

PUBLIC ATTITUDES TOWARDS HOUSING SYSTEMS FOR PREGNANT PIGS

by

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Abstract

Public concern for the welfare of farm animals is increasing. Formal methods of gathering public attitudes are important for the development of socially sustainable animal production practices. This study used an online survey to gather public attitudes towards the issue of housing pregnant sows in intensive systems (group housing versus gestation stall housing). Additionally, this research aimed to understand how participant's stance changed when they were provided additional information on the issue, including two scientific papers, YouTube videos, Google images, and a frequently asked questions page. Initial attitudes (from responses to the first question) and changes in responses before and after accessing additional information were quantitatively analyzed from Likert-scale responses made by 268 participants. One-hundred-and-thirteen comments, written before accessing additional sources of information, were qualitatively analyzed to identify themes and understand reasons behind decisions. Forty-one pairs of comments were analyzed to understand the effect of information on attitudes. Quantitative results reveal that the majority of participants strongly supported group housing before the provision of additional information. Most participants maintained their stance even after accessing additional information; however, an effect of information was found, such that more people strongly supported stalls after the provision of additional information. Regardless of whether participants moderately supported groups or gestation stalls before the provision of additional information, almost half of the people in each of these groups abandoned their position after accessing additional information and shifted to strongly support group housing. Qualitative analysis showed that supporters of gestation stalls tended to focus on physical health, predominantly focusing on

spread of disease and the elimination of aggression between animals. Supporters of group housing sows, tended to factor in other requirements for sow welfare, including the importance of social interaction and the ability to perform natural behaviours. With the exception of participants that strongly supported gestation stalls, numerous participants commented on the complexity of choosing one system over the other and described the effect that images had on attitudes.

These results point to the importance of providing detailed descriptions, including imagery to the public in efforts aimed at gathering feedback for the development of socially sustainable practices.

Preface

The University of British Columbia's Behavioural Research Ethics Board (BREB) approved this study. The Certificate Number of the Ethics Certificate obtained for this research is H11-02774.

Erin Ryan and Drs. David Fraser and Daniel Weary designed the study collaboratively. Drs. Fraser and Weary supervised data collection, analysis as well as manuscript preparation.

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Dedication

To the pigs – may our society become enlightened enough to enable you to fulfill your interests and lead meaningful lives.

Chapter 1: Introduction

1.1 Background on sow housing

As Europe recovered from World War II, and the United States came out of the Great Depression, both societies drove to increase food production output through greater production and efficiency to address food shortages (Mench, 2008; Vanhonacker *et al.*, 2009). This dramatically changed the way farm animals were housed. Specifically, the pork industry has changed its production practices over the last century, with a move from small, outdoor herds, to large, intensive indoor systems (Kittawornrat and Zimmerman, 2010; Mench *et al.*, 2011).

1.2 The development of social ethics specific to animal welfare issues

In areas as diverse as genetically modified crops and xenotransplantation, governmental, industrial, and scientific bodies are acknowledging that some awareness and responsiveness to public attitudes is necessary for sound policy development (Rowe and Frewer, 2000; Vaughan, 1993). Hence, one of the aims of engaging the public in ethical discussions is to increase democratic participation in the process of policy development and identify publicly acceptable practices as they pertain to the lives of agricultural animals.

Socially conscious citizens have a history of expressing concern for animals in production systems (Lassen, 2006; Krystallis, 2009). The articulation of these concerns informs the ongoing development of what Rollin describes as a “new social ethic” for animal welfare (Rollin, 2004). The traditional ethic in the 19th century and early 20th century, was an ethic that used the term ‘cruelty’ in condemnation of passive and active acts that took place in public spaces and that resulted in animals suffering (Woods, 2012). In England, in 1876, animals in experiments were the focus of the Cruelty to Animals Act, and in 1911, the

Protection of Animals Act made it a punishable offense to “cause unnecessary suffering by doing or omitting to do any act” (Woods, 2012; p. 15), including beating, over-driving, infuriating, or ill-treating an animal (Woods, 2012). The new ethic of animal welfare that Rollin speaks of involves the expansion of animal ethics to include social, ethical concerns relating to both public and private actions towards animals.

In the 1950s and 1960s, when awareness of livestock husbandry issues captured the public imagination, (Woods, 2012), concerns arose partly “as a consequence of a general distrust in societal values, industry, and modern technology” (Krystallis, 2009, p. 47). Concerns responded to dramatic changes in animal agriculture, specifically the move from small-scale systems to intensive systems that housed greater numbers of animals together in smaller spaces and that relied more on automation and technology (Rollin, 2004). Further, the public was becoming aware of the increased use of animals for purposes such as research and testing (Rollin, 2004). The concept of animal welfare, and a new vocabulary replacing the language of cruelty, came to be during this time, due to a perception that the vocabulary of cruelty was too minimalist, and a view that using the productivity of animals (i.e., their ability to grow and produce) as a primary indicator of their welfare was inadequate to capture the experiences of animals in intensive systems (Woods, 2004). In the 1960s Ruth Harrison, author of *Animal Machines*, pushed legislators and producers to acknowledge the deficiencies of measuring animal well-being solely on the ability to produce. She argued that animals living in systems where their basic needs are taken into consideration (i.e., provision of food, water, shelter etc.) may nevertheless experience suffering as a result of lack of space, ‘discomfort, boredom and actual denial of health’ (Harrison, 1964; p. 3, in Woods, 2012; p. 17). Today, animal welfare scientists assess animal welfare using multiple indicators that

include health and productivity, emotional or affective states, and the animals' ability to live in a manner that suits their adaptations (Fraser, 2008).

Public concerns over farm animal welfare issues have driven changes in markets in recent years (Eriksen and Kristensen, 2001; Millet *et al.*, 2005; Honeyman, 2005).

Smithfield, the largest producer of pork in the United States, has begun to phase out gestation stalls on company-owned farms, in response to consumer beliefs that “group housing is a more animal-friendly form of sow housing” (Smithfield, 2007 in Mench, 2008). The UK's Royal Society for the Prevention of Cruelty to Animals (RSPCA) initiated a relationship with producers in 1994, through a program called Freedom Foods, to address what the RSPCA saw as significant animal welfare issues in farming (RSPCA, 2013). Farms that participate in the animal welfare assurance program meet over 500 welfare standards, which are inspired by the “Five Freedoms” (Mench, 2008). Freedom Foods products, sold in supermarkets, use a labeling scheme to highlight welfare standards designed to assure a reasonable quality of life for animals. Today, 28% of all pigs reared in the UK and 13% of all chicken sold in supermarkets are Freedom Food certified (RSPCA, 2013). Fast food chains are also responding to social concerns for animal welfare. After auditing slaughter facilities to examine handling and stunning methods, McDonalds in the USA established an animal welfare committee and has created on-farm standards and purchasing requirements for suppliers (Mench, 2008).

As Bernard Rollin (2004) notes, the continued development and articulation of a social ethic reflective of concern for animals in intensive systems is necessary to ensure that animals' interests are not greatly diminished by endeavors focused on progress, efficiency, safety, and knowledge. Lassen *et al.* (2006) suggest that animal suffering is not the only

potential side-effect of intensive systems. They claim that the numbers of people necessary to work in the agricultural sector and, in turn, those who feel connected to the community of animal production in one form or another, have been dramatically reduced by technological developments and efficiency. Ultimately, this has affected the political influence of the agricultural community (Lassen *et al.*, 2006). In this context, communicating practices to the public opens communication channels between producers and the rest of society that support farmers in one way or another, which in turn has the potential to bolster producers' political autonomy. If industry and policy developers do not engage the public in discussions about common animal farming practices and are not responsive to their concerns, they risk using animal production practices that are out of line with public values. Practices perceived negatively by the public can result in distrust of industries and their products (Frewer and Salter, 2002, Pennings *et al.*, 2002, Verbeke, 2001), or in pressure for legislative change, such as the recent bans on gestation stalls in some US states and the European Union.

The European Union's legislation requiring a ban on gestation stall housing (except for the first four weeks of pregnancy) came into effect in 2013 (Mui *et al.*, 2010). In the US, legislation has caused gestation stalls to be banned in Florida (2008), Maine (2011), Arizona and Oregon (2013) (Croney and Anthony, 2010). California's ban, as a result of Proposition 2 in 2008 will come into effect by 2015 (Goll, 2008). Colorado's ban will be effective by 2018 (Croney and Anthony, 2010), and Michigan's by 2019 (AASV, 2012).

Dictating management practices to producers through legislation can have unpredictable effects. On the one hand it may assuage a public concerned with practices they perceive to be negative, but it may also result in a loss of autonomy and freedom for producers (Rollin, 2004). It may also lead to unintended animal welfare consequences as

illustrated by a recent example. In 2006 in the United States, public pressure to end the slaughter of horses destined for human consumption resulted in an end to federal funding for meat inspection in US horse slaughter plants (Mench 2008; Graham, 2011). However, the change did not end horse slaughter; rather it resulted in the diversion of horses to slaughter plants in Canada and Mexico, creating a new welfare concern surrounding the long transport times and conditions for those animals having to cross borders (Mench 2008; Graham, 2011).

1.3 The Canadian Code of Practice for the Care and Handling of Pigs

In Canada, in order to create broadly supported standards for raising farm animals, the federal government funded a process that led to the development and publication of the Code of Practice for the Care and Handling of Pigs in 1984. A range of participants developed these codes including the pork industry, the Canadian Federation of Humane Societies (CFHS), veterinarians, and animal welfare scientists. An updated version of the Code was published in 1993 (NFACC, 2011). The Code was designed to be a *grounded in science* educational tool for producers, providing suggestions for management, husbandry, transportation, and processing practices that promote animal welfare under intensive management systems (Connor, 1993).

In December of 2010 the National Farm Animal Care Council (NFACC) announced that the Code of Practice for the Care and Handling of Pigs would be updated through a collaborative process including stakeholder input from swine producers, animal welfare scientists, veterinarians, and the CFHS. Later this year (2013), before publication of the new code, a draft of the updated Code will be available on-line for public comment. NFACC hope that the updated version will represent current stakeholder concerns and provide suggestions for the care of pigs that will be followed by swine producers (NFACC, 2011).

1.4 The issue of housing pregnant sows

Gestation stalls have become one of the most controversial aspects of pig production. Specifically, the practice of individually confining sows in gestation stalls for the duration of their 115 day pregnancy is contentious.

Housing systems for pregnant sows can generally be divided between individual confinement housing (also known as gestation stall or crate housing) and group housing. In Canada today, there are approximately 1.3 million sows (a pregnant pig that has had one or more parities of piglets) and gilts (pigs that are pregnant for the first time) (Statistics Canada, 2011). The majority of these animals spend their pregnancies in gestation stalls (Pajor, 2005).

Individual gestation stalls are made of metal bars, usually with concrete flooring. They are approximately 66-71 centimeters wide by 2 meters long. Stalls allow sows to stand up, sit and lie down and take about one step forward or backward; however, they do not allow sows to turn around (Fraser *et al.*, 2001; BCSCA, 2009). It is common to keep sows in gestation stalls for the first 105-110 days of a pregnancy lasting roughly 115 days total. Sows are then moved to farrowing crates (similar in size to gestation stalls but differing in design to accommodate piglets) to give birth to their young, where they remain for 2-4 weeks. After this time, sows may be returned to gestation stalls to be artificially inseminated. This cycle is repeated for three or four parities (pregnancies), after which time, sows are often culled (BCSPCA, 2009).

An alternative to gestation stalls is to group-house sows during most or all of pregnancy. Group-housing systems vary with respect to feeding system and floor type (Gonyou, 2005). Group size also varies from 5-50 animals per pen, with an average floor space allowance of 0.7m² per pig (Morrison *et al.*, 2007). Because they vary so much, group-

housing systems cannot be considered one simple category (Gonyou, 2005). However, all intensive group-housing systems share the feature of keeping pregnant sows and gilts together for the greater part of their gestation period, allowing more freedom of movement and social interaction than gestation stalls afford (Rhodes *et al.*, 2005).

Individual gestation stalls and groups give roughly equivalent production (Rhodes *et al.*, 2005); however they differ in their animal welfare advantages and disadvantages (Mench *et al.*, 2011).

1.5 Advantages and problems with each system

1.5.1 Gestation stalls

Farmers began using gestation stalls in the 1950s as a means of addressing problems of food competition and to control the feed intake of individual pigs (Gonyou, 2005). By feeding pigs individually, competition between animals was eliminated (Gonyou, 2005). Furthermore, proponents of this technology argue that gestation stalls allow for more efficient individual management of sows, including individual monitoring of health, and that stalls eliminate aggressive interactions between animals (Fraser *et al.*, 2001; Anil *et al.*, 2002).

The limited mobility, lack of social interaction and lack of environmental choice for animals in gestation stalls are of particular concern to many who oppose this system (Fraser *et al.*, 2001; Anil *et al.*, 2002). Sows and gilts in gestation stalls may stand inactive for prolonged periods. This may reflect difficulty lying down due to the confines of the gestation stall. Prolonged standing may also be due to a lack of a comfortable lying surface, as bedding on the surface reduces this behaviour (Fraser, 1975). Sows have also been observed attempting to root on concrete or metal slatted floors in gestation stalls. Rooting is a

behaviour these animals are highly motivated to perform in natural environments, or when provided with straw or other types of bedding, but one that they are not able to perform in gestation stalls (Fraser, 1975).

Sows in stalls have a decreased ability to exercise control over their environment (Rhodes *et al.*, 2005). For example, they are unable to respond to changes in environmental temperature, as they would if they were living in semi-natural or natural conditions where they would seek mud or shade on warm days and would huddle with other pigs to retain body heat on cold days. Although injury rates have been found to be less in gestation stalls compared to group housing, the stalls restrict the sows' movement, causing the sows to have decreased muscle mass and bone and joint strength (Rhodes *et al.*, 2005). The lack of opportunity for animals to exercise in gestation stalls has also been found to increase lameness (problems walking associated with hoof and leg injuries) compared to group-housed sows (Elliot and Doige, 1973).

1.5.2 Group housing

It has been argued that sows housed in groups have better welfare than those individually housed in gestation stalls (Kirkden and Pajor, 2006a). This argument is based in part on research showing that sows reared in pens with other sows of comparable weight and age have increased social contact with other animals and greater individual movement, which improves physical health (Marchant and Broom, 1996; Turner *et al.*, 2001). However, when stocking density in pens is high and unfamiliar animals are mixed together, there is increased aggression between animals (Tan *et al.*, 1991; Arey and Brooke, 2006). This can result in injuries that affect sow welfare (Tan *et al.*, 1991; Turner *et al.*, 2001).

Aggressive interactions are the greatest concern with group housing; however, various management strategies can mitigate the effects of aggression. Wounds on the neck and shoulders of sows typically reflect aggressive attacks when sows establish dominance relations. Sows that are less dominant may show signs of stress in groups. If feed is distributed all at once in group systems, sows may compete for feed and lower-ranking sows may have decreased feed intake leading to lower weight gains compared to more dominant animals (Brouns and Edwards, 1993; Fraser *et al.*, 1995).

Some group-housing systems use electronic sow feeders (ESF) to feed sows individually (Gonyou, 2005). In such systems, animals individually enter a feeding stall with a pneumatically operated gate that closes behind them. Once inside, a computer reads an electronic transponder on a tag attached to the sow's ear and an amount of food specific to the individual animal is dispensed. In early designs there was a significant problem of frustrated sows biting the vulva of other sows in feeding stalls (Rhodes *et al.*, 2005), but rates of vulva biting can be controlled in ESF designs with effective rear gate control (Andersen *et al.*, 1999).

1.6 Public attitudes on animal welfare issues: A definition of attitudes and their contribution to animal welfare debates

Azjen and Fishbein (2000) and Vaske (2008) distinguish between attitudes, beliefs, and norms. Attitudes include evaluations (like or dislike, favour or disfavour) and perceptions specific to a particular object, concept, or behavior. Attitudes are composed of two dimensions: one cognitive, the other evaluative (Vaske, 2008). The first dimension includes beliefs about an object, concept or behaviour possessing a certain attribute, which may or may not be factually true, while the second dimension attaches a positive or negative

evaluation to the object, concept or behaviour based on the beliefs associated with it (Vaske, 2008). Vaske (2008) emphasizes that two people can share the same cognitive belief about an object, for example that wolves are dangerous, but they may evaluate wolves differently, one attaching a positive evaluation to wolves based on feeling excited by their power and danger, while the other negatively evaluates wolves because of fear of dangerous animals. Thus, these two individuals may support (behaviour) wolf-culling efforts differently. Norms express the acceptability of an action, concept, or object, or express obligations and moral ideas of what people “should” or “ought to” do (Vaske, 2008). These three components together help predict future behaviour.

According to Azjen and Fishbein’s expectancy-value model (2000) attitudes may change and evolve as a result of a communication process whereby an individual is persuaded or educated to change their attitude towards an object through the acquisition of more information. Information can result in a change in evaluations and/or beliefs about an object’s attributes, which in turn can change attitudes (Fishbein, 1967).

Understanding these dimensions can help predict future behavior; thus studying attitudes towards different housing systems may be a first step in being able to predict whether people would be willing, for example, to support a legislative ban on gestation stall housing.

Scientific study of animal welfare, like many fields of “mandated” science, is underlain by values. For example, scientists may study the rates of injury amongst sows living in different systems if they believe that the prevention of injury is important (evaluative idea) for an animal to have a good life (Fraser, 2008). Objective ‘facts’ such as the rate of injury in different systems may be agreed upon by different people but may cause

disagreement over the effects of systems on ‘welfare’ because people attach different levels of importance to elements of welfare, including natural behaviour, health and well-being, and emotional states. However, beliefs, evaluations and facts do not provide producers or scientists with input on how sows ought to be housed. Without moral discussions that convey normative claims (norms) about whether producers ought to house sows in gestation stalls or in group pens, or whether certain rates of injury are acceptable if animals are able to have more natural lives, debates and discussions about animal welfare issues cannot be adequately resolved (Fraser, 2008). Resolving animal welfare debates requires an integration of both animal welfare science and social science, including research on public attitudes towards animals.

1.7 Factors influencing attitudes towards animals

A number of factors relating to personally held beliefs concerning animals and animal use have been found to influence attitudes concerning the use of animals (Knight and Barnett, 2008). Knight and Barnett identified three themes that influenced attitudes in their qualitative study: the type of animal used, the purpose of the animal use, and respondents’ knowledge of animal-use practices. Level of support for the use of a particular animal species was influenced by participants’ belief in the mental capacity of the species. “Belief in animal mind” (BAM), includes the belief that animals have the ability to be self-aware, to problem solve, and to experience emotions such as pain or pleasure (Hills, 1995; Knight *et al.*, 2003). In fact, BAM has recently been found to influence animal-use attitudes to a greater extent than characteristics previously demonstrated to shape attitudes, such as sex, and experience with animals such as pet ownership (Herzog and Galvin, 1997; Knight *et al.*, 2003). If an individual has positive BAM towards a species they will be less likely to support practices

that subject such animals to states of discomfort or pain. However, BAM may not be enough to deem the use of animals unacceptable in some cases if people believe there is no alternative to using them (Knight *et al.*, 2009). Furthermore, despite BAM, an individual may adjust their attitude so as not to encounter dissonance associated with their preferred behaviour; for example, a person may choose not to learn about food animal transport or slaughter practices so that their meat eating behaviour is not challenged (Knight *et al.*, 2003; Coleman, 2010).

Lassen (2006) showed that demographic variables including age, sex, education, and area of residence (urban or rural) affect people's attitudes towards pigs.

Research also demonstrates that in general the public lack contact with farming and consequently have little knowledge about farming practices, and furthermore that the information they have about farming practices is often inaccurate (Coleman, 2010; Boogaard *et al.*, 2011). Hence, it is useful to identify public attitudes and what kinds of information affect attitudes so that education and extension efforts can directly address areas of misinformation.

1.8 The use of images in surveys

The use of photos or images in research interviews, focus groups or surveys, is known as photo elicitation (Harper, 2002). The use of images in research helps in the gathering of unique and information-rich data in part because more of the brain is engaged when both words and images are used (Harper, 2002). Images and videos hold the potential to both reduce and increase misunderstanding, to mitigate participant fatigue in exploring a topic, and to stimulate new directions for conversation and debate. For example, participants can

compare their own beliefs about how farm animals live to the images they see (Harper, 2002).

The use of visual methods in research is increasing, adding a new dimension to methods of inquiry that have hitherto used text- and number-based methods (Prosser *et al.*, 2008). Internet images and videos are increasingly used as sources that alter perceptions of the world (Tonsor and Wolf, 2011; Coleman, 2010). Apart from a study by Tonsor and Wolf (2011), who found that US consumer's perception of the dairy industry were sensitive to video information, there is little scientific work on how images of farming practices affect public attitudes towards agricultural practices.

The selection of images for use in research raises important issues. Every photograph and video is subjective to some extent, whether through use of light, framing or focus (Harper, 2002). Indeed, whether using images or text-based materials to convey information about practices, it is impossible to impart wholly unbiased or value-free information since the simple selection of what to show or say, and what not to show or say, is a major aspect of subjectivity. In addition, as Coleman (2010, p.77) notes, "so-called facts are influenced by the underlying perspective of the person [or group] that imparts them".

1.9 The importance of public attitudes to policy development, market regulation, and farmers

Depending on the methods for resolving issues of animal welfare that different countries use, members of the public have the potential to support or change animal production practices through two main approaches: politically, as voting citizens, and/or through market-based approaches, as consumers. Research by Bock and van Huik (2007) suggests that citizens in France and the Netherlands tend to prefer the political approach,

following European Union Directives that dictate animal welfare standards, with the Netherlands adding a few additional national measures. Norway and Sweden have begun to develop some marketing schemes to address animal welfare but predominantly follow legal regulations, which in these countries are generally stricter than European Union Directives (Bock and van Huik, 2007). In countries including Holland and the United States, where freedom of business enterprise and liberal autonomy are socially prioritized (Kjaernes, 2003), animal welfare standards are driven more strongly by producer groups and retailers offering choices in products with different animal welfare attributes for consumers to choose from (Mench, 2008; Bock and van Huik, 2007). The United Kingdom has embraced both stringent legislative measures and many market-based animal welfare assurance schemes (Bock and van Huik, 2007).

Kanis *et al.* (2003) note that a great deal of research on concerns regarding animal production systems has focused on consumer behaviour and perception. This type of research is beneficial for understanding consumer attitudes as demonstrated by their willingness to pay (WTP) for certain products that may have higher welfare standards. However, it may not give a clear picture of people's concern if, for example, the market lacks products with desirable animal welfare attributes for consumers to choose from (Tonsor and Wolf, 2011), or if consumers struggle to differentiate between the choices available. Additionally, if economic constraints prevent consumers from purchasing products that adequately reflect their values and concerns for farm animals, WTP may not be a reliable indicator of concern. Research focused on consumers may also fail to reflect the impact those same people may have on animal production industries in their capacity as citizens to use political processes to express their concerns (Tonsor and Wolf, 2011). In fact, Krystallis *et al.* (2009), found only a

weak relationship between people's role as citizens (through their evaluations of pig production systems) and their role as consumers (by examining their pork consumption behaviour), despite the possibility that attitudes may be shared by the two groups, or that the same people are both citizens and consumers (Verbeke and Viaene, 1999). There may also be a lack of public acceptance of market-based solutions if people believe that an issue should be solved by policy. To illustrate the point, Tonsor *et al.* (2009) used the example of the consumer who is either not willing to pay more for products raised in a way that resonates with their values, or who is vegetarian, but is willing to vote against the continuation of practices they view as negative. This underscores the importance of understanding public attitudes, as distinct from willingness to pay, for their predictive value for future behaviour (Krystallis *et al.*, 2009).

Using quantitative methods to survey Dutch consumers about their attitudes toward the development of animal-friendly husbandry systems, Frewer *et al.* (2005) found that respondents felt there was a societal, moral obligation for high standards of animal welfare to be promoted by citizens. The same respondents expressed only moderate interest in participating in the consultation process for the development and maintenance of animal welfare standards, while expressing interest in being informed of practices through trustworthy food labeling strategies (Frewer *et al.*, 2005). The lack of desire by some consumers to be directly involved in development of standards may reflect limited enthusiasm for delving into the details of animal welfare issues in animal production systems, which could be a psychological strategy used to avoid the contradiction between one's beliefs and practices (Frewer *et al.*, 2005; Te Velde *et al.*, 2002).

1.10 Research goals

There is a great deal of scientific literature on the effects of different housing systems on animal welfare and productivity but little literature on public attitudes, and none at all on how information provided to the public may modify these attitudes. Research on attitudes towards this issue holds the potential to generate information relevant to the development of animal production practice standards, and may make a contribution towards articulating a social animal welfare ethic. Therefore, the aims of this study were:

- 1. To engage self-identified stakeholders in discussions on how sows should be housed during pregnancy.*
- 2. To understand stakeholder attitudes towards two types of housing systems and to investigate how these attitudes shift with the provision of additional information.*

Chapter 2: Assessing public attitudes towards housing pregnant sows using an online engagement tool

2.1 Introduction

In recent years public awareness of, and concern for how animals are housed and handled in intensive systems has increased (Lassen, 2006; Appleby, 1999). The use of gestation stalls to house pregnant sows is one example of a practice that has become the focus of public attention (Tonsor *et al.*, 2009).

The majority of pregnant sows in many industrialized countries are kept in single housing units called gestation stalls for the majority of their 115-day pregnancy (Pajor, 2005). Gestation stalls allow for individual monitoring and feed control but they provide space for only minimal physical movement: animals can lie down but cannot walk more than one step forward or back and cannot turn around (Fraser *et al.*, 2001; BCSPCA, 2009). An alternative method of housing pregnant sows is to keep them in group-pens, a method supported by those who value the greater freedom of movement but criticized by those who believe group housing results in more aggression and injuries (Rhodes *et al.*, 2005).

Societal concern has manifested itself in a number of ways. Animal protection groups have drawn attention to controversial agricultural practices, some of which have been featured in the media and on the Internet (Lassen, 2006; Lusk, 2010; Mench, 2008; Coleman, 2010). Numerous legislative bans on using gestation crates, resulting largely from citizen pressure (Croney and Anthony, 2010), are at various stages of implementation in nine states of the United States of America, while some producer organizations have voluntarily decided to phase out their use of stalls, including organizations in some US states and New Zealand.

The European Union's ban on using gestation stalls, except for the first four weeks of pregnancy, came into force January 1st of 2013.

The social sustainability of animal production practices is based in part on public acceptability of practices; therefore, there is a need for collaborative discussions between stakeholder groups, and for the inclusion of public perceptions in these discussions (Boogaard *et al.*, 2011). Indeed, there has been acknowledgment from scientific, industrial, and governmental bodies that greater public engagement in policy decisions is of value (Rowe and Frewer, 2000).

To date, studies specific to attitudes towards housing pregnant sows in gestation stalls have predominantly focused on the preferences, attitudes, and behaviour of consumers (Tonsor *et al.*, 2009a; Tonsor *et al.*, 2010a; Ngapo *et al.*, 2003). Research on public attitudes towards pig production has focused on European citizens and identified the need for the pork industry to alter socially contentious practices that give rise to public concern (Kanis *et al.*, 2003). Specifically, work by Lassen (2006) and Krystallis *et al.*, (2009) has highlighted concern for animals being placed in crowded group pens and subsequent aggression and injuries, as well as the importance of allowing natural behaviors. Less is known about public attitudes of North Americans on housing methods for pregnant sows.

One challenge in surveying the public on attitudes towards intensive farming methods is that they may lack direct experience with, and connection to, individuals involved in farming practices; thus, it is difficult for many people to actually envision the details of these practices (Boogaard *et al.*, 2011; Lassen, 2006). We endeavored to address this issue by providing numerous text- and image-based sources for participants to inform their attitudes. Our aims were 1) to explore attitudes towards housing pregnant pigs, and 2) to examine the

effect of additional information on these attitudes, and to explore the themes that emerged from the participants' comments. We used an online engagement survey composed of both qualitative and quantitative components to meet these research goals.

2.2 Methods

The methods followed those of earlier studies by Weary *et al.* (2011) and Ventura *et al.* (2013, in review) using The University of British Columbia's "*Your Views*" web site (www.yourviews.ubc.ca), which provide an interactive, on-line forum. *YourViews* was designed to provide an opportunity for participants to engage in discussions surrounding ethically contentious issues in technology and science (Ahmad, 2006) under approval of The Behavioural Research Ethics Board at the University of British Columbia.

Respondents provided quantitative (Likert-scaled) responses to two questions, and qualitative 'reasons' for their responses using the N-Reason platform of Danielson (2010).

This study follows type 2 and 3 consultation mechanisms for public engagement as described by Rowe and Frewer (2005). Specifically this study employs a type of electronic consultation, whereby a link to an interactive platform is provided to participants to gather high quality, information-rich responses specific to an issue (Rowe and Frewer, 2005).

2.3 Survey design

All *YourViews* surveys begin by collecting demographic questions on age, sex, level of education, and country of residence and of origin. At the end of our survey we also asked participants to provide additional personal characteristics, including knowledge ("Very familiar", "Somewhat familiar", or "Not familiar") of pig farming practices. Participants

were provided randomly generated pseudonyms; these pseudonyms were then used to link participant identity and the reasons they provided.

When first entering the survey participants were presented with the following brief synopsis of the sow housing debate:

In an effort to reduce production costs and to simplify the management of animals, intensive housing for pregnant sows and gilts began to increase in the 1950's. Throughout most of the industrialized world, pregnant sows and gilts are kept in confined housing, known as gestation stalls or gestation crates, for most of their four-month pregnancy. However, some US states and the European Union have banned the practice, calling for animals to be housed in groups. Outlined below are the perceived benefits and drawbacks of gestation stalls and group housing.

Gestation Stalls

Proponents suggest that gestation stalls:

- limit aggression
- limit the spread of disease between animals
- makes pork production more efficient
- allow for animals to be fed individually

Opponents suggest that gestation stalls:

- limit animals' ability to move
- limit animals' ability to socially interact
- limit animals' ability to perform natural behaviours

Group Housing

Proponents suggest that group housing:

- increases social contact between animals
- increases animals' ability to move
- improves bone, muscle, and joint health
- improves animals' ability to perform natural behaviours

Opponents suggest that group housing:

- increases aggression between animals

- results in wounds that affect animal welfare
- can affect workers' ability to monitor animals individually

Respondents were then asked, “Do you believe that pregnant sows should be housed in gestation stalls or in groups? Please Explain”. Response choices began with the following decision prompts: “I strongly believe sows should be housed in gestation stalls because...”, “I moderately believe sows should be housed in gestation stalls because...”, “I am neutral on this issue because...”, “I moderately believe sows should be housed in groups because...”, “I strongly believe sows should be housed in groups because...”, and “I don’t believe sows should be housed in either gestation stalls or groups because...”. After selecting a decision prompt, participants could add text explaining their response.

Reasons given by participants were added to a list on the screen that was visible to all participants within that group; future participants were able to choose from the list of reasons and/or add their own. The order of listing reasons on the page was determined by an algorithm, which combined the relative popularity of the reasons and the recency with which they were added. This resulted in more recent and more popular reasons being displayed at the top of the list and older, less popular reasons listed last (Danielson, 2010).

After the participants had responded to the initial question they were provided the opportunity to view additional information including: two scientific review papers on sow housing by Gonyou (2005) and Rhodes *et al.* (2005); a frequently-asked-questions page that was compiled by the primary author after two roundtable discussions with other animal welfare students and faculty regarding sow housing (Figure 2.1); and Google images and YouTube videos obtained using the search terms, “Sow gestation stalls” and “Pregnant sow group housing”. Accessing additional information was voluntary and participants could

choose any or all of the different sources of information. All sources of additional information were provided as links that opened in new windows. We did not track what information participants accessed, but asked participants to indicate which information they had viewed. The videos and images displayed changed over time according to You Tube and Google's proprietary algorithms and contained a mix of information, from dark stalls with injured animals posted by advocacy groups, to industry imagery of clean gestation stalls and group housing with slatted floors or straw. To determine if participant responses changed after the provision of information participants were asked, "Given the information you have now accessed, has your attitude changed? Do you believe that pregnant sows should be housed in gestation stalls or in groups? Please explain." The same response options described above were again available. Previous responses were listed in the same order as described above.

Figure 2.1. Frequently asked questions (FAQ) page from the list of additional sources of information that were made available to participants before the provision of additional information.

Q1: What is the average gestation period of a sow and how many piglets are born in each litter?

A1: A sow is pregnant for "three months, three weeks, and three days", or 115 days total. On average she gives birth to 10-12 piglets in each litter.

Q2: What is the average life span of a sow in an intensive system?

A2: On average, sows are culled (slaughtered) by their third or fourth parity (pregnancy).

Q3: When and why did farmers begin to use gestation stalls as a method of housing for pregnant pigs?

A3: Farmers began using gestation stalls in the 1950's as a means of addressing problems of food competition and to control the feed intake of individual pigs. By feeding pigs individually, competition between animals was eliminated.

Q4: What is ESF?

A4: ESF stands for Electronic Sow Feeder and it is a method of feeding used in group systems that allows farmers the greatest control in individually feeding sows. In a group pen, there is one or more electronic sow feeding stations that pigs enter into one at a time to access a daily amount of food. Each pig wears a tag in one ear that is read by a scanner in the feeder. The feeder then dispenses a ration of food specific to the individuals' weight and dietary needs.

Q5: How are pigs in groups fed individually?

A5: Pregnant pigs (sows) need different amounts of food, depending on their weight. When fed in groups, competition between animals can result in some sows eating too much and others going hungry. However, there are other ways to deliver food individually to group-housed pigs. One such high-tech method is known as ESF (Electronic sow feeder). Not all producers find the ESF method suitable for their barns, either because of the cost of setting up and training staff to use ESF, or because of its technical complexity.

Q6: How much of a sow's life is spent in a gestation stall?

A6: It is common to keep sows in gestation stalls for the first 105-110 days of pregnancy, at which point they are moved to farrowing crates (similar in size to gestation stalls but differing in design to accommodate piglets) to give birth to their young, where they remain for approximately 28 days. After this time, sows are returned to stalls to be artificially inseminated.

Q7: What is the size of an average gestation stall?

A7: Individual stalls are made of metal bars with concrete flooring. They are approximately 26-28 inches wide by 7 feet long.

Q8: Can sows turn around in stalls?

A8: Individual stalls allow for sows to stand up, sit and lie down and take about one step forward or backward; however, they do not allow for sows to turn around.

Q9: What environment and behaviours are natural for pigs?

A9: Watch a video from Q-Pork Chains Open Learning Platform on a study of pigs in semi-natural environments to learn about natural behaviours and environments for pigs.

Q10: What are natural behaviours for sows?

A10: Sows have inherited much of their natural behaviours from their ancestor, the wild boar. In natural, free-ranging environments, 2-3 sows, typically sisters, stay together in a group with their young, until the offspring are older and start their own groups. During the day these social animals graze together, searching for edible plants, or rooting in the soil for insects, worms and fungi. At night they sleep together in a communal nest. Before giving birth (also known as "farrowing"), sows are highly motivated to build a nest, isolating themselves from the group for the period of farrowing and for the first few days of lactation.

Sows wallow in mud or water on hot days to keep themselves cool, as these animals are unable to perspire. Grooming behaviours are also important for these animals. In natural systems, aggression is rare.

Q11: What kinds of unnatural behaviours occur in both housing systems?

A11: Sows and gilts in gestation stalls may stand inactive for prolonged periods of time. This may be a response to experiencing difficulty when attempting to lie down, due to the confines of the gestation stall. Sows and gilts may also be observed attempting to root on concrete or metal slatted floors in gestation stalls. Rooting is a behaviour sows and gilts are motivated to perform in natural environments, or when provided with straw or other types of bedding. Nest building before giving birth is a natural behaviour performed by pregnant sows and gilts. When there is no bedding or other materials to manipulate, frustration is evident in sows and gilts and can be reflected in increased postural changes (switching from lying to sitting to standing position), which can also cause skin damage and lesions.

Q12: What are the typical sow and gilt injuries and health concerns associated with group housing?

A12: In systems that group house sows, aggressive interactions can occur between unfamiliar sows when they are mixed together to form new groups and when they must be in close proximity to one another due to space restrictions. Wounds on the necks and shoulders of sows are reflective of aggressive attacks due to sows negotiating social rank. Sows that are less dominant may exhibit signs of stress in groups. If feed is distributed all at once in group systems, less dominant sows may have access to less feed, which can result in wounds to hindquarters and can affect weight gain. Some group housing systems use electronic sow feeders (ESF) to individually feed sows. Sows enter a feeding stall with a gate that closes behind them. Once inside, a computer scans their ear tag and dispenses food rations specific to their needs. When sows are entering ESF stalls, other sows, frustrated at not being fed at the same time, have the opportunity to bite the vulva of the sow in the stalls. Lameness (problems walking associated with hoof and leg injuries) is also a concern for sows living in groups on concrete or slatted floors, compared to those that have straw or other types of bedding material covering floor space. Sows that have lived in groups for the duration of their pregnancy have been found to have higher levels of stress, indicated by decreased productivity (number of piglets alive at the end of weaning) and increased skin lesions, when they are moved to farrowing crates where they give birth to and nurse their young for up to a month, compared to sows that lived in gestation stalls for the duration of their pregnancy.

Q13: What are the typical sow and gilt injuries and health concerns associated with individually housing sows in stalls?

A13: Sows living in gestation stalls have a decreased ability to exercise control over their environment. This means, for example, that they are unable to respond to changes in

environmental temperature, as they would if they were living in semi-natural or natural conditions where they would seek mud, or shade on warm days and would huddle with other pigs to retain body heat on cold days. Additionally, sows cannot avoid aggressive neighbouring sows when they are confined in crates and this can affect stress levels; however, injury rates have been found to be less in gestation stalls compared to groups. Due to the restriction in movement that stalls cause, sows in these systems have been found to have skin lesions from repeated postural changes and have decreased muscle mass, as well as decreased bone and joint strength. Lameness (problems walking associated with hoof and leg injuries) is also a concern for sows living in groups on concrete or slatted floors, compared to those that have straw or other types of bedding material covering floor space.

Q14: What is the current percentage of sows housed in each system?

A14: In the US in 2003, over 82% of the total crop from pigs was produced by large farms with sow herd numbers over 5000. In Canada today, there are approximately 1.3 million sows and gilts. It is believed that the majority of these animals spend the term of their pregnancies in gestation stalls.

Q15: **What are the laws in other countries regarding gestation stalls?**

A15: In the European Union legislation has been passed calling for a ban on gestation stall housing (except for the first four weeks of pregnancy) by 2013.

2.3 Pre-testing of survey

The survey was initially tested within the research team prior to being published online to check for technical problems and spelling errors. Before being opened to the public, the survey was then tested by 28 participants within the Animal Welfare program and by people outside the program, unfamiliar with the survey, to further identify any remaining technical problems and to ensure clarity of content.

2.4 Participant recruitment and selection

Our sample was not intended to be representative of any defined population; rather, the responses reflect the range of views, from self-identified stakeholders in animal welfare and industry, as well as views from people without an explicit interest in the subject.

The survey was open from May 9, 2012 to September 25, 2012 and participants were sequentially allocated into 11 groups over this period. Initial recruitment (for groups 1 and 2) used purposive sampling (Tashakkori and Teddlie, 2003) by advertising with posters (on

community boards within the City of Vancouver and at the Vancouver Farmers Market), on websites (including that of the British Columbia Society for the Prevention of Cruelty to Animals and UBC's Faculty of Land and Food Systems), and was sent to people associated with the animal production industry through the National Farm Animal Care Council (NFACC). The survey was also distributed to individuals on Facebook using snowball sampling. Group 3 was recruited from a 3rd-year undergraduate course at UBC (Animals and Society). Other participants from Canada (groups 4, 5, 6 and 7) and the US (groups 8, 9, 10 and 11) were recruited using Amazon's crowdsourcing service, Mechanical-Turk (M-Turk; The Economist, 2012). Group 1 contained 130 participants; this initial group was used to determine the most effective group size for eliciting qualitative responses from the respondents. Preliminary analysis of Group 1 showed that the rate at which new reasons were added declined as more participants enter a group, and votes tended to coalesce around a few prominent reasons. Based on this experience and other research using this platform (Moon *et al.*, 2012) for subsequent participants, a new "group" was started after approximately every 30 participants. In practice, the number of participants in groups 2 to 11 ranged from 24 to 44. Multiple groups were created to examine whether there were differences in attitudes between the groups and to prevent participant responses from coalescing around the most popular responses.

2.5 Data analysis

2.5.1 Qualitative comment analysis

Qualitative comments were analyzed to examine the reasons why participants did or did not support gestation stalls or group housing, and why people did or did not change their

views after considering the additional information provided. Analysis focused on understanding what concerns influenced participants' responses.

Comments were interpreted with an emphasis on bringing to the foreground issues that participants expressed as being most significant (Sandelowski, 2000). Qualitative content analysis (within the framework of qualitative description) (Sandelowski, 2000) and codes were used to identify the key ideas expressed by participants followed by the identification of themes and sub-themes (Coffee and Atkinson, 1999, p. 26-53). The codes used to summarize the comments were generated iteratively by reading comments multiple times (by the primary author and a research assistant) to identify and resolve any inconsistencies. Codes were then organized into themes (e.g. Animal welfare) and sub-themes (e.g. physical health, movement) (Table 2.1) (Onwuegbuzie *et al.*, 2009). We report both common and less frequently articulated themes and comments within the data in an attempt to reflect the diversity of views (Aguinaldo, 2004; Onwuegbuzie *et al.*, 2009).

Comments from responses made before the provision of information (Question 1) were used to understand the most prevalent themes on the issue of sow housing. To explore how the provision of additional information affected attitudes, comments were used where either the decision changed from before to after the provision of additional information (Question 1 to 2) (e.g., a change from moderately supporting one system to strongly supporting it), or the comment made after accessing additional information referred to the effect of the additional information.

Table 2.1. A summary of the main themes and sub-themes that emerged from participants' responses to the question "Do you believe that pregnant sows should be housed in gestation stalls or in groups?", before the provision of additional information (n=113) and after participants had the opportunity to view images, videos, two scientific review papers on the issue, and a frequently asked questions page (n=41 pairs of comments).

Theme	Sub-theme	Description of theme/sub-theme
Animal welfare		
	Social interaction	Sows access to other pigs, and isolation.
	Physical health	Sow safety and injury, individual health monitoring, feed control and management of disease transfer.
	Movement	Space allowance, movement, and exercise.
Theme	Sub-theme	Description of theme/sub-theme
	Natural behaviour	Rooting, nest building, access to straw, and ability for pigs to perform behaviours they are motivated to do.
	Emotional states	Stress, happiness, pain, suffering, mental health, and psychological distress.
	Natural environments and evolution	How animals have evolved, what is natural to them, and natural environments.
	Conditional acceptance	Housing conditions necessary for participant acceptance, and/or suggestions for design changes or modifications to improve housing systems.
Moral comments about animals and intensive farming systems		

Theme	Sub-theme	Description of theme/sub-theme
	Cruelty	Use of words such as “cruelty”, “inhumane” and “torture”, to describe the effect of housing on pigs.
	Rights	What pigs deserve, what they should be allowed to do, what their purpose is (food or pet or individual), and how humans ought to treat pigs.
	Sentience	Pigs’ intelligence or sentience.
Managing aggression		Group size, stocking density feeding system and management approaches for dealing with aggression.
How information affects attitudes towards housing pregnant sows		Comments where respondents mention information accessed or how information affected their response.

2.5.2 Self-reflexive comment on qualitative analysis

As a result of my background in animal welfare, final analysis of comments may have been approached with a bias that emphasized comments referring to animal welfare concepts and values (i.e., comments referring to expression of natural behaviour or affective states). However, every effort was made to remain objective in comment coding by cross-referencing codes and themes between the first author and an assistant researcher.

2.5.3 Statistical analysis

Each participant’s response choice was coded using a 5-point Likert-scale (Vaske, 2008), from 1-5 respectively, with strong acceptance of gestation stalls at one end of the scale

and strong acceptance of group housing at the other, plus an additional option for those who reject both systems. Participant's choices that correspond with this scale are hereafter referred to as their decision category. All quantitative results were analyzed using SAS statistical software (Version 9.3). Sample size varied depending on the specific question under investigation and method used for analysis (Table 2.2). The N-Reasons platform allowed participants to vote for as many reasons as they liked in each question (i.e., split-vote or inconsistent voting); this could result in participants choosing reasons that varied in level of support for housing methods (e.g., voting for a reason for moderate support of groups and voting for another reason strongly supporting groups). Data used in quantitative analysis were filtered to include only those participants that voted consistently within each question, meaning that they chose only one point on the Likert-scale for each question. Twenty-four participants that voted inconsistently within question(s) were removed from the data.

To describe increased or decreased support for housing methods from before the provision of additional information to after accessing information, each participant's numeric Likert-scale score for their response before and after the provision of additional information was used in a Friedman's within-subject, non-parametric to test for significant change between the two questions.

For analysis of additional demographic data we combined 'somewhat familiar' and 'not familiar' to compare as one category against 'very familiar' for the question regarding knowledge of pig farming practices. To create meaningful categories for analysis, respondents' age was categorized as >30 or ≤ 29 years, country of origin was categorized as Canada, and the United States, and level of education was categorized as post graduate (including doctorates and master's degree holders), undergraduate college degree holders,

and secondary school participants. Decision categories were combined, such that moderate and strong support of group housing was combined into one category called “group support” and were compared against those that were moderate or strong supporters of gestation stalls, or who chose neutral. All Mechanical Turk groups were combined to compare with all other non-Mechanical Turk groups to investigate whether support for group housing differed between the two types of participants. In all cases significance was declared when $P < 0.05$.

Table 2.2. Types of analysis, data used and sample size for the six analyses performed.

Type of analysis	Data includes	n
Descriptive statistics of participant characteristics (sex, age, country of origin, and level of education)	participants who provided demographic information, and answered question before the provision of additional information	Sex: 257 Age: 252 Country of origin: 230 Level of education: 254
Friedman's test to analyze the effect of information on response	participants who answered both survey questions	227
Qualitative analysis of reasons for support of different housing options	unique comments written by participants before accessing additional information	113
Qualitative analysis of comments associated with changes in response and the effect of additional information	pairs of comments written by participants, in response to both questions (before and after the provision of additional information) from those who either wrote reasons for both questions, or wrote a reason for one question and voted for another participant's reason for the other question	82 comments from 41 participants
Test to analyze the effect of type of information accessed on responses given before the provision of additional information	participants who reported which types of additional information they accessed before answering the second question	224

2.6 Results and discussion

The majority of respondents supported housing sows in groups before the provision of additional information (34/268 moderate support; 137/268 strong support) (Table 2.3). Only 49 participants supported gestation stall housing (45/268 moderate support; 4/268 strong support), 7/268 respondents were neutral, and 41/268 did not support either system.

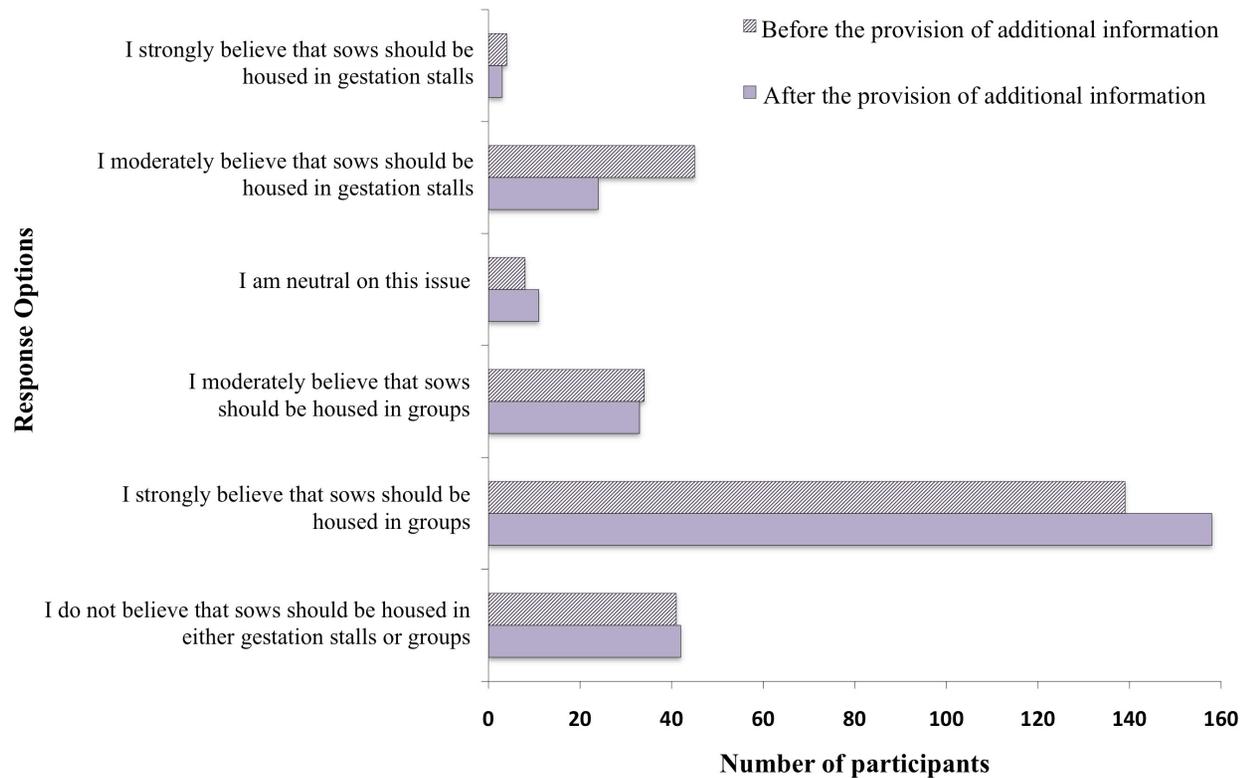


Figure 2.2. Number of participants (n=268) that answered the question, "Do you believe that pregnant sows should be housed in gestation stalls or in groups?", before the provision of additional information and after participants had the opportunity to view images, videos, two scientific papers on the issue, and a frequently asked questions page.

2.6.1 Demographic results

The majority of participants were female (70%), 30 years or older (52%), Canadian (59%) and with an undergraduate level education (67%). Most respondents (85%) reported not having direct involvement with farm animal food production. Women supported groups (80% of all women) more than men (65%) ($P=0.0119$). Participants over 30 years of age were more supportive of group housing (83%) compared to 19-29 year olds (66%) ($P=0.0014$). Canadians were more supportive of groups than Americans (84% of all Canadians versus 61% of all Americans) ($P<0.0001$). Post-graduates were the most supportive of group housing sows (90%), followed by participants with undergraduate degrees (76%); those with only secondary school education were least supportive of group housing (49%) ($P<0.0001$). Mechanical Turk participants were less supportive of group housing pregnant pigs (62% of Canadian and US M-Turkers) compared to all other groups recruited through methods other than crowdsourcing (90% supportive of group housing) ($P<0.0001$).

2.6.2 Main themes expressed that influenced responses

Four main themes emerged from participant responses about how pregnant sows should be housed (Table 4): 1) animal welfare concerns, 2) moral comments about pigs, 3) management issues with respect to the problem of aggression, and 4) how information affects understanding and responses to the issue.

Animal welfare concerns

Concern for pigs' physical health and well-being, their ability to live naturally, and their emotional states were prominently featured in responses, with comments from all decision categories (82/113 comments) addressing one or more of these three spheres of animal welfare (Fraser *et al.*, 1997). In addition to these three explicit animal welfare concerns, participants also wrote about conditions or design modifications they felt were necessary for animal welfare and which would be necessary for maintaining the participant's support for one method or another. Comments often included a combination of concerns and varied depending on which aspect of animal welfare took priority.

Moderate and strong supporters of gestation stalls tended to highlight concerns for sows' physical health, including concern for reducing spread of disease (6/19 comments) the importance of individual monitoring of sows (5/19 comments), and issues associated with injuries and aggression (13/19 comments). For example, a strong supporter of gestation stalls said,

"I grew up on a farm where we originally had sows housed in groups and they were very aggressive toward each other. We later changed to gestation stalls and both the sows and their offspring were in better health and were less stressed than they had been in groups."

This comment agrees with Boogaard *et al.*'s (2011) finding that individuals with direct experience in livestock farming tend to be more supportive of trading-off natural ways of living for approaches that control animals' natures. In addition, this comment reflects an Industrialist world-view, wherein, a good life for animals is provided through the rational

application of technology to improve their health and performance (Fraser, 2008). Supporters of stalls tended to emphasize health and avoidance of injury, while other decision categories tended to express ideas about health in broader terms, highlighting the importance of movement, physical exercise, and the benefits to “well-being” that are conferred by social interaction and being able to express natural behaviours.

Moderate and strong supporters of groups tended to focus on a combination of concerns and shared perceptions about the benefits of social interaction (31/60 comments), space for greater movement (17/60 comments), expression of natural behaviour (12/60 comments) (including 4 comments on rooting and nesting behaviours), and environmental control or choice (7/60 comments). For example, one respondent commented:

“Pigs are social animals and I think they should have the opportunity to engage in social interactions with other pigs or decide [when] they want to be alone. As well, pigs need an area to walk about and have the opportunity to perform behaviours they are motivated to do.”

Comments from these participants echo concerns of Flemish focus groups that linked good animal welfare with not being housed individually (Vanhonacker *et al.*, 2009). Comments indicating the importance of being able to “root”, “forage”, or “nest build” also illustrate a misperception that adequate substrates for nesting or rooting are typically provided in group pens.

Sixteen comments focused on the idea of natural environments and pigs’ evolved ‘natures’, with the majority of responses reflecting beliefs that a good life for animals could be achieved either by minimizing human interference and emulating nature, while some

comments described the need for human control and management of animals' natures and environments (Boogaard *et al.*, 2011). These beliefs were expressed by all decision categories, except those participants who were strong supporters of stalls or those that were neutral on the issue.

Moderate supporters of stalls either acknowledged the possible need for sows to socially interact or prioritized protection from injury or disease. For example, one participant commented:

“They are being raised for food, which means that curbing disease and injury is in the best interest of those involved; however, if they are to be bred repeatedly, it raises the question of what manner of social structure pigs form naturally. If it would be beneficial for them to be kept in a group of other animals...it should be considered.”

Another individual commented:

“They evolved to live in social packs out in the wild [but] have been bred ...away from that, and their lives are nowhere close to what they are in the wild. Having them congregate while pregnant at the cost of injuries and disease is a token gesture that does nothing to actually help the pig and does much to hurt the farmers.”

The idea that sows' natural behaviours have been eliminated by domestication is not well supported by the scientific literature. Several studies have found high levels of retention of heritable behavioural traits among domesticated pigs when housed in seminatural conditions (Fraser *et al.*, 1995; Jensen, 1986). Gestation stall supporters tended to suggest an association between group housing and decreased health (i.e., that disease was better mitigated in gestation stalls compared to groups). In their review of housing systems for

pregnant sows, Rhodes *et al.* (2005) note that there is little scientific literature comparing health in different housing systems. However, the authors list the factors that are believed to affect health more than housing method alone, including “daily management, pathogen exposure, geographic location, and biosecurity measures” (Rhodes *et al.*, 2005; p. 1585).

Moderate and strong supporters of groups used language that expressed a desire to see sows “*live naturally*” and referred to living conditions of wild pigs to support their assertion that sows’ adaptive behaviours are thwarted in certain captive settings (Fraser, 2009). A strong supporter of group housing situated the issue of behavioural deprivation in the context of evolution:

“Ethological studies have proven again and again that removing animals from their natural conditions causes stress. Pigs have evolved for thousands of years to be herd animals...To confine a sow, apart from the direct, physiological cruelty inherent in such a situation is [to force] her into a situation which goes against all of her natural instincts (namely to root and forage with a herd).”

The comment above, while focused on living naturally, features concern for sows’ mental and emotional states. Thirteen other comments shared this concern and included views on sows’ capacity to feel stress, pain, and happiness. All but one of these comments came from participants who either supported groups (moderately and strongly) or were not supportive of either system. One moderate supporter of gestation stalls said that stalls were, “*ok only if...the sow does not show any signs of pain*”, while a strong supporter of groups said, “*the more naturally pigs are housed, the less stressed they will become.*”

Whether the focus is on avoiding pain or providing pleasure through social opportunities, these comments illustrate the different values and limits that different people define for meeting animals' emotional needs (Pajor, 2005) and reflect differing emphasis on which animal welfare aims are most important to pursue (Fraser, 2008).

Participants in our study expressed views on animals' need to socialize with one another (47 comments made by participants in all decision categories), with the majority of comments expressing a belief that this activity is necessary, while a few thought it was not. These are subjective value judgments; determining what is an essential part of a sow's nature, whether that is to be social, or to root and forage, is important for assessments of animal welfare. This can be achieved in part by observing animals in the wild to see which behaviours they perform; in captive environments, preference and motivation tests are useful in assessing how persistent an animal will be in accomplishing a given task (Kirkden and Pajor, 2006a) and can give us insight into the minds of animals.

At present, we are only aware of one study by Kirkden and Pajor (2006b) that has assessed the motivation of dominant sows to access a group pen and a study by Elmore *et al.* (2011) that tested dominant and subordinate sows' motivation to access an enriched group pen containing straw, compost, a rubber mat and cotton ropes. Kirkden and Pajor's results from 7 animals tested revealed a weak motivation for dominant sows to access a fully slatted group pen but suggested that results may change with modifications to the experiment, including improvements in the quality of the pen environment (Kirkden and Pajor, 2006b). Elmore *et al.*'s (2011) findings suggested that both dominant and subordinate sows value access to an enriched group pen, as evidenced by their equal motivation to enter the pen.

Twenty-one participants described what they would need to see changed for them to accept one housing method or the other, or made suggestions for modifying current forms of housing to improve welfare. These comments predominantly focused on increasing space but also included diverse concerns from creating environments that allow sows to exercise choice or escape aggression, to providing adequate substrates for nesting and rooting. These types of comments were made by individuals in all decision categories but not by strong supporters of stalls and those that rejected both systems. For example, one individual commented that, “*A system involving both stalls and free space should be developed.*” Another participant said they would strongly support group housing, “*As long as [sows] have adequate space and things to do (root, nest, etc.)*”. The provision of a manipulable substrate as a condition for acceptance was echoed by this moderate supporter of gestation stalls who stated that, “*Stalls should...allow for normal behaviours (e.g., nesting).*” Indeed, alternative systems, such as outdoor housing, or providing pigs in groups with enrichment, are being developed in response to increased social criticism of intensive systems and their perceived effects on animal welfare (Millet *et al.*, 2005; Lassen *et al.*, 2006).

Many comments from supporters of groups mentioned the importance of animals being able to express behaviours they are motivated to perform (i.e., moving, rooting, nest building, and socializing) while some explicitly mentioned the need to provide straw or substrates that allowed for rooting. The fact that concerns for provision of straw or other manipulable substrates exists should be considered by producers looking to gain public support for their housing methods. Gestation stalls typically have bare concrete flooring or slats and the majority of indoor group pens use concrete flooring that is partially slatted to

allow feces and urine to be removed (Morrison, *et al.*, 2007). Providing pigs with straw has been found to increase both the well-being and comfort of pigs (Fraser, 1991; Millet *et al.*, 2005), and reduces oral stereotypies and increases time spent lying down, compared to animals kept on barren flooring (Fraser, 1975). Studies examining perceptions of pork production systems found that type of flooring is a primary attribute that lay persons use to evaluate the system in meeting animal welfare requirements (Millet *et al.*, 2005; Vanhonacker *et al.*, 2008).

Moral comments about animals and intensive farming systems

Comments about the ethical nature of intensive farming systems were included in 39/113 comments; sub-themes focused on the cruelty of confinement systems, sows' rights, and intelligence or sentience. All decision categories made comments about this theme, except for strong supporters of gestation stalls.

Twenty comments used vocabulary such as "*cruelty*", "*inhumane*" "*torture*", or "*nasty*" to describe either raising pigs for slaughter, or keeping them in confined housing and suggested that these methods cause unnecessary pain and suffering to animals. A moderate supporter of groups noted, "*Housing in gestation stalls for months on end seems needlessly cruel.*" However one participant, who was neutral on how to house sows, provided a different perspective, with this comment: "*I believe that producers will not intentionally cause harm or stress to their animals in either system.*"

Comments on the cruelty of gestation stalls, followed by statements that they "*should be outlawed immediately*" or "*should be eliminated ASAP*" suggest that some group-housing proponents would be willing to support a legislative ban on gestation stalls.

Nineteen comments made reference to pigs' rights, what they deserve from humans, remarked on pigs' purpose, and whether methods of housing were "wrong" or not. Two moderate supporters of gestation stalls justified individually housing sows on the basis that their rights are limited due to their purpose as food animals. One participant commented:

"They [sows] are being raised for food." Another said:

"While I see the need to exercise the animal...all other social issues are of no concern since the animal is being bred to be a source of food...not a pet."

Managing aggression

As discussed earlier, moderate and strong supporters of gestation stalls tended to justify this housing method on the basis that it mitigated aggression between animals and they rejected group housing because of its inability to control aggression. Fifteen comments from moderate and strong supporters of group housing mentioned the issue of aggression between animals housed in groups. The majority of these comments (11/15) focused on how management could ameliorate the problem of aggression among sows.

A common view was that aggression between animals in groups is a result of how the groups are managed and not simply a result of living in groups. Specifically, responses focused on issues of stocking density, group composition, and approaches to feeding that could reduce aggression. For example, one respondent who was strongly supportive of groups suggested that:

"The only reason sows are aggressive in group housing is because the [sows] ...are crowded in small enclosures where they feel the need to be territorial. I've raised pigs

and as long as they have adequate space and things to do (root, nest, etc.) they are very rarely aggressive enough to cause injury.”

Another questioned the assertion by some supporters of gestation stalls that group housing puts animals at risk for aggressive interactions with this comment:

“...Why does group housing risk aggressive behaviour? Perhaps the group housing situations are too constrictive? Or could it be that pregnant sows need ‘areas of refuge’? Maybe we should look at what group housing looks [like] instead of assuming that gestation [stalls] are the only alternative.”

One strong supporter of group housing commented on management approaches to reduce aggression, noting that:

“Most aggression among sows in groups seems to occur when new members are added to a group (i.e., when group composition changes). A good stockperson should be able to add members gradually and take the time to observe. As well, if sows have open stalls for feeding...with gates that swing shut behind the sow after she has entered, each sow can eat without aggression.”

How food is distributed affects social dynamics (Carlstead and Shepherdson, 1994). Particularly, if food is ‘clumped’ – either in space or time – it becomes a defensible resource which dominant animals are likely to monopolize (Grant and Guha, 1993; Goldberg *et al.*, 2001). The food may thus become a cause of conflict for many members of the group. Therefore aggression can be minimized by providing food to sows in a manner that reduces competition, for example, by using electronic sow feeders, in addition to providing complex environments (Fraser, 1995).

Concerns for both the animals' safety and ease of labour were articulated by another respondent who moderately supported gestation stalls who commented: "*I think the lowering of aggression, and the fact that the workers can individually monitor [the sows] sounds nice.*" A strong supporter of groups suggested that, "*keeping groups small would make it easier for workers to access animals as well as monitor their health, and could potentially reduce aggression*". These comments illustrate an evaluative scheme of "modernity" in farming, as described by Boogaard *et al.* (2011; p. 1460) from their study of Dutch citizens perceptions of livestock farming. Positive evaluations of modernity include valuing efficiency and innovations that lead to reductions in work burden (Boogaard *et al.*, 2011).

Dutch respondents also voiced concern for aggressive interactions occurring between pigs kept in crowded pens (Lassen *et al.*, 2006). In a study conducted by Vanhonacker *et al.* (2009), Flemish citizens ranked stocking density and pen size as the most problematic aspects of farm animal production impacting animal welfare. The authors suggest that the public's perception and societal acceptance of food animal farming practices can be improved by efforts to increase the amount of space animals have to live in.

How information affects attitudes towards housing pregnant pigs

The majority of participants (192/268) did not change their response (i.e. responded identically before and after the provision of additional information; Table 2.3). However, a significant number of responses changed after the provision of additional information ($P=0.0032$) with more people strongly supporting housing pigs in groups in response to Question 2 (after accessing information) (156/268) versus Question 1 (before additional information) (137/268) (Figure 2.2).

Respondents were able to consider as many different sources of additional information as they desired. Eighty-three percent of respondents reported having looked at images or videos of either gestation stalls or group housing for pregnant sows; 40% said they looked at the scientific papers (2 available), and 37% reported reading the frequently-asked-question page. Using the Wilcoxon non-parametric test, we found an effect of additional information accessed on respondents change in response before and after the provision of additional information, such that people who accessed more than one source of information were more likely to become supportive of group housing ($P=0.03$).

Nine respondents (out of 41) who did not change their decision after the provision of additional information commented on why they did not change their view. These comments were made by 7 strong supporters of group housing, 1 individual that did not support either system, and 1 moderate supporter of stalls. Comments suggest that information either had no effect on their attitude or intensified their position. For example, a strong supporter of group housing commented, “*Viewing the images of sows in gestation stalls renewed and strengthened my opposition to them*”.

The largest percent of participants that maintained their position from before the provision of additional information to after (Question 1 to Question 2) were the strong supporters of group housing (119/268 from Question 1). Of the 34 who moderately approved of groups in Question 1, almost half moved to strong support of groups but there was also some moderation of views in both directions. In most of the rows (Table 2.2), the majority of participants who were moderate in their support of either system or neutral on the issue on before accessing additional information, changed after accessing sources. Only those who

answered chose to strongly support groups or rejected both systems before accessing information had the majority keeping the same answer after accessing information. But also, of 137 who strongly supported groups before accessing additional information, 10% downgraded to the left towards neutral or support for gestation stall housing.

The following comments from participants that changed from supporting groups (strongly and moderately) to being neutral on the issue denote the complexity of choosing one system over the other and speak to a hesitancy to generate a “one-size –fits-all” solution to the problem of how to best house sows (Croney and Anthony, 2010):

“The new information I read lets me see that the welfare of the animal is dependent on a number of different factors. There are benefits from one style that seem to be difficult to be addressed with the other...and it is difficult to measure definitely which ONE method would work best over all factors and much depends on the management of either system...An extra trouble of naming ONE method "the better way" is that it is very easy for managers and consumers to say/think "there, we did it, all is well" and not truly optimize the system.”

“...perhaps the question isn't so much only about 'should pigs be in stalls or groups' but 'what methods can be developed to ensure that if a producer chooses stalls or groups, that producer has the best practices for that method.’”

Eight comments from respondents who changed their decision mentioned that either seeing “*photos*”, “*images*”, or “*information*” affected their change in attitude, or described their impression of the opposite system after accessing additional information. However,

many participants (25) voted for these comments further suggesting that images had an impact on attitudes.

The comments below, from formerly moderate supporters of group housing, that changed to strongly support groups, or not support either system, signify the capacity for imagery to affect previously held beliefs:

“...after seeing photos of the stalls...I believe they should be housed in groups because it’s the best of two bad choices”.

“The images of stalls are horrific, they should be called cages and the group situation really looked no better. These animals should be housed in an area as close to their natural habitat as possible.”

These comments demonstrate the emergence of concerns about practices when “the difference between what people want or expect and what they observe or perceive is larger than a certain (individual) tolerance level.” (Kanis *et al.*, 2003; p. 155).

Eighty-five percent of all respondents were unfamiliar with pig farming practices and this had an effect on responses before the provision of additional information ($P=0.0098$), with 98% of those respondents that supported gestation stall housing (including moderate and strong support) being unfamiliar with pig farming practices. Interestingly, more than half of the people that supported gestation stalls before the provision of additional information (including moderate and strong support), moved away from supporting gestation stall housing after accessing additional information. Of the 45 participants who moderately supported gestation stalls before the provision of additional information, more than half (26) abandoned their position in after accessing additional information, all moving in the direction

of less acceptance of gestation stalls, with the greatest number (16) shifting to strong support for groups. One moderate supporter of gestation stalls justified gestation stall housing with this comment: *“It seems that this method has been working since the 1950s, and I believe it is important to avoid the spread of diseases above all, especially if the pigs are used for meat.”* After accessing additional information the same respondent wrote:

“It seems inhumane to house them in gestation stalls. I did not realize that the stalls were so small. Knowing the size of the stalls, I think it is completely unfair and unreasonable to leave a pregnant pig unable to move for part or all of the pregnancy.”

This comment expresses the view that negative experiences of animals can exceed the compromises that people are willing to accept. In this case, acceptance of the use of animals for human benefit is based, at least in part, on a certain level of freedom of movement (Sandøe *et al.*, 2003).

This response from a strong supporter of gestation stalls who changed to moderately support group housing after accessing additional information, said, *“I thought that the gestation stalls would be cleaner and have more room but they were tiny and they said the sows stayed in there for the duration of their lives, so it's probably better for them to be housed in groups.”*

Another moderate supporter of gestation stalls concerned with preventing injury and disease became neutral on the issue after accessing additional information, wrote:

“It's pretty clear there are pros and cons to both ways, but any way you look at it the pig still suffers and eventually dies. Without major reforms to the meat farming industry minor differences like this still seems like token gestures.”

This comment may indicate a lack of belief in governmental and policy-making bodies to make meaningful changes in animals' lives through incremental or small reforms (Sandøe *et al.*, 2003).

Table 2.3. Likert response to questions, “Do you believe that pregnant sows should be housed in gestation stalls or in groups?”, before the provision of additional information and after participants had the opportunity to view images, videos, two scientific review papers on the issue, and a frequently asked questions page. The number in each cell of the table shows the number of participants (out of total sample of 268) adopting each pair of Likert responses. The number in brackets beside possible responses represents total participants within each row or column.

After the provision of additional information	I strongly believe sows should be housed in gestation stalls (3)	I moderately believe sows should be housed in gestation stalls (24)	I am neutral on this issue (10)	I moderately believe sows should be housed in groups (33)	I strongly believe sows should be housed in groups (156)	I don't believe sows should be housed in either gestation stalls or groups (42)
Before the provision of additional information						
I strongly believe sows should be housed in gestation stalls (4)	2	1	0	1	0	0
I moderately believe sows should be housed in gestation stalls (45)	0	19	3	5	16	2
I am neutral on this issue (7)	1	1	2	0	2	1
I moderately believe sows should be housed in groups (34)	0	0	3	16	14	1
I strongly believe sows should be housed in groups (137)	0	2	2	10	119	4
I don't believe sows should be housed in either gestation stalls or groups (41)	0	1	0	1	5	34

2.7 Conclusions

The aim of this study was to describe public attitudes towards the issue of how to best house pregnant sows and to explore the effect that the provision of additional information had on attitudes. Our findings show strong support for group housing sows and an effect of information on responses, such that people generally became more supportive of groups after accessing additional information.

Qualitative results highlight the importance participants placed on the provision of social opportunities and environments that enable animals to express natural behaviour. In addition, comments captured the complexity of the debate on how to best house pregnant sows. Some respondents expressed that one system may not be better than the other and that new approaches to design and management are necessary to provide adequate space and to mitigate aggression in groups.

Misinformation also affected attitudes in this study and may be a valuable area to target in future extension efforts. Specifically, this study found misperceptions about disease being prevented for sows in stalls (Rhodes *et al.*, 2005) compared to groups, and assumptions that group pens provided straw or other substrates appropriate for rooting.

Chapter 3: General discussion and recommendations

3.1 Introduction

Bernard Rollin, a philosopher concerned with animal use, said, “Let us recall the need for constantly monitoring societal ethical concerns, and staying abreast of them in our actions” (Rollin, 2010, p.10). This statement captures the impetus behind conducting this study on public attitudes towards housing pregnant pigs.

Public awareness of animal welfare issues is increasing (Lassen *et al.*, 2006); however, in forming their opinions on animal welfare issues, members of the public do not always seek out expert advice, and little is known about the effect of additional sources of information, including images, on public attitudes towards housing pregnant sows. To fill this gap, this thesis explores views on how to best house pregnant sows and the effect that the provision of additional information has on these views.

3.2 Limitations and successes of the thesis research

3.2.1 Addressing the criticisms of online engagement/surveys

This thesis employed both quantitative and qualitative elements in an online platform. The platform itself, and the mixing of methods, had strengths and weaknesses. Online surveys have been criticized for their potential to bias studies towards those with higher education or to those with the technical aptitude to navigate the platform. Nonetheless, we were able to collect responses from a diverse group of respondents in a relatively short time using the Internet. We found value in recruiting participants using a crowd-sourcing method through Amazon’s Mechanical Turk (The Economist, 2012). Mechanical Turk participants have diverse backgrounds and our participants gave detailed responses, in addition to

supporting group housing less than other non-Mechanical Turk recruited participants in our sample.

Another criticism of online survey tools is the possibility of sampling bias, whether through a voluntary selection bias, non-response bias, by failing to represent some members of the population, or by over-representing segments of the population with strong views. This study did not seek to be representative of any specific population but sought to explore attitudes of people interested in the issue. Including Mechanical Turk participants in our study reduced the possibility of over-representing strong views.

3.2.2 Addressing the criticisms of mixed methods

The qualitative component complemented the quantitative results by providing insight into the reasons why people supported or rejected systems. Qualitative comments also allowed us to identify areas of misunderstanding for future extension work to address, for example, the belief that disease is reduced when sows are housed in gestation stalls compared to group pens.

There were challenges in the interpretation of some comments due to their brevity or lack of clarity; some of this confusion might have been resolved through follow-up questions in one-on-one interviews. Finally, interpretation of quantitative data was reduced due to the opportunity participants had to vote inconsistently within questions (i.e., vote for reasons in support of both systems, or varying levels of support for one system). It would be advantageous for future surveys that employ methods similar to this study to remove the possibility for split-voting, or to force respondents to make a final decision after considering all arguments.

3.2.3 The importance of using both images and text-based sources of information

The results of the study illustrate the importance of using images and text-based sources of information in informing attitudes. There was an effect of information on participant's attitudes, with more people supporting group housing after accessing additional sources of information. In some decision categories, more than half changed after accessing additional information with most of those changing to favour groups.

Unlike previous work on public attitudes towards pigs in production systems, this thesis used images and videos as sources of information for participants. One limitation of this survey is that participant activity on links to Google images and YouTube videos could not be monitored. It is possible that participants' accessed sources of information on Google and YouTube that misrepresented the housing practices.

3.3 Recommendations

3.3.1 Use of images in research, agricultural communication, and policy development to represent systems and animals

All members of a community play a role in shaping societal ethics. Political theorist, Will Kymlicka, encourages people to expand their political and moral spheres through increased inclusion of domesticated species within our communities (Donaldson and Kymlicka, 2011). Kymlicka suggests that domesticated animals can participate in the processes that affect their lives, rather than simply being passive recipients of policy and management decisions (Donaldson and Kymlicka, 2011). For example, pigs in intensive systems can figuratively be part of discussions about methods used to house them when

animal welfare science results are used to convey their experiences (health, affective state, and expressions of natural behaviour) within these systems. In our survey, others are representing the lives of pigs through images.

In urban centers the public is largely removed from farms and the process of meat production. This separation makes it difficult to envision how farm animals are treated in agricultural systems (Tonsor and Wolf, 2011). Keeping farm animals largely out of view from the general public alters public understanding of the animals' lives (Kymlicka and Donaldson, 2011). Paralleling the disability movement, Kymlicka speaks of the violation of rights that is made possible when people and animals alike are absent from the public sphere, noting that “absent bodies” cannot “act as a corrective presence...in political life” (Donaldson and Kymlicka, 2011; p. 113). Therefore, sharing images of animals in these systems, as I have done in my survey, can be a method of representing farm animals' existence. This holds the potential to influence perceptions and attitudes and shape policy that affects animals.

In public consultations regarding the development of socially acceptable practices, providing the public with descriptions of each system, including types of flooring used, whether there is a manipulable substrate, and dimensions of housing areas, coupled with images of what the systems actually look like, may result in more nuanced and well-informed responses. Detailed descriptions of systems can also address areas of misunderstanding; for example, extension and educational efforts could let the public know that gestation stalls and group housing systems experience similar rates of disease. Transparency on the part of producer organizations regarding details of practices may reduce concern from the public and

decrease their desire to seek out details from other sources. Given the rise of video and image-based campaigns from animal protection groups to convey animal welfare issues, producer groups may want to formally cooperate with these organizations to develop and distribute information about practices to the public. Furthermore, organizations that advance farm animal welfare through collaborative efforts, such as NFACC, could work with producer organizations and animal protection groups like the CFHS to create a bank of images and videos that are widely accepted as representative of farming systems. These steps should improve public engagement methods aided by the ability of users to “Like” or comment on these posts. For producer organizations these actions would also be a step toward self-regulation and responsiveness to social concerns, and could thus lay the ground for a more “professional” model of animal production (Hurnik, 1988; Fraser, 2008).

3.3.2 Provision of straw or other manipulable substrate

Some participants reported having their attitudes changed as a result of viewing images. For example, some participants no longer supported either system after they saw images of group pens without straw or what they perceived to be inadequate space. The majority of participants in the survey were strongly supportive of group housing sows and their stance remained the same even after accessing additional sources of information. However, qualitative comments from some strong supporters of groups revealed that they believed group pens included straw and enough space for the expression of natural behaviours such as rooting and nesting, which is not always the case. Thus, my findings indicate that access to straw or other types of bedding may be important for public acceptance regardless of housing system.

3.3.3 Modified systems, new designs, and management approaches to control aggression

Although the majority of participants supported group housing for sows, several participants described how the system could look with modifications or new designs and why they felt systems should be changed. Suggestions for systems included the option for sows to choose when they wanted to be with the group or on their own, and the provision of manipulable substrates. These comments illustrate the complexity of the debate and indicate that some people would like to see new approaches to housing sows. The argument made by some proponents of gestation stalls – that individual housing is necessary to mitigate aggression – was seen by some respondents as specious. These participants articulated an understanding that stocking density, pen size, group composition, and feeding strategies will affect aggression; therefore, extension efforts could focus on management solutions to reduce aggression in groups.

3.4 Next steps

3.4.1 Further work investigating the impact of images and videos on attitudes

The question of how additional sources of information affect attitudes towards production practices persists. By engaging the public through an online survey, this study has identified the potential for images and videos to impact attitudes. However, it is only possible to speculate about which specific images caused people to change views. Therefore, future work looking at which kinds of images cause people to change their attitudes and why is worth investigating.

3.4.2 Preference testing to identify which type of housing system sows are motivated to spend their time in

Respondents in this study commented on behaviours that sows are motivated to perform or discussed modified environments where sows would have the choice to be alone or with others. Currently, however, there is a paucity of understanding of sow's preference for different environments and what factors influence choosing one area over another. This gap could be addressed through detailed choice experiments focused on determining where pigs are motivated to spend their time (Kirkden and Pajor, 2006a). Research by Elmore *et al.* (2011) suggests that sows are motivated to access enriched group environments. A deeper understanding of the actual preferences of sows could help inform public attitudes.

3.4.3 Continued public engagement

Beliefs about animal welfare and what constitutes a good life for animals in production systems are informed by ethical values and science (Boogaard *et al.*, 2011). Initiatives aimed at improving animal welfare must work towards finding common ground on divisive attitudes (Lassen, 2006). The first step involves understanding the concerns and priorities of all stakeholders, including the public, which this project has endeavored to do. However, other methods of engagement, including focus groups and one-on-one interviews could extend and validate findings of this project by providing the opportunity to probe participants on their responses and confirm understanding of the views they express. Additionally, future work would benefit from creating dialogue between producers and the public, to look for responses to the issue that are broadly acceptable.

3.5 Conclusions

The results of this study hold potential implications for both animal management and the development of codes of practice specific to housing sows. Quantitative results revealed that the majority of participants support group-housing sows and that support for group housing increased after participants accessed additional sources of information. The qualitative component underscores the complexity of the issue, with comments revealing a desire to see systems provide greater opportunity for sows to interact socially, greater space allowance, and to have straw or other manipulable bedding material. Comments also helped to identify areas of misperception about intensive housing methods that need to be addressed in future extension work and policy development, perhaps by using images in addition to text to convey information.

Whether support for animal production practices increases or decreases after accessing more information, the need remains for the public to be informed so that engaged, informed deliberation can take place (Schuppli *et al.*, 2013; Castle, 2006). Enhancing public understanding of animal production practices holds the potential to increase meaningful public engagement in the development of animal care guideline and practices, and ultimately increase social sustainability of emergent practices (Lassen *et al.*, 2006; Levitt *et al.*, 2005).

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