THESIS

USE OF THE HEALTH BELIEF MODEL TO EXPLAIN PERCEPTIONS

OF ZOONOTIC DISEASE RISK BY ANIMAL OWNERS

Submitted by

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ABSTRACT

USE OF THE HEALTH BELIEF MODEL TO EXPLAIN PERCEPTIONS OF

ZOONOTIC DISEASE RISK AMONG ANIMAL OWNERS

The rise in the number of public health risks from zoonotic disease in just the past two decades has underscored both the importance of educating the public about risky health behaviors and preventive measures, and the need to communicate these topics in clear, concise and accessible language without inciting fear.

People love their animals, typically sharing physical gestures of affection similar to those exchanged between humans. Most pet owners are poorly informed about risks posed by infectious agents that can be shared between animals and humans, and which pose a public health risk.

To effectively communicate this information, we must first understand the determinants of a particular behavior: the role of beliefs, perception of risk, benefits, and barriers to change. The Health Belief Model, a theory that incorporates each of these factors, allows researchers to assess what might constitute a *cue to action* for individuals to make recommended changes in preventive health behavior.

For this study examining the knowledge and perceptions of zoonotic disease risk and information-seeking behavior amongst small and mixed animal owners in the Inter-Mountain West, one thousand names were randomly selected from the client lists of the James L. Voss Veterinary Teaching Hospital at Colorado State University.

Four hundred participants (40 percent) responded to a mailed, self-administered, anonymous survey. Descriptive analysis assessed awareness of two zoonotic diseases: *Salmonella* and Methicillin-resistant *Staphylococcus aureus*; and information-seeking behaviors related to animal health and disease risk. Analysis revealed that, adopting protective behaviors is best achieved by perceiving greater benefits to adopting the recommended behavior, perceiving fewer barriers, and receiving more cues to action.

Results also found differences between small and mixed animal owners in several areas of inquiry, including knowledge of disease, perception of risk, perception of cues to action and in information-seeking behaviors.

ACKNOWLEDGEMENTS

DEDICATION

To Paul and "the herd," I would like to express my deepest gratitude for the unshakable

belief, complete trust and consistent support throughout the journey along this sometimes

rocky road.

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Chapter 1

INTRODUCTION

"The white man must treat the beasts of this land as his brothers. What is man without the beasts? If all the beasts were gone, man would die from a great loneliness of spirit. For whatever happens to the beasts also happens to man. All things are connected. Whatever befalls the earth befalls the sons of the earth."
$-$*Chief Si'alh, of the Suquamish and Duwamish tribes, 1862*

People love their animals. Decades of research has lent scientific support to what many laypeople have known for centuries: animals have a beneficial physical and emotional effect on the people with whom they socialize (Lagoni, Butler & Hetts, 1994). From the time man first domesticated animals, they have supplied a variety of human needs: as a source of transportation, entertainment, food, clothing, and household goods and—most importantly—as trusted and much loved companions (Soave, 2000). Along with the many positive aspects achieved by this change in lifestyle--animals and humans living closely with one another--are the negative aspects, including easier transmission of pathogenic organisms between the two species. This is a zoonosis. As currently defined by the World Health Organization (WHO), zoonoses are "those diseases and infections which are naturally transmitted between vertebrate animals and man."

Awareness of zoonotic infection is not recent phenomenon. Man's first experience with zoonoses probably extends back before written history (Reaser, 2008). Rabies, for example, considered the oldest communicable disease, was first recorded in the 23rd century B. C. when Babylonian law demanded a financial penalty from the owner of any rabid animal that bit a person. Homer, Democritus and Aristotle also used descriptions of rabies in their works (Romich, 2008). Descriptions of clinical signs of disease and advice on preventive behaviors have

historically been passed from generation to generation, helping to shape many religious and socio-cultural conventions (Shakespeare, 2002).

Knowledge about many classic zoonotic diseases, traditionally passed orally from generation to generation, has been lost in modern western society. Rapid social changes, the move from rural to urban living and the fragmentation of many social structures has contributed to this loss. Traditional knowledge about basic food hygiene, personal protective hygiene practices and good animal husbandry is no longer as common as it had been in previous generations (Shakespeare, p. 11).

The focus of veterinary and human medicine has also changed. In the 19th century, the practice of *environmental health* engaged professionals and laypersons across a spectrum of disciplines including technically trained physicians, agriculturalists, politicians, lawyers and others who regularly exchanged ideas related to community health (Reaser, p. 392). Beginning in the middle of the last century, veterinary training and service began to shift from public health and serving the agricultural community to companion animal medicine and serving the urban community. A similar shift in human medical training and service also occurred during that period, with an increase in specialization and more emphasis on research into environmentally-related diseases and cancer (Salman, 2007). This fragmentation in health science and practice has continued and become even more highly specialized with human, wildlife, farm animal and companion animal health constructed as different disciplines and managed by separate institutions that typically do not communicate (Reaser, p. 392). Specific disease events in the past ten years have refocused the attention of the human and veterinary medical communities, as well as the general public on zoonoses and the mechanics of disease transmission and what has become a general complacency about preventive health behaviors.

The term *emerging zoonoses* has frequently been a hot news item over the past two decades with outbreaks such as foot-and-mouth disease in Europe, South America and Asia in 2000-2001; West Nile virus and Exotic Newcastle disease in the United States in 2002-2003; highly

pathogenic avian influenza (HPAI) in Asia and Europe in 2003-2004 which subsequently spread

to other parts of the globe; severe acute respiratory syndrome (SARS) in Asia, Europe and the

United States in 2003 and the A/H1N1 pandemic of 2009 (www.WHO.int/zoonoses). These

outbreaks received dramatic media coverage that included statements from various governments,

industries and public health agencies about the etiology of the disease and efforts to control its

spread. Not all zoonotic diseases receive such extensive media attention, nor are the media the

best source of information about infection risk. Shakespeare (p. 17) warns that, "In a population

dominated by an appetite for sound bites, profound fear and anxiety can rapidly be generated by

such reports. The only solution to the problem is education relating to the true likelihood of

infection and its associated risks."

Professionals in both human and veterinary medical health fields are particularly concerned

with the risks associated with the spread of zoonotic disease. Although veterinarians understand

their professional obligation to provide clients with current, unbiased information about zoonotic

disease risks, many feel uncomfortable with the topic (Palmer, *et al*, 2009). Veterinarians are not

trained to recognize the clinical signs of disease in their clients, or to ask human-related health

questions. Neither are physicians trained to ask questions about the number, breed or health status

of companion or other family-owned animals, nor to investigate the etiology of zoonotic agents

(Grant & Olsen, 1999).

A study by Lipton (2008) recommends that veterinarians become more involved in

zoonotic disease prevention, including "discussing zoonotic diseases with clients, physicians and

public health agencies… [and]…having educational materials on zoonotic diseases available for

clients…" The same study, however, revealed that only 43 percent of veterinarians surveyed had

initiated conversations about zoonotic disease with clients on a daily basis, and only 57 percent

said they had client educational materials on zoonotic diseases in their clinics (p. 1247).

The purpose of this study is to gain a better understanding of the typical animal owner's

knowledge and awareness of zoonotic disease, its associated human health risks and patterns of

information-seeking behavior. With a better understanding of how animal-owners perceive zoonotic disease risk, veterinary health care professionals will be better equipped to provide specific verbal, print and internet-based communication to improve health-related decisions, behaviors and outcomes.

Dr. Dean Hendrickson, Director of the James L. Voss Veterinary Teaching Hospital, which is part of the Colorado State University Veterinary Medical Center in Fort Collins, CO., acknowledged that "as veterinarians, we think we know what we should be telling our clients about zoonotic health risks, but perhaps we are only guessing. To be more effective, we should really understand what clients do and do not know and how we should be communicating with them…" (personal communication, August, 2009).

Shaw, Ibrahim, Reid, Ussher and Rowlands, (2009) noted that "it is a critical empowerment strategy to increase people's control over their health, their ability to seek out information and their ability to take responsibility, thus acknowledging the broad set of skills required to be health literate" (p. 115).

It is this knowledge "whose provision and application could safeguard people far more effectively than legislation," (Shakespeare, p. 19) and would benefit clients, patients and both human and veterinary health care professionals.

A literature review of human and veterinary medical journals and media and health communication journals reveal a dearth of research with this particular focus. The information gathered by this study will make a worthwhile contribution to the current literature and will point to opportunities for further research.

The Health Belief Model (HBM) was used as the theoretical framework to identify and measure the animal-owning client's level of concern for zoonotic disease risk from their animals and the reasons for not regularly engaging in preventive health behaviors. The HBM evaluates the correlation between health beliefs and the performance of preventive health behaviors.

Study Objectives

      The objectives of this study are to evaluate the use of the Health Belief Model to explain attitudes and behaviors of animal-owning clients regarding:

- Perceptions of zoonotic disease risk

- Perceptions of disease-preventive behaviors

- Sources and patterns of information seeking behavior related to topics of animal and human health

Chapter 2

LITERATURE REVIEW

"Between animal and human medicine there is no dividing line – nor should there be. The object is different but the experience obtained constitutes the basis of all medicine."
--Rudolf Virchow (1821-1902)

History and Definition Zoonotic Disease

In 1967, the Joint Food and Agricultural Organization (FAO) and the World Health Organization (WHO) defined zoonoses as "diseases and infections that are naturally transmitted between vertebrate animals and humans. A zoonotic agent may be a bacterium, a virus, a fungus or other communicable disease agent" (www.WHO.int/zoonoses). As more simply defined by Acha and Szyfres (2003), zoonoses are "those infections common to animals and man."

By this definition, the term *zoonoses,* is now used to encompass what were previously separate terms: *zooanthroponoses*, infections passed from man to animals such as *mycobacterium tuberculosis* or streptococcal meningitis; and a*nthroponoses*, infections transmitted from animals to man, such as monkey pox. A third disease classification is *sapronoses,* where the infectious agent is found in the environment (soil, water and decaying plants) such as leptospirosis or giardiasis (Hubálek, 2003).

Neither zoonotic infection nor awareness of its origin is a modern phenomenon. Man's first experience with zoonoses may have occurred before written history, when man and animals first began sharing a closer space. As people pursued the more sedentary lifestyle of farming, dogs and cats moved into the home as trusted and loved companions, and barnyards filled with domesticated agricultural animals and opportunities for disease increased (Diamond, 1999).

Some of these shared diseases were known to originate in animals with the ability to be passed to humans. It was not understood for centuries that, for many diseases, the pathway also existed in the reverse.

Rabies, considered the oldest zoonotic disease, was first recorded in the 23rd century B. C. when Babylonian law demanded a financial penalty from the owner of any rabid animal that bit a person. Homer, Democritus and Aristotle also used descriptions of rabies in their works (Romich, p. 603). The invention of the microscope in the late 17th century brought increased recognition and understanding of the nature and transmission of contagious and zoonotic diseases (Aceto & Schaer, p. 709).

Jared Diamond, in his award-winning book *Guns, Germs and Steel: The Fates of Human Societies* (1999) writes that "questions of the animal origins of human disease lie behind the broadest pattern of human history and behind some of the most important issues in human health today" (p. 197).

Classification, Modes of Transmission and Characteristics of Zoonotic Disease

Zoonoses are classified by causative agents into four categories: *parasitic disease,* those caused by internal or external parasites; *microbial disease,* those caused by bacteria or viruses, or *fungal disease*. Recently, a fourth agent has been added: *prion disease,* which is responsible for various spongiform encephalopathies, including bovine spongiform encephalopathy (BSE) which, when transmitted to humans, has been shown to cause the disease *variant Creutzfeldt-Jakob disease (*vCJD) (Colville & Berryhill, 2007).

Disease transmission may vary its routes, but typically occurs through one of two methods: direct or indirect. Direct transmission means disease is spread through intimate contact with the infected individual via bite or scratch wounds, infected bodily fluids such as tears, nasal or respiratory secretions, urine or reproductive fluids (Aceto & Schaer, p. 709). Indirect modes of transmission include aerosolization (airborne), handling organic residues such as urine or fecal

matter, placental transmission (from mother to baby), ingestion (taken in as food or drink),

fomites (previously infected inanimate objects such as shoes, clothing, tools, animal bedding,

etc.), through an intermediary (animal to person, then person-to-person), environmental (infected

soil or water) or arthropod-borne (fleas, ticks, flies, mites, mosquitoes and lice). Arthropods, or

insects, can be either a *biological* or a *mechanical vector*. As a biological vector, the insect carries

the pathogen within its body while it progresses through its life cycle before passing it on, like

West Nile virus. As a mechanical vector, the insect can carry the pathogen on its body, such as

flies transmitting salmonellosis with their feet (Shakespeare, pp. 4-10; Colville & Berryhill, pp.8-

10; Romich, p. 5).

All diseases, including zoonoses, are also classified by degree of infectivity, severity and

longevity. Terms characterizing infectivity include *infectious, communicable, and

noncommunicable* and *contagious.* Infectious and communicable diseases are "acquired from an

infectious host" and, according to some authorities, both are transmitted from individual to

individual through direct or indirect contact (Andreason, 2006). Other references describe the

method of transmission as "not specifically defined, and risk for potential spread…are not

characterized" (Aceto & Schaer, p. 709). Contagious diseases are those that are easily

transmitted, such as measles or chickenpox. Noncommunicable or non-transmissable diseases

cannot be spread (Romich, p. 7). Not every contagious disease is also zoonotic in nature.

Acute, subacute, chronic and *latent* are terms that characterize the severity and longevity

of a disease. Acute diseases, like the common cold, develop abruptly, with severe onset of clinical

signs, but are short lived. Chronic diseases develop slowly, with less severe clinical signs and are

continual or recurrent, such as tuberculosis. Subacute diseases, falling in the middle, show

varying degrees of severity and longevity. Latent diseases can remain dormant for long periods of

time before manifesting, such as herpes simplex (Romich, p.7-8).

Significance and Trends of Zoonotic Disease

In 1969, then United States Surgeon General, Dr. William Stewart, announced, "The war against diseases has been won," (Beran & Steele, 1994*a*) believing that advances in antibiotics, programs of vaccination and disease eradication had made the world a secure and healthy place. Since then the changing medical, social and environmental landscape has instead experienced new diseases and the re-emergence of many old, familiar ones.

Emerging infectious diseases, or EIDs, are "an infectious disease that has newly appeared in a population or that has been known for some time but is rapidly increasing in incidence or geographic range." This term first came into popular use in the mid-1980s when a number of highly pathogenic diseases suddenly made their debut, including Legionnaire's disease, toxic shock syndrome, autoimmune deficiency syndrome (AIDS), hantavirus pulmonary syndrome, Lyme disease and several multidrug resistant bacterial infections (Daszak & Cunningham, 2002). Many emerging or re-emerging diseases are caused by pathogens originating from animals or products of animal origin (Meslin, Stohr & Heymann, 2000). More than 60 percent of the known human pathogens are zoonoses (Donham, Bickett-Weddle, Gray and Thelin, 2006) and according to the Centers for Disease Control and Prevention, of the 175 species of pathogens identified as emerging, 75 percent are zoonotic (Taylor, 2001).

The term *emerging zoonoses* has frequently been in the news in the past decade, with disease outbreaks such as foot-and-mouth disease in Europe, South America and Asia in 2000-2001; West Nile virus and Exotic Newcastle disease in the United States in 2002-2003; highly pathogenic avian influenza (HPAI) in Asia and Europe in 2003-2004 which has subsequently spread to other parts of the globe; severe acute respiratory syndrome (SARS) in Asia, Europe and the United States in 2003, human monkeypox in the Midwestern United States in 2003 and, most recently, the A/H1N1 pandemic of 2009 (www.WHO.int/zoonoses).

In the preface to Laurie Garrett's book, *The Coming Plague* (1994), Jonathan M. Mann, M.D., M.P.H., explains "The world has rapidly become much more vulnerable to the eruption

and, most critically, to the widespread and even global spread of both new and old infectious diseases…dramatic increases in worldwide movement of people, goods, and ideas is the driving force behind the globalization of disease."

Globalization of trade and travel is not the only contributor to the rise in infectious and zoonotic diseases. Other causes include the effects of climate change, which alters the distribution of vector-borne and waterborne diseases (Graczyk, 2002), increased human susceptibility to disease due to drug and alcohol impaired organ systems or a suppressed immune system (Beran & Steele, 1994*b*), urban sprawl encroaching into wildlife habitat, contact among animal species that previously did not interact, an increasing number of large-scale industrial food processing factories, intensified and uncontrolled commercial agricultural production, an increase in outdoor recreation and leisure activities, a rise in the exotic pet trade (Graczyk, pp. 220-228), microbial adaptation and change, and a breakdown of public health capacity required for infectious diseases at the local, state, national, and global levels (Hughes, 2000).

Zoonotic diseases can have serious impacts at the family, community and national levels. According to a 2009 Expert Consensus Report from the National Academy of Sciences, economic losses due to zoonotic disease outbreaks include personal loss of income, trade sanctions, travel warnings or restrictions, costs associated with disease control efforts and loss of public confidence in animal products. Another important social and economic impact is the necessity of redirecting resources to staunch an emergency situation when local, state and national budgets are limited (Meslin, Stöhr and Heymann, p. 311).

In both human and animal victims, zoonoses can cause acute and chronic health problems. The psychological stress that often accompanies chronic ailments can be, in many cases, as debilitating as the disease itself. (Donham, et al, p. 357).

Recognizing and Reporting Human Zoonotic Infection

The focus of veterinary and human medicine has changed since the 19th century, when the practice of *environmental health* included contributions from a cross-section of community members including physicians, agriculturalists, politicians, lawyers and others who exchanged ideas to benefit community health (Reaser, p. 392). In the middle of the 20th century, veterinary training and service began to shift from public health and serving the agricultural community to companion animal medicine and serving the urban community. At about the same time, medical schools saw a rise in specialization and more emphasis on research into diseases such as cancer and environmental related diseases (Salman, 2007). This fragmentation in veterinary and human health science has only increased in the subsequent decades, separating human, wildlife, farm animal and companion animal health into different disciplines, with different approaches and governed by different institutions (Reaser, p. 392). Recent specific disease events have again refocused professional and public attention on zoonoses, the mechanics of disease transmission and societal complacency about preventive health behaviors.

Researchers at the University of Edinburgh have reported 1,415 infectious agents known to cause disease in humans, and of that number 868 (61 percent) are zoonotic (Taylor, 984-985). Cleaveland, Laurenson and Taylor (2001) found that the greatest number of these zoonoses are transmitted by "domestic carnivores" (dogs and cats), and domestic livestock (cattle, sheep, goats, pigs and horses). The researchers also reiterate a point made by other scientists, that many "human emerging infections involve free-ranging wildlife, raising suggestions that human encroachment on wildlife habitats may result in increased transmission at the wildlife-human-domestic animal interface" (p. 992).

It has been estimated that more than 4 million animal-related infections occur annually in the United States, resulting in a cost of more than $300 million annually. Accurately capturing the number of zoonotic related infections is difficult because they are underreported (Stehr-Green, 1987)*.* Not all zoonotic diseases are reportable. Of those associated with companion animals, only

brucellosis, leptospirosis, tularemia, plague, rabies and psittacosis by law must be reported to public health authorities. Zoonotic infections displaying only mild clinical signs are not usually seen by physicians. Only severe cases, clusters of cases or deaths are diagnosed and reported (Stehr-Green, p. 3). Human infections are often misdiagnosed due to a physician's lack of awareness, training, or sufficient diagnostic support to identify a disease. Additionally, most industrialized countries currently have no comprehensive zoonotic disease reporting system in place (Donham, *et al*, p. 358).

At Risk Populations

The populations most at risk for acquiring a zoonotic infection are those which handle animals as part of their profession, such as zookeepers, animal trainers, animal rescue workers, veterinary health care workers and those in agricultural professions. Another at-risk group would be pet owners. Within this group, those more especially at risk are the elderly, the very young, pregnant women, those with compromised immune or other organ systems, and "those foolish enough to allow their animal to kiss or lick their face" (Shakespeare, p. 8).

The Human-Animal Bond

Over the ten thousand years since humans first domesticated animals, the relationship between the two species has evolved from one of supplying man's material needs to supplying an emotional need (Torrey and Yolken, 2005). Even ethnographic studies of twentieth century Amazonian hunter-gatherer societies refer to the practice of pet-keeping (Erikson, 2000). Decades of research have lent scientific support to what many laypersons have known for centuries: animals have a beneficial physical, emotional and psychological effect on the people with whom they socialize. The study of human-animal relationships has even become a new and respected field of research, anthrozoology (Podberscek, Paul & Serpell, 2000).

The idea of pet therapy is not a new one. The York Retreat, an 18th century asylum in England encouraged patients to interact with, and care for, the various small domestic animals kept on the grounds in the belief that the animals created a "humanizing influence," and the patients would benefit from the association. In the 19th century, Florence Nightingale recognized the potential benefits of animal companionship and introduced birds into the hospital setting to aid in patients' recovery (Serpell, 1986). Numerous studies have repeatedly demonstrated a strong correlation between animal companionship and better health outcomes, including lowered blood pressure (Katcher, Friedmann, Beck and Lynch, 1983) decreased depression, especially among the elderly (Garrity, Stallones, Marx and Johnson, 1989), improved mental outlook among AIDS sufferers (Siegel, 1999) and victims of post-traumatic stress disorder (New York Times, 2010), a reduction in "physical and psychophysiological symptoms after bereavement in adults," and "increases in self-esteem for children and adolescents" (Lagoni et al, p. 16). For many pet owners, an animal companion is "a faithful, intimate, noncompetitive and non-judgmental friend" who can also help their owners "make contact with their animal nature, helping them to avoid estrangement from their inner animal selves" (Feldmann, 1979).

A number of public surveys and polls provide support for this close relationship between humans and their animals. According to the American Veterinary Medical Association (2007), more than 60 percent of households own a pet, and that number is on the rise. A pet owner survey from the American Pet Products Manufacturer's Association (2004) found that most pet owners consider their pet a member of the family, even referring to themselves as "mom" or "dad" to their pets. A 2001 American Animal Hospital Association (AAHA) survey revealed that 63 percent of pet owners say "I love you" to their pet at least once a day, 59 percent celebrate their pet's birthday and 50 percent said they would prefer a cat or dog rather than another human as their only companion if stranded on a desert island.

Torrey and Yolken (p. 73) report the results of two surveys that found that 16 percent of household dogs sleep on top of their owner's bed, an additional 2 percent sleep in the bed and 67

percent of America's cats "are allowed to sleep on their owner's beds or anywhere they want."

Seventy-five percent of cat owners responded "frequently" when asked how often they "kiss the

cat or allow it to lick you on the face" in a 2003 survey. In the same survey, 11 percent of dog

owners say they felt closest to their pets while exchanging kisses."

Many pet owners include their animals in traditional rituals, buying gifts or holiday specific

costumes or personalized decorations for them, and even throwing birthday parties in their honor.

Sonny, a 12-year-old gelding pacer was celebrated by his owner with a traditional *bar mitzvah*

that included more than two dozen guests and a full candle-lighting ceremony (Dresser, 2000).

Not all pet owners lavish their animal companions with such displays, but according to a survey

conducted by the American Animal Hospital Association (2004), 94 percent of respondents think

their pet has "human-like personality traits such as being emotional or sensitive, outgoing,

inquisitive or stubborn."

The same survey revealed that 94 percent of respondents say they get regular veterinary

check ups to assure a good quality of life for their pets, while 58 percent say they visit the

veterinarian more often than the family physician.

Physicians, Veterinarians, Pet Owners and Zoonoses

Most pet owners would say they understand the dangers of the classic zoonotic disease

rabies and one or two other diseases for which vaccination programs and long-established laws

are in place. Yet a recent study (Bingham, 2009) found that only 59 percent of participants

understood that exposure to rabies without treatment could lead to death, and only 85 percent said

they would seek emergency treatment if they believed that they may have been exposed to rabies.

The same study found that while 95 percent of respondents said they would report being bitten by

a wild animal, only 86 percent would report being bitten by a dog that was not their own.

Most pet owners are somewhat knowledgeable about health problems associated with

external parasites such as fleas, ticks and mosquitoes, thanks to multi-million dollar ad campaigns for available products. The family veterinarian is a reliable source for the product and information about associated infections. Pet owners are less knowledgeable about zoonotic diseases that are not popularized by the media, advertising programs or state laws and they are unaware of preventive methods. For such information, pet owners rely on veterinarians (personal communication, Dr. Frank Frucci, 2009).

Physicians also rely on the veterinary profession to take the lead in educating the public about zoonotic health risks. A 1999 survey of primary care physicians and veterinarians in Wisconsin revealed that veterinarians discussed zoonoses with pet owners more often than physicians, and that physicians felt veterinarians should be responsible for disseminating information about zoonoses to their clients and to physicians. However, the study found a "complete lack of communication between physicians and veterinarians about zoonotic disease" (Grant and Olsen, p. 161).

Similarly, a 2002 Connecticut survey also found a difference of opinion between human and veterinary medical practitioners, with 41 percent of participating veterinarians and 60 percent of participating pediatricians indicating that they had never consulted their counterparts regarding zoonoses. Additionally, when asked to rank four professions--animal control officer, physician, public health officer and veterinarian—in order of primary responsibility for educating the public about zoonotic disease prevention, veterinarians indicated that physicians had the primary responsibility, with public health officers ranked second. Pediatricians, in contrast, most often said that public health officers had the highest responsibility, with veterinarians ranked second (Gauthier and Richardson, 2002).

Veterinarians are well-qualified to advise about methods for preventing the transmission of zoonotic diseases and promoting public health (Lipton, 2008; Wright, 2008). For decades, national and international programs of eradication of zoonotic diseases such as bovine tuberculosis, brucellosis, rabies and other scourges have been largely in the hands of veterinary

medical professionals (Beran and Steele*a*, p. 2). Educational and training requirements for human

and veterinary medicine draw on common pools of knowledge related to anatomy, physiology,

pathology and other disciplines, but the two branches differ in required coursework related to

zoonotic disease (Schwabe, 1984). Veterinary students receive some training in zoonoses, while

animal health issues are not part of a physician's studies and neither is taught much public health

theory and practice (Rabinowitz & Conti, 2010*a*).

Veterinarians recognize their professional responsibility to provide animal owners with

current, unbiased information about zoonotic disease risk and prevention, but many lack

confidence in their knowledge or feel such a discussion would needlessly alarm clients and lead

to pet relinquishment. The opportunity to prescribe any number of broad-spectrum drugs has also

been cited as an easy way of avoiding these discussions (Palmer et al, p. 1).

Animal-associated pathogens have been identified as diseases of concern to pet owners, but

especially to immunocompromised persons, very young children, pregnant women, the elderly or

those with debilitating illnesses (Aiello, 1998). Disease transmission is often bi-directional: while

an infected companion animal may shed the disease in its feces, even the most careful owner can

bring the disease into the home on shoes, tools or clothing and infect the animal. Yet, medical

doctors are traditionally not trained to ask questions about the number, breed or health status of

companion or other family-owned animals, or to investigate the etiology of potentially zoonotic

agents. Neither are veterinarians trained to recognize signs of human disease in their clients, nor

to ask human health-related questions (Grant & Olsen, 1999; Cripps, 2000).

Despite years of training, a 2005 study of infection control practices and zoonotic disease

risks among U.S. veterinarians found that, in general, respondents were inconsistent in using self-

protective behaviors, in the use of personal protective equipment to guard against potential

zoonotic disease transmission, and in instructing their staff to do so (Wright, p. 1866).

Most practitioners—small animal, large animal and equine—reported occasionally eating,

drinking in animal examination areas, a behavior with high risk for fecal-oral transmission of

zoonoses. This behavior was most predominant amongst small animal practitioners, more than 85 percent. Hand washing before eating, drinking or smoking at work was very low amongst all groups, but much lower in large animal (68.9 percent) and equine (71.9 percent) practitioners. More than 85 percent of large animal and equine veterinarians reported not always washing their hands between patients (Wright, pp. 1866-1868). Other statistics in the study revealed a regular failure to follow standard protective procedures, such as gowning and gloving to reduce the potential spread of zoonoses. Failure to follow such protocols can sometimes be fatal, such as the case of the Dutch veterinarian who contracted a fatal infection of H7N7 avian influenza because he failed to follow standard, self- protective procedures (Wright, p. 1864).

In personal interviews with local area veterinarians in northern Colorado, respondents referred to a "lack of focus on zoonotic disease" and its potential social and ethical ramifications during their veterinary medical education, so it "isn't on my radar screen all the time" (Frucci, 2009). Although veterinarians receive some education in zoonoses; many go into practice with a lack of awareness to "look for, recognise [sic], prevent and control zoonotic diseases" (Cripps, 2000).

Considering this information, it is understandable why most pet-owners are not well informed about common zoonotic infections and methods for control and prevention (Cripps, p. 79).

At the James L. Voss Veterinary Teaching Hospital (JLV-VTH) at Colorado State University, biosecurity, infection control and biosafety are vital functions. Clinicians and staff are responsible for protecting each individual who enters the hospital: patients, clients, employees, volunteers and visitors. This means each staff member must be proactive in enforcing established infection control programs and guidelines to prevent the spread of disease.

Biosecurity protocols are intended to reduce the risk of all nosocomial (in-hospital) and Zoonotic illnesses, and are specifically tailored "to address contagious disease threats as they are

encountered in this unique environment," according to the JLV-VTH Biosecurity manual, 2009. An aspect not specifically addressed in the hospital's biological risk management plan is client education and communication.

With the broad range of public health threats that have occurred just in the past two decades, understanding the communication processes, what may influence an individual's perception of risk and the need for behavior changes—and being able to convey that message without inciting fear—has become an important public health tool (Dora, 2006).

Two Zoonoses of Interest

The two zoonotic threats selected for this study represent two ends of the zoonotic spectrum: one familiar and endemic worldwide, and one emerging. *Salmonella* and Methicillin-resistant *Staphylococcus aureus* are two zoonotic infections currently presenting challenges to physicians, veterinarians, public health officials and animal-owners.

Salmonellosis

A well-recognized, but not well-understood, zoonotic disease is Salmonellosis, caused by the bacterium *Salmonella*, of which there are several types or *serovars* (www.cdc.gov). Salmonella infections affect an estimated 1.4 million people annually in the United States. Most infections are uncomfortable, causing diarrhea, vomiting abdominal cramps and fever, serious *Salmonella* infections are responsible for approximately 15,000 human hospitalizations and more than 500 deaths annually (Wright, 2005).

Salmonella is found worldwide to infect both animals and humans, with the two most common types being *Salmonella enteritidis* and *Salmonella typhimurium* (Rabinowitz and Conti, 2010*b*).

In human patients, *Salmonellosis* is typically caused by eating food contaminated with feces from an infected animal, although transmission through direct exposure to infected animals

is not uncommon. Companion animals, farm animals and wildlife transmit the bacteria to others through feces or, in the case of reptiles and young chicks, through other forms of direct contact (www.cdc.gov). Stehr-Green (1987) estimated that "at least 1% of annually-reported *Salmonellosis* cases in the USA are likely to be associated with companion animals." Although that sounds small, one veterinarian generalized that statistic to explain that "this translates into hundreds of thousands of US households…" (Hancock, 2002).

Any animal can serve as a natural reservoir for most types of *Salmonella*, and can act as carriers with no signs of infection. Most adult dogs shedding *Salmonella* in their feces appear asymptomatic or signs are subclinical. Fecal samples from dogs with vomiting and diarrhea are not usually submitted to a veterinarian for culturing (McDonough & Simpson, 1996).

A diagnosis of *Salmonella* in the family dog often follows that of human cases in the family (Kozak, *et al,* 2003). Simultaneous symptoms of *Salmonella* in animals and humans often occurs in small animal and equine veterinary clinics, traceable to poor hand hygiene, food consumption in work areas and the over use of antimicrobials in humans or animals (Wright, 2005).

A common cause of diarrhea in adult horses, *Salmonella* is also considered a serious gastrointestinal infection because of the potentially severe and sometimes fatal conditions it can cause. Infection can be attributed to contaminated feed or water, the environment or contact with infected animals actively shedding the bacteria. Stress is also an important factor contributing to the severity of the disease (Khan, 2005).

All animal hospitals have protocols in place to reduce the risk of an in-hospital spread of infectious diseases such as *Salmonella* to patients and staff. Equine hospitals especially recognize the importance of following these protocols because a breach can be more costly in both expense and reputation than for a small animal hospital. For example, the equine hospital at Michigan State University experienced four outbreaks of *Salmonella* between 1997 and 2006, each outbreak requiring the hospital to shut down completely for a thorough disinfection of the entire facility (West, 2010).

In 1999 and 2000, the Centers for Disease Control and Prevention received reports regarding outbreaks of multi-drug resistant *Salmonella typhimurium* involving more than 45 people and animals in four animal care facilities in three different, non-contiguous states. Four independent investigations found direct evidence of zoonotic transmission in two of the three facilities, demonstrating that animals shedding the bacterium can transmit the disease to humans as well as other animals (Wright, 2005; Guardabassi, 2004; MMWR, 2001).

It has been suggested that the rise in the use of antimicrobial agents in agriculture is a major factor in the increasing numbers of emerging multidrug resistant strains of bacteria now found in humans. The same class of drugs used to treat human infections are used in food animals as growth promoters, for disease prevention and as therapeutic treatment for sick animals (Beaudin, 2002). An emerging multidrug resistant bacterium of deep concern to physicians, veterinarians and public health officials is Methicillin-resistant *Staphylococcus aureus.*

Methicillin-resistant *Staphylococcus aureus (MRSA)*

Staphylococcus aureus (*S. aureus)* is a spherical shaped microorganism capable of causing an infection in any vertebrate animal, ranging from mild to life-threatening. Bacteria are single-cell microorganisms found naturally in the intestines of all animals, including humans, where they aid in the digestion; and in soil, where they help to maintain fertility. An infection is the "invasion and multiplication of microorganisms in or on body tissue that produce signs and symptoms as well as an immune response" (Holmes, 1998). Most bacteria are beneficial, but a small percentage can cause serious illness or death.

Methicillin, a member of the penicillin family, was first used in the 1950s for the treatment of penicillin-resistant *Staphylococcus* infections in human patients. Various new strains of methicillin-resistant *Staphylococcus aureus* (MRSA) appeared very quickly and became a serious human health problem in the United States in the 1970s, especially in hospital settings (Leonard

and Markey, 2008). By the 1990s, MRSA had grown to a global problem of significance in both human and animal medicine, especially in hospitals and health care facilities (Weese, 2005). MRSA has reportedly been responsible for more than 125,000 hospitalizations annually in the United States alone (Weese, 2006). The Centers for Disease Control and Prevention has published recent figures showing the mortality rate for MRSA in the United States is higher than the mortality rate for AIDS. In 2005, the morbidity and mortality rate for MRSA was an estimated 94,000 and 18,650 respectively, while AIDS claimed 16,000 lives (Cuddy, 2008).

S. aureus typically infects the skin and other soft tissue organs, causing abscesses and severely inflamed areas. Highly invasive strains of the bacterium, such as MRSA, can cause the death of tissue cells ("fascia"), known as "necrosis," resulting in the loss of that tissue. MRSA has been associated with necrotizing pneumonia and necrotizing fasciitis in even previously healthy persons (Rabinowitz & Conti, p. 209).

The disease has increasingly been identified in dogs, cats, horses and other companion animals (Baptiste, 2005). Suspected transmission of MRSA between humans and companion animals was the subject of a few studies conducted in the 1960s, and several recent studies.

As an infection in domestic animals, *S. aureus* was first reported in 1959 when detected by nasal swabs sampled from 23 of 100 dogs. The author of the study concluded that "the common house pet can serve as an important reservoir or carrier of staphylococcal infective [sic] for man" (Oehler, 2009).

In 1963, a veterinary study conducted on twenty Belgian dairy herds found them all to be uniformly infected with the bacteria traceable to a single human source (Rich, 2005).

The theory of humans as a primary pathway of MRSA infection for animals was supported by a 1999 study by Seguin *et al*. In this study, a veterinary teaching hospital conducted an evaluation of eleven equine cases that had been treated at the facility using different medical and surgical procedures. Treated and released, the horses were later readmitted with infections at the site of the original procedure. Follow up screenings found three members of the medical and

surgical staff to be culture-positive for MRSA. Strains from human and equine samples were found to be identical. The findings suggested the outbreak originated among the staff since the horses were from different geographical locations and all had tested negative for infection at the time of their hospital admittance (p. 1462).

Faires, et al (2009) found a high prevalence of concurrent MRSA infection by identical strains in humans and pet dogs and cats in the same household, suggesting interspecies transmission of MRSA. The study also suggested that, as part of recommended infection control, household hygiene should be carefully examined (p. 542). The authors also cautioned against the automatic relinquishment or euthanization of animals thought to contribute to MRSA infection in pet owners (p. 543).

Dr. Richard L. Oehler, an infectious disease specialist at the University of South Florida College of Medicine in Tampa, reviewed several reports of MRSA jumping between species. The study, published in The Lancet (July, 2009), discusses several cases, including one of a 15-year-old girl and her cat who developed simultaneous MRSA infections. Testing confirmed that the strain of bacteria in both the girl and the cat were the same (p. 444).

Manian (2003), reports one case of a 48-year-old diabetic man and his diabetic wife with recurrent MRSA skin infections that were eventually traced to their dog. The dog was a healthy 18-month-old Dalmatian who carried the bacteria but was asymptomatic. Manian suggests the dog was initially infected by its owner because the animal slept in the same bed with the couple and often licked their faces. The dog became a reservoir for the bacteria, reinfecting the couple. The infection was eliminated only after all three were treated (p. 27).

In a September, 2009 interview with the New York Times (Science section), Dr. Oehler characterized the increasing incidence of MRSA as "a burgeoning epidemic" (p. D5), and recommended that owners be more alert to their pets' health in general, and employ protective behaviors such as: increased hand washing or the use of hand gels before and after interacting

with a pet; not letting the animal lick people around the face, and washing pet food and water

bowls separately from dishes used for human food consumption (p. D 7).

A 2009 study by E.A. Scott and colleagues at the Center for Hygiene and Health in Home

and Community at Simmons College in Boston found MRSA in nearly half of 35 randomly

selected homes where the team swabbed various household surfaces. A pet was the one variable

found to predict the presence of MRSA in the household (p.450).

One qualitative risk assessment study conducted by a Scottish research team used a

conceptual model of seven potential pathways for MRSA infection in a dog over a given 24-hour

period. According to Heller *et al* (2010), humans were found to be the primary source of canine

infection in both community and veterinary hospital settings; the environment was secondary.

In determining the best way to communicate health risk and engage the risk taker in

accepting responsibility for their own health, including making behavioral changes, one must

determine the best channel for effective communication as well as the key variables in shaping

the message for change.

The Importance of Patient/Client Education and Communication

Effective communication between health care provider and client or patient is a hallmark of

quality health care, but has also been shown to have a significant beneficial effect on patient

health. Neumann, *et al* (2010), in studying the effect of a positive, high quality patient-provider

interaction, found that such an exchange can actually increase the effectiveness of medical

treatment.

Compliance with medical recommendations is typically seen by those in the medical

professions as the responsibility of the individual receiving the advice, e.g., the patient in human

medicine or the client in the case of veterinary medicine. Bellamy (2004) points out that

"compliance should not be seen as the patient's duty, but a joint responsibility of the [health care

worker] and patient working in partnership. A British study of patients' experience with the

doctor/patient interaction found that the quality of the communication with their doctor was very important, and that the face-to-face exchange of information was the best way to assure understanding of health care instructions and a more positive health outcome, especially for those patients with a lower level of health literacy (Shaw, Ibrahim, Reid, Ussher and Rowlands, 2008). The authors also suggest that practitioners employ a "range of supplementary communication methods" such as brochures, to help reinforce health recommendations to meet patients' individual needs (p. 119).

In discussing patient education and medical providers, one researcher explained that "…we are attempting to facilitate behaviour change. Patient education is therefore not just the provision of information, or of an intervention such as counselling or behavioural instruction. Patient acquisition of knowledge is often an essential component of patient education…" (Bellamy, p. 359).

Pet owners may feel more responsibility and anxiety when visiting the veterinarian because they have to speak on behalf of their animal, as they would for a child (Serpell, 1986, p. 78), and try to understand the information given in order to make informed decisions regarding their pets' care. It has been suggested that a lack of compliance with veterinary recommendations is not necessarily attributable to client negligence or complacency, but rather "the need to impart a large amount of information in a limited amount of time" while in "a distracting environment." Owners may be burdened with misbehaving pets or competing with the noises of other patients in the hospital, while simultaneously attempting to understand health care instructions. In such instances, portable health care information would be important so that the material can be reviewed and absorbed when the owner is more prepared to do so (Murphy, 2006).

A study examining the information resources most often sought by individuals looking for health information and preventive behaviors, O'Keefe, Boyd and Brown (1998) found that television news and information programs were the sources most often indicated, followed by health professionals, family and friends; then magazines and newspapers and thirdly, educational

brochures and materials (p. 31). The authors also found three important patterns related to where most people look for information on preventive health care: older, better educated and wealthier individuals most often turned to printed materials, while younger, less educated individuals said they learned more from television, and the more active, motivated sought information from their health care provider (p. 32).

In considering how to most effectively provide clients with important information about ways to prevent or change unhealthy behaviors, Fishbein and Cappella (2006) suggest "there are only a limited number of variables that must be considered in predicting and understanding any given behavior" (p. S2) and in understanding these motivations, an effective method of communication "or other type of intervention" (p. S1) can be created.

One such theory for understanding and predicting health behavior is the Health Belief Model.

The Health Belief Model Theory of Behavior

Although there are a number of theories related to behavior and behavior change, one of the well-researched and widely used theories of health-related behaviors is the health belief model (Champion and Skinner, 2008). The HBM emerged from the research of several social psychologists in the 1950s, which sought to explain why some individuals declined participation in preventive health care programs such as immunization and tuberculosis screening that could aid with early diagnosis and prevention of disease (Jantz and Becker, 1984). As with other theories exploring behavior modification or change, the HBM includes a belief component, an attitude component and a behavior component. The belief component pertains to what the individual assesses as the true situation, while the attitude component pertains to how the individual *feels* about the situation. Together these two components work as the driver for the individual to behave in a specific manner. The model has been revised and expanded over the years to include a self-efficacy component, based on the research of Albert Bandura, and a cues to

action or stimulus component, and has been extensively used by social science researchers to explain and predict health-related behaviors (Shillitoe and Christie, 1989).

The six key components of this model are cognitive-based, stipulating specific factors that a person who believes himself to be healthy must consider when deciding whether or not to adopt a recommended health behavior. These six components include:

- **Perceived threat-** the combination of perceived susceptibility and perceived severity of a health condition.
    - **Perceived Susceptibility:** perception of the risk of contracting a specific illness.
    - **Perceived Severity:** perceptions of the seriousness associated with contracting a specific illness or of leaving it untreated (medical, clinical and possible social consequences).
- **Perceived Benefits:** The believed effectiveness of adopting specific strategies designed to reduce the risk of the severity, morbidity or mortality.
- **Perceived Barriers:** The potential negative consequences that may result from taking particular health actions, including financial, physical and psychological costs; the inability to access resources to take specific actions, or the belief that the threat does not exist for a particular individual, group or region for specific reasons.
- **Cues to Action:** Private or public events such as physical signs of a health condition, a friend or acquaintance who has contracted the condition or publicity, media attention that motivate people to take action.
- **Self-efficacy:** The belief in being able to successfully execute the behavior required to produce the desired outcomes with little or no help from others.

Developed initially to explain preventive health-related behavior, the HBM has also been successfully used to study sick-role behavior (those already ill, including acute and chronic illness), as well. Jantz and Becker (1984) conducted a 10-year critical review of 29 investigations using the HBM, the summary of which "provided substantial empirical support for the HBM." The review found, amongst those studies related to preventive health behaviors, perceived *barriers* to be the strongest variable across all studies and behaviors. *Perceived susceptibility* was also found to be significant, while the weakest variable amongst preventive health behaviors was *perceived severity* (p. 1).

There has been some criticism leveled at the HBM. Davidhizar (1983) noted that the early model was "more concerned with the subjective state of the individual than with history or

experience." She also noted that the theory failed to take into account "personally and socio-culturally" determined perceptions of health and illness (p. 471). Becker (1977) acknowledged that the model is useful in its predictive utility related to preventive health behaviors, but offers "no particular strategy for altering beliefs" (p. 364). Calnan and Rutter (1986) also found that the HBM has predictive utility, but the "relationship between behavior and the dimensions of belief which the model stresses was not a strong or a simple one;" and that "prior behavior was a stronger predictor of subsequent behavior than beliefs" (p. 677). Weinstein (1993) expressed concern about the lack of guidelines or rules for combining the independent variables when "predicting action" or the model's inability to predict "the amount of precautionary behavior that will occur" (p. 326). Other researchers have pointed to the problems of operationalizing the various components. Different definitions and differing dimensions were used for each HBM component from study to study, which in turn affected measures of validity and reliability (Cummings, 1978, Champion, 1984, Becker and Maiman, 1975, Harrison, *et al*, 1992). Champion (1984) addressed the problem of validating scales for accurately measuring the HBM components in a study of breast self-examination, pointing out that definitions need to be consistent and specific to the behavior being addressed (p. 77). She revised the scales again in 1993, adding the construct of self-efficacy, and once more in 1999.

The HBM has been used extensively in the study of health screening behaviors ranging from influenza inoculations, seat-belt use, nutrition, chronic illness, smoking, breast cancer screening--both self-examination and mammography, to health beliefs and AIDS-related health behaviors (Champion and Skinner, 2008).

A Review of the HBM Constructs

Perceived Susceptibility and Perceived Severity

Threat perception is highlighted in this model as an important step in recognizing the value in taking a recommended action to reduce the threat. Earlier versions of the model, in fact,

combined perceived susceptibility and perceived severity and labeled the component as *perceived threat* (Champion, 1999). Whether or not the two concepts are actually perceived by the average person separately has been raised (Rosenstock, Strecher and Becker, 1994). Perceptions of susceptibility and severity are highly subjective. Where some people will see a particular health problem as imminent and life-threatening, and are prepared to take preventive action, others will see themselves as immune and preventive measures are unnecessary. Weinstein (1982) examined this phenomenon, referring to it as "unrealistic optimism." Clarke, Lovegrove, Williams and Machperson (2000) noted this phenomenon affected three of the HBM constructs in studying women and screening behaviors: susceptibility, severity and barriers, but not benefits. The same study found unrealistic optimism to be an important factor affecting all HBM components related to men and screening behaviors for prostate cancer.

Rosenstock, Strecher and Becker (1994) in studying the HBM and HIV risk behavior, described how perceptions of threat might be made sequentially, on a scale of one to ten, where one is low and ten is high. If the perception of severity is low, then "there might be no subsequent consideration of susceptibility," but when the perception of severity reaches a certain point, then susceptibility becomes more real and preventive measures are considered (p. 14).

People are more likely to change health behaviors, the model proposes, when they perceive a condition to be serious, and are less likely to engage in healthy behaviors if they believe the condition is not serious (Harrison *et al*, 1992; Rosenstock, 1974). Janz and Becker (1984) found the construct of severity was more problematic and statistically less significant than the susceptibility or barriers constructs. They found only one study, related to high blood pressure screening, where the severity component was described as "'significantly related to the study's measure of behavioral intention...'" (p. 19). Harrison, *et al* found very small effect sizes for associations between severity and preventive behaviors (p. 113).

Perceived Benefits and Barriers

Even if an individual perceives susceptibility to a health threat to be serious, whether the individual will change risky behaviors is influenced by the perception of benefits resulting from making the changes. Equally, the individual may perceive the benefits of adjusting the behavior, but be constrained by perceived barriers to taking action. The perceived benefits from the action must outweigh the perceived barriers (Rosenstock, 1974; Janz and Becker, 1984; Rosenstock *et al*, 1988).

These two constructs have often been shown to be the more significant than the others, with the barriers construct most often shown to be the most important one for predicting performance of a particular health behavior (Janz & Becker, 1984; Norman & Brain, 2005; Carpenter, 2010). Perceived barriers can include physical deterrents such as distance, money, time, convenience and physical inability or accessibility. Rosenstock, *et* al (1988) included psychological barriers to this dimension, as including embarrassment, comprehension, lack of belief in the validity of a particular threat or the personal acceptability of the recommended behavior. As an example, Becker and Maiman (1975) cited concern about vaccine safety outweighing worries about contracting poliomyelitis in a person's rejection of vaccination.

Self-efficacy

The concept of self-efficacy, as defined by Bandura (1977) is "the conviction that one can successfully execute the behavior required to produce the outcomes," is a relatively recent addition to the HBM. In 1988, Rosenstock, Strecher, and Becker included the self-efficacy component in the reformulated model, while maintaining the original concepts of susceptibility, severity, benefits and barriers. Confidence in the ability to perform a recommended health behavior can be a vital factor to an individual's actually implementing behavior change and/or compliance with a recommended health behavior. According to Bandura (2002), self-efficacy beliefs "also determine how obstacles and impediments are viewed." Those who have "low

efficacy are easily convinced of the futility of effort in the face of difficulties," while those "of

high efficacy" will persevere in the face of deterrents (p. 145).

<u>Cues to action</u>

Several early versions of the HBM included the concept of cues, or triggers, to action.

"Belief modification presents some problems including the fact that attempts at change include

providing cues" (Kirscht and Becker, 1974). Cues to action can include physical events such as

pain or illness onset, a sick animal, a family member or friend who contracted a condition, media

coverage of a health condition or health care professionals providing educational information.

Each of these examples could result in improved compliance with a recommended health

behavior. Although this component of the model has received little research attention, possibly

because, as described by Champion and Skinner "cues to action are difficult to study in

explanatory surveys; a cue can be as fleeting as a sneeze or the barely conscious perception of a

poster (p. 49). However, Shillitoe and Christie (1989) suggest that there is considerable evidence

that this component can have powerful effects on health behavior.

Research Questions

Using the Health Belief Model, this study sought to examine specific questions related to

perceptions of zoonotic disease, the adoption of protective health behaviors and the information

seeking behaviors of a specific pet-owning population and how these findings might extrapolate

to a general pet-owning population

RQ1: Which of the HBM constructs effectively predict the adoption of prophylactic behaviors?

RQ2: Do the HBM constructs found to predict the adoption of prophylactic behaviors in this

study follow the patterns found in previous preventive health behavior studies using this model?

RQ3: Is knowledge of MRSA and Salmonella associated with greater compliance with

prophylactic behaviors?

RQ4: Are veterinary health-care professionals the preferred source for clients seeking information about health risks related to zoonotic disease?

RQ5: Does a difference in risk perception and protective behavior exist between mixed animal owners and small animal owners?

RQ6: Does a difference in information seeking behaviors exist between mixed animal owners and small animal owners?

RQ7: Do demographic trends in this study population reflect trends in the general population?

RQ8: Are the information seeking behaviors found to be most prominent among the study population reflective of trends in the general population?

Chapter 3

METHODS

Instrument Design

The survey created for this study was designed using the Health Belief Model (HBM) as reconceptualized by Rosenstock (1988), which is appropriate as this theoretical model measures the relationship between perceived threat and protective behavior. Since this study is designed to gauge animal owners' knowledge and perceptions of the threat of zoonotic disease, and measure their willingness to adopt new protective behaviors, it was felt the HBM offered the best guide for evaluating the relationship between perceptions of threat and responsive behaviors.

HBM constructs were measured using Champion's Health Belief Model Scales (CHBMS), which were first developed and validated in 1984 during research into attitudes related to breast cancer screening. Champion noted that, although the HBM had been used extensively to measure attitudinal aspects of health behaviors, problems had occurred with the lack of standardization of measurement of the components. The scales were further refined by Champion in 1993 and in 1999. The CHBMS has been validated in many studies both in the United States and abroad (Avci, 2008; Gozum, 2004; Karayurt, 2007, Ozsoy, 2007).

The HBM guided the construction of the survey, which was developed to study the veterinary hospital client's perception of risk and general understanding of potential threats from zoonotic disease. This study evaluated the awareness of, and concerns for, two zoonotic disease threats: *Salmonellosis* and Methicillin-resistant *Staphylococcus aureus* (MRSA). Six constructs were used to evaluate the relationship between perceived disease threats and prophylactic health behaviors: perceived susceptibility to the disease threat, perceived severity of the disease if

contracted, perceived benefits of prophylactic behaviors, perceived barriers to performing those behaviors, perceived self-efficacy in the ability to perform these behaviors and cues to action. Demographics were also calculated, as they are an important factor in determining whether or not a particular behavior may be adopted.

All attitudinal and behavioral questions were rated on a 5-point Likert scale ranging from "strongly agree" to "strongly disagree." These scales have typically been used in studies that have applied the HBM to evaluate health behaviors.

As mentioned previously, there have been almost no studies with this focus conducted on this population. Far more information could be captured and applied to improved communication between veterinarians and client families, physicians, and public health professionals.

Measures

Preventive health behaviors (Dependent Variable)

Specific preventive, or prophylactic, behaviors were measured to assess their relationships with the HBM constructs. This variable was measured in relation to all of the independent variables in an effort to determine whether health beliefs related to zoonotic disease risk could be associated with preventive health behaviors.

Survey participants indicated their level of agreement or disagreement with six statements using a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

1. I kiss my animals on the face or allow them to kiss my face.
2. I allow my pets to sleep with me on the bed.
3. I wash my hands thoroughly after cleaning up animal waste.
4. I encourage other family members to thoroughly wash their hands after interacting with animals.
5. My animals get regular veterinary checkups.
6. I talk with my veterinarian about the risk of sharing diseases between humans and animals.

<u>Knowledge</u>

Knowledge was assessed through a set of four questions for each disease that examined the participants' awareness of how the pathogens are transmitted and what symptoms, or clinical signs, may look like in animal and human sufferers.

Participants indicated their level of agreement or disagreement with eight statements using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

1. I do not believe that X disease (Salmonella, MRSA) exists in the Western United States.

2. If an animal has X disease (Salmonella, MRSA) it will show symptoms.

3. I know the symptoms of X disease (Salmonella, MRSA) in animals.

4. I know the symptoms of X disease (Salmonella, MRSA) in people.

<u>Perceived susceptibility</u>

In this study, the health threat was the risk of contracting one of two zoonotic diseases and the subsequent exposure of family, friends and other animals to also contracting the disease. Perceived susceptibility measured the individual's belief in how predisposed they might be to contracting one of these two conditions.

Participants indicated the strength of their agreement or disagreement with six statements, three for each disease, using a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

1. I can get X disease (Salmonella, MRSA) from my animals

2. It is likely I will get sick from X disease (Salmonella, MRSA) sometime during my life.

3. I will be exposed to X disease (Salmonella, MRSA) sometime during my life but will not get sick.

<u>Perceived severity</u>

Participants indicated their level of agreement or disagreement with four statements, two for each disease, using a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

1. If I got sick from X disease (Salmonella, MRSA), the illness would be very bad.

2. If I got sick from X disease (Salmonella, MRSA), I could pass it to other including my animals.

<u>Perceived benefits</u>

This construct refers to the belief that taking specific action to deter the health threat outweighs the costs associated with taking that action.

Participants indicated their level of agreement or disagreement with eight statements using a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

1. When I wash my hands after interacting with my animals I am doing something to care for myself and my animals.

2. When I wash my hands after interacting with my animals I am setting a good example for others.

3. When I avoid letting my animal lick my face I am doing something to care for myself and my animals.

4. When I avoid letting my animals lick my face I am setting a good example for others.

5. When I wash my hands after cleaning up after my animals, I am decreasing my chances of getting Salmonella/MRSA.

6. By monitoring my animal's health daily, I am setting a good example for others.

7. By talking with my veterinarian about the risk of zoonotic disease, I am doing something to take care of myself and my animals.

8. When I talk with my veterinarian about the risk of zoonotic disease, I am setting a good example for others.

Perceived barriers

The negative aspects of engaging in a particular health behavior are considered a perceived barrier, impeding the individual's performance of a recommended behavior.

Participants indicated their level of agreement or disagreement with seven statements using a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

1. Not sharing gestures of affection with my animals reduces the quality of life for me and for my animals.
2. Washing my hands each time after interacting with my animals will take too much time.
3. Washing my hands each time after interacting with my animals is not important.
4. It is hard to remember to wash my hands after interacting with my animals.
5. Regular veterinary visits are too expensive.
6. Regular veterinary visits are not important.
7. The veterinarian is too far away for regular visits.

Self-efficacy

The concept of self-efficacy, the perception that an individual is competent to perform a particular recommended behavior, can be a vital factor in taking action to implement behavior change and compliance with a recommended health behavior.

In this study, the construct of self-efficacy is the perception of competence in being able to communicate with veterinary health care professionals and/or physicians about information related to preventing zoonotic disease. The questions are intended to measure whether the individual perceives that they are capable of asking for information, whether they feel they are

capable of understanding verbal instructions alone, or if supportive materials would enhance their capability for understanding information about preventing zoonotic disease risk.

Survey participants indicated their level of agreement or disagreement with four statements using a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

1. I don't know how to ask my veterinarian or my doctor about zoonotic disease risk for my family.

2. I am afraid to ask my veterinarian or my doctor about zoonotic disease risk for my family.

3. I am confident that I can understand health instructions from my veterinarian about zoonotic disease risk prevention.

4. I would be more confident of understanding and acting on health instructions from my veterinarian if an informational brochure and/or website were provided as well.

Cues to action

Participants indicated their level of agreement or disagreement with six statements using a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

1. I have looked for information about zoonotic disease in general.

2. When I encounter information about zoonotic disease, I am likely to stop and think about it.

3. I have looked for information about Salmonella/MRSA.

4. When I encounter information about Salmonella/MRSA I am likely to stop and think about it.

5. I have talked with my veterinarian about risks of disease shared between humans and animals.

6. I have talked with my family doctor about risks of disease shared between humans and animals.

<u>Demographics</u>

Demographics can affect health behaviors in several ways, as demonstrated by Rosenstock (1974) in his research on the HBM and preventive health behavior. Age, gender, education, socioeconomic status (SES), urban/rural living, occupation, children under 18 years or elders over a certain age in a household can affect adoption rates of preventive health behaviors. An individual in a higher SES, for example, can afford more frequent veterinary clinic visits, more expensive diagnostic tests, may provide better home care for their animal and is less likely to be affected by distance to veterinary health services. An individual in a lower SES may find these things to be barriers. Young children or elders in the household tend to increase awareness of health risk and thereby, improve adoption rate of preventive health behaviors.

Each of the following characteristics was assessed for its relationship with the HBM constructs:

Age	Gender
Income	Highest educational level achieved
Number of persons in household	Number of persons under age 18
Number of persons over the age of 75	Number of pets in household
Number of animals living on property outside of home	Works in human or veterinary medical field

Selection of Participants and Data Collection

The population consisted of clients of the James L. Voss Veterinary Teaching Hospital (JLV-VTH), a part of the Colorado State University Veterinary Medical Center in Fort Collins, CO. The JLV-VTH is the largest and most comprehensive veterinary medical facility in the state of Colorado and the region that includes Wyoming, North and South Dakota, Montana, Nevada, Utah, Arizona, New Mexico and the most western portions of Nebraska and Kansas. As a department of the Colorado State University College of Veterinary Medicine and Biomedical Sciences, the hospital provides a full range of veterinary services for all species except wildlife. Clinicians provide the highest level of treatment, care and advice while utilizing state of the art

diagnostic and treatment tools and the expertise of a broad spectrum of specialists. The hospital

is also progressive in providing the latest in natural healing and integrative pain management

medicine, and access to a professionally staffed client emotional support service.

JLV-VTH clients typically fall into categories ranging from urban households and semi-

rural hobby farms to large ranching and commercial livestock operations.

The region served by the JLV-VTH has a strong animal-friendly population. Once home to

a wide range of wildlife and ranching and agricultural operations, the area has increasingly

become urbanized but still supports many small and large family farm-holders, hobby farm

enthusiasts, equine breeding and training facilities and large cattle and sheep operators. As the

region offers a variety of outdoor pursuits, there are also a number of outfitters providing horses,

llamas and donkeys as pack animals for camping and hiking. These various characteristics make

the region an excellent location for the purpose of this study.

The sampling frame was selected from the client database of the equine and small animal

departments within the JLV-VTH and restricted to those clients living within the 11-state region

previously described. The names of JLV-VTH faculty, staff, professional veterinary medical

students and their spouses were removed from the list, as well as those names that included

medical professional titles such as DVM, MD, MPH, RN, LPN, PA, CVT, LVT, RVT and AHP

(See Appendix 1, glossary of titles).

For the purposes of this study, the term *equine* or *equid* refers to horses, donkeys and mules

of all breeds. The term "small animal" refers to domesticated cats and dogs of all breeds.

The oncology unit at the hospital was excluded from the client list since cancer treatments

typically require many visits over an extended period of time, and an infection with Salmonella or

MRSA would be secondary to cancer. This unit has one of the largest caseloads at the hospital.

To qualify for inclusion, small animal clients must have used hospital services at least

twice within the past two years, while equine clients were included if they had used hospital

services at least once within the last two years. The reason for this variance is the increased

planning, cost and stress related to transporting large animals to and from a hospital appointment. This translates into fewer visits but the appointments are typically more serious and more comprehensive in nature.

A systematic random sampling method was used, selecting every third case in the population, until a total of 1,000 names were selected for participation: 500 from a total equine population of approximately 2,000 and 500 from a total small animal population of approximately 8,000.

Data Collection Tools and Procedures

Data were collected using a four-page, paper-and-pencil self-administered mail survey. Best practices were used for survey administration including sending advance postcards to inform the potential participant that a survey would be arriving in the mail. One week later, an envelope was mailed containing a professionally-printed recruitment letter (Appendix 2) that provided general information about the purpose of the study and the reassurance that the survey was anonymous and completely voluntary, a four-page survey (Appendix 3), and a self-addressed, postage-stamped, reply envelope. Follow-up reminder cards were mailed one week after the survey mailing.

Items on the survey were grouped into logically coherent sections, with each section containing questions related to one specific construct of the HBM, and a section related to information seeking behaviors. Survey questions were tested for content validity (see below).

The recruitment letter included contact telephone numbers should recipients have questions regarding the study.

No cash or any other incentives were used, nor was the survey sponsored by any outside organization, business or group.

The survey was executed in the summer of 2010 and resulted in a final response rate of 43 percent.

Content Validity

Content validity is defined "as the degree to which an instrument actually measures what it sets out to measure (Wimmer & Dominick, 2006).   All questions created for the survey were reviewed by two faculty members of the Journalism and Technical Communication Department at Colorado State University, as well as one faculty and one staff member of the James L. Voss Veterinary Teaching Hospital at Colorado State University. Questions were assessed for readability, understandability and content validity and recommendations were provided by the assessors. Where applicable, modifications to the survey were made.

Reliability

Reliability was calculated using Cronbach's α for each of the six index items. Reliability is defined as "the property of a measure that consistently gives the same answer at different times" (Wimmer & Dominick, 2006). The survey questions must be tested for consistency and dependability. Cronbach's α is a measurement tool used to collect a reliability estimate when only a single test administration is used. It is used for internal consistency, referring to consistency among the items of a construct or the degree to which a particular set of items measures a dimension of a latent construct.

For this study, internal consistency was assessed using the item-to-total score and Cronbach's alpha coefficient for five HBM constructs: protect, barriers, benefits, cues to action and self efficacy.

Human Subject Research Approval

This study was approved by the Institutional Review Board at Colorado State University.

Statistical Analyses

All data were analyzed using Predictive Analytics SoftWare (PASW) version 17.0 for windows (PASW, 2009). Descriptive statistics were run for all collected data, including demographics. Survey responses for beliefs and behaviors were measured by continuous variables.

Construct definitions for this study are drawn directly from HBM theory and measures were designed to be specific to the particular behavior being studied, which is prophylactic behavior, and relevant to the population being studied. To reduce measurement error, multi-item measures were used to capture latent constructs that could potentially influence the behavior. For this reason, as well as to include as many possible relative factors of each construct, multiple items were created for each model element, as suggested by Champion (1993).

Univariate and bivariate analysis

Independent sample t-tests were applied as appropriate to measure independent and dependent variables, comparing HBM construct means between those who practice preventive behaviors and those who do not. Pearson's r was used to determine the relationship among all of the HBM constructs. One-way ANOVA was used to determine relationships between the categorical measure of education and/or SES and use of health preventive behaviors.

A standard multivariate regression analysis was used, based on the HBM model, to test the predictive ability with regards to the studied health behavior: prophylactic behavior.

Chapter 4

RESULTS

Reliability

Reliability was calculated using Cronbach's α for each of the five index items. Cronbach's α is a measure of internal consistency, used to collect a reliability estimate when only a single test administration is used and several items are being measured. It evaluates how closely a set of items measures a dimension of a latent construct. It has been used most effectively when measuring attitudes, beliefs or perceptions of communication and when the sample size is not small (Reinard, 2006).

For this study, internal consistency was assessed using Cronbach's alpha coefficient for five of the seven HBM constructs: *protect, barriers, benefits, cues to action* and *self efficacy*. The scores of all the variables were added together to produce a summated scale. The constructs *severity* and *susceptibility*, combined as *risk* for each of the two diseases discussed in this study, could not be calculated for an alpha coefficient because of the way in which they were composed.

Reliability coefficients should be as near to 1.00 as possible. Reinard (p. 121) provides this guideline for interpreting reliability: .90 and above = highly reliable; .80-.89 = good reliability; .70-.79 = fair reliability; .60-.69 = marginal reliability; under .60 = unacceptable reliability.

Cronbach's alpha values for the HBM constructs were run for the full sample (n = 397). The variables *benefits* and *cues to action* had Cronbach's alpha values of 0.80 or higher, while the variables *barriers, self-efficacy* and *protect* consisting of 7 items, 4 items and 6 items respectively, had alpha values of less than 0.70. Table 4.2 which lists the means, standard deviations, and Cronbach's alpha for five of the HBM constructs and for information seeking

behaviors. Table 4.5 shows the full table of correlations for all questions composing the seven

HBM constructs and for two items related to knowledge of each of the two diseases.

Survey Participation Rates

Of the one thousand (1000) surveys originally mailed, 61 were returned as "undeliverable."

Four hundred and three (403) surveys were completed and returned, of which 397 met the

participant criteria, resulting in a 42 percent response rate. The six surveys not included in the

analysis were eliminated because the respondent either did not meet the age criteria or they no

longer had animals in the household. Two hundred and seven (52.1 percent) respondents were

small animal owners and one hundred ninety (47.9 percent) respondents were mixed animal

owners, having both equines and small animals in their household.

Composition of Indices for Analysis

In creating the indices for the variables to be analyzed, the items created for each construct

were scored and summed. A mean, standard deviation and alpha score were calculated for each.

The information exposure index was composed of eight sources, with a range of 8.0 to

40.0, $M = 19.86$, $SD = 4.6$, $alpha = .60$. The dependent variable, *protect*, was composed of six

items, with a range of 10.0 to 30.0, $M = 20.32$, $SD = 3.73$, $alpha = .49$. The independent

variables *susceptibility-salmonella* and *susceptibility-MRSA* were each composed of 3 items,

ranging from 3.0 to 15.0, with $M = 10.28$, $SD = 1.76$, and $M = 9.39$, $SD = 1.33$ respectively. The

independent variable *severity-salmonella* and *severity-MRSA* were each composed of 2 items,

with *severity-salmonella* ranging from 2.0 to 10.0, $M = 6.88$, $SD = 1.4$; and *severity-MRSA*

ranging from 4.0 to 10.0, $M = 7.0$, $SD = 1.36$. *Alpha* scores were not calculated for either

susceptibility or *severity*.

The *barriers* index was the sum of seven items, ranging from 7.0 to 30.0, $M = 17.24$, $SD = 4.25$

and *alpha* = .62. The *benefits* construct was the sum of eight items, ranging from 13.0 to 40.0, *M*

= *31.70, SD = 4.71, alpha = .84.* The *cues to action* variable was the sum of six items, ranging

from 6.0 to 30.0, *M = 17.38, SD = 4.66, alpha = .80.* The self-efficacy item was the sum of four

items, ranging from 6.0 to 15.0, *M = 12.50, SD = 2.09, alpha = .68.*

A full survey codebook can be found in Appendix D.

Demographics

Descriptive statistics were examined to determine the frequencies and percentages of the

small animal (SA) and mixed animal (MA) participants for each demographic characteristic. The

data were analyzed using chi square and independent t-test analyses to identify demographical

differences existing between the two groups that might influence attitudes and behaviors

regarding the perception of risk for zoonotic infection and engaging in prophylactic behaviors.

Age, Sex, Household and Dependents

Overwhelmingly, the sample population was found to be older, female and well-educated.

The average age was 52.9 (*SD* = 9.48), with almost no difference between the two animal groups

(SA: *M* = 53.08, *SD* =10.018; MA: *M* = 52.73, *SD* = 8.87). Female respondents numbered 311

(78.3 percent) to 86 male respondents (21.7 percent). Interestingly, the number of female

respondents owning a mix of equines and small animals was found to be larger (84.2 percent)

than the number of female respondents owning small animals only (72.9 percent), and the number

of male respondents with small animals only was almost equally larger than the number of males

owning a mix of equines and small animals (27.2 percent vs. 15.8 percent).

Results of a Pearson chi-square statistic indicate a strong dependence between sex and

animal group (Chi square= 7.41, *df* = 1, *p* = .006), but considerable independence between

income and animal group (Chi square= 8.13, *df* = 5, *p* = .149).

Our study population demonstrated a larger percentage of two-person households (51.6

percent), with no dependents (69.5 percent), which is in keeping with an older population. Only

24.7 percent reported children less than 18 years of age and only 5.8 percent reported elders over

the age of 75 sharing the household.

Education

More than two-thirds of our respondents were college graduates or above (38.5 percent =

college graduate; 31.2 percent = post graduate degree). Some difference exists between animal

groups related to the education question. Of those acknowledging a high school degree or GED as

the highest level of education completed, 14.5 percent were small animal owners while 24.2

percent were mixed animal owners. Of those with a post graduate degree, 36.2 percent were small

animal owners versus 25.8 percent of mixed animal owners (Chi square= 8.73, df = 3, p = .033).

Income

In our sample population, the likelihood of having a pet increased with income, both in the

mixed animal category and the small animal category. The exception for mixed animal owners

was in the $61,000-$80,000 range where the percentage dropped from 21.6 percent to 16.3

percent, and again in the $81,000-$90,000 range when it dropped again to 13.2 percent, but

tripled in the highest ($91,000+) category to 39.5 percent.

In the small animal group, percentages gradually increased as income increased, dipping

only slightly in the second highest income category ($81,000-$90,000) and peaking in the highest

($91,000+).

Information Seeking Behaviors

Respondents were asked to rate eight sources by how frequently they sought information

about animal health. Participants were given the following usage choices:

1. Never 2. Sometimes 3. Often 4. Frequently 5. Very Frequently.

The eight sources of information included: newspapers, television, radio mail, the web, family, friends, and doctors or nurses (human or veterinary). Means, standard deviation and results of Independent Samples Test are included in Table 4.4.

Overall, respondents cited newspapers, mail, the internet and friends as more frequently sought sources of information than television, radio, family or medical professionals. Between the two groups, some interesting and statistically significant differences ($p \leq .05$) emerged related to information seeking behaviors.

Results showed that mixed animal owners more often than small animal owners will seek information from friends (MA: $M = 3.05$, $SD = 1.03$ versus SA: $M = 2.68$, $SD = 1.14$) and the mail (MA: $M = 2.32$, $SD = 1.13$ versus SA: $M = 1.94$, $SD = 1.03$), while small animal owners rely more on newspapers as an information source (SA: $M = 2.10$, $SD=1.05$ versus MA: $M =1.86$, $SD=.95$).

Comparison of Mixed Animal and Small Animal Owner Groups on Health Belief Model Constructs, Protective Behaviors and Disease Risk Awareness

Both animal owner groups were analyzed in correlation with each of the Health Belief Model constructs, and other independent variables using independent t-tests. Unexpectedly, the data revealed almost no statistically significant difference ($p \leq .05$) between the two groups. Scores for all HBM constructs were almost identical between groups, although the mixed animal owners demonstrated a slightly higher awareness of the cues to action variable than the small animal group (MA: $M = 18.07$, $SD = 4.57$ vs. SA: $M = 16.74$, $SD = 4.65$, $t = -2.87$, $p = .004$).

Mean values and t-test scores for *knowledge of Salmonella* and MRSA were similar and not significant across animal groups, although *knowledge of Salmonella* scored slightly higher amongst the mixed animal group than the small animal group (MA: $M = 2.02$, $SD = 1.04$ vs. SA: $M = 1.98$, SD .86, $t = -.370$, $p = .711$); and *knowledge of MRSA* scored only very slightly higher amongst the small animal group (SA: $M = 1.11$, $SD = 1.14$ vs. MA: $M = 1.05$, $SD =1.15$,

t = .547, *p* = .585).

A paired samples t-test comparing the mean values for perceived risk, which is a combination of *susceptibility* and *severity*, showed that *Salmonella* was perceived as more of a risk than MRSA (Risk S: *M* = 71.5, *SD* = 22.0 vs. Risk M: *M* = 66.4, *SD* = 19.62, *t = 4.50, p* = .000), and that perception of risk was slightly higher among the mixed animal group than the small animal group (MA: *M* = 72.9, *SD* = 22.4 vs. SA: *M* = 70.1, *SD* = 21.5).

In t-tests to compare differences between the groups related to the independent variables *benefits, barriers, and self-efficacy*, scores were found to be almost identical and of no statistical significance. Only the variable *cues to action* was found to be significant among all participants (*p* = .004), and had a higher mean value (*M* = 18.0) amongst the mixed animal group than the small animal group (*M* = 16.7).

Correlations Among All HBM Constructs

Table 4.5 illustrates all the Pearson's correlation coefficients among the HBM constructs found in this study. Tables 4.3 *a, b, c, d, e* and *f*, breaks out individual values for the items composing each of the five HBM constructs and how they correlate to the dependent variable, *protect*. Table 4.3*g* breaks out individual values for the dependent variable *protect* and each item in *information seeking behaviors*.

In interpreting the strength of relationships, we followed guidelines found in Morgan, Leech, Gloeckner and Barrett (2011) created by Cohen when using Pearson's r (p. 101), and used the slightly modified description recommendations suggested by the authors. Those guidelines are as follows: Larger than typical $\geq$ .70; Medium or typical $\geq$ .50; Smaller than typical $\geq$ .10.

 Knowledge for either disease showed only slightly significant correlation with any of the HBM constructs. Knowledge of *Salmonella* (*know_s)* showed no significant association with *barriers* (r = .014) or *benefits* (r = .079), and a only a smaller than typical association with *cues*

($r = .223$) and *self-efficacy* ($r = .136$). Knowledge of MRSA (*know_m*) were also not significant or smaller than typical scores: *barriers* ($r = .027$), *benefits* ($r = .103$), *cues* ($r = 294$) and *self-efficacy* ($r = .179$).

The dependent variable *protect* showed a significant inverse correlation with four of the seven items composing the independent variable *barriers*. See Table 4.3*a*.

As discussed earlier, previous studies have shown this construct to be a strong predictor of adopting preventative health practices. In our study, a Pearson pair-wise test showed an inverse relationship of moderate significance between the dependent variable, *protect* and the four underlying items related to personal protective hygiene practices. The three other subset items related to veterinary medical services showed no correlation between the variables.

Table 4.3*b* shows that, amongst the *benefits* items, the *protect* variable showed a positive and significant correlation with all eight items. Four of the five items related to personal protective hygiene showed a moderately significant correlation, with the fifth item showing significance, but in a smaller than typical effect size ($r = .103$, $p = .040$). The two veterinarian-related items showed a significant correlation but a smaller than typical effect size ($r = .218$, $p = .000$ and $r = .197$, $p = .000$).

Tables 4.3*c* and 4.3*d* illustrate no significant correlation between *protect* and the independent variables *susceptibility* (*susc_s* and *susc_m*) and *severity* (*sev_s* and *sev_m*).

The *cues to action* variable was composed of six items, all of which demonstrated significance in correlation with *protect*. Of these, only the single veterinarian-related item showed a medium or typical strength of correlation ($r = .406$, $p = 000$). All other items were far smaller, including the family physician-related item ($r = .284$, $p = .000$). See Table 4.3*e*.

Interestingly, the four items composing the construct *self-efficacy* demonstrated no significant correlation with *protect*. Table 4.7*f* shows Pearson's correlations and *p* values for the four self-efficacy items and the dependent variable, *protect*.

The variable *protect* showed a significant association with four of the eight channels of information listed in this study. Table 4.*3g* shows that mail, newspapers and television were shown to have the most significance for respondents ($r = .149$, $p = .003$; $r = .142$, $p = .005$; $r = .132$, $p = .008$, respectively). The items *family* and *friends* showed a negative, non-significant score ($r = -.001$, $p = .978$ and $r = -.008$, $p = .877$ respectively).

Quite surprisingly, the categories of the Worldwide Web and the medical community (physicians, veterinarians and nurses) showed no significant association ($r = .055$, $p = .275$ and $r = .027$, $p = .593$ respectively).

Predictors for Adoption of Prophylactic Health Behaviors for All Survey Participants Using Multiple Regression Analysis

Multiple regression analyses were conducted to determine which HBM constructs, individually or in combination, were the strongest predictors for the adoption of preventive behaviors. The combination of variables to predict protective health behaviors include *animal groups, income, age, sex, education, knowledge of salmonella, knowledge of MRSA, risk of salmonella, risk of MRSA, barriers, benefits, self-efficacy and cues to action* was found to be statistically significant $F(13, 383) = 14.60$, $p < .001$. The adjusted R^2 value was .313, indicating that 31 percent of the variance in preventive health behaviors can be explained by the model. Clearly, *benefits*, *barriers* and *cues to action* significantly predict the adoption of preventive health behaviors when all three variables are included.

In multiple regression correlation, beta coefficients are regression coefficients that have been standardized to create comparable measures, and are interpreted similarly to correlation coefficients. As can be seen in Table 4.5, the individual constructs that are significantly adding to predicting the adoption of protective behavior are *barriers* (*Beta* = -.330, $p = .000$), *benefits*

(*Beta* = .213, *p* = .000) and *cues to action* (*Beta* = .248, *p* = .000). None of the other constructs

demonstrate any contributive values.

Table 4.1 Independent Sample T-test for Information Exposure/Information Seeking Behaviors among Mixed Animal and Small Animal Owners

Medium	*t*	*df*	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Papers	2.421	395	.016	.244	.101
TV	1.271	395	.204	.136	.107
Radio	-.885	395	.377	-.080	.090
Mail	-3.446	395	.001	-.374	.108
Web	-2.128	395	.034	-.266	.125
Family	.106	395	.916	.012	.114
Friends	-3.343	395	.001	-.366	.110
Drs/Nurses	.701	395	.484	.096	.138

Table 4.2 Summary Statistics for Health Belief Model Constructs

	Mean (SD)	Internal Consistency (Cronbach's α)
Protect	20.32 (3.73)	.49
Barriers	17.24 (4.25)	.62
Benefits	31.70 (4.71)	.84
Cues to Action	17.40 (4.70)	.80
Self-efficacy	12.50 (4.70)	.54
Risk S*	71.50 (22.00)	-----
Risk M*	66.42 (19.62)	-----
Info Exposure	19.90 (4.60)	.60

*Risk = susceptibility +severity

Table 4.3*a* Correlations: *Protect* with *Barriers* Items

	Pearson's Correlation *r*	Sig. (2-tailed)	N
Not sharing gestures of affection…reduces the quality of life for me and for my animals	-.255**	.000	397
Washing my hands…will take too much time	-.462**	.000	397
Washing my hands…is not important	-.472**	.000	397
It is hard to remember to wash my hands…	-.422**	.000	397
Regular veterinary visits are too expensive	-.045	.367	397
Regular veterinary visits are not important	-.012	.819	397
The veterinarian is too far away for regular visits.	-.007	.884	397

Table 4.3*b* Correlations: *Protect* with *Benefits* Items

	Pearson's Correlation *r*	Sig. (2-tailed)	N
When I wash my hands…I am doing something to care for myself and my animals.	.361**	.000	397
When I wash my hands…I am setting a good example for others.	.365**	.000	397
When I avoid letting my animal lick my face, I am…care for myself and my animals.	.367**	.000	397
When I avoid letting my animal lick my face, I am setting a good example for others.	.413**	.000	397
When I wash my hands…I am decreasing my chances of getting Salmonella/MRSA.	.156	.002	397
By monitoring my animal's health daily, I am setting a good example for others.	.103	.040	397
By talking to my veterinarian about the risk of zoonotic disease…care of myself and animals.	.218	.000	397
When I talk with my veterinarian about zoonotic disease…a good example for others.	.197	.000	397

Table 4.3c Correlations: *Protect* with *Severity* and *Susceptibility-Salmonella* Items

	Pearson's Correlation *r*	Sig. (2-tailed)	N
I can get *Salmonella* from my animals.	.007	.892	397
It is likely I will get…*Salmonella* sometime during my life.	.094	.062	397
I will be exposed to *Salmonella*…but will not get sick.	-.070	.171	397
If I got sick from *Salmonella,* I could pass it to others, including my animals.	.022	.656	397
If I got sick from *Salmonella,* the illness would be very bad.	.059	.242	397

Table 4.3d Correlations: *Protect* with *Severity* and *Susceptiblity-MRSA* Items

	Pearson's Correlation *r*	Sig. (2-tailed)	N
I can get *MRSA* from my animals.	.110	.030	397
It is likely I will get…*MRSA* sometime during my life.	.111	.027	397
I will be exposed to *MRSA*…but will not get sick.	-.009	.865	397
If I got sick from *MRSA,* I could pass it to others, including my animals.	-.050	.362	397
If I got sick from *MRSA,* the illness would be very bad.	.030	.614	397

Table 4.3e Correlations: *Protect* with *Self-Efficacy* Items

	Pearson's Correlation (*r*)	Sig. (2-tailed) (*p*)	N
I don't know how to ask my veterinarian or my doctor about zoonotic disease risk for my family.	.101**	.843	397
I am afraid to ask my veterinarian or my doctor about zoonotic disease risk for my family.	.033**	.515	397
I am confident that I can understand health instructions provided by my veterinarian about disease risk prevention for my family	.072**	.151	397
I would be confident of understanding and acting on health instructions from my veterinarian if an informational brochure and/or website were provided as well. .	.090**	.072	397

Table 4.3*f* Correlations: *Protect* with *Cues to Action* Items

	Pearson's Correlation *r*	Sig. (2-tailed)	N
I have looked for information about zoonotic disease in general.	.248**	.000	397
When I encounter information about zoonotic disease I…stop and think about it.	.157**	.002	397
I have looked for information about Salmonella/MRSA.	.263**	.000	397
When I encounter information about Salmonella/MRSA I… stop and think about it.	.155**	.002	397
I have talked with my family doctor about… diseases shared between humans and animals.	.406**	.000	397
I have talked with my veterinarian about… diseases share between humans and animals.	.284**	.000	397

Table 4.3*g* Correlations: *Protect* with *Information Exposure* Items

	Pearson's Correlation *r*	Sig. (2-tailed)	N
Newspapers	.142**	.005	397
Television	.132**	.008	397
Radio	.106**	.035	397
Mail	.149**	.003	397
Worldwide Web	.055	.275	397
Family	-.001	.978	397
Friends	-.008	.877	397
Medics	.027	.593	397

Table 4.4 Beta Coefficients and P-Values for Regression Analysis of HBM Constructs
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
5	(Constant)	17.072	2.208		7.733	.000
	ANIMALS	-.046	.324	-.006	-.143	.887
	AGE	.010	.017	.024	.565	.572
	SEX	.386	.394	.043	.980	.328
	INCOME	.051	.107	.021	.472	.637
	EDU	-.139	.155	-.040	-.901	.368
	know_s	.247	.181	.063	1.363	.174
	know_m	-.133	.179	-.041	-.742	.458
	Risk_S	-.006	.008	-.033	-.693	.489
	Risk_M	-.007	.011	-.035	-.591	.555
	barriers	-.289	.041	-.330	-7.130	.000
	benefit	.169	.039	.213	4.349	.000
	cues	.199	.039	.248	5.062	.000
	selfeff	-.024	.079	-.014	-.309	.758

a. Dependent Variable: protect

Table 4.5 Correlations Matrix for All HBM Constructs

	protect	infoexp2	know_s	know_m	Risk_S	susc_s	severe_s	Risk_M	susc_m	severe_m	barriers	benefit	cues	selfeff
protect	1	.185**	.090	.032	.047	.024	.054	.087	.108*	.041	-.457**	.413**	.363**	.048
infoexp	.132**	1	.053	-.023	.074	.013	.091	.069	.008	.093	-.110*	.168**	.184**	.030
know_s	.090	.061	1	.360**	.266**	.314**	.132**	.284*	.217**	.251*	.014	.079	.223**	.136**
know_m	.032	.003	.360**	1	.189**	.213**	.120*	.596**	.405**	.592**	.027	.103*	.294**	.179**
Risk_S	.047	.011	.266**	.189**	1	.762**	.841**	.426*	.347**	.362**	-.002	.172**	.214**	.203**
susc_s	.024	-.041	.314**	.213**	.762**	1	.316**	.329*	.335**	.245*	.004	.138**	.202**	.092
severe_s	.054	.046	.132**	.120*	.841**	.316**	1	.357*	.251**	.340**	-.011	.125*	.159**	.247**
Risk_M	.087	.062	.284**	.596**	.426*	.329*	.357*	1	.777**	.864**	-.029	.236**	.355**	.198*
susc_m	.108*	.008	.217**	.405**	.347**	.335**	.251**	.777**	1	.374**	-.043	.165**	.278**	.107*
severe_m	.041	.041	.251**	.592**	.362**	.245*	.340**	.864**	.374**	1	-.007	.205**	.308**	.229**
barriers	-.457**	-.125*	.014	.027	-.002	.004	-.011	-.029	-.043	-.007	1	-.395**	-.177**	-.111*
benefit	.413**	.161**	.079	.103*	.172**	.138**	.125*	.236**	.165**	.205**	-.395**	1	.355**	.127*
cues	.363**	.170**	.223**	.294**	.214**	.202**	.159**	.355**	.278**	.308**	-.177**	.355**	1	.066
selfeff	.048	.031	.136**	.179**	.203**	.092	.247**	.198*	.107*	.229**	-.111*	.127*	.066	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Chapter 5

Discussion

Correlations Among HBM Constructs

The results obtained by this study find moderate support for the association between adopting protective health behaviors for the prevention of zoonotic disease and the HBM constructs of *benefits*, *barriers* and *cues to action*, but not with *self-efficacy, susceptibility* or *severity* (*RQ1*).

These findings are consistent with those of previous studies *(RQ2)* that sought to apply the HBM constructs to protective health behaviors. Champion (1987, 1988, and 1990) found that *barriers* was the strongest predictor of preventive health behaviors, specifically breast self-examination among women at risk for breast cancer. Janz and Becker (1984) and Harrison *et al* (1992) found that the *barriers* construct displayed the most significance of all HBM constructs for predicting preventive health behaviors. The Janz and Becker study found the construct *barriers* was significant in 89 percent of hypotheses across the 24 preventive health behavior studies examined (p. 41).

In our study, as expected, the variable *protect* correlated negatively with the aggregate variable *barriers* (r = -.457) indicating that, as the implementation of prophylactic behaviors increases, the perception of these behaviors as barriers decreases.

Knowledge of the two diseases had low scores (*know_s:* r = .090; *know_m:* r = .032) indicating little awareness of these diseases among the study population and no significant correlation with the variable *protect* (*RQ3*)

A key finding was that participants value the services provided by their veterinarian, and don't perceive cost or distance as barriers to seeking those services. Examining the subset of seven individual items, the three items found not to be significantly correlated with the dependent variable "protect" were related to the importance of seeking veterinary care ($r = -.012$, $p = .819$), cost ($r = -.045$, $p = .367$), and convenience of location of veterinary care ($r = -.007$, $p = .884$).

Participants indicated that they understand the value of regular hand washing protocols in preventing the spread of zoonotic disease, and don't perceive any of the reasons presented in statements as a barrier to performing that act.

Items suggesting barriers to regular hand washing demonstrated a negative association. Statements about hand washing relative to its taking "too much time" ($r = -.462$, $p = .000$), that it is "not important" ($r = -.472$, $p = .000$) and that regular hand washing is "too hard to remember" ($r = -.422$, $p = .000$) were not. The association between protective behaviors and the statement about not sharing gestures of affection with one's pet as affecting the quality of life for the owner and the pet was still not significant, but demonstrated a lower negative score, thus indicating some agreement with this statement amongst some respondents ($r = -.255$, $p = .000$).

As expected, the aggregate variable of *perceived benefits* was found to have a positive association with the variable *protect* ($r = .413$), but no significant levels of association were demonstrated.   "When I avoid letting my animal lick my face, I am doing something to care for myself and my animals" ($r = .413$, $p = .000$), "When I avoid letting my animals lick my face I am setting a good example for others" ($r = .367$, $p = .000$), indicating that most respondents grasp the connection between this gesture of affection and the potential for the transfer of disease. Other statements were related to the benefits of hand washing as "doing something to care for myself and my animals" ($r = .361$, $p = .000$); as "setting a good example for others" ($r = .365$, $p = .000$). Typically, as perceived benefits of protective behaviors increases, so does the protective action. Of the eight items measuring *perceived benefits*, none demonstrated a significant association.

Four statements showing only a weak association, two described the act of talking about the risk of zoonotic disease with a veterinarian as "doing something to take care of myself and my animals" ($r = .218$, $p = .000$); or "setting a good example for others" ($r = .197$, $p = .000$). Nor did most respondents relate the benefit of "monitoring my animal's health daily" as "setting a good example for others" ($r = .103$, $p = .040$). Hand washing after "cleaning up after my animals" was not seen as "decreasing my chances of getting Salmonella/MRSA" ($r = .156$, $p = .002$) and thus, as a significant protective benefit. As our study population was older, with no dependent children or elders, perhaps the statements designating the performance of a private action such as "monitoring my animal's health daily" or "talking with my veterinarian about the risk of zoonotic disease" as an "example to others" didn't resonate.

Unlike several previously mentioned studies, our study found the constructs *susceptibility* and *severity* had no significant correlation to preventive behaviors. Results of the Janz and Becker study showed that *susceptibility* was the second most important predictor in 81 percent of the hypotheses, followed by *benefits* (78 percent) and, finally, *severity* (65 percent).

Other studies related to risky sexual behavior and contracting HIV/AIDS found a strong relationship between perceived *susceptibility* and the preventive behavior of condom use (Mahoney, Thombs and Ford, 1995; Steers *et al*, 1996). Harrison *et al,* however, found a "significantly lower mean effect size for severity" compared to the other three HBM constructs (p. 113) explored in their study. Neither s*elf-efficacy* nor *cues to action* were studied by Janz and Becker or the Harrison *et* al, only "the four fundamental HBM dimensions."

A few previous studies have found *self-efficacy* to be a strong predictor of protective health behaviors, especially those examining condom use or safe sex behaviors (Steers, *et al*, 1996; Zak-Place and Stern, 2004), but our study found this construct to correlate only negligibly across all variables. It was especially low in relation to the dependent variable *protect* ($r = .048$), indicating that all participants felt sufficiently confident in their ability to ask for information about zoonotic disease prevention, and in possessing the skills to act on information provided.

Cues to action demonstrated no significant associations with the variables *protect* (r = .363), *benefits* (r = .355) and risk (susceptibility to and severity of infection) for MRSA, but not for risk of *salmonella* (r = .214).

In examining this construct in correlation with the variable protect, this study found support for *RQ4,*that veterinary health care providers are the source clients rely on the most for information about health risks related to zoonotic disease.

Among the six individual statements that composed the *cues to action* construct, one stood out as demonstrating a moderately strong, positive correlation with *protect*. Response to the statement "I have talked with my veterinarian about risks of disease shared between humans and animals" (r = .406, p = .000) indicates that many participants view their veterinarian as the most reliable source of information about zoonotic disease risk, even more so than physicians (r = .284, p = .000).

Although *cues to action* is one of the least studied variables in the HBM, there have been studies that have operationalized this concept in various ways and found it to be effective in spurring the decision to act. Rosenstock *et al* (1994) in their study of the HBM and HIV risk behavior change, wrote that this construct has been overlooked in most studies, and that "brief, though salient cues that stimulate a decision to act" are important in evaluating protective health behaviors. Weinberger, Green and Mandin (1981) found that a doctor's recommendations were effective cues in helping patients toward their goal to stop smoking. Secginli and Nahcivan (2006) in their study of factors associated with breast cancer screening behaviors among Turkish women, reported that those women who had read or heard about mammography were eight times more likely to have a screening; and those women who had a gynecologist as a regular physician were three times as likely to have a screening (p. 166)

Norman and Brain (2005) did not measure *cues to action* in their study of the frequency of breast self-examination in women with a family history of breast cancer, but they do mention

other researchers in this area of study who found this construct to be an important determinant of enacting protective behavior (p. 12).

Marginal support was demonstrated for the question of a difference in perception of the HBM constructs between mixed animal owners and small animal owners (*RQ5*). Mixed animal owners showed an increased perception of *cues to action* ($M = 18.07$, $SD = 4.57$) than do small animal owners ($M = 16.74$, $SD = 4.65$). Either mixed animal owners are more apt to look for cues or cues are more effective with this group.

Certainly there are a number of considerations when examining this result, considerations such as complications associated with transporting a large animal to a veterinary hospital, or having a veterinarian to make a farm call; costs, time, and effort related to treating a large animal versus a small animal. These factors would make such owners more perceptive to triggers to actions that might prevent ill health in their animals and possibly, their families.

This heightened perceptiveness may also carry over to the category of information seeking behavior, where again, mixed animal owners ($M = 20.13$, $SD = 4.48$) show a slightly increased use of media versus small animal owners ($M = 19.61$, $SD = 4.72$).

Demographics

Descriptive statistics revealed that many responses from the sample pet-owning population used in this study follows some national trends found in the general population (*RQ7*), according to annual surveys conducted by the American Veterinary Medical Association (AVMA) and the American Pet Products Association (APPA), while other findings in this study run counter to popular trends. The following is an informal comparison of our study's findings to the broader population studied by these two entities.

<u>Household and Dependents</u>

In national trends, households with children, characterized as "parents" households, continued to rank the highest in pet ownership (70.5%), followed by couples (59.8%) and singles (42.1%) (2007 AVMA, p. 98). In contrast, our study population demonstrated a larger percentage of two-person households (51.6 percent), with no dependents (69.5 percent), which is in keeping with an older population. Only 24.7 percent reported children less than 18 years of age and only 5.8 percent reported elders over the age of 75 sharing the household.

<u>Age and Sex</u>

Age data were acquired as a continuous category, with 78 percent of respondents comprised of women and a mean age of 53 years. This statistic was found to be typical of a national demographic trend found in both pet ownership studies and survey-taking.

Sociology researchers have found that, although there are typically more males than females in the general population, more females than males will respond to surveys, usually in approximately a 60 to 40 ratio (Johnson, 2008).

According the *American Veterinary Medical Association's U.S. Pet Ownership and Demographics Sourcebook (2007),* in 75 percent of pet owning households, the individual with primary responsibility for animal care is female—across all companion animal species and, to varying degrees, across all age groups (p. 9). This finding is consistent with a pattern repeated over a dozen years of pet owner surveys conducted by the American Pet Products Association, which found that "the average age of the person most responsible for purchasing pet products is 46 years old and typically, the primary product purchaser of pet products is the female (2009-2010 APPA, p. 528).

In our study, the number of female respondents owning a mix of equines and small animals was larger than the number of female respondents owning small animals only (84.2 percent vs. 72.9 percent), whereas the number of male respondents with small animals only was almost

equally larger than the number of males owning a mix of equines and small animals (27.2 percent vs. 15.8 percent).

There were an estimated 3.9 million horse-owning households in the U.S. in 2008 (2009-2010 APPA Survey, p. 513) with the highest percentage (4.6 percent) found to be in the eight states comprising the region identified by the United States Census Bureau as the Mountain region (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming) from which most of this study's sample population was drawn. In fact, the Mountain region has the highest percentage of pet owners (64.2 percent) across the nine census regions of the United States (2007 AVMA, p. 10).

Education

Overall, the sample population for this study was a well-educated group with more than two-thirds of respondents acknowledging a college degree (38.5 percent) or above (31.2 percent). However, comparing statistics for the two groups, a smaller percentage of mixed animal owners were found at the upper end of the educational spectrum. Animal ownership statistics diverged at either end of the educational spectrum and, to some degree, is inconsistent with the national trend.

According to the 2007 AVMA pet ownership survey, horse ownership in the United States was found to decrease as education level increased. Among all households (female and male heads of household), 2.3 percent of those with a high school education or less owned horses, compared to 1.6 percent of households with advanced degrees. Rates were similarly dispersed among male heads of household. However, the AVMA survey found that amongst female heads of household, horse ownership was fairly consistent across all educational categories, but the highest (2.3 percent) was in the college graduate category (p. 123). The trend was the same for dog and cat owners in the AVMA survey.

Similarly, our study found that amongst the mixed animal group, the numbers were fairly consistent across all educational categories with the larger percentage (37.9 percent) in the

college graduate category but with almost equally one quarter of mixed animal respondents at the lowest and highest end of the educational spectrum.

Unlike the AVMA survey, our study found that small animal ownership increased with the respondent's educational level.

Overall, 36.3 percent of mixed animal owners had an Associate's degree or less compared with 24.6 percent of small animal owners. Additionally, 63.7 percent of mixed animal owner s were college graduates or above, compared with 75.3 percent of small animal owners.

Income

Our study found that the likelihood of having a pet increased with income, both in the mixed animal category and the small animal category. The exception for mixed animal owners was in the $61,000-$80,000 range where the percentage dropped from 21.6 percent to 16.3 percent, and again in the $81,000-$90,000 range when it dropped again to 13.2 percent, but tripled in the highest ($91,000+) category to 39.5 percent.

In the small animal group, percentages gradually increased as income increased, dipping only slightly in the second highest income category ($81,000-$90,000) and peaking in the highest ($91,000+).

The trends found in our study are strikingly similar to those found nationally in surveys done by the American Veterinary Medical Association and the American Pet Products Association annual surveys.

Information Seeking Behaviors

Overall, our study found both groups to be somewhat proactive in their search for information. Both small animal owners and mixed animal owners most often seek information about zoonotic disease and animal health from friends, family, medical professionals and the

internet. Significant differences were found between the two groups, however, regarding preference for these information sources as well as others (*RQ8*).

The American Pet Products Association has been following the pattern of information sources used by pet owners for the past 12 years in their annual National Pet Owners Survey. According to the 2009-2010 survey, pet owners overall have demonstrated a shift in where they choose to look for information about their animals. As in our study, the APPA also found a difference in information-seeking behavior between small animal owners versus mixed animal owners.

In addition to medical professionals, our study found the categories of friends, the mail, and the web are sources more often used by mixed animal owners than small animal owners. Both groups found radio and television to be of little value. These findings are consistent with national trends amongst equine owners, according to the 2009-2010 APPA National Pet Owner's Survey (p. 526) which noted that equine–owning households tended to rely more on personal experience (69 percent), their veterinarians (61 percent), and friends (53 percent) for information concerning their animals, than dog and cat owners at 44/45 percent, 60/55 percent and 28/35 percent, respectively (pp. 101 and 200).

The APPA survey did not have a category for "mail" or "newspapers" *per se*, but they did have categories for "advertising" and, for dog and cat owners, the category of "magazines" was offered but not for equine owners. In the APPA survey, dog and horse owners used advertising very little (10 percent and 13 percent, respectively) versus 20 percent of cat owners. Magazines were more important for cat owners (26 percent) than dog owners (17 percent). While books/library/video were useful sources for 39 percent of equine owners, this category was useful for only 19 percent of dog owners and 14 percent of cat owners.

Our study considered the "mail" category to include advertising and magazines, and was found to be more important to mixed animal owners than small animal owners. However, newspapers were shown to be read more by small animal owners than mixed animal owners.

Where our study found that mixed animal owners used the internet as a source of information more frequently than small animal owners, the APPA survey similarly reported that equine owners were shown to be slightly ahead, with 29 percent, to dog and cat owners at 27 percent and 28 percent respectively.

Although some differences exist, this study found moderate support for *RQ8* in comparing the information seeking behaviors of our sample population to trends found in the general population.

Limitations

There were limitations to this study, which need to be considered when interpreting the results. All study participants were recruited from the Colorado State University James L. Voss Veterinary Teaching Hospital client list. This limited the variability among the sample of animal owners and the ability to make generalizations to the general population. The participants were mostly female, older, well educated, with higher incomes and limited to the Western portion of the United States. Residents of the American West, like other regions of the United States, have their own unique attitudes, opinions and lifestyles based on the history of the region. It is also more likely, given that the Colorado State University College of Veterinary Medicine and Biomedical Sciences is a highly ranked and well-respected institution of learning and research, that these participants have a higher level of awareness of animal health problems and disease risk than members of the general public who only visit their general practice veterinarian once a year unless required to do so by pet illness or injury.

Certain limitations also exist in using close-ended versus open-ended questions. It has been acknowledged that open-ended questions often derive more reflective and informative responses, and a recommendation for future research includes possibly pursuing a qualitative study that would address this limitation.

Consideration must also be given to response bias. Since so few studies have been conducted with this focus, and with this population, it would be difficult to assess what changes might be made to encourage non-respondents to participate, or to determine what difference of opinion they represent.

Considering these limitations, the results obtained by this study extend the contributions of the Health Belief Model through explicating the decision-making processes in adopting or choosing not to adopt preventive health behaviors related to the risk of zoonotic infection. Such information could be useful to veterinary medical practitioners and communicators.

The Health Belief Model (HBM) was the framework used to determine the constructs associated with prophylactic health behaviors and any differences in perceptions of disease risk between small animal owners and mixed animal owners.

Future Research

This study is among the first to use the HBM to study client awareness and perception of risk related to zoonotic disease in a veterinary medical context and suggests several opportunities for extending future research in this area.

A qualitative study, using in-depth, one-on-one interviews of 12-15 clients asking about their knowledge and beliefs of zoonotic disease risk would be a good complementary study to this one. Using a semi-structured interview guide composed of 20-25 questions, the interviewer should collect some very interesting data illuminating knowledge, beliefs about disease origin and risk, health motivations and perceptions of the veterinarian/client relationship as an interactive source of health information.

Using the HBM as an empirical model, further studies could be conducted specifically examining the construct of *cues to action* in a veterinary health care setting to explore how cues being used by veterinary staff to communicate with their clients regarding potentially zoonotic

infection and which are found to be most effective. Is there unwillingness on behalf of veterinary staff to cue others appropriately because of their personal health beliefs?

Using the HBM, another study might explore how veterinary staff is trained in risk preventive behaviors in a clinical setting. As we found in the review of literature for this study, many veterinarians are very poor at following protocols for infection control, and are poor at training their own staff in the proper protocols for preventing infection. A study to understand the veterinarian's perception of risk, susceptibility, severity, barriers and benefits, self-efficacy and cues to action would be enlightening.

Applications to Practice

The findings in this study have implications for clinicians, students and hospital staff of the James L. Voss Veterinary Teaching Hospital who interact with clients. It has been shown that perceived benefits, barriers and cues to action are primary motivations to be considered when communicating with hospital clients about pet health issues and adoption of protective behaviors, Less effective message components include references to susceptibility, severity and self-efficacy.

Results have also revealed this audience to be more passive than active in its information seeking behaviors, and therefore hospital staff should be more proactive in communicating important information directly to the client, supplementing verbal recommendations with other materials. Active efforts to provide well-designed, well-written informational brochures, fact sheets, informational CDs and DVDs as well as content and streaming videos on the hospital websites is an important step in creating good will, reinforcing a positive client/practitioner relationship and fulfilling a professional ethical obligation. It also means making the client a partner in protecting the health of all family members, the community and assisting in hospital infection control.

As a first step, a well-executed, jargon-free informational brochure, tailored to the hospital's audience is one of the best and most convenient communication tools. It can be used by clinicians and veterinary students as a visual, interactive aid to initiate important conversations with clients during consultation; as an easily carried resource to help educate hospital staff and volunteers; and can be used as a good-will gesture to strengthen relationships with local referring veterinarians when given as complimentary informational pieces for use in private practice. Most importantly, the client can control the pace at which they read and absorb the message and it can be reviewed at any time. Illustrations and graphics can enhance the message and contribute to client comprehension and recall of important points.

Interpersonal communication between client and veterinarian during consultation, as mentioned above, has the potential to communicate the most information because it is interactive. Each party can ask questions, respond with information to clarify points and generate an effective and satisfactory exchange. However, as noted earlier, many clients leave with the hospital without a clear understanding of the instructions or explanations provided by their clinician. The failure to communicate can occur on either side of the conversation.

The hospital has already done an excellent job in responding to this need by using follow-up e-mails to the client, reiterating post-visit patient care instructions to the client. Using audio and video, in the form of a take-home CD or DVD, to relay health messages regarding recommended behavior change, natural history of the disease or disorder, detailed medication profile, and other appropriate client/patient advice can increase in positive health outcomes as well as positive hospital experiences. Using streaming instructional videos on the hospital websites also gives clients the opportunity to review interactive information in their own time.

Hospital administration should consider developing a message team with the goal of creating specifically designed brochures, informational CDs and DVDs, and video programs for the website. Preliminary designs could be tested with a pilot focus group consisting of clinicians, students, staff and clients to offer suggestions for revision.

Important points to consider when presenting a health message:

- Verbal and visual message elements tailored by age, gender, species of animal, race/ethnicity and regional characteristics.

- Language should be jargon-free that is engaging, not fear-inducing or lecturing in tone or content, and written at a readability level that is accessible by a broad spectrum of the population.

- Key points should include the many ways the recommended action benefits the individual, the individual's pet, family members and/or the community; suggestions for ways to reduce perceptions of obstacles to performing the recommended, and other suggestions for maintaining motivation to continue to perform the recommended action.

- A format that includes interactive opportunities for clients, such as checklists, multiple choice questions, and fill-in-the blank statements with answers found elsewhere in the content.

The James L. Voss Veterinary Teaching Hospital is a highly respected institution of research , learning and service. Developing a more proactive and interactive dialogue with clients, colleagues and the local community would only enhance an already illustrious reputation and strengthen relationships with key stakeholders.

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APPENDIX A

Medical Abbreviations

Medical Abbreviations

AHP – Animal Health Professional

DVM – Doctor of Veterinary Medicine

VMD – Veterinary Medical Doctor

MD – Medical Doctor

MPH – Master of Public Health

RN – Registered Nurse

LPN – Licensed Practical Nurse

PA – Physician's Assistant

CVT – Certified Veterinary Technician

LVT – Licensed Veterinary Technician

RVT – Registered Veterinary Technician

APPENDIX B

Recruitment Letter

Colorado State University

Department of Journalism and Technical Communication
1785 Campus Delivery, Fort Collins, CO 80523

Dear ,

People love their animals, whether large or small, feathered or furred, pampered pet or working partner. With that in mind, we would like to invite you to take part in our study of how people think about the risks of two diseases that can be passed between humans and animals, or zoonotic diseases: Salmonella, and methicillin-resistant Staphylococcus aureus (MRSA).

We are conducting this study with current clients of the James L. Voss Veterinary Teaching Hospital at the Colorado State University Veterinary Medical Center in Fort Collins. You have been randomly selected from the hospital's list of clients. This study is part of a master's degree project and has the support and approval of the Colorado State University Veterinary Medical Center.

This study has two main purposes. First, it is designed to gather information about how people view zoonotic disease risks in order to provide veterinary health care professionals with a better understanding of this topic as it relates to prevention efforts. Second, the results of this project will provide veterinary health care professionals with useful information on how people are protecting themselves from zoonotic diseases.

This project has no link to any business interest. The survey mailing is coordinated by the Department of Journalism and Technical Communication and the Colorado State University Veterinary Medical Center.

You have been selected to represent the larger community of large and small animal owners. In order for our results to be a fair representation of this community, it is critical that completed surveys are returned from all of the individuals we have contacted. Please take the 15 minutes required to complete the brief survey now and return it to us in the enclosed pre-paid mailer. **Any adult member of the household may complete the survey.**

Your participation in this survey is completely voluntary. You may refuse to participate or refuse to answer any question without penalty. Your responses will be kept confidential. You will in no way be personally linked to any of the results of the survey. There is no risk to you from participating in this project, and there is no anticipated direct benefit. The results of the survey will help veterinarians to understand how individuals view zoonotic disease risks.

If you have questions about the project, please contact the faculty advisor, Dr. Trumbo. If you have any questions about your rights as a volunteer in this research, contact Janell Barker, Human Research Administrator, Colorado State University, at 970-491-1655. Refer to project title "Zoonotic Disease Risk Survey." Thank you for taking the time to participate in this project.

Sincerely,
Dr. Craig Trumbo   Karen Wheeler

970-491-2077   ctrumbo@colostate.edu   CSU Graduate Student

APPENDIX C

Zoonotic Disease Risk Survey

ZOONOTIC DISEASE SURVEY   *EQ*
ANY MEMBER OF THE HOUSEHOLD OVER 18 YEARS OF AGE MAY COMPLETE THIS SURVEY

Please select one response only to each of the following questions. Please answer all questions on the survey to the best of your knowledge. Thank you very much for your time.

Please tell us about yourself: What year were you born? _____

Are you: ___ Male   ___ Female

What is the highest level of education you have completed? *Check one:*

___ Some High School   ___High School Graduate or GED ___ Associate's Degree
___ College degree   ___ Graduate degree

Which of the following ranges includes your annual household income before taxes?
___ Less than $20,000   ___ $40,000 - $60,000   ___ $90,000 – $100,000
___ $20,000 - $40,000   ___ $60,000 - $80,000   ___ $100,000 +

Do you or any immediate family member work in the human or veterinary health care field?
_____ yes   _____ no

How many people in your household?
___ 1   ___ 2   ___ 3   ___ 4   ___ 5 or more

How many individuals in the household are under the age of 18? _____

How many pets share your house with you? _____ Dogs   _____ Cats

_____ Other *(please describe)*

How many animals do you have living on your property outside of the house?
___ Dogs   ___ Cats   _____Other *(please describe)*

Where do you most often get information about animal health? *Please check one.*
___ Veterinarian   ___ TV ___ Newspaper   ___ Internet ___ Family/Friend
_____ Other *(please explain)*   ___ Don't Know

I believe that humans and animals can pass diseases to one another.
 ___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

Below are questions asking about your awareness of two diseases that can affect animals and humans. Please select only one response for each question. Thank you for your time.

Have you heard of Salmonella? ___Yes   ___ No

Have you heard of Methicillin-resistant Staphylococcus Aureus (MRSA)?
___Yes ___ No

Salmonella does not occur in the Western United States.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

MRSA does not occur in the Western United States.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

If an animal has Salmonella it will show symptoms.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

If an animal has MRSA it will show symptoms.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I know the symptoms of Salmonella in animals.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I know the symptoms of Salmonella in people.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I know the symptoms of MRSA in animals.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I know the symptoms of MRSA in people.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

Susceptibility and Severity

I can get Salmonella from my animals.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I can get MRSA from my animals.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

It is likely I will get sick from Salmonella sometime during my life.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

It is likely I will get sick from MRSA sometime during my life.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I will be exposed to Salmonella sometime during my life but will not get sick.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I will be exposed to MRSA sometime during my life but will not get sick.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

If I got sick from Salmonella I could pass it to others including my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

If I got sick from MRSA I could pass it to others including my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

If I got sick from Salmonella, the illness would be very bad.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

If I got sick from MRSA, the illness would be very bad.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

If I got sick from Salmonella, it could hurt my relationship with my family, friends and my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

If I got sick from MRSA, it could hurt my relationship with my family, friends and my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

Protective
I kiss my animals on the face or allow them to kiss my face.
___ never   ___ sometimes   ___ usually   ___ always

I wash my hands thoroughly after playing or interacting with my animals.
___ never   ___ sometimes   ___ usually   ___ always

I wash my hands thoroughly after cleaning up animal waste.
___ never   ___ sometimes   ___ usually   ___ always

I encourage other family members to thoroughly wash their hands after interacting with animals.
___ never   ___ sometimes   ___ usually   ___ always

My animals get regular veterinary check ups.
___ never   ___ sometimes   ___ usually   ___ always

I talk with my veterinarian about the risk of sharing diseases between humans and animals.
___ never   ___ sometimes   ___ usually   ___ always

Benefits

When I wash my hands after interacting with my animals, I am doing something to care for myself and my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I avoid letting my animals lick my face I am doing something to care for myself and my animals
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I avoid letting my animals lick my face I am setting a good example for others.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I wash my hands after cleaning up animal waste, I am decreasing my chances of getting Salmonella.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I wash my hands after cleaning up animal waste, I am decreasing my chances of getting MRSA.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I wash my hands after interacting with my animals I am setting a good example for others
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

By monitoring my animal's health daily I am setting a good example for others.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

By talking with my veterinarian about the risk of zoonotic disease I am doing something to care for myself and my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

By talking with my veterinarian about the risk of zoonotic disease I am setting a good example for others.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

More barriers

Not sharing gestures of affection with my animals reduces the quality of life for me and for my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

Washing my hands each time after interacting with my animals will take too much time.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

It is hard to remember to wash my hands after interacting with my animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

Washing my hands each time after interacting with my animals is not important.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

Regular veterinary visits are too expensive.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

Regular veterinary visits are not important.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

The veterinarian is too far away for regular visits.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

Cues to action

I have looked for information about zoonotic disease in general.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I encounter information about zoonotic disease, I am likely to stop and think about it.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

I have looked for information about Salmonella.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

I have looked for information about MRSA.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I encounter information about Salmonella, I am likely to stop and think about it.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

When I encounter information about MRSA, I am likely to stop and think about it.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

I have talked with my family doctor about the risks of diseases shared between humans and animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

I have talked with my veterinarian about the risks of diseases shared between humans and animals.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

Self-efficacy
Please indicate how strongly you agree or disagree with these statements about protecting yourself from Salmonella/MRSA by selecting one response for each question. Thank you for your time.

I don't know how to ask my veterinarian or my doctor about zoonotic disease risk for my family.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

I am uncomfortable asking my veterinarian or my doctor about zoonotic disease risk for my family.
___ strongly disagree   ___ disagree   ___ neutral   ___ agree   ___ strongly agree

I should not have to ask about zoonotic disease risk, my veterinarian should automatically share this information.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I am confident that I can understand health instructions from my veterinarian about zoonotic disease risk prevention for my family.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I would be confident of understanding and acting on health instructions from my veterinarian if an informational brochure were provided as well.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

I would be confident of understanding and acting on health instructions from my veterinarian if an informational website were provided as well.
___ strongly disagree ___ disagree ___ neutral ___ agree ___ strongly agree

Hospital

What are your greatest concerns about Salmonella and/or MRSA?
_____
_____
_____
_____

Do you think your animal is likely to become sick as a result of hospitalization?   ____ yes ____ no

If you answered "yes" to the previous question, can you say why?
_____
_____
_____
_____

Do you think it is likely that your animal will become ill from the stress of transport to a hospital?
_____
_____
_____
_____

Do you think it is likely that your animal will become ill from the stress of hospitalization?

_____
_____
_____
_____

APPENDIX D

Full Survey Codebook

and Descriptive Statistics

ZOONOTIC DISEASE SURVEY CODEBOOK-KEY

DEMOGRAPHICS

AGE   2010 - YEAR   (30 missing)   **missing estimated by sex, income, educate**
SEX   1 = male, 0 = female   (7 missing)   **missing estimated by age, income, educate**
INCOME   1 = Less than $20,000   2 = $20,000 -$40,000   3 = $41,000-$60,000   99 = no answer
4 = $61,000-$80,000   5 = $81,000-$90,000   6 = $91,000+   **(27 missing) recoded mode**

EDUCATE   What is the highest level of education you have completed?   **(6 missing) recoded mode**
 1 Less than High School   2 High School graduate/GED   3 Associate's degree
4 College Graduate   5 Post Grad

HSHLD
How many people in your household?   1   2   3   4   5   6+ **(3 missing also DEPS = 1, recoded 1)**

DEPS   Household dependents
1 = no dependents   2 = kids under 18   3 = elders over 75
(2 cases children+elders coded elders)(12 missing recoded = 1)

MEDFIELD   0 = no   1 = yes   Do you or anyone in your family work in the human or
veterinary health care field?   **14 missing recoded 0 = no**

ANIMALS   1 = cats/dogs   2 = equids + cats/dogs
(7 equids w/o cats/dogs recoded 2, 1 missing recoded = 1)

 3 cases = 0 flagged for removal cases 303, 341, 350

INDICES FOR ANALYSIS

INFOEXP   PAPERS + TV + …. MEDICS   range 8-40, **alpha = .60**
INFOEXP2   papers + tv + radio + mail   alpha = .69

KNOW_S   Salmonella knowledge score 0-4
KNOW_M   MRSA knowledge score 0-4

severe_s   severity of salmonella   = sampass + sambad
susc_s   susceptability to salmonella   = samcon + … samxpose
RISK_S Risk perception for salmonella   = susc_s * severe_s

susc_m   susceptability to mrsa   = mrsacon + …. mrsxpose
severe_m   severity of mrsa   = mrsapass + mrsabad
RISK_M   risk perception for mrsa = susc_m * severe_m

PROTECT   self-protective actions taken
= animkis_r + …. vettalk **alpha = .50**

BARRIERS   barriers to self-protective action
afxqual + … vetfar   **alpha = .62**   (wash items .82 and vet items .63 form distinct subsets)

BENEFIT = washcare + … vetexpl **alpha = .84**

CUES   information cues to action
 = infozosk + …. infovet   alpha = .80

SELFEFF self-efficacy for protective actions
= cantask_r + arfask_r + contalk   **alpha = .68**
(exclude conadd, **alpha .54**)

INFORMATION EXPOSURE
 How much use these sources for information about animal health care:
1 none   2 little   3 some   4 much   5 very much   99 no answer
Categories:
PAPERS (10), TV (11), RADIO (15), MAIL (15), WEB (6), FAMILY (8), FRNDS (7), MEDICS (10)

ALL MISSING VALS RECODED = 1

INFOEXP   PAPERS + TV + …. MEDICS   range 8-40**, alpha = .60**

UNDERSTANDING
0 don't know   1 strongly disagree   2 disagree   3 neutral   4 agree   5 strongly agree

RECODE ALL miss, 0, 1, 2, 3 = 0 (wrong)   4, 5 = 1 (correct) (sknow1-4, mknow1-4)

SALMONELLA
BELIEXS   I do not believe that Salmonella exists in the Western United States.
SASHOSYM   If an animal has Salmonella, it will show symptoms.
SAMSYMAN   I know the symptoms of Salmonella in animals.
SAMSYMPP   I know the symptoms of Salmonella in people.

MRSA
BELIEXM   I do not believe that MRSA exists in the Western United States.
MRSHOSYM   If an animal has MRSA, it will show symptoms.
MRSYMAN   I know the symptoms of MRSA in animals.
MRSYMPP   I know the symptoms of MRSA in people.

KNOW_S   Salmonella knowledge score 0-4
KNOW_M   MRSA knowledge score 0-4

SUSCEPTIBILITY AND SEVERITY-*SALMONELLA*
0 don't know   1 strongly disagree   2 disagree   3 neutral   4 agree   5 strongly agree
RECODE 0 = 3   missing recoded mode

SUSCEPTIBILITY
SAMCON   I can get Salmonella from my animals (10)
SAMLIFE   It is likely I will get sick Salmonella sometime during my life. (6)
SAMXPOSE   I will be exposed to Salmonella sometime during my life but will not get sick. (5)

SEVERITY
SAMPASS   If I got sick from Salmonella I could pass it to others, including my animals. (10)
SAMBAD   If I got sick from Salmonella, the illness would be very bad. (6)

severe_s = sampass + sambad
susc_s = samcon + ... samxpose
RISK_S susc_s * severe_s

SUSCEPTIBILITY AND SEVERITY-*MRSA*
0 don't know   1 strongly disagree   2 disagree   3 neutral   4 agree   5   strongly
agree   **RECODE 0 = 3 missing recoded mode**

SUSCEPTIBILITY
MRSACON   I can get MRSA from my animals.(6)
MRSALIFE   It is likely I will get sick MRSA sometime during my life. (5)
MRSXPOSE   I will be exposed to MRSA sometime during my life but will not get sick. (5)

SEVERITY
MRSAPASS   If I got sick from MRSA I could pass it to others, including my animals. (5)
MRSABAD   If I got sick from MRSA, the illness would be very bad. (5)

susc_m = mrsacon + ... mrsxpose
severe_m = mrsapass + mrsabad
RISK_M = susc_m * severe_m

PROTECTIVE BEHAVIORS
0 don't know   1 strongly disagree   2 disagree   3 neutral   4 agree   5 strongly
agree   **recode 0/miss = 3**

PROTECTIVE BEHAVIORS
ANIMKIS   I kiss my animals on the face or allow them to kiss my face.   (2) REVERSE
ANIMSLEP   I allow my pets to sleep with me on the bed.(3) REVERSE
WASHWAST   I wash my hands thoroughly after cleaning up animal waste. (3)
OTHWASH   I encourage other family members to thoroughly wash their hands after
interacting with animals.(5)
VETEXAM   My animals get regular veterinary check ups.(5)
VETTALK   I talk with my veterinarian about the risk of sharing disease between humans and
animals.(3)

PROTECT = animkis_r + ... vettalk   alpha = .50

BARRIERS & BENEFITS
0 don't know   1 strongly disagree   2 disagree   3 neutral   4 agree   5 strongly agree   **recode 0/miss = 3**

BEHAVIOR: BARRIERS
AFXQUAL   Not sharing gestures of affection with my animals reduces the quality of life for me and for my animals. (4)
TOOTIME   Washing my hands each time after interacting with my animals will take too much time. (4)
WASHNTIM   Washing my hands each time after interacting with my animals is not important (3)
WASHREM   It is hard to remember to wash my hands after interacting with my animals. (5)
VETEXP   Regular veterinary visits are too expensive. (4)
VETNOIMP   Regular veterinary visits are not important. (2)
VETFAR   The veterinarian is too far away for regular visits. (2)

BARRIERS   afxqual + … vetfar   alpha = .62   (wash items .82 and vet items .63 form distinct subsets)

BEHAVIOR: BENEFITS
WASHCARE   When I wash my hands after interacting with my animals I am doing something to care for myself and my animals. (4)
WASHEX   When I wash my hands after interacting with my animals I am setting a good example for others. (7)
NOKISCAR   When I avoid letting my animal lick my face I am doing something to care for myself and my animals. (11)
NOKISEX   When I avoid letting my animals lick my face I am setting a good example for others. (9)
WASHDEC   When I wash my hands after cleaning up after my animals, I am decreasing my chances of getting Salmonella/MRSA. (4)
ANHELEX   By monitoring my animal's health daily, I am setting a good example for others. (6)
VETASK By talking with my veterinarian about the risk of zoonotic disease, I am doing something to take care of myself and my animals. (5)
VETEXPL   When I talk with my veterinarian about the risk of zoonotic disease, I am setting a good example for others. (6)

BENEFIT   = washcare + … vetexpl **alpha = .84**

CUES TO ACTION
How strongly do you agree or disagree with these statements about looking for information about zoonotic diseases?

0 don't know   1 strongly disagree   2 disagree   3 neutral   4 agree   5 strongly agree
recode 0/miss = 3

INFOZOSK   I have looked for information about zoonotic disease in general. (6)
INFOZOTH   When I encounter information about zoonotic disease I am likely to stop and think about it. (7)
SMINFOSK   I have looked for information about Salmonella/MRSA. (4)
SMINFOTH   When I encounter information about Salmonella/MRSA I am likely to stop and think about it. (5)
INFODOC   I have talked with my family doctor about risks of disease shared between humans and animals. (2)
INFOVET   I have talked with my veterinarian about the risk of diseases shared between humans and animals. (3)

CUES = infozosk + …. infovet   alpha = .80

SELF-EFFICACY
How strongly do you agree or disagree with these statements about protecting yourself from Salmonalla/MRSA?
0 don't know   1 strongly disagree   2 disagree   3 neutral   4 agree   5 strongly agree
recode 0/miss = 3

CANTASK   I don't know how to ask my veterinarian or my doctor about zoonotic disease risk for my family. (3) (REV)
AFRASK   I am afraid to ask my veterinarian or my doctor about zoonotic disease risk for my family. (3) (REV)
CONTALK   I am confident that I can understand health instructions provided by my veterinarian about disease risk prevention for my family. (6)
CONADD   I would be confident of understanding and acting on health instructions from my veterinarian if an informational brochure and/or website were provided as well. (4)

SELFEFF = cantask_r + arfask_r + contalk   alpha = .68   (exclude conadd, alpha .54)

393 mising cells estimated   (1.5% of total)
65 variables by 397 cases = 25805 cells

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ANIMALS	397	1	2	1.48	.500
MEDFIELD	397	0	1	.15	.356
AGE	397	33	84	52.91	9.477
SEX	397	0	1	.22	.412
INCOME	397	1	6	4.47	1.525
EDU	397	2	5	3.82	1.077
HSHLD	397	1	6	2.44	1.051
DEPS	397	1	3	1.36	.590
infoexp	394	8.00	40.00	19.8604	4.60372
know_s	397	.00	4.00	2.0025	.95478
know_m	397	.00	4.00	1.0856	1.15151
susc_s	397	3.00	15.00	10.2821	1.75551
severe_s	397	2.00	10.00	6.8741	1.41037
Risk_S	397	6.00	150.00	71.4610	21.99407
susc_m	397	3.00	15.00	9.3879	1.33547
severe_m	397	4.00	10.00	7.0025	1.35866
Risk_M	397	12.00	150.00	66.4156	19.62273
protect	397	10.00	30.00	20.3199	3.73300
barriers	397	7.00	30.00	17.2443	4.25432
benefit	397	13.00	40.00	31.7003	4.70958
cues	397	6.00	30.00	17.3753	4.65504
selfeff	397	6.00	15.00	12.4987	2.08606
Valid N (listwise)	394				

ANIMALS

		Value	Count	Percent
Standard Attributes	Label	small animals, equines or both in family		
Valid Values	1	cats and/or dogs	207	52.1%
	2	equids and cats/dogs	190	47.9%

MEDFIELD

		Value	Count	Percent
Standard Attributes	Label	Respondent or member of family is employed in human or veterinary health care field		
Valid Values	0	no	338	85.1%
	1	yes	59	14.9%

AGE

		Value
Central Tendency and Dispersion	Mean	52.91
	Standard Deviation	9.477

SEX

		Value	Count	Percent
Standard Attributes	Label	Respondents gender		
Valid Values	0	female	311	78.3%
	1	male	86	21.7%
Missing Values	99	missing	0	.0%

INCOME

		Value	Count	Percent
Standard Attributes	Label	Respondents income		
Valid Values	1	less than $20,000	13	3.3%
	2	$20,000-$40,000	36	9.1%
	3	$41,000-$60,000	70	17.6%
	4	$61,000-$80,000	66	16.6%
	5	$81,000-$90,000	57	14.4%
	6	$91,000+	155	39.0%
Missing Values	99	missing	0	.0%

EDU

		Value	Count	Percent
Standard Attributes	Label	Respondents educational level achieved		
Valid Values	1	some high school	0	.0%
	2	High School Grad or GED	76	19.1%
	3	Associate's Degree	44	11.1%
	4	College Graduate	153	38.5%
	5	Post Graduate Degree	124	31.2%
Missing Values	99	missing	0	.0%

HSHLD

		Value	Count	Percent
Standard Attributes	Label	Number people in household		
Valid Values	1	one person	55	13.9%
	2	two people	205	51.6%
	3	Three people	67	16.9%
	4	Four people	52	13.1%
	5	Five people	15	3.8%
	6	more than five people	3	.8%
Missing Values	99	missing	0	.0%

DEPS

		Value	Count	Percent
Standard Attributes	Label	Dependents under age 18 or over age 75 in household		
Valid Values	1	no dependents	276	69.5%
	2	children under 18 years of age	98	24.7%
	3	elders over 75 years of age	23	5.8%
	4	children and elders	0	.0%
Missing Values	99	missing	0	.0%

infoexp

		Value	Count	Percent
Standard Attributes	Label	Additive index of information exposure across eight sources		
N	Valid		394	
	Missing		3	
Central Tendency and Dispersion	Mean		19.8604	
	Standard Deviation		4.60372	
Labeled Values	8.00	low	2	.5%
	40.00	high	1	.3%

know_s

		Value	Count	Percent
Standard Attributes	Label	Salmonella knowledge score		
Valid Values	.00	low	22	5.5%
	1.00		95	23.9%
	2.00		159	40.1%
	3.00		102	25.7%
	4.00	high	19	4.8%

know_m

		Value	Count	Percent
Standard Attributes	Label	MRSA knowledge score		
Valid Values	.00	low	173	43.6%
	1.00		80	20.2%
	2.00		92	23.2%
	3.00		41	10.3%
	4.00	high	11	2.8%

susc_s

		Value	Count	Percent
Standard Attributes	Label	Susceptibility Salmonella		
Valid Values	3.00	low	1	.3%
	5.00		1	.3%
	6.00		4	1.0%
	7.00		9	2.3%
	8.00		34	8.6%
	9.00		83	20.9%
	10.00		96	24.2%
	11.00		82	20.7%
	12.00		53	13.4%
	13.00		15	3.8%
	14.00		10	2.5%
	15.00	high	9	2.3%

severe_s

		Value	Count	Percent
Standard Attributes	Label	Severity Salmonella		
Valid Values	2.00	low	1	.3%
	3.00		3	.8%
	4.00		17	4.3%
	5.00		35	8.8%
	6.00		100	25.2%
	7.00		111	28.0%
	8.00		84	21.2%
	9.00		34	8.6%
	10.00	high	12	3.0%

Risk_S

		Value	Count	Percent
Standard Attributes	Label	Risk Perception Salmonella		
Labeled Values	6.00	low	1	.3%
	150.00	high	2	.5%

susc_m

		Value	Count	Percent
Standard Attributes	Label	Susceptibility MRA		
Valid Values	3.00	low	1	.3%
	5.00		1	.3%
	6.00		3	.8%
	7.00		11	2.8%
	8.00		29	7.3%
	9.00		236	59.4%
	10.00		57	14.4%
	11.00		33	8.3%
	12.00		14	3.5%
	13.00		5	1.3%
	14.00		3	.8%
	15.00	high	4	1.0%

severe_m

		Value	Count	Percent
Standard Attributes	Label	Severity MRSA		
Valid Values	4.00	low	6	1.5%
	5.00		4	1.0%
	6.00		201	50.6%
	7.00		47	11.8%
	8.00		77	19.4%
	9.00		35	8.8%
	10.00	high	27	6.8%

Risk_M

		Value	Count	Percent
Standard Attributes	Label	Risk Perception MRSA		
	Standard Deviation	19.62273		
Labeled Values	12.00	low	1	.3%
	150.00	high	1	.3%

protect

		Value	Count	Percent
Standard Attributes	Label	Index of protective actions taken		
Labeled Values	10.00	low	2	.5%
	30.00	high	3	.8%

barriers

		Value	Count	Percent
Standard Attributes	Label	Index of barriers to action		
Valid Values	7.00	low	5	1.3%
	8.00		4	1.0%
	9.00		2	.5%
	10.00		9	2.3%
	11.00		30	7.6%
	12.00		11	2.8%
	13.00		15	3.8%
	14.00		30	7.6%
	15.00		23	5.8%
	16.00		40	10.1%
	17.00		35	8.8%
	18.00		31	7.8%
	19.00		33	8.3%
	20.00		34	8.6%
	21.00		33	8.3%
	22.00		23	5.8%
	23.00		18	4.5%
	24.00		8	2.0%
	25.00		3	.8%
	26.00		6	1.5%
	27.00		1	.3%
	28.00		2	.5%
	30.00	high	1	.3%

benefit

Standard Attributes	Label	Value	Count	Percent
Standard Attributes	Label	Index of benefits of action		
	Standard Deviation	4.70958		
Labeled Values	13.00	low	1	.3%
	40.00	high	38	9.6%

cues

		Value	Count	Percent
Standard Attributes	Label	Index of cues to action		
Valid Values	6.00	few	12	3.0%
	8.00		3	.8%
	9.00		5	1.3%
	10.00		9	2.3%
	11.00		6	1.5%
	12.00		24	6.0%
	13.00		10	2.5%
	14.00		34	8.6%
	15.00		19	4.8%
	16.00		54	13.6%
	17.00		27	6.8%
	18.00		31	7.8%
	19.00		26	6.5%
	20.00		47	11.8%
	21.00		20	5.0%
	22.00		21	5.3%
	23.00		15	3.8%
	24.00		15	3.8%
	26.00		9	2.3%
	27.00		3	.8%
	28.00		2	.5%
	29.00		1	.3%
	30.00	many	4	1.0%

selfeff

		Value	Count	Percent
Standard Attributes	Label	Index of self-efficacy		
Valid Values	6.00	low	2	.5%
	7.00		6	1.5%
	8.00		9	2.3%
	9.00		20	5.0%
	10.00		25	6.3%
	11.00		44	11.1%
	12.00		108	27.2%
	13.00		40	10.1%
	14.00		39	9.8%
	15.00	high	104	26.2%

Respondents Age

Mean = 52.91
Std. Dev. = 9.477
N = 397

Additive index of information exposure across eight sources

Mean = 19.86
Std. Dev. = 4.604
N = 394

Risk Perception Salmonela

Mean = 71.46
Std. Dev. = 21.994
N = 397

Risk Perception MRSA

Mean = 66.42
Std. Dev. = 19.623
N = 397

Index of protective actions taken

Mean = 20.32
Std. Dev. = 3.733
N = 397

Index of barriers to action

Mean = 17.24
Std. Dev. = 4.254
N = 397

Index of benefits of action

Mean = 31.70
Std. Dev. = 4.71
N = 397

Index of cues to action

Mean = 17.38
Std. Dev. = 4.655
N = 397

Index of self-efficacy

Mean = 12.50
Std. Dev. = 2.086
N = 397