cure as ma	I don't know		Burn		Slaughter	Joint pain
	0	0	2	1	1	0	1	3	3		2		1	1
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla			Fed to dogs			Blood born
	3	0	0	0	4			0			1			2
		Freezing	Other					Other			Other			Rabies
		1	0					0						2
		Other												Brucellosis
		0												1
Number an		4	2	5	5	6	1	6	4	6		5	9	13

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
86	21.05.2018	older than 56yrs		SASSA gran	Yes		Less than o	Cattle	90	Yes	More than	Negative	No		No		
								Sheep	92								
								Goats	54								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
87	23-05-2018	older than	2	Pensioner	Yes		Once a mo	Cattle	20	No			No		No		
								Sheep	7								
								Goats	4								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
88	24/05/201	older than	9	Pensioner	Yes		Once a mo	Cattle	47	Yes	I cant rem	I don't kno	Yes	Negative	Yes	as big as a	No
								Sheep	30								
								Goats	28								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
89	04/07/201	36-55yrs	4	Unemployi	Yes		Daily	Cattle	42	Yes	More than	Negative	Yes	Negative	No		
								Sheep	2								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
90	04/06/201	older than	6	Unemployi	Yes		Daily	Cattle	5	Yes	More than	Negative	Yes	Negative	No		
								Sheep	1								
								Goats	7								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
91	04/07/201	36-55yrs	4	Self emplo	Yes		Once a wee	Cattle	1	Yes	More than	Negative	Yes	Negative	No		
								Sheep	1								
								Goats	25								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
92	05/07/201	36-55yrs	3	Unemployi	Yes		Daily	Cattle	10	Yes	More than	Negative	Yes	Negative	No		
								Sheep	21								
								Goats	4								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
93	05/07/201	36-55yrs	6	Unemployi	Yes		Daily	Cattle	30	No			No		Yes	as big as a	No
								Goats	25								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
94	05/07/201	36-55yrs	3	Unemployi	Yes		Daily	Cattle	24	Yes	More than	Negative	Yes	Negative	No		
								Sheep	62								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
95	05/07/201	36-55yrs	4	Self emplo	Yes		Once a mo	Cattle	68	Yes	Less than 6	Negative	Yes	Negative	Yes	as big as a	No
								Sheep	41								

Respondant nr	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus sia	Abortus ha
10 Total	18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	10	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
0	6	0	10	0	5	Sheep	9	8	1	0	7	0	3	0	3	
26-35yrs	>5	Unemployi	No	No	Once a wee	Goats	7	No	Less than 6	Negative	No	Negative	No	as big as a	Yes	
0	3	5	0	0	1	Pigs	0	2	0	7	3	7	7	0	0	
36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a dog		
6		2			3	Other	0	0	6	1	0	0	0	2		
older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a calf		
4		1			0				1					1		
		Pensioner														
		2														

Nr ppl in household	
1	0
2	1
3	2
4	3
5	0
6	2
7+	1

Number answered Q	10	9	10	10	0	9			10	8	8	10	7	10	3	3	

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
86		Never				Yes	No	No									

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
87		Once ot tw	Cattle	Female	Yes	Yes	No	No		Cultural/Re	Family Mer	Man	Yes	Overalls	Yes	Heart	Cooked
										Special occasion				Gumboots		Lungs	
																Liver	
																Kidneys	
																Rumen	
																Intestines	
																Diaphragm	

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
88	Fed to dog	Never			No	Yes	No	No									

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
89		Once or Tw	Cattle	Not Import	Yes	Yes	No	Yes	Auction	Home cons	Self	Man	Yes	Overalls	Yes	Heart	Cooked
										Cultural/Religious				Gumboots		Lungs	
										To sell meat						Liver	
																Kidneys	
																Rumen	
																Intestines	
																Diaphragm	

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
90		Once or Tw	Cattle	Not Import	Yes	Yes	No	Yes	Auction	Home cons	Self	Man	Yes	Overalls	Yes	Heart	Cooked
										Cultural/Religious				Gumboots		Lungs	
										To sell meat						Liver	
																Kidneys	
																Rumen	
																Diaphragm	
																Intestines	

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
91		Once or Tw	Cattle	Not Import	Yes	Yes	No	Yes	Auction	Home cons	Self	Man	Yes	Overalls	Yes	Heart	Cooked
										Cultural/Religious				Gumboots		Lungs	
										To sell meat						Liver	
																Kidneys	
																Rumen	
																Diaphragm	
																Intestines	

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
92		Once ot tw	Sheep	Female	Yes	Yes	Yes	Yes	Auction	Home cons	Self	Man	No		Yes	Liver	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
93	Bury	Once ot tw	Cattle	Both	No	Yes	Yes	Yes	Farmer	Cultural/Re	Family Mer	Man	No		Yes	Heart	
			Sheep						Auction		Neighbor					Lungs	
			Goats													Liver	Raw
																Kidneys	

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
94			Cattle		No	Yes		Yes	Farmer	Cultural/Re	Family Mer	Man	No		Yes	Liver	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
95	Bury	Once ot tw	Cattle	Male	No	No	No	No			Hired Pers	Man	Yes	Overalls	Yes	Liver	Cooked
			Sheep											Gumboots			
			Goats														
			Pigs														

Respondan	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consi
10 Total	Veld	Daily	Cattle	Both	Yes	Yes	Yes	Yes	Farmer	Home cons	Self	Man	Yes	Overalls	Yes	Heart	Raw
	0	0	7	1	5	9	2	6	2	4	4	8	5	5	8	5	1
	Bury	Once or Tw	Sheep	Male	No	No	No	No	Auction	Cultural/Re	Family Mer	Woman	No	Gumboots	No	Lungs	Cooked
	2	0	3	1	4	1	7	4	5	6	3	0	3	5	0	5	7
	Burn	Once or Tw	Goats	Female					Roadside s	Special occ	Friend			Gloves		Liver	Preserved
	0	3	2	2					0	1	0			0		8	0
	Fed to dog	Once ot tw	Pigs	Not Important						To sell mea	Neighbor			Mask		Kidneys	
	1	4	1	3						3	1			0		5	
		Never	Other								Hired Personnel			Eye protection		Rumen	
		2	0								1			0		4	
														Other		Intestines	
														0		4	
																Diaphragm	
																4	
																Uterus	
																0	
Number an	3	9	13	7	9	10	9	10	7	14	9	8	8	10	8	35	8

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
86												Yes	Live animal	Brucellosis
													Dead animals	
													Slaughter	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
87	>30min	Freezing	Do not use	Bury	No, removed & not co		Only Occas	Isiphandla	Yes	horns	Bury	Yes	Live animal	TB
										hooves			Dead anim	Anthrax
														Brucellosis

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
88												Yes	Dead anim	TB
													Slaughter	

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
89	>30min	Drying	Throw awa	Fed to dog	Yes consun	Consumed	Only Occas	Cure mysel	Yes	horns	Veld	Yes	Dead anim	Anthrax
		Salting												Brucellosis

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
90	>30min	Drying	Throw awa	Fed to dog	Yes consun	Consumed	Only Occas	Cure mysel	Yes	horns	Veld	Yes	Dead anim	Anthrax
		Salting												Brucellosis

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
91	>30min	Drying	Throw awa	Fed to dog	Yes consun	Consumed	Only Occas	Cure mysel	Yes	horns	Veld	Yes	Dead anim	Anthrax
		Salting												Brucellosis

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
92	10-15min		Throw awa	Bury	No, removed & not co		No, never					Yes	Live animal	Rabies

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
93	15-30min		Cut out ab	Fed to dog	Yes consun	Consumed	No, never		Yes	Skin	Burn	Yes	Live animal	TB
										Hooves				
										Horns				

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
94	>30min	Freezing	Do not use	Fed to dog	No, removed & not co		Only Occas	Isiphandla				Yes	Live animal	Rabies
								Cure as mat for household use						

Respondar	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
95	>30min			Bury	I don't recc	Consumed	No, never		Yes	horns	Fed to dog	Yes	Live animal	Rabies
										hooves				
										Repro organs				

Respondan	Offal consu	Offal consu	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaug	Skin actior	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
10 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, always	Tannery	Yes	Horns	Veld	Yes	Live animal	Rabies
	0	3	0	0	4	0	0	0	6	6	3	10	6	3
	10-15min	Smoking	Cut out ab	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Hooves	Bury	No	Dead anim	TB
	1	0	1	3	0	5	3	3	0	3	1	0	6	3
	15-30min	Salting	Throw awa	Burn	No, removed & not co		Only Occas	Cure as ma	I don't kno	Repro orgz	Burn		Slaughter	Brucellosis
	1	3	4	0	3	0	5	1	0	1	1		2	5
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla		Skin	Fed to dogs			Anthrax
	6	0	2	5	1			2		1	1			4
		Freezing	Other					Other			Other			
		2	0					0						
		Other												
		0												
Number an		8	8	7	8	8	5	8	6	6		6	10	14

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Lives	Handle livi	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
96	05/07/2018	older than	6	Currently E	Yes		Daily	Cattle	3	No			No		No		
								Goats	3								
97	05/07/2018	older than	5	Self emplo	Yes		Daily	Cattle	12	Yes	More than	Negative	Yes	Negative	No		
								Sheep	14								
								Goats	17								
98	05/07/2018	36-55yrs	2	Unemploye	Yes		Daily	Cattle	70	I don't know			I don't know		Yes	as big as a	Yes
								Sheep	30								
								Goats	40								
								Other	Poultry 160								
99	05/07/2018	36-55yrs	2	Currently E	Yes		Daily	Cattle	18	Yes	More than	I don't kno	Yes	I don't kno	No		
								Sheep	10								
								Goats	11								
								Other	Poultry 18								
100	05/07/2018	36-55yrs	2	Unemploye	Yes		Daily	Cattle	13	Yes	More than	Negative	Yes	Negative	No		
								Goats	2								
101	05/07/2018	36-55yrs	1	Pensioner	Yes		Daily	Cattle	31	No			No		No		
								Sheep	2								
102	05/07/2018	36-55yrs	2	Unemploye	Yes		Daily	Cattle	6	No			No		No		
								Sheep	6								
								Goats	5								
								Pigs	30								
								Other	poultry 30								
103	15/06/2018	36-55yrs	6	Self emplo	No	Yes				Yes	Less than 6	I don't kno	I don't know		Yes	as big as a	No
104	05/04/2018	36-55yrs	13	Unemploye	Yes		Daily	Cattle	69	Yes	Less than 6	I don't kno	Yes	Negative	Yes	as big as a	No
								Sheep	70								
								Goats	80								
								Pigs	140								
105	06/04/2018	36-55yrs	4	Self emplo	Yes		Once a wee	Cattle	12	I don't know			I don't know		Yes	as big as a	No

Respondant nr		Age:	Nr ppl in h	Financial S	Own Lives	Handle livi	How often	Livestock c	Nr owned:	CA tested:	CA tested r	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
10 Total		18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	9	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
	0	6	2	9	1	8	Sheep	6	5	1	0	4	0	4	0	3	
		26-35yrs	>5	Unemploye	No	No	Once a wee	Goats	7	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
	0	4	4	1	0	1	Pigs	2	3	1	2	3	3	6	2	1	
		36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a	dog
	8	3				0	Other	3	2	3	3	3	1	0	2		
		older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a	calf
	2	0				0				0						0	
				Pensioner													
				1													

Nr ppl in household	
1	1
2	4
3	0
4	1
5	1
6	2
7+	1

Number answered Q	10	10	10	10	1	9		10	5	5	10	4	10	4	4

Respondar	Abortus ac	Slaughter f	Slaughter :	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase c	slaughter ;	who slaugl	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal cons
96		Never	Pigs			No	No	Yes	Farmer	Cultural/Re	Self	Man	No		Yes	Heart Lungs Liver Diaphragm	Cooked
97		Once ot tw	Cattle	Male	No	No	No	Yes	Auction	Cultural/Re	Self	Man	Yes	Overalls Gumboots	Yes	Heart Liver Rumen Intestines Diaphragm	Cooked
98	Bury	Once or Tw	Cattle Sheep Goats	Both	Yes	No	No	Yes	Farmer	Cultural/Re Special occasion	Family Mer	Man	No		Yes	Intestines	Cooked
99		Once ot tw	Cattle	Male	Yes	Yes	No	Yes	Farmer	Home cons To sell meat	Hired Persc	Man	Yes	Overalls Gumboots	Yes	Liver Rumen Intestines	Cooked
100		Once ot tw	Goats	Female	Yes	Yes	No	Yes	Auction	Home cons	Self	Man	No		Yes	Liver	Cooked
101		Once ot tw	Cattle	Both	Yes	Yes	Yes	No		Special occ	Hired Persc	Man	Yes	Overalls	Yes	Heart Lungs Liver Kidneys	Cooked
102		Once ot tw	Cattle Sheep Goats Pigs	Both	Yes	Yes	No	Yes	Farmer	Cultural/Re	Self	Man	No		Yes	Heart Liver Kidneys	Cooked
103	Veld	Once ot tw	Cattle Goats	Male	No	Yes	Yes	Yes	Farmer	Cultural/Re Special occ To sell meat	Self Family Member	Man	Yes	Overalls Gumboots	Yes	Heart Lungs Liver Kidneys Rumen Intestines Uterus	Raw
104	Fed to dog	Once or Tw	Pigs	Both	Yes	Yes	No	No		Home cons	Self	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Diaphragm Intestines	Cooked
105	Veld	Once ot tw	Cattle	Not Import	No	Yes	No	Yes	Auction	Home cons Special occ	Self Family Member	Man	No		Yes	Heart Lungs Liver Kidneys Rumen Intestines	Cooked
10 Total	Veld 2 Bury 1 Burn 0 Fed to dog 1	Daily 0 Once or Tw 0 Once or Tw 2 Once ot tw 7 Never 1	Cattle 7 Sheep 2 Goats 4 Pigs 3 Other 0	Both 4 Male 3 Female 1 Not Important 1	Yes 6 No 3	Yes 7 No 3	Yes 2 No 8	Yes 8 No 2	Farmer 5 Auction 3 Roadside s 0	Home cons 4 Cultural/Re 5 Special occ 4 To sell mea 2	Self 7 Family Mer 3 Friend 0 Neighbor 0 Hired Personnel 2	Man 10 Woman 0	Yes 4 No 6	Overalls 4 Gumboots 3 Gloves 0 Mask 0 Eye protection 0 Other 0	Yes 10 No 0	Heart 7 Lungs 5 Liver 9 Kidneys 5 Rumen 5 Intestines 6 Diaphragm 3 Uterus 1	Raw 1 Cooked 9 Preserved 0
Number an	4	10	16	9	9	10	10	10	8	15	12	10	10	7	10	41	10

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
96	>30min		Cut out abr	Burn	No, removed & not cor		No, never		Yes	horns	Veld	Yes	Live anima	Brucellosis

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
97	>30min		Cut out abr	Burn	No, removed & not cor		No, never		Yes	horns	Other	Yes	Live anima	Brucellosis

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
98	>30min	Freezing	Throw awa	Bury	I don't recognise them		Only Occas	Cure as ma	I don't know		Veld	Yes	Live animals	
								Other					Dead animals	
								Skin for Sangoma drum					Slaughter	

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
99	>30min	Freezing	Do not use	Fed to dog	No, removed & not cor		Only Occas	Cure as ma	No	horns	Fed to dog	Yes	Live anima	Brucellosis
										Repro organs			Dead animals	
													Slaughter	

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
100	10-15min		Throw awa	Bury	No, removed & not cor		No, never					Yes	Live anima	Rabies

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
101	>30min	Salting	Throw awa	Bury		Consumed	cooked	Tannery	Yes	horns	Burn	Yes	Live anima	Rabies
		Freezing								hooves				

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
102	>30min	Salting	Throw awa	Fed to dog	I don't recognise them		Yes, always	Cure mysel	I don't know			No		
								Cure as mat	for household use					
								Isiphandla						

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
103	>30min	Freezing	Cut out abr	Bury	Yes consun	Consumed	Only Occas	Other	Yes	horns	Bury	Yes	Live anima	Diarrhoea
			Throw away whole organ					Sold locally, someone		Bones	Other		Dead anim	Inhalation
										Also collec	Horns kept by tree, box		Slaughter	

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
104	>30min	Freezing	Do not use	Fed to dog	No, removed & not cor		Only Occas	Cure as ma	Yes	Repro orga	Fed to dog	Yes	Live anima	Brucellosis
													Slaughter	TB
														RVF

Respondar	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
105	>30min	Freezing	Cut out abr	Fed to dog	I don't recognise them		Only Occas	Isiphandla	Yes	Repro orga	Fed to dog	No		

Respondan	Offal consu	Offal consu	Abnormal ·	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin actior	Left overs	Which left	Left overs :	Zoonosis	Zoonosis o	Zoonosis d
10 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, always	Tannery	Yes	Repro Orgs	Veld	Yes	Live anima	Brucellosis
	0	0	0	0	1	0	1	1	6	3	2	8	8	4
	10-15min	Smoking	Cut out abr	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Horns	Bury	No	Dead anim	TB
	1	0	4	4	0	2	3	1	1	5	1	2	3	1
	15-30min	Salting	Throw awa	Burn	No, removed & not cor		Only Occas	Cure as ma	I don't kno	Hooves	Burn		Slaughter	RVF
	0	2	5	2	5	0	5	4	2	1	1		4	1
	>30min	Pickling	Do not use	Fed to dog	I don't recognise them			Isiphandla		Bones	Fed to dogs			Rabies
	9	0	2	4	3			2		1	3			2
		Freezing	Other					Other			Other			Diarrhoea
		6	0					2						1
		Other												Inhalation
		0												1
Number an		10	8	11	10	9	2	9	10	9		7	10	15

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
106	09/04/201	36-55yrs		Self emplo	Yes		Daily	Cattle	45	Yes	More than	Negative	Yes	Negative	No		
								Sheep	80								
								Goats	56								
								Pigs	10								
								Horses/Do	4								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
107	10/04/201	36-55yrs		SASSA grar	Yes		Once a mo	Cattle	2	No			I don't know		I don't know		
								Goats	90								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
108	02/05/201	older than 56yrs		Pensioner	Yes		Daily	Cattle	51	Yes	More than	Positive	Yes	Negative	Yes	as big as a	Yes
								Goats	28								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
109	04/05/201	older than 56yrs		Currently E	Yes		Once a we	Cattle	22	Yes	I cant reme	Positive	Yes	Negative	Yes	as big as a	No
								Sheep	4								

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha

Respondar	Date	Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha

Respondant nr		Age:	Nr ppl in h	Financial S	Own Livest	Handle live	How often	Livestock c	Nr owned:	CA tested:	CA tested v	CA test res	TB tested	TB test res	Aborted?	Abortus si	Abortus ha
4 Total		18-25yrs	<5	Currently E	Yes	Yes	Daily	Cattle	4	Yes	Less than 6	Positive	Yes	Positive	Yes	as big as a	No
		0	0	1	4	0	2	Sheep	2	3	0	2	3	0	2	0	1
		26-35yrs	>5	Unemploy	No	No	Once a we	Goats	3	No	Less than 6	Negative	No	Negative	No	as big as a	Yes
		0	0	0	0	0	1	Pigs	1	1	0	1	0	3	1	1	1
		36-55yrs		Self employed			Once a mo	Horses/Do	0	I don't kno	More than	I don't kno	I don't kno	I don't kno	I don't kno	as big as a dog	
		2		1			1	Other	0	0	2	0	1	0	1	0	
		older than 56yrs		SASSA grant			Once or twice a year				I cant remember					as big as a calf	
		2		1			0				1					1	
	Nr ppl in household			Pensioner													
	1	0		1													
	2	0															
	3	0															
	4	0															
	5	0															
	6	0															
	7+	0															
Number answered Q		4	0	4	4	0	4			4	3	3	4	3	4	2	2

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
106		Once or Tw	Cattle Sheep Goats Pigs	Both	No	Yes	Yes	Yes	Auction	Special occ	Hired Perso	Man	Yes	Overalls Gumboots Gloves	No		

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
107		Once ot tw	Cattle Sheep Goats	Both	Yes	Yes	No	Yes	Auction	Cultural/Re Special occasion	Family Mer	Man	No		Yes	Rumen Intestines	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
108	Veld	Once ot tw	Goats	Not Import	Yes	Yes	No	Yes	Auction Roadside s	Home cons Special occasion	Self	Man	Yes	Overalls	Yes	Heart Liver Intestines	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
109	Burn	Once or Tw	Cattle Sheep	Not Import	Yes	Yes	Yes	Yes	Roadside s	Special occ	Family Mer	Man	No		Yes	Intestines	Cooked

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondar	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu

Respondan	Abortus ac	Slaughter f	Slaughter s	Sex of slau	slaughter c	slaughter i	slaughter s	purchase s	Purchase o	slaughter p	who slaugh	sex of slau	PPE?	PPE select	Consume c	Offal selec	Offal consu
4 Total	Veld 1 Bury 0 Burn 1 Fed to dog 0	Daily 0 Once or Tw 0 Once or Tw 2 Once ot tw 2 Never 0	Cattle 3 Sheep 3 Goats 3 Pigs 1 Other 0	Both 2 Male 0 Female 0 Not Important 2	Yes 3 No 1	Yes 4 No 0	Yes 2 No 2	Yes 4 No 0	Farmer 0 Auction 3 Roadside s 2	Home cons 1 Cultural/Re 1 Special occ 4 To sell mea 0	Self 1 Family Mer 2 Friend 0 Neighbor 0 Hired Personnel 1	Man 4 Woman 0	Yes 2 No 2	Overalls 2 Gumboots 1 Gloves 1 Mask 0 Eye protection 0 Other 0	Yes 3 No 1	Heart 1 Lungs 0 Liver 1 Kidneys 0 Rumen 1 Intestines 3 Diaphragm 0 Uterus 0	Raw 0 Cooked 3 Preserved 0
Number an	2	4	10	4	4	4	4	4	5	6	4	4	4	4	4	6	3

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
106														

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
107	>30min			Burn	No, removed & not cor		Only Occas	Isiphandla	I don't know		Fed to dog:	No		

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
108	>30min	Freezing	Do not use	Burn	No, removed & not cor		Only Occas	Cure as ma	Yes	Repro orga	Burn	Yes	Live anima	Brucellosis

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
109	>30min		Do not use	Burn	No, removed & not cor		Only Occas	Isiphandla	Yes	Repro orga	Fed to dog:	Yes	Live anima	TB
										kidneys	Burn			

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d

Respondar	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d

Respondan	Offal cons	Offal cons	Abnormal	Offal disca	Lymphnod	Lnn consur	Skin slaugh	Skin action	Left overs	Which left	Left overs	Zoonosis	Zoonosis o	Zoonosis d
4 Total	5-10min	Drying	Do nothing	Veld	Yes consun	Consumed	Yes, alway	Tannery	Yes	Repro orga	Veld	Yes	Live anima	Brucellosis
	0	0	0	0	0	0	0	0	2	2	0	2	2	0
	10-15min	Smoking	Cut out abr	Bury	Yes, remov	Consumed	No, never	Cure mysel	No	Kidneys	Bury	No	Dead anim	TB
	0	0	0	0	0	0	0	0	0	1	0	1	0	1
	15-30min	Salting	Throw awa	Burn	No, removed & not cor		Only Occas	Cure as ma	I don't know		Burn		Slaughter	
	0	0	0	3	3	0	3	1	1		2		0	
	>30min	Pickling	Do not use	Fed to dog:	I don't recognise them			Isiphandla			Fed to dogs			
	3	0	2	0	0			2			2			
		Freezing	Other					Other			Other			
		1	0					0			0			
		Other												
		0												
Number an	3	1	2	3	3	0	3	3	3		4	3	2	