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# An Exploratory Study of The Influence of Attitudes Toward Animal Welfare on Meat Consumption in Ghana

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**Abstract**

Meat is an important source of nutrients for human health and wellbeing. However, because meat intake is reportedly linked to diseases such as obesity, cancer, cardiovascular diseases and other health problems, more and more people are reducing meat consumption in the developed world. Yet in developing countries, maternal and childhood malnutrition continue to bedevil people due to a lack of or inadequate consumption of meat and other foods rich in protein. In this paper, we undertook an exploratory study of the influence of attitudes toward animal welfare on meat consumption among Ghanaians. After controlling for other covariates of meat consumption, we found that people who express concern about animal welfare are significantly less likely to consume meat in Ghana.

**Keywords**: Meat consumption; Consumer behaviour, Meat quality; Animal welfare; Slaughter; Animal transport.

**1. Introduction**

The system of animal production, transport and slaughter, and the subsequent consumption of meat may be influenced by the religion, culture, geographical location and the purchasing ability of the consumer (White, 1967, Attfield, 1983, Hemsworth, Barnett, & Coleman, 1993, Deemer & Lobao, 2011). In most developed economies, animal welfare is of paramount importance during the production of meat, and greatly influences consumer behaviour (Schröder & McEachern, 2004). It is therefore not surprising that some aspects of religious slaughter, particularly the requirement by some religious authorities for animals to be slaughtered whilst they are fully conscious, i.e., slaughter without *stunning* (a process used to disrupt normal brain function and loss of sensibility), continue to divide opinion in these countries (Grandin, 2010). Conversely, the slaughter of conscious animals is a common practice in the developing world due mainly to economic reasons. That is, meat producers are unable to invest in stunning equipment. Additionally, lack of animal welfare regulations in those countries mean that most meat producers slaughter animals whilst they are still conscious.

The welfare of animals and ultimately the quality of meat may be affected by the way animals are transported and/or handled prior to slaughter and the method of slaughter used (e.g., Warriss, 1990; McNally and Warriss, 1996; Boleman et al., 1998). For instance, Warriss (1990) reported that poor pre-slaughter handling of animals could cause injury, bruising and dark cutting beef, resulting in the downgrading of products, which have detrimental effect on the economic value of beef. In the UK, McNally and Warriss (1996) estimated the financial loss associated with bruising alone to be £616 per 1000 cattle whilst Boleman et al. (1998) estimated this to be $4.03 per animal, which is equivalent to a total annual loss of $114,452,000 to the beef industry in the USA.

Whilst countries in the developed world have strict legislations in place to protect the welfare of food animals during slaughter (e.g., European Council Regulation, EC1099/ 2009, The Humane Slaughter Act, 1958), abattoir operations in many developing countries are geared towards maximising profits with little or no regard for the welfare of animals, product quality or safety (Annan-Prah, Mensah, Akorli, Asare, & Kumi-Dei, 2012). The authors specifically blamed the lack of animal welfare policy in Ghana on poor record keeping of animal welfare compromises during transport and at slaughter. Moreover, animal slaughter operations in abattoirs in Ghana are mostly done by Muslims who argue that pre-slaughter stunning is contrary to the rules of Halal slaughter (e.g., Frimpong et al., 2012). This is because many Muslims are of the opinion that pre-slaughter stunning of animals results in death before bleeding-out (Fuseini et al., 2016). However, research has demonstrated that there are some forms of stunning that support the recovery of animals (e.g., Wotton, Zhang, McKinstry, Velarde, & Knowles, 2014). Due to the lack of consensus surrounding the acceptability of stunning for halal production, the majority of animals in Ghana are slaughtered without any form of stunning (Adzitey, Teye & Dinko, 2011; Annan-Prah et al., 2012).

In this paper, we are interested in knowing whether attitudes toward animal welfare influence meat consumption in Ghana. Consequently, we surveyed a total of 915 respondents. Results from our statistical analyses show that people who expressed concerns for animal welfare tend to consume meat less frequently. Specifically, we found that (1) people who care about the humaneness of the slaughter method used, and (2) people whose purchase of meat is influenced by animal welfare concerns are significantly less likely to consume meat.

## 2. Background literature

### 2.1. Meat consumption

Meat and meat derivatives form an important component of the human diet (Font-i-Furnols and Guerrero, 2014). They are a source of protein and other essential nutrients (e.g., Kauffman, 2001). For instance, Kauffman (2001) reported that pork is an important source of essential amino acids, high biological value protein, B-vitamins, minerals (e.g. heme iron) and various trace elements. Despite the benefits associated with the consumption of meat, it has been reported that in developed countries, there is a negative perception about meat among consumers due to suggestions that regular uncontrolled consumption of red and processed meats may be responsible for diseases such as cancer, cardiovascular abnormalities and obesity (Todra and Reig, 2011). In particular, excessive intake of pork can result in increased body fat, cholesterol and saturated fatty acids, which can result in physiological complications (Todra and Reig, 2011).

It has also been reported that the incidence of colon cancer is high in countries with high meat consumption (Armstrong and Doll, 1975). This is especially true for red meat consumption (Willet, Stampfer, Colditz, Rosner, & Speizer, 1990; Giovannucci et al., 1994). Other studies have shown that red and processed meat consumption have adverse health effects such as obesity, diabetes mellitus, coronary heart disease, cancer (e.g., Song, Manson, Buring, & Liu, 2004, Wang and Beydoun, 2009, Micha, Wallace & Mozaffarian, 2010; Choi, Song, Song, & Lee, 2013) and even mortality (Rohrmann et al., 2013; Larsson and Orsini, 2013). In most developed countries, more and more people are reducing red meat intake and increasingly having meatless diets (Richardson, MacFie and Shepherd, 1994, Lea and Worsley, 2001; Povey, Wellens and Conner, 2001). For instance,

Richardson, MacFie and Shepherd (1994) found that 28.3% of people in the UK reported reducing meat consumption. Povey, Wellens and Conner (2001) observed that 7% of the UK population was vegetarian. In the US, whilst eating out at restaurants, about 57% of people reported having ever (sometimes, often, or always) ordered a vegetarian diet (Vegetarian Resource Group, 1999). Yet in developing countries such as Ghana, the concern is not one of high meat intake; instead, it's lack of meat in diets as meat is less frequently consumed (e.g., Nti, 2008). Ghana's Ministry of Food and Agriculture (MOFA, 2011, p. 19) reported that the domestic meat production is 111,067 metric tons in 2010. This level of meat production is woefully inadequate to cater for the nutritional needs of a country with a population of over 24 million. Consequently, Ghana imports 90% of meat and meat products to augment domestic supply (Footprint to Africa, 2015).

## 2.2. Animal welfare

Animal welfare is defined as the condition of an animal in relation to its environment (Broom, 1986). In assessing the welfare of animals, it is important to take into consideration the health of that animal, as well as the components of its coping behaviour, such as pain, fear and other forms of pleasure (see e.g., Broom, 1998; Broom, 2001). As noted above in Section 1, the welfare of non-human animals may be affected by peoples' beliefs and other factors. Animal welfare is therefore perceived differently depending on one's system of beliefs or geography. For instance, pet dogs are regarded as members of the household in most developed countries (Westgarth et al., 2008; Chomel and Sun, 2011). Accordingly, much attention is paid to their health and wellbeing (Jeppsson, 2014). This contrasts sharply with the plight of dogs in most developing countries (World Health Organisation, 2004; Jackman & Rowan, 2007; Davlin and VonVille, 2012). For example,

Davlin and VonVille (2012) reported that the majority of dogs in developing countries are often very young with short lifespans and lack vaccination. Moreover, dog meat is consumed in Ghana (e.g., Tripp, 1992), Nigeria (e.g., Garba et al., 2013), among others.

Broom (1986, 2001) reported that the complete failure or the difficulty experienced by an animal in coping with its environment might result in retarded growth, failure to reproduce or even death. Poor handling techniques from the farm gate to the abattoir can also cause physical and emotional injuries to animals. As Warriss (1990) noted, bruising is the most important problem associated with the handling of extensively reared cattle. This is because such cattle are usually not used to being handled. Frimpong et al (2012) highlighted some of the poor animal welfare issues associated with the transport and slaughter of food animals in Ghana. They outlined the various stages involved in the transportation of livestock to the Kumasi abattoir. Animals are transported from farms within Ghana or neighbouring countries to livestock markets. They are then transported to "animal collection centers" before further transport to the abattoir. Similarly, Adzitey et al. (2011) observed that the majority of livestock are transported to abattoirs in the Bawku Municipality in the Upper East Region of Ghana through various modes of transportation; namely, 56% on foot (walking the animals to the abattoir from the point of purchase), 19% on bicycles and 10% through trekking and push trucks and others. This chain of pre-slaughter events can have deleterious effect on the welfare of animals (particularly ruminants) and product quality (Farm Animal Welfare Council (FAWC) 1984; Warriss, 1990; Broom, 2003). For instance, according to Warriss (1990), pre-slaughter handling involving the mixing of unfamiliar animals over long duration of transport could result in the depletion of muscle glycogen. Furthermore, long period of transportation may cause

chronic stress. This reduces post-mortem acidification, resulting in the production of dark, firm, dry meats (Warriss, 1990), which causes rapid microbial spoilage of fresh meat (Wirth, 1985).

In addition to the consequences of pre-slaughter handling on animal welfare, the slaughter of animals, when carried out without stunning can have a negative impact on the welfare of animals (Ferguson and Warner, 2008). A number of scientific investigations into the pain associated with slaughter have demonstrated that the slaughter of animals without stunning is likely to be painful (Gregory, 2004, Mellor, Thornber, Bayvel, & Kahn, 2008, Mellor, Gibson, & Johnson, 2009; Johnson, Mellor, Hemsworth, & Fisher, 2015; Gregory, Fielding, von Wenzlawowicz, von Hollenben, 2010). Despite this evidence, the majority of animals are still being slaughtered without any form of stunning in the developing world. For instance, the majority of abattoirs slaughter animals without any form of stunning in Ghana (Annan-Prah and others, 2012) and Kenya (HSA, 2016). Broom (2003) suggested that the majority of the animal welfare breaches highlighted above can be eliminated or improved by (1) the training of animal handlers, (2) enacting and enforcing animal welfare laws, (3) using suitable transport and stocking densities, and (4) avoiding the mixing of unfamiliar animals.

## 2.3. Influence of ethical and social considerations on meat consumption

### 2.3.1. Animal welfare

Ethical consumption, defined as the intentional consumption of a product or service in support of an ethical view (Strong, 1996, Schaefer & Crane, 2001; The Cooperative Bank, 2003) is not a new phenomenon (Cowe & Williams, 2000; Hilton, 2004; Carrigan, Szmigin

&Wright, 2004). However, there are signs that it is gaining momentum in many parts of the world (Low & Davenport, 2005). This can take the form of animal welfare, human rights or environmental protection (The Cooperative Bank, 2003). The Cooperative Bank estimated that in the year 2002, ethical consumption in the UK alone was worth £20 billion, with free-range eggs representing 27% of the animal welfare related consumption. Consumers can therefore play a vital role in influencing a change of attitude towards animals by demanding an improvement in the welfare of animals during transport and slaughter (Harper & Henson, 2000; Harper, 2001; Blokhuis, Jones, Geers, Miele, & Veissier, 2003). A European Commission funded project (Harper & Henson, 2001) reported that consumers normally define good animal welfare with regard to the humane death and natural life and that the consumer's willingness to buy animal welfare-friendly meat is hindered by the lack of information on production methods and the lack of availability of such products. The report further highlights the fact that although consumers believe that they are powerless in influencing changes to animal welfare practices, many food business operators regard them as the market drivers.

In a study investigating the impact of ethical consideration on meat purchases in Scotland, Schröder & McEachern (2004) observed that consumers considered all forms of cruelty toward animals as unacceptable and that they regarded extensive livestock agriculture as the most welfare-friendly system of rearing food animals. Loughnan, Haslam & Bastian (2010) suggested that it is ironical for people who eat meat to suggest that they are concerned for the welfare of the animals they eat. They conducted a study involving 108 participants on the morality of eating meat. They concluded that the consumption of

meat leads people to withdraw their moral concern for food animals in particular and all non-human animals.

Thus, ethical consumption may be influenced by attitudes, religion, and culture, among others. If attitudes are a strong predictor of behaviour or behavioural intentions per the theory of planned behaviour (e.g., Fishbein and Azjen, 1975; Ajzen and Fishbein, 2005), then people's attitudes toward animal welfare may affect their meat consumption. More specifically, individuals who have concerns for animal welfare may consume less or no meat at all. Therefore, we hypothesize that attitudes toward animal welfare may be negatively correlated with meat consumption.

### 2.3.2. Religion

Many religions recognise animals as sentient beings, this has resulted some religious scriptures restricting meat consumption, forbidding the consumption of some species of animals or putting a total ban on the slaughter and consumption of animals. The importance of religion on meat consumption and welfare of animals has been reported (e.g., Attfield 1983, Videras, 2006). For instance, Muslims and Jews are forbidden from eating meat from certain animals (e.g., pork from pigs, dog meat and meat from carnivorous animals) and they are expected to follow certain guidelines during the slaughter of 'acceptable' species of animals for food. Additionally, there are strict religious laws governing the protection of the welfare of all animals and the species believers allowed to consume and keep as pets (Regenstein, Chaudry & Regenstein, 2003). Whilst some religions (e.g. Muslims, Jews, Hindus) may be forbidden from eating certain species of animals, this does not necessarily effect the total volume of meat they consume. For instance, in the UK, Muslims consume above average meat when compared with the general population, with peak consumption

around the 3 main Islamic festivals; Ramadan and the two Eid festivals. A study commissioned by the UK's English Beef and Lamb Executive (EBLEX, 2010) found that with a population of just 5%, Muslims accounted for over 20% of sheep meat consumption in England. Another survey found that Halal slaughter accounted for 41% of sheep, 21% of poultry and 3% of cattle slaughtered in Great Britain (FSA, 2015). Hinduism and Buddhism also teach the need to protect the welfare of animals because many Hindu and Buddhist followers hold a belief that their ancestors return in the form of animals (Szűcs, Geers, Jezierski, Sossidou, & Broom, 2012). As a result, animals are considered sentient beings and must not be destroyed (Szűcs et al., 2012). This has resulted in many Hindus and Buddhist completely avoiding certain types of meats.

### 2.3.3. Gender

The effect of gender on meat consumption has been reported (Gossard and York, 2003; Prättälä et al., 2007; Sobal, 2006; Daniel et al., 2011). Prättälä et al. (2007) surveyed consumers in three European countries; Finland, Estonia, Latvia and Lithuania. They found that men ate meat more frequently than women and that women preferred vegetables to meat. They also observed similarities in gender differences across all the three countries. These findings appear to confirm carol Adams' theory of sex and politics of meat eating in which she associates feminism with vegetarianism (Adams, 1990). The lower intake of meat by women may be attributable to 'part-time vegetarianism' or conscious reduction in meat consumption for health (e.g. weight loss) reasons. It has been reported that women are more aware of their health than men (Dean, 1989), women rather than men would therefore make conscious efforts to improve their diet, health and wellbeing. In the USA, the Centre for Disease Control and Prevention (CDCP, 2005) as part of their National

Health and Nutrition Examination Surveys, conducted a much broader survey between 2003 and 2004 on the influence of gender on the level of consumption of different species of meat; red and poultry meat. They found that men consumed slightly less poultry meat than women, and that, the consumption of red meat was higher in men than in women. This again could be due to health reasons, women may be intentionally consuming more white meat than red meat due to the reported health issues with red meat in comparison with white meat., additionally, white meat has less fat than red meat. In the preceding sections, we highlighted the perceived link between processed red meat and cancers and other coronary diseases. In addition to these, Hu et al. (1999) showed that red meat consumption carries a greater health risk than low fat products such as fish and poultry meat. Further, there is evidence that meat with high fat content, regardless of the type and distribution of fatty acids, can increase the level of cholesterol in blood with its associated health risks (Hegsted et al., 1965; Vergroesen, 1989). Wardle et al., 2004 reported that women were more likely to avoid meat with high fat content than men. The higher level of fat in red meat than poultry meat may therefore influence the preference of white to red meat by women who are more health conscious than men.

The low intake of meat in women in comparison with men may be attributable to higher level of concern for animal welfare in women than their male counterparts. Several studies have looked at the attitudes of man towards non-human animals. Herzog and Galvin (1997) studied the attitudes of men and women towards the concept of animal sentience and mental capabilities. They showed that more women than men believe animals have conscience, can feel pain and have mental capabilities. Additionally, research has found that more men than women were in support of the use of animals in scientific

research in at least 15 different countries (Pifer, Shimizu and Pifer, 1994). Animal rights campaigners believe using animals in scientific research affects their welfare.

### 2.3.4. Culture

Agriculture has evolved drastically since its earlier days of hunting and gathering when man was living in primitive society. Whilst some nations and cultures have developed their agricultural systems over the years, others have barely mechanised their systems, resulting in the continuation of some aspects of hunting and gathering which can significantly impact the welfare of animals. For example, many farmers in some parts of Africa still practice peasant arable agriculture and hunting of animals using firearms, bow and arrow, mechanical traps and even poisonous substances (Personal Communication, Dr Moses Teye, 2017). The effect of culture on meat consumption may be influenced by the prevailing climatic conditions of the locality and their belief systems. Around the globe, cultural inclinations can affect what people eat and the way they treat animals. Nam, Jo, &Lee (2010) argued that one of the most important factors differentiating cultures around the world is the food they eat. Kittler, & Sucher (2001) noted that the Chinese believe food is consumed for psychological advancement and not to sustain life, whilst Sun et al. (2004) reported that whilst Western cultures view food as scientific and realistic, the Chinese regard food as artistic and sensitive. The historical differences between European, American and Asian food cultures have been discussed with reference to their meat consumption patterns. Whilst Europeans and Americans have well developed meat industries, the meat industries in Asian countries were comparatively less developed, resulting in less meat consumption (Nam, Jo, & Lee, 2010). The authors pointed out that improvements in the economic performance of some Asian countries in the last 5 decades

or so has resulted in increased meat consumption. The link between food culture and economic growth is discussed by Park et al. (2007). Countries with well-developed meat industries (e.g. the majority of EU member states) usually have regulations in place to protect the welfare of animals. Due to the less developed nature of the meat industries in Africa and Asia, agricultural practices and food processing in these continents are more likely to compromise the welfare of animals. In recent years, there has been increased efforts in the Chinese meat industry to improve animal welfare, the Humane Slaughter Association recently visited China to train operatives in the meat industry on good animal welfare (HSA, 2017). A number of African countries including Ghana and Kenya have also recently introduced captive bolt stunning equipment in some of their abattoirs to encourage humane killing of animals for human consumption.

## 3. Material and methods

### 3.1 Data collection and sampling procedure

We conducted a cross-sectional population survey of Ghanaians between March 2016 and August 2016 using the online software and questionnaire web service, SurveyMonkey (https://www.surveymonkey.com). Although respondents were recruited through Facebook and email ($n = 78$) and WhatsApp ($n = 14$), most of them ($n = 823$) were interviewed through face-to-face meetings using hard copies of the questionnaire. We used random sampling together with the Snowball sampling technique where a respondent invites family and friends to participate in a study (Bonne & Verbeke, 2008). Our total sample size was 915 respondents. All participants were fully informed about the aims and objectives of the study and the fact that data would be collected anonymously.

## 3.2 Data analysis procedure

### 3.2.1. Dependent variable

The dependent variable is a measure of the individual's frequency of meat consumption. We asked respondents to indicate how often they consume meat:

*"Please indicate how often you eat meat? [1=At least once a day; 2 = At least once a week; 3 = At least once a month; 4 = Occasionally; 5 = Never].*

For ease of interpretation, we reverse coded these responses so that 0 = Never; 1 = Occasionally; 2 = At least once a month; 3 = At least once a week; and 4 = At least once a day. Thus, the dependent variable is a 5-point ordinal variable.

### 3.2.2. Explanatory variable

The explanatory variable in the study is attitudes toward animal welfare. We considered two measures of attitudes toward animal welfare by asking respondents two distinct sets of questions. First, the respondents were asked to indicate which animal welfare indices they consider when purchasing meat. The question was presented as follows:

*"Which of the following animal welfare indices do you consider when purchasing meat?" [1=The animal production system e.g. free-range, organic farming, intensive farming etc; 2= The suitability of the transport and distance travelled to the abattoir/ slaughterhouse; 3 = The humaneness of the slaughter method; 4 = Other index].*

Accordingly, we constructed the variables "Production system," "Transport system," "Humaneness of slaughter" and "Other index" respectively for the responses. Second, to assess the influence of attitudes toward animal welfare on consumer behaviour,

respondents were asked to select one of five factors that influence their purchase of meat. It was presented as follows:

> *"What is the main driver influencing your purchase of meat?" [1 = Price of meat; 2 = Hygiene or meat safety; 3 = Religious beliefs; 4= Animal welfare e.g. how the animal was treated prior to and during slaughter; 4 = Other driver, e.g., meat quality]*

Again, we constructed "Price of meat", "Meat hygiene or safety", "Religious beliefs", "Animal welfare" and "Other driver" to correspond to these answer options.

### 3.2.3. Control variables

We control for socio-demographic characteristics such as age, gender, marital status, whether or not they have kids, their highest educational attainment, self-reported household income decile within Ghana, employment status, and their religious denomination.

### 3.2.4. Empirical model

Since we are interested in knowing whether people's attitudes toward animal welfare influence their meat consumption behaviour, our empirical model is specified as follows:

$$MEATCONS_i = \alpha + \beta * ANIMWELF_i + \gamma * \sum_{i=1}^{n} CONTROLS_i + \varepsilon_i \quad \dots (1)$$

where *MEATCONS* is meat consumption (i.e., how often they consume meat), *ANIMWELF* denotes their attitude toward animal welfare, *CONTROLS* are the socio-demographic characteristics we control for, and ε is the idiosyncratic error term. i indexes the individual respondent. Because the dependent variable is ordinal in nature, we estimate Equation (1) using ordered probit regressions (Ronning and Kukuk, 1996; Greene, 2003).

### 4. Results and discussion

Figure 1 presents the distribution of responses to the question on how often the respondents eat meat. The majority of respondents eat meat on a daily basis. 60.54% of them reported eating meat at least once a day, 26.72% eat meat at least once a week, 4.85% eat meat at least once a month while 6.65% eat meat occasionally. Only 1.24% of respondents do not eat meat at all. In a follow-up question, we asked respondents to indicate their reason(s) for not eating meat often if they do not eat meat on a regular basis. The results indicate that 61.46% of respondents said they could not afford meat on a regular basis compared to 0.58%, 0.46%, 0.23%, and 5.44% for being a vegetarian, being an animal welfare activist, for religious reasons, and for health reasons (e.g., weight loss), respectively. Most respondents purchase their meat from butchers (83.30%) compared to retailers/shops (9.02%). 6.01% of them slaughter meat at home while 1.67% of them depend on hunting/game for their meat.

Table 1 report the variables used in the study along with their descriptions and summary statistics. The mean score for meat consumption is 3.383, which lies between "At least once a week" and "At least once a day." When asked about what animal welfare index influenced their purchase of meat, about 25.2%, 2.1% and 4.1% indicated animal production system, suitability of transport, and humaneness of slaughter, respectively. The majority of respondents (64.5%) indicated "other index." The main drivers influencing respondents' purchase of meat are price of meat (70.7%), hygiene or meat safety (12.6%), religious beliefs (6.1%), animal welfare (0.4%) and other driver such as meat quality (8.6%).

The socio-demographic characteristics of the respondents are as follows: 37%, 28.3%, 20.3%, 7.9% and 4.3% of them were within age 20 or less, 21-30, 31-40, 41-50,

and 51-60, respectively. Only 1% of them were over 60 years. These figures suggest that the majority of respondents (65.3%) were 30 or less. Consequently, 63.3% reported their marital status as single compared to 32.8% who were married. Only 1.2% of them were divorced while 0.7% of them were widowed. There were more male participants (59.6%) than female (40.4%). Also, 30.7% of them had kids. With respect to educational attainment, the results show that about 25% of respondents had primary education or less (including no formal education), 56.8% had obtained the WASSCE, O-Level or the A-Level, 12.3% had university education (e.g., diploma and degree) while 4.7% of them had attained post-graduate education (e.g., masters and PhD). The average household income decile was 2.354 on a 1 to 10 scale and 54.3% of respondents reported being unemployed.[1] 5.7% of respondents were Roman Catholic, 11.9% were Protestant, and 79.8% were Muslim while 1.9% indicated the other religious denomination category.[2]

We now turn to the empirical results. Table 2 reports the ordered probit regression results when we regress meat consumption on attitudes toward animal welfare while controlling for the socio-demographic characteristics mentioned in section 3.2.3. There are 3 models on Table 2. Since there are two distinct sets of measures examining people's attitudes toward animal welfare, we first regress meat consumption on the first measure of animal welfare attitudes (animal welfare indices) in Model 1. We repeat the exercise replacing the animal welfare indices with the "main drivers of meat purchase" in Model 2.

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[1] Because 65.3% of respondents were aged 30 or less, it could be that the majority of them were actually out of the labor force. In Ghana, most school going young adults especially those in the university, colleges of education and nursing training college usually go to school on full-time basis and do not concurrently hold a job. This could explain the high unemployment rate.

[2] Admittedly, the proportion of respondents in our sample who were Muslim was disproportionately high. This is because most of the surveys were administered in Tamale and other towns in Northern Region where the majority of the people are Muslim. For instance, according to the 2010 Housing and Population Census, while about only 17.6% of Ghanaians were Muslim, 60% of residents of Northern region were Muslim, making Islam the dominant religion in that region (Ghana Statistical Service, 2012).

Model 3 is the full model in which we test the joint effect of both animal welfare attitudes measures. Each model controls for the socio-demographic characteristics mentioned above.

[INSERT TABLE 2 ABOUT HERE]

The results in Model 1 indicate that the coefficient of the humaneness of the slaughter method is negative and statistically significant at the 5% level. Respondents who care about the humaneness of the slaughter method were 8.1% less likely to consume meat compared to those influenced by "Other animal welfare index." Those who indicated the production system and the suitability of the transport system were 13.3% and 19.9% more likely to purchase meat than those who indicated "Other animal welfare index." In Model 2, the coefficient of animal welfare is negative and statistically significant at the 1% level. Relative to respondents in the "other driver" category, those who indicated "animal welfare" as the main driver influencing their meat purchasing behaviour were 24.6% less likely to purchase meat. Hygiene or meat safety is also negatively correlated with meat consumption while price of meat and religious beliefs do not have a significant effect on meat consumption. Consistent with the findings in Models 1 and 2, our results in Model 3 show that both humaneness of the slaughter method and concern for animal welfare are negatively and significantly associated with meat consumption.

Based on the results above, we conclude that attitudes toward animal welfare matter for meat consumption in Ghana. Our results corroborate previous studies that found a negative association between animal welfare attitudes and meat consumption (e.g., Worsley and Skrzypiec, 1998; Verbeke and Viaene, 2000; Cordts, Nitzko and Spiller, 2014). For instance, in a study conducted in Australia to determine whether attitudes

influence red meat consumption among young people (aged 18 to 32 years), Worsley and Skrzypiec (1998) found that attitudes toward animal welfare significantly exert a negative effect on red meat consumption, and that this is true for both men and women. Empirical results from Germany show that animal welfare concerns are among the strongest factors driving reduced meat consumption (Cordts, Nitzko and Spiller, 2014).

Although respondents over 60 years of age are not significantly different from those 20 and less in meat consumption, we find that people in older age groups (particularly those in the 41-50 and 51-60 age groups) tend to consume meat less frequently. This is consistent with previous findings (e.g., Worsley and Skrzypiec, 1998; Lea and Worsley, 2001) but contrasts prior studies that observed that older people eat more meat than younger ones (e.g., Fraser, Welch, Luben, Bingham, & Day, 2000). One explanation is that, being aware of some of the health problems associated with meat consumption, older people who are more focused on their health may decide to consume meat less frequently (e.g., Lea and Worsley, 2001).

We do not find significant differences between men and women with respect to meat consumption. Some previous studies have demonstrated that men tend to eat more meat than women, while women eat more vegetables and fruits than men (e.g., Fraser et al., 2000; Cordts, Nitzko and Spiller, 2014; Prättälä et al., 2007). Furthermore, marital status does not exert a significant effect on meat consumption as neither married, divorced, nor widowed individuals consume significantly more or less meat than single respondents. Having kids, unemployment and income scale are not significantly correlated with meat consumption. Conversely, educational attainment significantly influences meat consumption. Relative to respondents with primary education or less, those with

WASSCE/O-Level/A-Level, University, and Post-graduate qualifications are 10.8%, 6.7% and 6.6% more likely to consume meat, respectively in Model 1. The corresponding figures are 12.6%, 11.0% and 9.4% in Model 2. However, in the full Model (Model 3), only those with WASSCE/O-Level/A-Level and University qualifications are more likely to consume meat than those with primary education or less. Thus, while we find some evidence that educational attainment affects meat consumption (e.g., Fraser et al., 2000; Prättälä et al., 2007), this effect is inconsistent (see e.g., Prättälä et al., 2007). Moreover, it seems that better-educated people tend to eat meat less frequently (e.g., Fraser et al., 2000). Perhaps, in countries where education is negatively correlated with meat consumption, one could argue that the awareness of health hazards associated with meat consumption causes better-educated people to consume less meat. In developing countries such as Ghana, such awareness may be lacking.

The effect of religious denomination on meat consumption is unstable. In Model 1, only Muslims are significantly different from those in the "Other religious denomination" category. In Model 2, there are no significant differences between respondents in the ""Other religious denomination" category on the one hand and Catholics, Protestants and Muslims on the other hand. Yet, in Model 3, Protestants and Muslims are significantly more likely to consume meat than respondents in the "Other religious denomination" category at the 10% and 5% levels, respectively. Thus, the effect of religious denomination on meat consumption is inconsistent.

**5. Summary and conclusion**

In this paper, we examined whether (and the extent to which) people's attitudes toward animal welfare influence their meat consumption in Ghana. Accordingly, we used two

measures of animal welfare (1) whether respondents consider the humaneness of the slaughter method when purchasing meat, and (2) whether animal welfare is a main driving influencing their meat purchases. Results from ordered probit regressions indicate that, after controlling for socio-demographic characteristics, individuals who have concern for animal welfare tend to consume less meat. Each of the two measures above was negatively and significantly correlated with meat consumption in Ghana.

While attitudes toward animal welfare matter for meat consumption in Ghana, the results of this survey generally suggest that animal welfare may not be a very popular concept among Ghanaians. For instance, when we asked respondents whether they were familiar with the term stunning, 95.92% of them answered "No." This is consistent with the findings of Adzitey et al. (2011) who reported that butchers in the Bawku Municipality of the Upper East Region of Ghana were not familiar with stunning and its benefits. One recommendation is that the government, multinational corporations, non-governmental organizations, and individual animal welfare activists could increase awareness and improve attitudes toward animal welfare through research, education as well as in technical assistance programs (e.g., Fraser, 2008).

Meat consumption has many implications for human health. By studying the meat consumption behaviour of Ghanaians, this study contributes to the literature on meat consumption behaviour. Additionally, concern for animal welfare seems to be on the rise in the developed world (Harper & Henson, 2001). Yet, animal welfare concerns are virtually non-existent in most developing countries (Bracke, 2009; Frimpong et al, 2012). Bracke (2009) reported that there is generally no concern for animal welfare in Ethiopia and South Africa. However, efforts are being made in Kenya to increase awareness about

animal welfare. The African Network for Animal Welfare (ANAW) is currently working with Kenyan universities to incorporate animal welfare in higher education curricula (Bracke, 2009). Also, the Humane Slaughter Association (HSA) recently highlighted the lack of stunning during slaughter in Kenya and expressed their willingness to contribute to improve the welfare of animals at slaughter in that country (HSA, 2016). This study contributes to the literature on attitudes toward animal welfare by adding empirical findings from a developing country perspective.

Our study has limitations. First, although we attempted to measure meat consumption among respondents, we failed to be specific about meat types (e.g., beef, lamb, poultry, goat, etc.). While we do not believe that being specific about the type of meat would change our results significantly (if at all), future research could endeavor to assess how animal welfare attitudes influence people's consumption of various meat types in Ghana. Second, the majority of the surveys were conducted in and around Tamale in the Northern Region. We did this due to resource constraints. A more representative sample would interview many more people in all 10 regions in Ghana and hence have a much larger sample. Therefore, the results need to be interpreted with caution. In particular, because the sample size is relatively small, and because most of the surveys were conducted in and around Tamale in the Northern Region, these results may be "localized" and should not be generalized. [3]

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[3] We are sincerely grateful to an anonymous reviewer for pointing this out to us.

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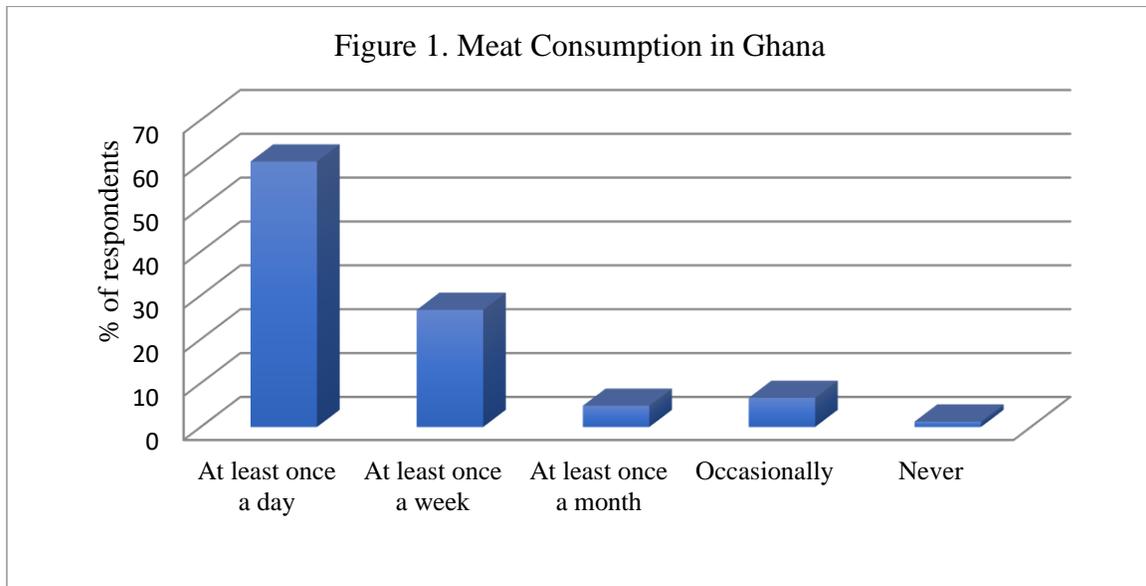
## Figure 1. Meat Consumption in Ghana



Figure 1. Meat Consumption in Ghana

### Table 1. Variable descriptions and summary statistics

| Variable | Description | Mean | S.D. | Range |
|---|---|---|---|---|
| Meat consumption | A measure of how often the respondent eats meat (0 = Never; 1 = Occasionally; 2 = At least once a month; 3 = At least once a week; and 4 = At least once a day0 | 3.383 | 0.940 | 0-4 |
| Production system | Unity if respondent indicated animal production system to the question "Which of the following animal welfare indices do you consider when purchasing meat?"; zero otherwise | 0.252 | 0.435 | 0-1 |
| Transport system | Unity if respondent indicated "The suitability of the transport and distance travelled to the abattoir/ slaughterhouse" to the question "Which of the following animal welfare indices do you consider when purchasing meat?"; zero otherwise | 0.021 | 0.143 | 0-1 |
| Humaneness of slaughter | Unity if respondent indicated "The humaneness of the slaughter method" to the question "Which of the following animal welfare indices do you consider when purchasing meat?"; zero otherwise | 0.041 | 0.198 | 0-1 |
| Other animal welfare index | Unity if respondent indicated "Other index" to the question "Which of the following animal welfare indices do you consider when purchasing meat?"; zero otherwise | 0.645 | 0.479 | 0-1 |
| Price of meat | Unity if the price of meat is the main driver influencing the respondent's purchase of meat; zero otherwise | 0.707 | 0.455 | 0-1 |
| Meat hygiene or safety | Unity if hygiene or meat safety is the main driver influencing the respondent's purchase of meat; zero otherwise | 0.126 | 0.332 | 0-1 |
| Religious beliefs | Unity if the respondent's religious beliefs are the main driver influencing their purchase of meat; zero otherwise | 0.061 | 0.2403 | 0-1 |
| Animal welfare | Unity if animal welfare (e.g. how the animal was treated prior to and during slaughter) is the main driver influencing the respondent's purchase of meat; zero otherwise | 0.004 | 0.066 | 0-1 |
| Other driver (e.g., meat quality) | Unity if Other driver (e.g., meat quality) is the main driver influencing the respondent's purchase of meat; zero otherwise | 0.086 | 0.280 | 0-1 |

| | | | | |
|---|---|---|---|---|
| Age 20 or less | Unity if respondent is age 20 or less; zero otherwise | 0.370 | 0.483 | 0-1 |
| Age group 21-30 | Unity if respondent is with the 21-30 age group; zero otherwise | 0.283 | 0.451 | 0-1 |
| Age group 31-40 | Unity if respondent is with the 31-40 age group; zero otherwise | 0.203 | 0.403 | 0-1 |
| Age group 41-50 | Unity if respondent is with the 41-50 age group; zero otherwise | 0.079 | 0.270 | 0-1 |
| Age group 51-60 | Unity if respondent is with the 51-60 age group; zero otherwise | 0.043 | 0.203 | 0-1 |
| Age group > 60 | Unity if respondent is over 60 year; zero otherwise | 0.010 | 0.099 | 0-1 |
| Female | Unity if female; zero otherwise | 0.404 | 0.491 | 0-1 |
| Single | Unity if marital status is single/never married; zero otherwise | 0.633 | 0.482 | 0-1 |
| Married | Unity if married; zero otherwise | 0.328 | 0.470 | 0-1 |
| Divorced | Unity if divorced; zero otherwise | 0.012 | 0.109 | 0-1 |
| Widowed | Unity if widowed; zero otherwise | 0.007 | 0.081 | 0-1 |
| Has kids | Unity if respondent has kids; zero otherwise | 0.307 | 0.461 | 0-1 |
| Primary or less | Unity if highest educational attainment is primary or less or no formal education; zero otherwise | 0.250 | 0.433 | 0-1 |
| WASSCE/O-Level/A-Level | Unity if highest educational attainment is WASSCE/O-Level/A-Level; zero otherwise | 0.568 | 0.496 | 0-1 |
| University education | Unity if highest educational attainment is university education (e.g., diploma, degree); zero otherwise | 0.123 | 0.329 | 0-1 |
| Post graduate | Unity if highest educational attainment is Post graduate (e.g., Masters, PhD); zero otherwise | 0.047 | 0.212 | 0-1 |
| Household income scale | Measure of rank of household income decile within Ghana (1= lowest decile; 10 = highest decile) | 2.354 | 1.90 | 1-10 |
| Unemployed | Unity if unemployed; zero otherwise | 0.543 | 0.498 | 0-1 |
| Roman Catholic | Unity if Roman Catholic; zero otherwise | 0.057 | 0.232 | 0-1 |
| Protestant | Unity if Protestant (e.g., Pentecost, Methodist, Presbyterian, Baptist, etc.); zero otherwise | 0.119 | 0.323 | 0-1 |
| Muslim | Unity if Muslim; zero otherwise | 0.798 | 0.401 7 | 0-1 |
| Other religious denomination | Unity if Other religious denomination; zero otherwise | 0.019 | 0.135 | 0-1 |

**Table 2. Ordered probit regression results showing the effect of attitudes toward animal welfare on meat consumption**

| Variable | Estimate | Model 1 SE | Marginal effect | Estimate | Model 2 SE | Marginal effect | Estimate | Model 3 SE | Marginal effect |
|---|---|---|---|---|---|---|---|---|---|
| **Animal Welfare Indices (Ref = Other animal welfare index)** | | | | | | | | | |
| Production system | 0.789*** | 0.118 | 0.133 | | | | 0.761*** | 0.122 | 0.125 |
| Transport system | 1.186*** | 0.414 | 0.199 | | | | 1.416*** | 0.422 | 0.234 |
| Humaneness of slaughter | -0.483** | 0.215 | -0.081 | | | | -0.439* | 0.227 | -0.072 |
| **Drivers of meat purchases (Ref = Other driver)** | | | | | | | | | |
| Price of meat | | | | 0.125 | 0.159 | 0.021 | 0.010 | 0.163 | 0.002 |
| Meat hygiene or safety | | | | -0.5110*** | 0.178 | -0.087 | -0.529*** | 0.182 | -0.087 |
| Religious beliefs | | | | 0.212 | 0.234 | 0.036 | 0.088 | 0.255 | 0.014 |
| Animal welfare | | | | -1.440*** | 0.548 | -0.246 | -1.932*** | 0.565 | -0.319 |
| **Age group ( Ref =Age 20 or less)** | | | | | | | | | |
| Age group 21-30 | -0.000 | 0.120 | -0.000 | -0.157 | 0.117 | -0.027 | -0.042 | 0.122 | -0.007 |
| Age group 31-40 | -0.108 | 0.156 | -0.018 | -0.290* | 0.155 | -0.050 | -0.167 | 0.158 | -0.028 |
| Age group 41-50 | -0.352* | 0.197 | -0.059 | -0.536** | 0.199 | -0.092 | -0.441** | 0.200 | -0.073 |
| Age group 51-60 | -0.492** | 0.232 | -0.083 | -0.610** | 0.231 | -0.104 | -0.577** | 0.235 | -0.095 |
| Age group > 60 | -0.138 | 0.418 | -0.023 | -0.226 | 0.411 | -0.039 | -0.229 | 0.420 | -0.038 |
| **Gender (Ref = Male)** | | | | | | | | | |
| Female | -0.086 | 0.087 | -0.014 | -0.114 | 0.087 | -0.020 | -0.090 | 0.088 | -0.015 |
| **Marital status ( Ref = Single)** | | | | | | | | | |
| Married | -0.083 | 0.143 | -0.014 | -0.064 | 0.144 | -0.011 | -0.066 | 0.144 | -0.011 |
| Divorced | 0.353 | 0.410 | 0.059 | 0.480 | 0.401 | 0.082 | 0.460 | 0.413 | 0.076 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Widowed | 0.387 | 0.488 | 0.065 | 0.344 | 0.487 | 0.059 | 0.416 | 0.488 | 0.069 |
| **Has kids (Ref = No)** | | | | | | | | | |
| Has kids | -0.080 | 0.141 | -0.013 | -0.089 | 0.142 | -0.016 | -0.089 | 0.142 | -0.015 |
| **Education (Ref = Primary or less)** | | | | | | | | | |
| WASSCE/O-Level/A-Level | 0.643*** | 0.106 | 0.108 | 0.736*** | 0.105 | 0.126 | 0.666*** | 0.107 | 0.110 |
| University education | 0.399** | 0.170 | 0.067 | 0.646*** | 0.169 | 0.110 | 0.459*** | 0.175 | 0.076 |
| Post graduate | 0.390* | 0.233 | 0.066 | 0.548** | 0.231 | 0.094 | 0.356 | 0.237 | 0.059 |
| **Income Decile** | | | | | | | | | |
| Household income scale | 0.001 | 0.027 | 0.000 | 0.022 | 0.029 | 0.004 | 0.030 | 0.029 | 0.005 |
| **Employment status (Ref = Other)** | | | | | | | | | |
| Unemployed | -0.127 | 0.118 | -0.021 | -0.069 | 0.119 | -0.012 | -0.088 | 0.119 | -0.015 |
| **Religious denomination (Ref = Other)** | | | | | | | | | |
| Roman Catholic | 0.402 | 0.331 | 0.068 | 0.170 | 0.326 | 0.029 | 0.481 | 0.333 | 0.079 |
| Protestant | 0.486 | 0.306 | 0.082 | 0.310 | 0.301 | 0.053 | 0.557* | 0.306 | 0.092 |
| Muslim | 0.567** | 0.285 | 0.095 | 0.160 | 0.280 | 0.027 | 0.591** | 0.286 | 0.097 |
| | | | | | | | | | |
| Pseudo-$R^2$ | 0.193 | | | 0.156 | | | 0.221 | | |
| % Correctly predicted | 70.70 | | | 69.80 | | | 73.50 | | |
| Likelihood Ratio | 163.923*** | | | 127.080*** | | | 190.0712*** | | |
| (df) | (21) | | | (22) | | | (25) | | |
| Average density | 0.168 | | | 0.171 | | | 0.165 | | |

Note: N=887. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level. Marginal effects are calculated by multiplying the coefficient by the average density.