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# Evaluating the prevalence and effectiveness of breed-specific legislation

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Thesis/Dissertation Acceptance**

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Entitled

EVALUATING THE PREVALENCE AND EFFECTIVENESS OF BREED-SPECIFIC LEGISLATION

For the degree of Doctor of Philosophy



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EVALUATING THE PREVALENCE AND EFFECTIVENESS OF BREED-SPECIFIC LEGISLATION

A Dissertation

Submitted to the Faculty

of

Purdue University

by

Felicia E. Trembath

In Partial Fulfillment of the

Requirements for the Degree

of

Doctor of Philosophy

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## LIST OF ABBREVIATIONS

<b>Abbreviation</b>	<b>Explanation</b>
AKC	American Kennel Club
BSL	Breed-specific Legislation
CABI	Center for Agriculture and Bioscience International
CDC	Centers for Disease Control and Prevention
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CI	Confidence Interval
DBIH	Dog Bite Injury Hospitalizations
DBRF	Dog Bite Related Fatality
DDA	Dangerous Dogs Act
ED	Emergency Department
GRADE	Grading of Recommendations, Assessment, Development, and Evaluations
MedLine	Medical Literature Analysis and Retrieval System Online
PAIS Intl.	Public Affairs Information Service International
PY	Person years
PRISMA	Preferred Reporting Items for Statistical Reviews and Meta-analysis
PubMed	Public MedLine Database
SCOPUS	Elsevier's Interdisciplinary Scientific Database
SQ	Sub-question
UK	United Kingdom
UKC	United Kennel Club
USA	United States of America
WHO	World Health Organization

## ABSTRACT

Trembath, Felicia E. Ph.D, Purdue University, August 2016. Evaluating the Prevalence and Effectiveness of Breed-specific Legislation. Major Professor: Alan M. Beck.

Dog bites pose a persistent public health problem, which some jurisdictions pass breed-specific legislation (BSL) to address. However, very little non-anecdotal evidence regarding the efficacy of BSL has been presented. Currently, BSL research is hampered by the absence of standard terminology, an established prevalence, or a scientific consensus on its effectiveness. The purpose of this study is to propose standardized terminology for BSL, establish the prevalence of each type of BSL in the USA, and conduct a systematic review of the effectiveness of BSL.

After review of terminology currently in use, as well as review of the regulatory actions of 100 breed-specific ordinances, the standardized terminology proposed to discuss BSL is: *declaration, restriction, ban, and grandfather clause*.

Municipal ordinances with breed-specific language were located through compilation of existing lists and mining of ordinance websites. Ordinances were reviewed and classified according to the proposed terminology. Six representative bibliography databases were queried using search string (dog\* or canine) AND (law or legislation) AND (breed). The summary of findings and quality of the body of the evidence were generated using the GRADE approach.

Of 1144 ordinances evaluated, 5 were erroneously reported, 11 could not be classified, 44 were not municipalities, and 139 were repealed. Of the remaining 945 ordinances, many fit into more than one category: 505 declared a breed dangerous *a priori*, 741 placed ownership restrictions, and 513 banned at least one breed. Exemptions for existing animals were included in 338 of the bans. Five studies met the inclusion criteria; three of these showed some effect, and two reported no effect. The majority of studies had methodological flaws, consequently the overall evidential quality was graded *very low*. Despite being a goal, a meta-analysis proved impossible, and the low quality of evidence precluded substantive conclusions about the global effectiveness of BSL. However, studies show evidence that BSL may reduce dog bite injury hospitalizations and that the effect may differ for various age groups.

Efforts should be made to standardize data collection and warehousing procedures to make dog bite injury data accessible to researchers. Additionally, future studies on BSL should consider temporal trends, requisite lead time prior to legislation passing, the severity of injuries, differing effects in subgroups, the type of BSL, and the length of time required for an effect to become demonstrable.

*Keywords:* breed-specific, pit bull, ban, canine, legislation, law, regulation

## I. INTRODUCTION

Dog bite injuries represent a significant public health issue, affecting an estimated 4.5 million Americans per year.<sup>1</sup> In the United States, dog bites are the third leading cause of homeowner insurance claims, and cost the insurance industry an estimated \$489 million annually.<sup>2</sup> When insurance claims are coupled with hospitalizations and lost productivity, dog bites in the USA alone cost an estimated \$2 billion/year.<sup>2</sup> Additionally, dog bites disproportionately affect children<sup>1,3-5</sup> who are more likely than adults to have an injury to the head or face, and suffer more severe injuries.<sup>4-</sup>

<sup>7</sup> Despite reductions to other areas of preventable injuries, dog bites rates remain fairly constant and continue to present a public health problem.<sup>1,8</sup> In response to highly publicized dog attacks, many municipalities have enacted breed-specific legislation (BSL), regulating one or more dog breeds, in an effort to protect the public.<sup>9-11</sup> BSL immediately became a polarizing issue, with some people supportive of it and others touting it as unfair and ineffective.<sup>12</sup> Although there is no shortage of opinions on the merits and utility of BSL,<sup>11,13-15</sup> there have been very few scientific studies to guide the development of scientifically sound policies and guidelines on BSL. Generating policies about BSL driven by science has been hampered by several issues. First, there is currently no standard terminology for the different types of BSL, impeding

cross-comparison of policies and studies. Second, the true distribution of BSL in the USA is unknown. Finally, there is currently no scientific consensus on the efficacy of BSL.

This project addressed these shortcomings by proposing standardized terminology for BSL, establishing a baseline number of each type of BSL in the USA, and conducting a systematic review of the effectiveness of BSL at reducing dog bite injuries. Proposed terminology was established by reviewing the vocabulary being used in the field, as well as municipal ordinances which contain breed-specific language. Terminology which best described the differing regulatory actions of the ordinances was developed and is proposed to be adopted as standardized terminology. The distribution of BSL in the United States was determined by compiling existing lists kept by both pro-BSL and anti-BSL groups, as well as mining websites which serve as repositories for municipal ordinances. Ordinance with breed-specific language were reviewed and categorized according to the standard terminology proposed. The results of the classification process are synthesized and described. A systematic review of the effectiveness of BSL in reducing dog bite injuries was conducted by searching relevant databases using specially selected parameters. The summary of the findings and the assessment of quality were developed according to the grading of recommendations, assessment, development, and evaluations (GRADE) approach, as recommended by the Cochrane Collaboration.<sup>16</sup> These results are presented and discussed. Finally, recommendations are given for improving data collection, and data warehousing for dog bite injuries, as well as for conducting future research on BSL.

## II. BACKGROUND

### Dog Bites in the United States

Dog bites have been a significant source of unintentional injury in the USA since the mid-1960s,<sup>17</sup> and despite repeated calls for better research to help understand the issues surrounding them,<sup>1,10,18</sup> they remain “a poorly understood and complex public health problem.”<sup>4(p. 1940)</sup>

An estimated 4.5 million dog bites occur annually in the USA.<sup>1</sup> Approximately 17-20% of these bites require medical attention,<sup>1</sup> while 1-3% require hospitalization.<sup>19,20</sup> Dog bites are a significant source of medical expenditures, with the average dog bite related hospital stay costing \$18,200, an amount 50% higher than the average injury-related hospitalization.<sup>3</sup>

Dog bites disproportionately affect children, especially young males,<sup>4</sup> with males under the age of nine usually being the most frequently afflicted group.<sup>21,22</sup> Children are also more likely to suffer more severe injuries and more wounds to the head and face.<sup>4,5</sup> Furthermore, in addition to the medical impact, dog bites often inflict emotional trauma on children, with as many as 50% of children reporting some form of post-traumatic stress for more than one month following the incident.<sup>23-25</sup>



The frequency of dog bites is higher in rural areas; up to four times as many bite-related emergency department (ED) visits and three times as many hospital stays occur in rural areas than in urban areas.<sup>3</sup>

Despite the popular myth that strays, or dogs used for fighting purposes are responsible for most dog bite injuries and fatalities, the majority of injuries are inflicted by pets.<sup>17,26-29</sup> Additionally, in the majority of instances a family member or person acquainted with the animal is the victim.<sup>26,28-30</sup> In fact, in one study, 85% of patients seeking treatment for a dog bite injury in an ED had been bitten by their own dog.<sup>31</sup>

Even though dog bites are a reportable public health condition in the USA, they are consistently underreported.<sup>26,32-35</sup> The reasons for under-reporting are unknown, however, since the majority of bites are caused by a dog acquainted with the victim, people may be reluctant to report bites from their pets or the pets of friends or family members for fear of getting the animal or its owner in trouble.<sup>17</sup> Another potential reason for underreporting could be the historical viewpoint that the primary reason for reporting animal bites is to be evaluated for rabies exposure.<sup>17,36</sup> Rabies had been virtually eradicated from the domestic dog population in North America by the 1960s.<sup>37,38</sup> Consequently, rabies transmission from a dog bite is very unlikely, and people may no longer feel the need to seek treatment for a bite that can be reasonably cared for at home. Additionally, municipalities may feel less urgency to report bites to state public health departments or the Centers for Disease Control and Prevention (CDC), because these bites no longer represent a significant vector for rabies.

Although the estimated number of dog bites in the USA has remained relatively constant for over 20 years,<sup>1,35</sup> there are indicators that the rate of severe bites is increasing. Between 1986 and 1994, the number of dog bites requiring medical attention increased by 36%,<sup>22</sup> and between 1993 and 2008, dog bite injury hospitalizations (DBIH) increased by 86%.<sup>3</sup> Additionally, the number of dog bite related fatalities (DBRFs) has been increasing.<sup>39</sup> Between 1979 and 1994, there were an average of 15 DBRFs per year,<sup>40,41</sup> while from 2000-2009 there were an average of 25 DBRFs annually.<sup>42</sup> Taking into account the USA population, this represents a 37.7% increase in the rate of DBRFs.<sup>43</sup>

#### History of Breed-specific Legislation

The use of legislation to regulate injuries caused by dogs dates at least as far back as the third century BC when Roman law held owners liable for injuries or damages caused by their dog.<sup>44</sup> Additionally, a British law that levied a fine of six shillings against owners whose dog bit a man can be traced back to 849 AD,<sup>44</sup> while in medieval times animals themselves could be put on trial for their perceived misdeeds.<sup>45</sup> Although there is a long history of legislation requiring payments and fines in the case of injuries caused by a dog, all known laws prior to the 1800s regulated dogs generically, rather than singling out a particular breed. Legislation that targets a specific breed or breeds of dog is called BSL. The first recorded BSL aimed at reducing injuries caused by dogs was an ordinance passed in Sacramento, California in 1896 which forbade owners of 'bulldogs'

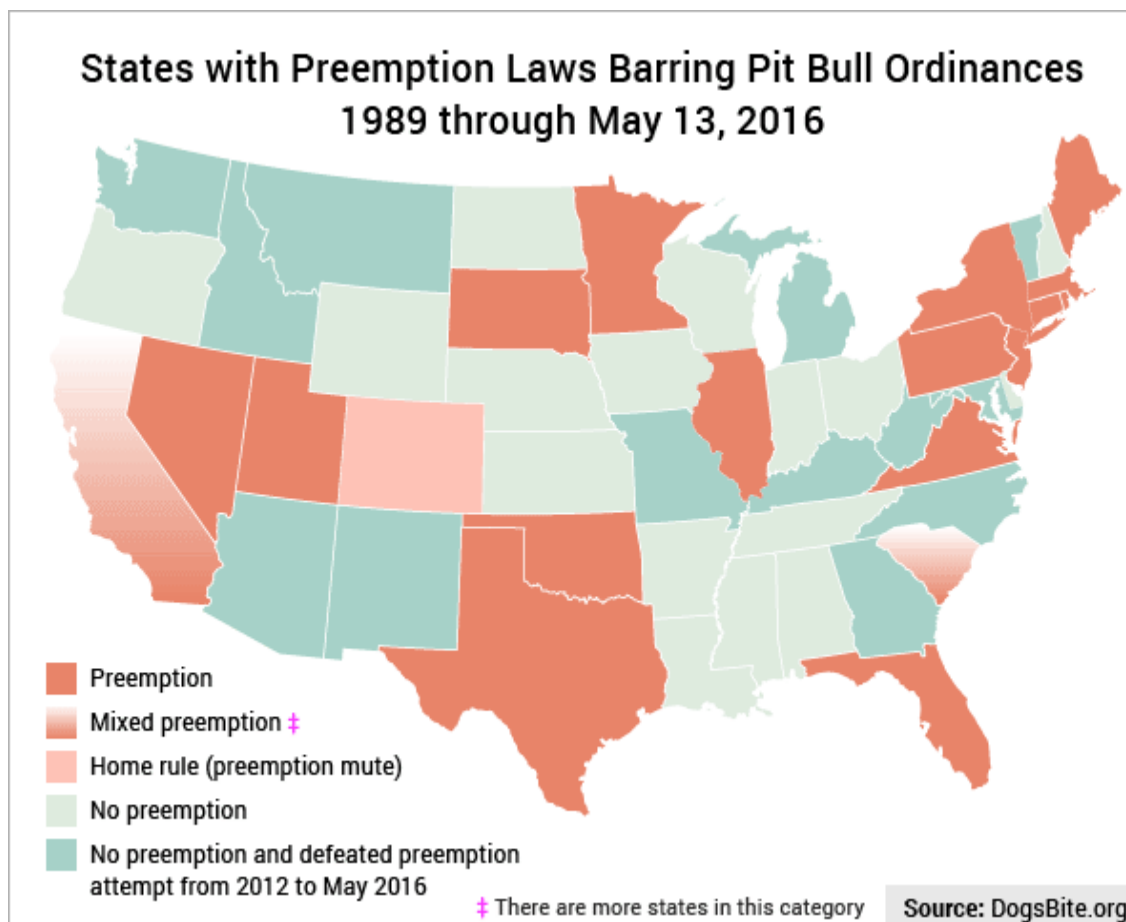
from allowing them to run loose in the streets.<sup>46</sup> The term 'bulldog' is different from contemporary use of the term, which typically refers to English bulldogs. What was called a 'bulldog' or 'bull terrier' at that time is now more commonly referred to as a pit bull or pit bull terrier.<sup>47</sup> Between 1896 and 1912, a handful of other cities in the USA followed Sacramento's lead with breed-specific ordinances passing in Maysville, Kansas, Ogden, Utah, Richmond, Virginia, and Washington, D.C.<sup>48-51</sup> There is no record of what happened to these ordinances, and there was relatively little public conversation about BSL until the 1970s when there was a rash of highly publicized fatal and near-fatal dog attacks attributed to pit bulls.<sup>52,53</sup> In 1976, Henderson, Tennessee enacted legislation banning pit bulls,<sup>54</sup> and in 1977, Florida City, Florida and Lyons, Georgia both passed ordinances restricting their ownership.<sup>55,56</sup> In 1980, Providence, Rhode Island and Hollywood, Florida both enacted legislation requiring pit bull owners to complete special registration forms and maintain a \$25,000 public liability insurance policy,<sup>57,58</sup> and in 1984, Tijeras, New Mexico passed an ordinance banning pit bulls.<sup>59</sup> Although Tijeras, New Mexico is a small town, prior to passage of BSL, 18 out of 80 houses in the town owned at least one pit bull, and repeated attacks on people and other animals had been reported.<sup>59</sup> However, the final catalyst to spur the implementation of BSL in Tijeras was the severe mauling of a nine year old girl on her way home from school.<sup>59,60</sup> In 1986, Lynn, Massachusetts also passed BSL.<sup>61</sup> Attacks like the one in Tijeras, New Mexico continued to receive a lot of media attention throughout the 1980s,<sup>10,11,62</sup> and by 1987 a national and international conversation about regulating pit bulls had been well-established.<sup>47,63</sup> In 1987 Overland Park, Kansas, Liberty, Missouri, South Point, Ohio,

and Yakima, Washington all passed BSL.<sup>64-68</sup> The discussion of pit bull attacks became so common-place in the USA that attacks were featured in the popular column by Ann Landers and wire services began to run roundups featuring pit bull attacks.<sup>63,66</sup> Conversations about banning pit bulls were further fueled in 1989 by a published study reporting that despite being a relatively small percentage of the overall dog population, pit bulls were responsible for 62% of DBRFs in 1987-1998.<sup>40</sup>

Up to this point, all of the BSL being passed was in relatively small cities, but in 1989, Denver, Colorado and Miami, Florida became the first large cities in modern times to pass legislation banning pit bulls.<sup>69,70</sup> Also in 1989, South Milwaukee, Wisconsin passed a breed-specific ordinance that banned pit bulls.<sup>71</sup> The first highly publicized international ordinance was passed by Winnipeg, Canada in 1990.<sup>72</sup> In 1991, the United Kingdom (UK) became the first country to pass a nationwide ban, passing the Dangerous Dogs Act of 1991 (DDA), banning pit bull terriers, Dogo Argentinos, Fila Brasileiros, and Japanese Tosas.<sup>73</sup> Between 1999 and 2000, Norway, Denmark, The Netherlands, Sweden, and Germany each followed suit.<sup>11</sup> Although most of the legislation banned certain breeds of dogs, some legislation, such as that passed in Spain and France allowed the animals to remain, but placed restrictions on how they must be kept.<sup>11</sup> No established repository tracks BSL, so it is difficult to know the true current scope, but an estimated 39 states in the USA and 41 countries worldwide have some type of breed-specific ordinance.<sup>74</sup>

Shortly after municipalities began passing breed-specific ordinances in the 1980s, opponents of the legislation in the USA started advocating for states to pass laws

banning ordinances with breed-specific language.<sup>75</sup> By 1992, ten states, including California, Florida, and Texas, had adopted state-level laws prohibiting local jurisdictions from enacting animal ordinances with breed-specific language.<sup>75</sup> Between 1997 and 2004, anti-BSL laws had been passed by three more states. Currently 19 states have anti-BSL laws.<sup>75</sup> However, many of the state-level anti-BSL laws didn't overturn existing legislation, rather they merely preempted new legislation from being enacted. Additionally, some states have home rule authority, also called Dillon's Rule, meaning that local jurisdictions have the ability to pass any law they see fit, provided the law does not violate state or federal constitutions.<sup>76,77</sup> This principle effectively means that jurisdictions in home rule states are not beholden to the state anti-BSL, and can still pass a breed-specific ordinance if they desire. Thus in some states, BSL is prohibited at the state-level, but municipalities within the state still have BSL on the books. Laws preempting BSL seem to be an American phenomena; a search failed to find any other countries with similar legislation. A map from DogsBite.org portraying which states in the USA have state-level laws preempting BSL is depicted in Figure 1.



**Figure 1:** States with Preemption Laws Barring Pit Bull Ordinances 1989 through May 13, 2016<sup>75</sup>

In the USA, BSL was challenged in the judicial system almost immediately after BSL became prolific in the 1980s. Court rulings have favored both sides of the issue, but judiciary has ultimately upheld the right of municipalities to enact BSL,<sup>14</sup> with eight state supreme courts and seven state appeals courts upholding the constitutionality of BSL.<sup>78</sup> It should be noted that the constitutionality of BSL has never been argued before the Supreme Court of the United States. In 2008, the Supreme Court declined to hear an appeal of *Toledo v. Tellings*,<sup>79</sup> effectively affirming the Ohio Supreme Court ruling that BSL is constitutional. This particular case can no longer be appealed.<sup>78</sup> The legality of

state-level anti-BSL laws has yet to be tested in the courts, however, when in conflict, the rights of the municipality to self-govern have been determined to trump the rights of the state.<sup>14, 78</sup>

In England and Canada, legal tests of BSL have mostly been challenges to a violation received by a specific dog or owner, rather than challenges to the validity of the legislation itself.<sup>80-83</sup> The outcomes of these cases vary, as they are each dealing with situations of individual circumstances. Although there may have been legal challenges in other countries, these cases have not been publicized.

### Policy Development

The tendency of organizations in similar environmental conditions to resemble each other is a phenomenon termed isomorphism.<sup>84</sup> In the area of policy, this manifests in the similarity of the policies of different governments.<sup>85</sup> There are three types of isomorphism: 1) coercive, 2) mimetic, and 3) normative. Each of these will be described, and related to how they may influence the adoption of BSL.

Coercive isomorphism occurs due to tangible rules or political pressure.<sup>84,85</sup> When a neighboring city passes or is considering BSL, coercive isomorphism may occur due to pressure from city officials, such as animal control officers, police officers, or citizens. Coercive pressure from officials and citizens may especially be exerted if there is a DBRF in an adjacent area. News coverage of a fatality in a nearby area is likely to frighten people, who will then want to protect themselves from the perceived threat.

They may put pressure on their local leaders to pass BSL as a way to protect their community. This type of political pressure would be difficult for local leaders to ignore, since they are elected as a representative of the community, and in fact depend upon community support for reelection. Additionally, policymakers may take advantage of a “policy window” wherein political or social interest piques in an issue to pass legislation that has already been developed.<sup>86,87</sup> DBRFs are always well reported, and any highly publicized dog bite related event may open a policy window enough to enable BSL to be implemented.

Mimetic isomorphism is the tendency to copy or mimic others when facing an uncertain or ambiguous situation.<sup>84,85</sup> Many policy decisions are inherently uncertain and complex, which may influence the mimicking of peers as a form of validation. For example, appropriate methods to protect the public from “dangerous dogs” is an issue that has concerned communities for centuries, yet no clear evidence-based consensus has been reached. The uncertainty inherent to this decision could cause municipalities to look to what others in their area are doing as a baseline for action. Thus if a neighboring jurisdiction passes BSL, local leaders could mimic this behavior as a way of reducing the perception of uncertainty. The trail has been blazed, as it were. The tendency to mimic other municipalities could also be influenced by the urge that policy makers have to simplify complex problems.<sup>87</sup> The management of “dangerous dogs” is a complex and ambiguous problem, since dog bite injuries involve the interaction of many human and canine factors.<sup>88</sup> Passing BSL may appeal to politicians and the public they



represent as a way to simplify the issue, by removing or restricting breeds perceived to be dangerous.

Normative isomorphism results from adherence to the norms and customs of a profession.<sup>84,85</sup> Normative pressures would come in the form of professional standards or practices,<sup>84,85</sup> and although there are normative standards to report dog bites, especially fatalities, there is no professional “standard” promoting BSL. Rather, there are advocates on both sides of the debate. Depending on which profession is examined, there may actually be a professional culture against BSL. The majority of organizations and people who work with animals are not in favor of BSL.<sup>88,89</sup> However, these opinions are being developed based on individual experiences with animals rather than through an objective, evidence-driven review of the efficacy of BSL.

### III. STANDARDIZED TERMINOLOGY

#### Background

Accepted terminology is essential to effective reporting, precise communication, and the accurate comparison of results.<sup>90,91</sup> For example, without standardized terminology research cannot be replicated or properly compared to other studies. Developing fields commonly go through a phase of confusion created by the use of discrepant terminology.<sup>92</sup> Consequently every academic field reaches a point where standardized terminology must be developed and adopted. The objective in doing so most often is to facilitate “improved precision and communication in [the] field, [which] leads to more accurate comparison of technologies and results.”<sup>90(p. 1)</sup> BSL is a developing field which has reached the point where the absence of standardized terminology hampers efficient discourse and comparison of scientific findings. To improve communication and comparisons, standardized terminology for discussing BSL must be proposed and adopted.

#### Objectives

The specific objectives of proposing standardized terminology for BSL are to:

- i.* Assess existing terminology

- ii. Compare current terminology to regulatory actions of breed-specific ordinances
- iii. Develop standardized terminology to be used when discussing BSL

### Methods

Pro-BSL websites, anti-BSL websites, published literature discussing BSL, and 100 randomly selected ordinances with breed-specific language were reviewed to determine the terminology currently being utilized to describe BSL. After compiling information from all of these sources, the proposed terminology which most accurately reflects the regulatory actions of the different types of BSL was developed.

### Results

Municipal ordinances typically do not use specific terminology to refer to what type of BSL is in place. Rather, the ordinances describe the regulatory action of the ordinance, such as stating that a particular breed is prohibited within the city limits, or listing items that must be complied with by owners of a particular breed. The majority of published materials on BSL do not acknowledge or discuss the fact that breed-specific ordinances may contain different regulatory actions.<sup>13,18,93-98</sup> Additionally, authors and organizations who do acknowledge that BSL may have different regulatory actions generally only discuss legislation that restricts how a certain breed may be kept or legislation that bans a certain breed.<sup>14,72,99-102</sup> Little attention or acknowledgement has

been given to ordinances that have a statement saying that a particular breed is considered to be dangerous *a priori*. The sources that do discuss these type of statements alternately refer to them as automatic labelling, classifications, declarations, or labels.<sup>103-105</sup> The only term that is used consistently when discussing BSL is “ban”, which is used to describe legislation that prohibits a particular breed.

### Discussion

Based on these findings, the following terminology and definitions for BSL are proposed:

**Declaration:** A statement that declares a particular breed of dog to be dangerous, but placing no restrictions upon their ownership.

**Restriction:** A restriction allowing ownership of the breed in question, but imposing restrictions, such as mandatory insurance and/or spaying or neutering.

**Ban:** Prohibits ownership of a certain breed or breeds of dog.

**Grandfather clause:** Allows for the keeping of dogs of a banned breed previously within the city limits as of the effective date of the ordinance. Often these clauses require registration and include restrictions on the keeping of the animals.

It is important to note that a jurisdiction may have ordinances encompassing any or all of the above categories. For example, legislation may include a statement in the *definitions* section that a certain breed is automatically considered to be dangerous, but ownership of the breed is permitted without restriction. On the other hand, a

jurisdiction with a ban on pit bull ownership may include a grandfather clause for existing dogs, but place restrictions on how these dogs must be kept.

Burgeoning fields suffer from confusion owing to the use of disparate terminology.<sup>91,92</sup> This lack of standard terminology hampers effective communication, reproducibility of studies, and the comparison of results across studies.<sup>106,107</sup> Currently, no standardized terminology exists in the field of BSL, with different organizations using divergent terminology. To remedy this, the terms *declaration*, *restriction*, and *ban* are proposed to be adopted and utilized as standard terminology to discuss different types of BSL. The use of standardized terminology for BSL will enable the development of a framework for scientific discourse that is necessary for collaboration, documentation, training, reproducibility, and the development of legislation.<sup>92</sup>

#### IV. DISTRIBUTION OF BREED-SPECIFIC LEGISLATION IN THE USA

##### Background

While several pro-BSL and anti-BSL groups maintain complete or partial lists of jurisdictions with active BSL in the USA, there is no consensus on the number of ordinances with breed-specific language in the USA. Estimates of the number of cities with breed-specific ordinances range from 700-937.<sup>74,89</sup> To date, these estimates have relied on the compilation of information that is readily available on the internet, and reports from persons who live in jurisdictions with BSL. The accuracy of each individual ordinance on these lists has never been verified, however, preliminary review of a subset of these ordinances revealed several that were erroneously listed or incorrectly described. To date, there has not been a systematic attempt to verify the authenticity of these ordinances and mine ordinance repositories to establish the true number of breed-specific ordinances in the USA. Conducting a comprehensive search and review of breed-specific ordinances in the USA will enable researchers to have a reliable estimate of the true prevalence of BSL, as well as identify potential sources of data for future studies by accurately locating cities with each type of BSL.

## Objectives

The specific objectives of establishing the prevalence of BSL in the USA are to:

- i. Locate and combine available lists of BSL in the USA
- ii. Mine ordinance repositories for additional breed-specific ordinances
- iii. Verify the accuracy of all referenced ordinances
- iv. Categorize the type of BSL according to proposed standardized terminology
- v. Quantify each type of BSL
- vi. Describe characteristics of BSL in the USA

## Methods

### Data sources

Internet searches using the Google search engine and keywords “pit bull ban”, “Rottweiler ban”, “breed-specific list”, “breed-specific legislation by state”, “BSL list”, and “BSL by state” were conducted. The largest BSL list located, and the only list known to be updated on a yearly basis is maintained by the group, DogsBite.org. The founder of DogsBite.org was contacted and agreed to share their list for our research purposes. A spreadsheet with the names of cities and states with BSL was obtained, and used as the starting point for developing the master list. Based on the internet searches, additional lists were obtained from the websites of the groups: Adorabull, Animal Farm Foundation, Animal Rescue League of Iowa, Bless the Bullys, Btoellner Typepad, CDL

Life, Daxton's Friends, Dog Laws at Large, Dog Legislation, Evergreen Animal Protective League: Westminster Location, Filadog, Gixxer.com, Hupy and Abraham, S.C., the Kansas City Star, Missouri Pit Bull Rescue, and Stop BSL. These additional lists were compared to the Dogsbite.org list, and any unique ordinances were added to create the master list. After reviewing all of the ordinances referenced on existing lists, sites that serve as ordinance repositories for municipalities were mined for additional ordinances. Repository sites searched were Municode, Conway Greene, Sterling Codifiers, and the Wisconsin State Law Library. Searches were conducted using keywords "pit bull", "pitbull", "Staffordshire", "terrier", "Rottweiler", "fighting breeds", "coyote hybrid", "wolf", and "wolf hybrid". The terms "dangerous dog" and "vicious dog" were not used, since nearly every municipality in the USA has a dangerous and/or vicious dog ordinance. Ordinances located on these sites were compared to the master list, and any unique ordinances were added. Municipal websites, online ordinance repositories, BSL websites, blogs, and new articles were used to verify and review ordinances.

#### Inclusion Criteria

Municipal ordinances in the USA with breed-specific language were eligible for inclusion. No limitations were placed on the timeframe in which the ordinance had been enacted. Ordinances which were referenced on an existing list or discoverable in searches of ordinance repositories between March of 2015 and July of 2016 were eligible for inclusion. No limitations were placed on whether or not the ordinance is



currently in effect. Where relevant, repealed ordinances were reviewed and cataloged. However, since sufficient information to classify repealed ordinances could not always be found, they were not included in the analysis.

#### Exclusion Criteria

Ordinances which applied to housing authorities, counties, or cities which were disbanded or are no longer in existence were excluded from this study. Although some county-level legislation was located, counties were not the primary focus of the review, since most legislation is developed and enforced at the city-level. Cities may adhere to county-level ordinances, however, they may also have their own legislation which conflicts with county-level edicts. Additionally, cities which have been disbanded no longer have their ordinances in place. However, in these cities there was no formal action to repeal the BSL in favor of breed-neutral animal ordinances. For this reason, cities which were disbanded or no longer in existence were excluded rather than being classified as repealed. The ordinances for housing authorities, counties, and cities which are no longer in existence were reviewed and noted, but not included in the analysis.

#### Data Management

A master list of ordinances was maintained using Google Sheets. The use of an online based program allowed multiple researchers to work on the same document at different time periods without accidentally using an outdated version. Backup versions

of the Google Sheets file were periodically downloaded as a Microsoft Excel™ file and saved on a shared data drive. Upon review of ordinances, relevant information was extracted and entered into the master Google Sheet. A codebook and a catalog of sites with lists of municipalities with BSL were also developed, and maintained in the master Google Sheets file.

### Classification

Ordinances were classified according to the standardized terminology proposed in Chapter III: *declaration, restriction, ban, and grandfather clause*. A declaration is a statement that a particular breed is dangerous or vicious *a priori*. A restriction allows ownership of the breed in question, but places restrictions on ownership. A ban prohibits ownership of a certain breed or breeds of dog, and a grandfather clause exempts animals who resided within the city limits prior to the effective date of the ordinance. An ordinance could be classified as one category or up to all four, i.e. an ordinance could only have a statement declaring a breed to be dangerous *a priori*, or it could have a declaration that a breed is considered dangerous, a ban on the breed, and a grandfather clause that allows existing dogs to remain for the rest of their natural lives, but with restrictions on how they must be kept.

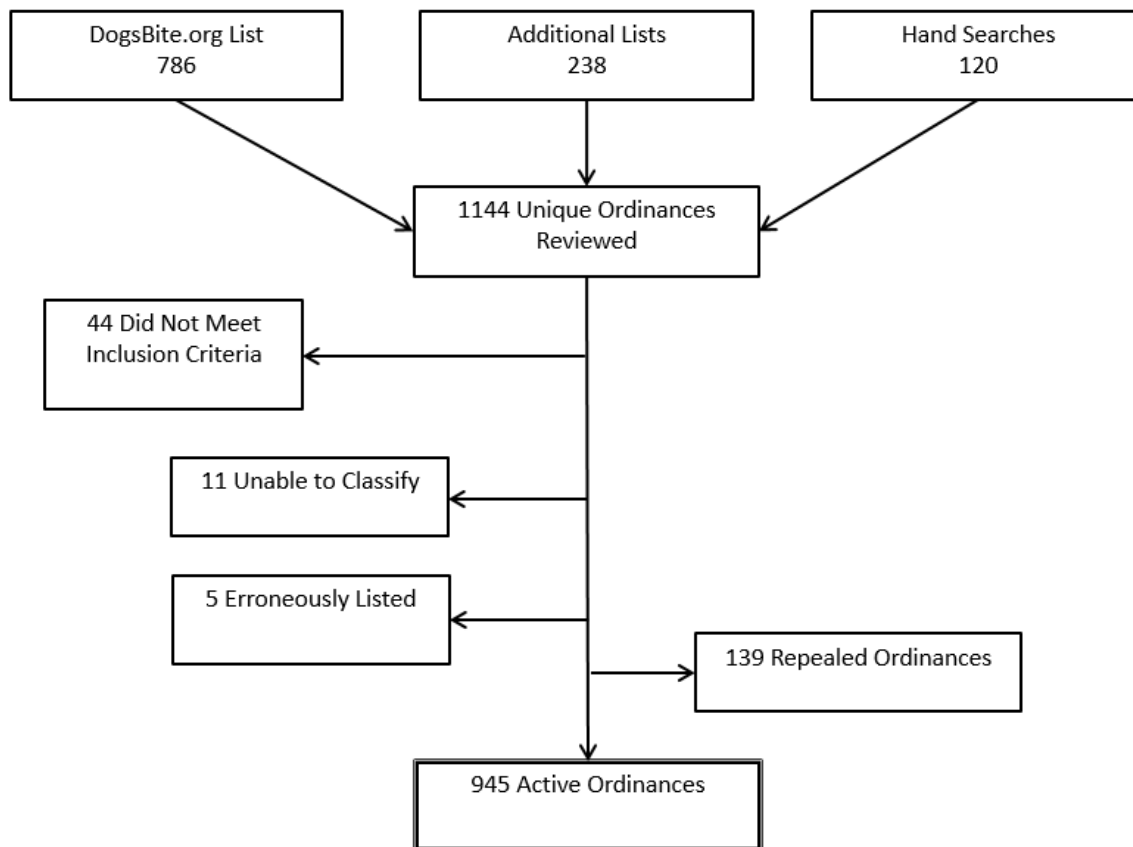
## Reviewing Ordinances

The ordinances included on the master list were verified using available web links on BSL lists and/or conducting online searches using keywords “city, state + pit bull”, “city, state + pit bull ban”, “city, state + BSL”, and “city, state + ordinances”. Once located, ordinances were reviewed and the following information was extracted: city name, state, ordinance or section number, whether or not there was a declaration, whether or not there were restrictions on ownership, whether or not there was a ban, whether or not there was a grandfather clause, date the ordinance was enacted, date an ordinance was repealed (if applicable), breed(s) affected, a brief description of the ordinance, any unique provisions, and the URL for ordinances available online. Additional information recorded was: the city population, whether or not the actual ordinance was located and reviewed, date of review, reviewer initials, any additional URLs for references to the ordinance, and any necessary notes about the search process. For ordinances which could not be located online, contact information was obtained for the person most likely to have knowledge of the city’s animal ordinances. These persons were emailed and asked to provide a copy of the ordinance. Follow up emails and phone calls were made to municipalities who did not respond. Finally, a letter requesting a copy of the city’s animal ordinances was sent. These attempts provided multiple actions for the ordinance information to be returned: fax, email, and USA postal service. Additionally, a self-addressed stamped envelope was provided with the letter, in order to make it easier for the municipalities to return a copy of the ordinance. For municipalities where no ordinance could be located and the city did not

respond to multiple requests for the ordinance, if available news articles or other online sources had enough information to be reasonably certain the BSL was in place and to enable classification of the regulatory actions, these ordinances were reviewed and classified.

### Results

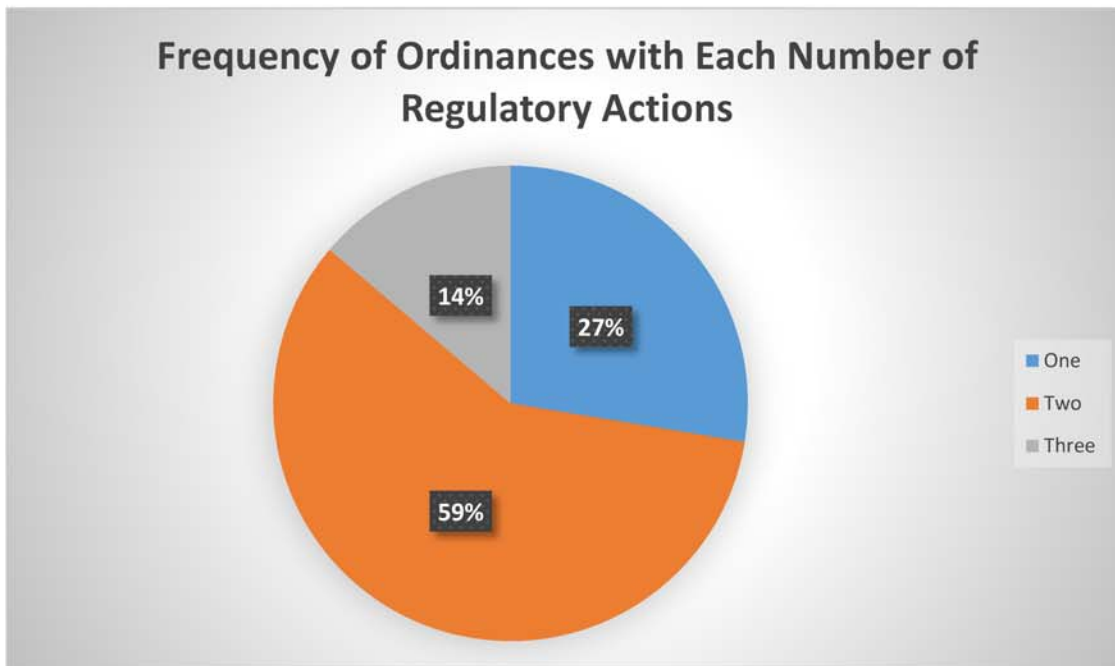
Review of existing BSL lists and searches of ordinance repository sites yielded 1144 unique municipal ordinances. Of these, 44 pertained to cities which were no longer in existence, counties, or housing authorities, and thus didn't meet the inclusion criteria. Of the remaining 1100, 11 could not be classified due to insufficient information, 5 never had breed-specific language and were determined to have been erroneously listed, and 139 had breed-specific language, but had been repealed. This resulted in 945 active municipal ordinances with breed-specific language. The ordinance review process is depicted in Figure 2.



**Figure 2:** Ordinance Review Process

Legislation is multi-faceted; ordinances could have declaration statements, and/or restrictions upon ownership, and/or a ban of one or more breeds, and/or a grandfather statement. Consequently, ordinances could have one, two, three, or four regulatory actions for included breeds. However, since grandfather clauses are most pertinent to bans, and no ordinance would exclusively have a grandfather clause, they were assessed separately. For analyzing the number of regulatory actions in each ordinance, declarations, restrictions, and bans were considered as separate regulatory actions. Thus for this analysis, any individual ordinance could have up to three regulatory actions (declaration, and/or restriction, and/or ban). The majority of the

ordinances reviewed had multiple regulatory actions, with 72.4% having two or more actions. The number of regulatory actions present in each ordinance is depicted in Figure 3.

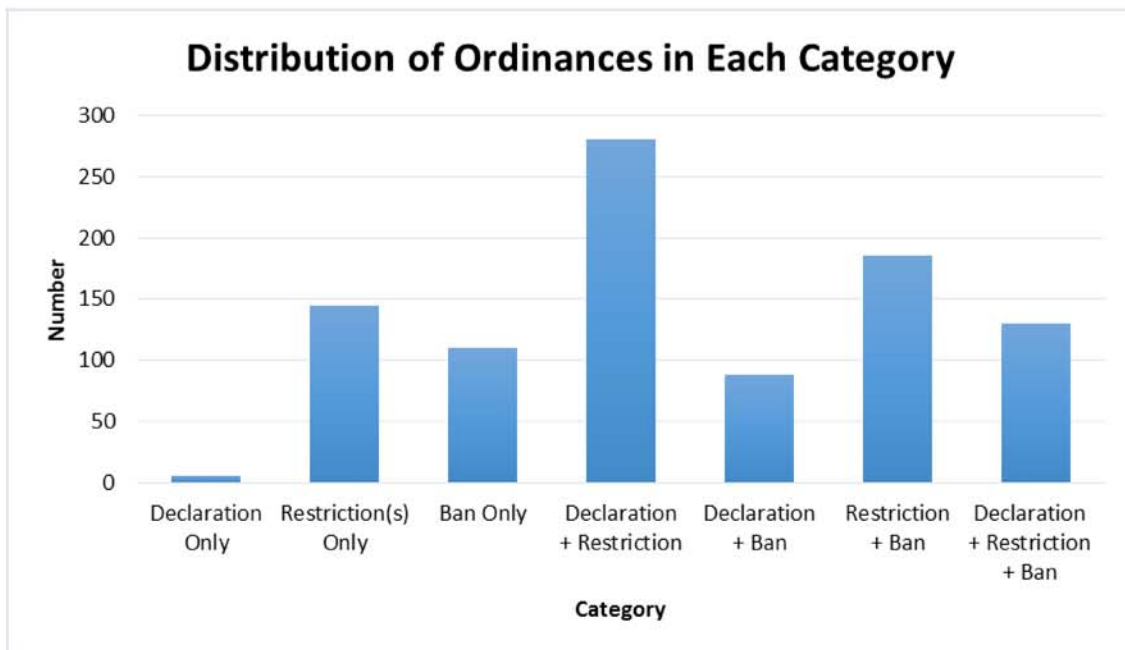


**Figure 3:** Frequency of Ordinances with Each Number of Regulatory Actions

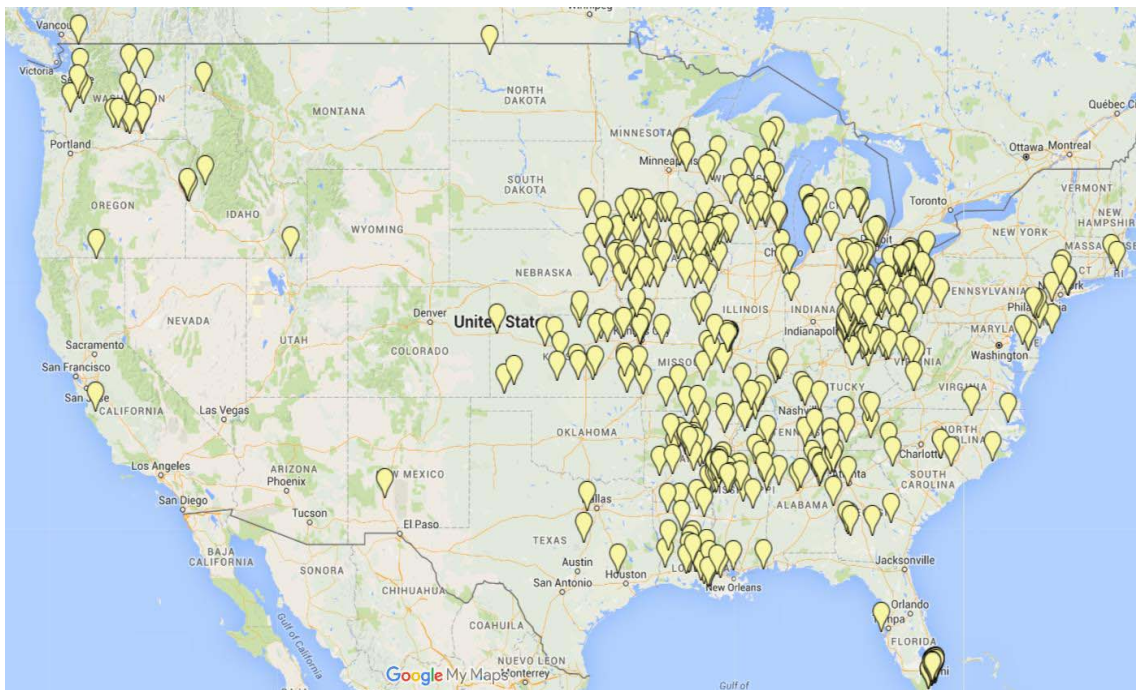
Considering the three possible regulatory actions that ordinances could have, there were seven unique potential combinations for categories that an ordinance could fit into. The categories for these combinations and the number in each are depicted in Table 1, while the distribution of ordinances in each category is depicted in Figure 4.

**Table 1.** Ordinance Categories

<b>Category</b>	<b>Frequency</b>	<b>Percentage</b>
Declaration only	6	.6%
Restriction(s) only	145	15.3%
Ban only	110	11.6%
Declaration + Restriction	281	29.7%
Declaration + Ban	88	9.3%
Restriction + Ban	185	19.6%
Declaration + Restriction + Ban	130	13.8%
<b>Total</b>	<b>945</b>	<b>100%</b>

**Figure 4:** Distribution of Ordinances in Each Category

Bearing in mind that ordinances could fit into multiple categories, of the 945 active ordinances, 505 included a declarative statement, 741 included restrictions, and 513 had a ban. A map of the municipalities with declarations, restrictions, and bans is presented in Figures 5, 6, and 7 respectively.



**Figure 5: Municipalities with Declarations**



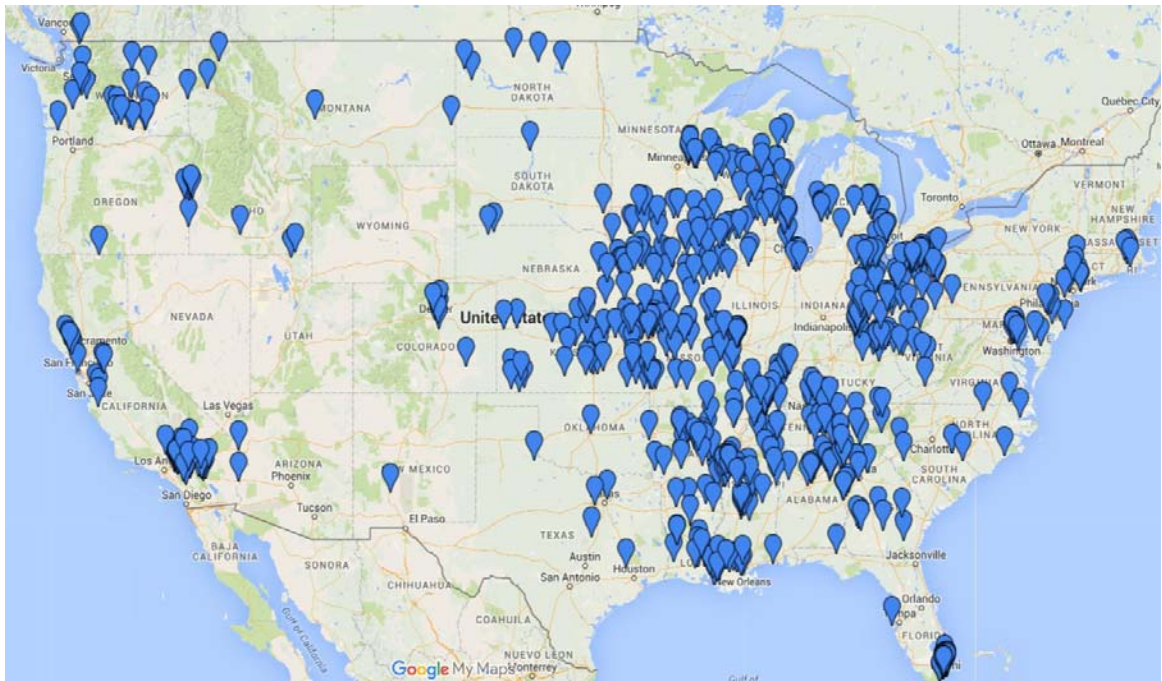


Figure 6: Municipalities with Restrictions

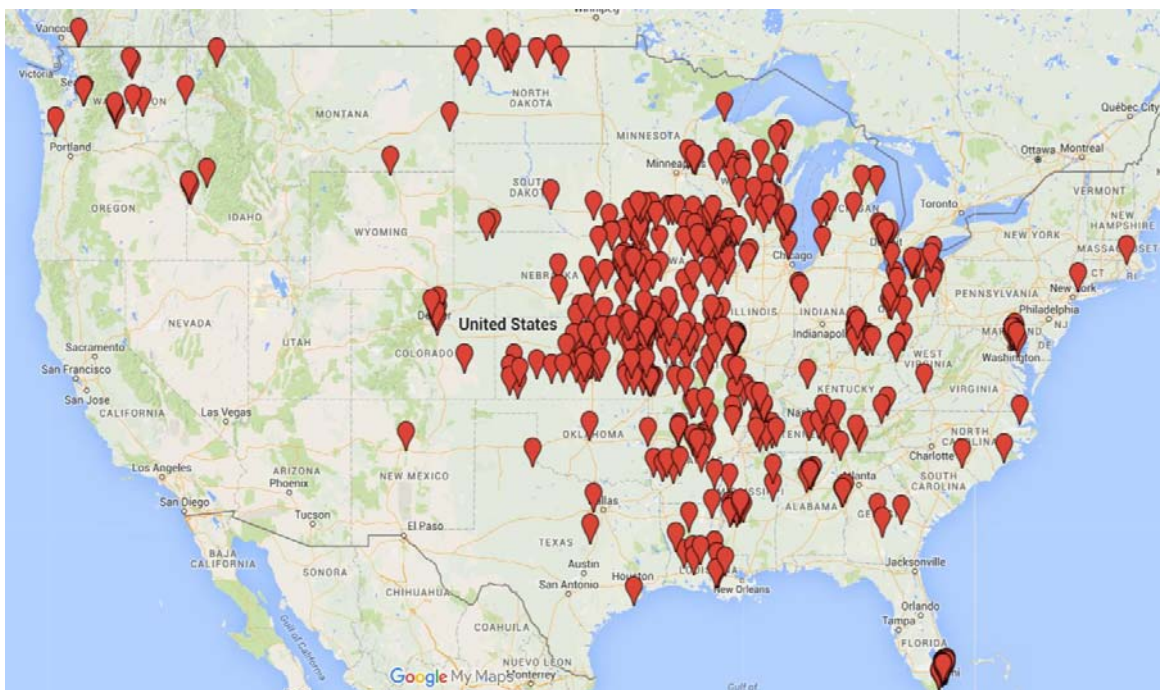
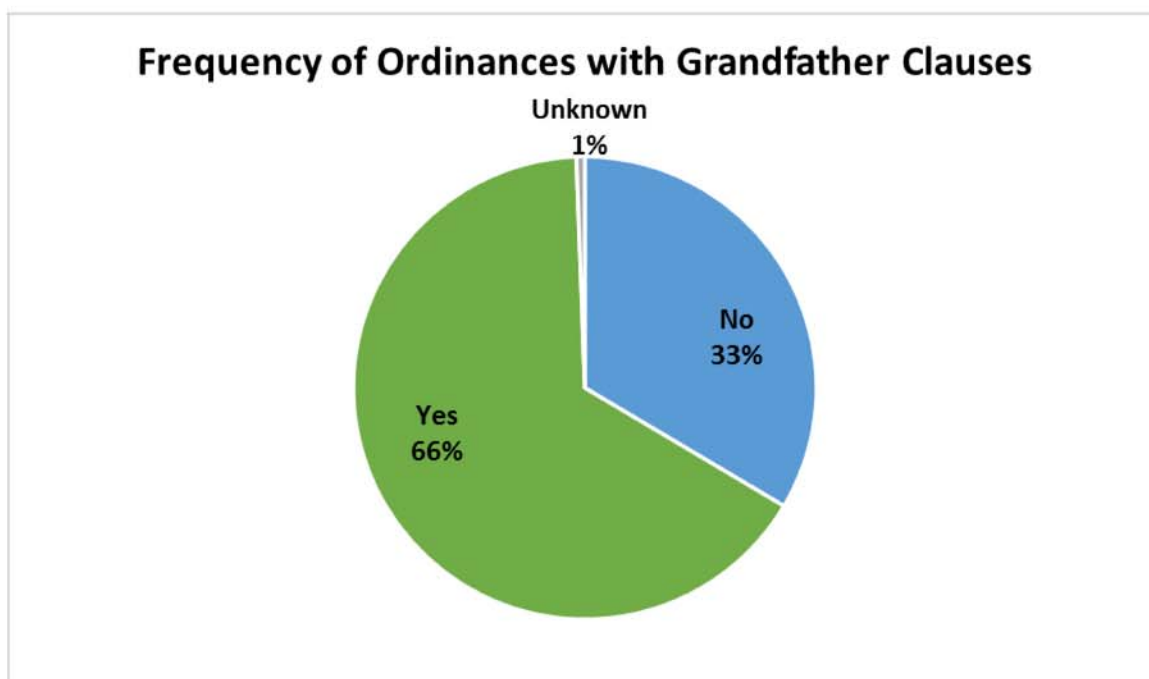


Figure 7: Municipalities with Bans

Declarative statements were found in various sections of the ordinance ranging from the definitions section to a specific section prohibiting one or more breeds. For example, Wayne, Nebraska includes pit bulls in their definition of vicious dogs, while Dellwood, Missouri has the following statement in the first paragraph of their ordinance regulating pit bulls: “[w]hereas, after an opportunity for full and complete discussion, the Board of Alderman finds that pit bull dogs are dangerous and potentially hazardous to the community...” Statements restricting ownership of a particular breed were also found in various sections of ordinances, ranging from a few sentences in the overall animal code to a devoted subsection. Restrictions imposed included combinations of the following: the owner being over a certain age (usually either 18 or 21), posting signage indicating the presence of a dangerous dog at the owner’s property, special registration process or fees, height and material specifications for enclosures, mandatory spaying or neutering, wearing of a muzzle in public, wearing a special collar, a special insurance policy, and mechanisms of identification, such as tattoo, microchip, or photographs on file with the city. Statements banning a certain breed or breeds of dogs were found in various sections of ordinances ranging from one sentence within a list of prohibited activities/items to an entire subsection devoted to regulating one or more breeds. For example, the city ordinances for Surfside City, Texas have a list of things that are prohibited in the city, number six of which is “[a]nimals raised primarily for fighting, including, but not limited to, fighting cocks and pit bull terriers.” On the other hand, the city of LaGrange, Georgia has an entire subsection of their animal control ordinance dedicated to regulating pit bulls. Grandfather clauses for existing animals were

exclusively present in ordinances with a ban. Of the 513 bans, the inclusion of a grandfather clause was indeterminable for 3 (1%), and 338 (66.6%) included grandfather clauses. Ninety-three percent of the grandfather clauses placed restrictions on the grandfathered animals. The percentage of ordinances with grandfather clauses is depicted in Figure 8.



**Figure 8:** Frequency of Ordinances with Grandfather Clauses

Ordinances that did not provide exemptions for existing dogs frequently provided a time period for compliance. For example, section 4-1-7 of Lewis, Iowa's ordinances simply state that pit bulls are deemed dangerous and that the keeping of dangerous animals is prohibited. No date is given, so it is assumed to be effective immediately upon passage of the ordinance. On the other hand, Newell, Iowa provided 30 days for existing pit bulls to be removed from the city.

Pit bulls were the only breed regulated by 742 or 78.5% of the ordinances, while 199 or 21.1% regulated pit bulls and one or more other breeds, and 4 did not specifically mention pit bulls. The other regulated breeds varied from Rottweilers to Chihuahuas. The four ordinances which did not specifically regulate pit bulls typically regulated another breed, such as Presa Canarios. The other regulated breeds are presented in Table 2, and descriptions of the four ordinances which did not specifically mention pit bulls are presented in Table 3.

**Table 2.** Other Regulated Breeds

<b>Breed</b>
Akita
Alaskan Malamute
American Bandogge Mastiff
American Bulldogs
American Tundra Shepherd
Belgian Malinois
Boerboel (South African Mastiff)
Borzoi (Russian Wolfhound)
Boxer
Bullmastiff
Cane Corso (Italian Mastiff)
Chihuahua
Chinese Shar-Pei
Chow Chow
Coyote Hybrid
Dalmatian

Table 2  
(continued)

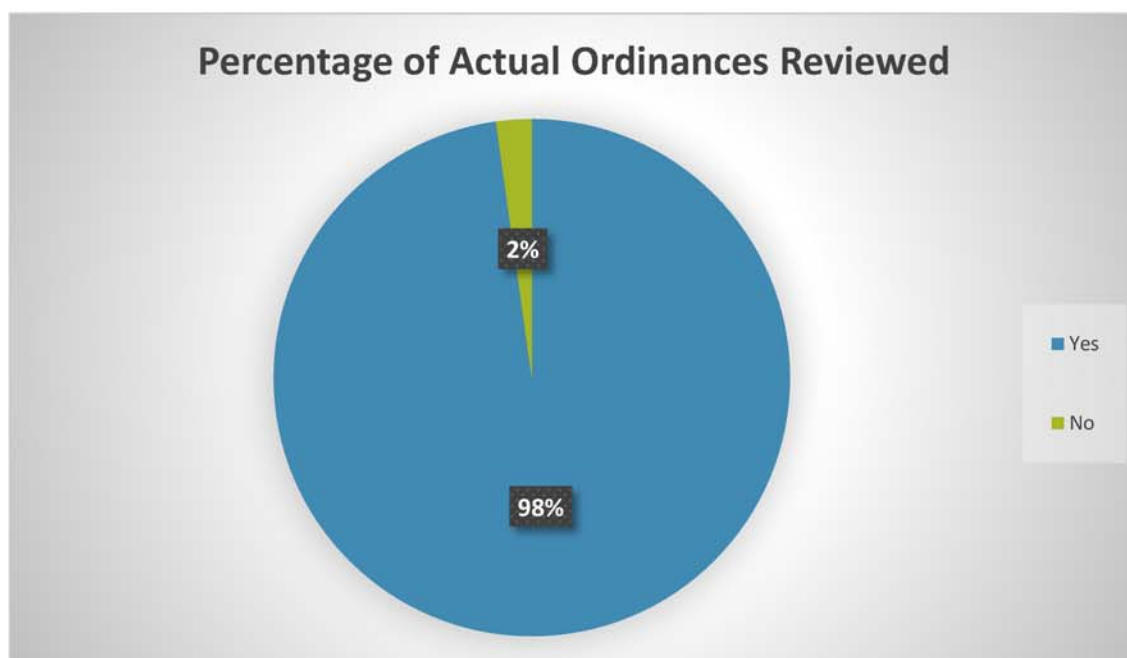
<b>Breed</b>
Dingo Hybrids
Doberman Pinscher
Dogo Argentino (Argentine Mastiff)
Dogo Cubana (Cuban Mastiff)
Dogo Sardesco (Dogo Sardo)
Dogue De Bordeaux (French Mastiff)
English Bulldog (Bulldog)
English Bull Terrier (Bull Terrier)
Fila Brasileiro (Brazilian Mastiff)
German Shepherds
Great Dane
Irish Wolfhound
Jackal Hybrids
Japanese Tosa Inu (Japanese Mastiff)
Kuvasz
Neapolitan Mastiff
Presa Canario (Canary Mastiff)
Presa Mallorquin (Ca de Bou)
Rhodesian Ridgeback
Rottweiler
Saint Bernard
Scottish Deerhound
Siberian Husky
Wolf Hybrid

**Table 3.** Ordinances not Specifically Regulating Pit Bulls

<b>Location</b>	<b>Regulated Breed(s)</b>
Blackshear, Georgia	Bulldog and bull terrier*
Canal Fulton, Ohio	Presa Canario
Saginaw, Michigan	Any of the top five breeds appearing on credible analytic listings of “Most Dangerous Dogs” as verified and supplemented by local data and records
Herman, Wisconsin	Coyote hybrid, dingo hybrid, jackal hybrid, and wolf hybrid

\*Bulldog (English bulldog) and bull terrier (English bull terrier) are distinct breeds from pit bulls

The actual ordinance was located and reviewed for 924 or 97.8% of the active ordinances, while the remaining 21 or 2.2% were classified based on available information in news articles and other sources. The percentage of actual ordinances reviewed is depicted in Figure 9.

**Figure 9:** Percentage of Actual Ordinances Reviewed

The most frequently missing variable was the date the ordinance was enacted, which was undeterminable for 118, or 12.5%, of the active ordinances. Of the ordinances for which the date enacted could be determined, the year enacted ranged from 1976 to 2015.

## Discussion

### Reviewing Ordinances

It is important for others who wish to undertake a similar endeavor to understand the process and challenges encountered. Locating and reviewing ordinances was a labor-intensive process. Depending upon the accessibility of relevant information online, the review of each individual ordinance took 10-25 minutes to complete. Additional time was spent synthesizing the multiple BSL lists and conducting supplementary searches of ordinance repositories. Due to the time-intensive process of locating and reviewing ordinances, it took approximately 500 man-hours to complete this project. Even assuming a 40 hour work week dedicated to the task, a project of this scale would still take approximately three months to complete. One of the most laborious tasks was searching for ordinances not available online. The main reasons for an ordinance to not be available were that it had been repealed or the municipality was a rural area with little to no information available online. Usually only the most up to date version of an ordinance was available online. With ordinances that had been

repealed, the breed-specific language had been replaced by a new ordinance with breed-neutral language. Consequently, the version with breed-specific language or the action repealing the breed-specific ordinance could frequently not be located. However, news stories often carried sufficient information to confirm that the ordinance had in fact been repealed. As previously detailed, for ordinances which were not repealed, and could not be located online, multiple attempts were made to contact city officials, in order to obtain a copy of the ordinance. This was a very time consuming process, but necessary to maintain the integrity of the review process. Despite these efforts, 21 ordinances which could not be confirmed to have been repealed could not be located for review. Of these 21 ordinances, 11 did not have sufficient information available online to allow for classification.

The most difficult information to locate was the date that an ordinance was enacted. This held true even when the actual ordinance could be located and reviewed, since the ordinances themselves usually do not give a date that they were passed or became effective. However, the date is occasionally included in the ordinance section name, or sometimes is referenced in the footnotes, and if an ordinance included a grandfather clause, there would generally be a date listed that the existing animals must be registered by. Nevertheless, the majority of the ordinances reviewed did not include a date. The date an ordinance was enacted or became effective was frequently referenced in news articles regarding the BSL, and these sources proved to be the most fruitful for locating this information. In some cases, an exact date could not be determined, however, the year the ordinance was enacted could sometimes be



determined from news articles or legal filings. Notwithstanding strenuous efforts, the date enacted was the most frequently missing piece of information, and could not be determined for 12.5% of the active ordinances. If the date an ordinance was enacted is not available, it may be difficult to analyze the effect of BSL based on temporal trends.

Some repositories for municipal ordinances do not have features to enable searching all ordinances on the site simultaneously. For example, on the ordinance repository site E-code 360, searches can be conducted within each municipality, but cannot be conducted at the state or national level. Since reviewing and searching each of the 2,417 municipalities for which they house ordinances individually was not feasible, this site was used when attempting to locate an ordinance that needed verification, but was not used for supplemental searches.

An additional complication for the review process is the fact that 19 states have laws that preempt local areas from enforcing or enacting BSL.<sup>75</sup> For example, Florida and South Dakota, both have such laws.<sup>75,108</sup> However, the legislation in Florida was only proactive, and as such only prevented cities from enacting new ordinances with breed-specific language, any cities with BSL prior to the law passing can still be enforced. Additionally South Dakota abides by the home rule principle, meaning that local jurisdictions can enact or enforce any regulations not prohibited by the state or federal constitution, even if the regulations are contrary to state law.<sup>76</sup> Consequently, after the state law prohibiting BSL passed, some cities in South Dakota repealed their BSL, while others left it in effect. Municipalities in states with laws preempting BSL had to be evaluated very thoroughly to determine whether or not the local BSL had been repealed

or was still intact. A map from the site DogBite.org that illustrates the complex issue of preemption laws in the USA was depicted in Figure 1.

### Regulatory Actions

It is difficult to summarize in simple terms how many ordinances are a declaration, restriction, or ban, since municipalities frequently enact breed-specific ordinances with more than one regulatory action. This may happen via multiple ordinances, or multiple regulatory actions may be contained within the same ordinance. Owing to this, the ordinances for each city being investigated must be reviewed in their entirety to ensure that all regulatory actions are being captured. The vast majority of ordinances fit into more than one category, as they contain multiple regulatory aspects for the breed(s) included. In fact, this review found that less than one third of ordinances contained only a declaration, restriction(s), or a ban. Of those, 6 only had a declaration, 145 only had a restriction, and 110 only had a ban. Over half of the ordinances had two regulatory actions, with nearly one third having a declaration and a restriction, nine percent having a declaration and a ban, and nearly one-fifth having a restriction and a ban. Only 13.8% of ordinances had a declaration, restriction, and a ban. Declarations and bans were present in nearly the same number of ordinances: 505 and 513 ordinances respectively. Restrictions were the most common regulatory action, with 741 or 78.4% of ordinances located containing at least one restriction. The multi-faceted aspect of legislation complicates the review process.

Further complicating the issue, many ordinances include grandfather clauses for existing animals. However, no ordinances with only declarations or restrictions were found to have grandfather clauses. Rather the only ordinances which contained grandfather clauses were those with a ban.

Contrary to previous assumptions, this review found that 33.7% of bans did not include a grandfather clause. The population in cities with a ban and no grandfather clause ranged from 44 to 80,429 persons. However, 98.25% of these areas have fewer than 50,000 people and meet the USA Census Bureau's definition of a rural area.<sup>109</sup> In fact 91.9% have fewer than 15,000 residents and 77.3% have a population under 5,000. In towns with small populations, it is unlikely that very many, if any, of the breed being regulated resided in town at the time the breed-specific ordinance was enacted. This idea is reinforced by news articles from several rural areas which indicate that very few dogs in town would be affected by the breed-specific ordinance that was being considered.<sup>110-113</sup> Thus it may be that many of these rural areas did not include a grandfather clause, because there were no existing animals that would be affected. The date the ordinance was enacted was missing for 19.2% of the ordinances which did not contain a grandfather clause, however, 46.5% of them were passed in 2006 or earlier, meaning that they have been in place for a decade or longer. It is also possible that any dogs initially covered by the grandfather clause are now deceased, and that this provision has been removed since it is no longer applicable. In fact, when first reviewed, several ordinances in Kansas, including Kansas City, Kansas, appeared to not have a grandfather clause. However, upon further examination, there was a statement in the

ordinance that it no longer included a grandfather clause, since there were no longer any animals living that were registered prior to the effective date. Thus it is possible that some of these older ordinances without grandfather clauses initially contained them, but that language pertaining to the grandfather clause has since been removed as it is no longer applicable.

Although most grandfather clauses were blanket statements covering all existing dogs of the breed being banned, some contained *caveats*. For example, in Ozawkie, Kansas, in order to be covered under the grandfather clause, dogs of the affected breeds cannot be “vicious”. However, the term “vicious” isn’t further defined in the ordinance. Additionally, in New Llano, Louisiana, grandfathered dogs who show aggression will be labelled vicious and excluded from the city; the same is true in Arpin, Wisconsin, where grandfathered dogs who attack a person will be banned.

In addition to exemptions provided by grandfather clauses in some of the ordinances, almost all of the ordinances had exemptions for one or more of the following: police dogs, city employees acting in the scope of their employment, animal shelters, veterinary clinics, dog shows or other public exhibitions, dogs travelling through town, service dogs, and therapy dogs. Furthermore, some cities provide exemptions for “good behavior”. For example, in Portsmouth, Ohio, owners of pit bulls who have never bitten anyone are exempt from the insurance requirements, while in Park City, Kansas, dogs who are determined to be sociable by a licensed veterinarian are exempt. In Wapato, Iowa, dogs who pass an obedience test are excepted, and in La

Porte City, Iowa, owners can keep their pit bulls, as long as the dog isn't "vicious." Once again the term "vicious" is not further defined in the ordinance.

### Geographic Patterns

Geographic patterns are visually evident on the maps depicting the declarations, restrictions, and bans in the USA, Figures 5, 6, and 7 respectively. There is a noticeable cluster of breed-specific ordinances in the Midwestern USA, and throughout the country the ordinances appear in clusters rather than being evenly distributed across a state. While there were some DBRFs in the Midwestern USA, the DBRFs covered by the media between 1970 and 2005 were spread throughout the country, with cases occurring from California to Pennsylvania.<sup>114</sup> Although historical records available may not be entirely representative of the media coverage at the time, there does not seem to be a clustering of DBRFs in the Midwestern USA that would explain the high concentration of BSL in these areas. However, American states are very heterogeneous and people with similar ideologies tend to group together,<sup>115</sup> which could explain in part why ordinances are clustered together in certain geographic areas. It is also possible that the geographic clustering in the Midwestern USA parallels overall pet ownership and dog population demographics, especially for medium and large breeds like those typically regulated by BSL. Conceptually medium to large dogs might be more prominent in less densely populated areas where there would be more space available for them, rather than

densely packed urban areas. A future study could explore the relationship between the demographics of pet ownership and the distribution of BSL.

Geographic clustering is further evident in the wording of ordinances, with adjacent jurisdictions frequently having ordinances with *verbatim* language. For example, 11 municipalities in Ohio prohibit debarking of vicious dogs, including pit bulls, yet this prohibition does not appear in any other ordinance reviewed. Additionally, 35 areas in Florida and 18 in Mississippi prohibit pit bulls from being within 50 feet of a school, while schools are only mentioned by 2 other ordinances, 1 in Wisconsin, and 1 in Utah. Moreover, nine municipalities in Wisconsin prohibit pit bulls from apartments or multi-tenant dwellings, restrictions which do not occur in other city ordinances reviewed. Furthermore, five municipalities in Oregon prohibit “fighting breeds”, including pit bulls, from riding in the open area of a vehicle. The prohibition on riding in an open area of a vehicle appeared in no other ordinances reviewed.

The geographic patterns seen in the language of ordinances is most likely due to coercive or mimetic isomorphism, with municipalities in adjacent areas adopting BSL as either a reactive or proactive approach to a DBRF. Additionally sometimes cities choose to adopt or adhere to the county-level ordinances, as is the case with the prohibition on “fighting breeds” (including pit bulls) riding in the open area of a vehicle in Oregon. The cities with this language are all located in Malheur County, and all adhere to the county-level code, which is why they have the exact same wording and unique provision.

## Regulated Breeds

Over 75% of the ordinances only regulated pit bulls, while 21.1% regulated pit bulls and 1 or more breeds, and 4 ordinances did not specifically mention pit bulls. The regulated breeds varied from Chihuahuas to Presa Canarios to Rottweilers. For example, in Hollister, California, Chihuahuas are subject to mandatory spay or neuter, although it is likely that this is in response to the high percentage of Chihuahuas in animal shelters in California, rather than an effort to reduce dog bite injuries.<sup>116,117</sup> Though wolf and coyote hybrids were frequently regulated, this was more commonly seen in rural areas.

One of the four ordinances which did not specifically mention pit bulls, required “vicious” bulldogs and bull terriers to be muzzled in public. It is likely that this ordinance in Blackshear, Georgia was intended to regulate pit bulls, however, bulldogs (or English bulldog) and bull terriers (or English bull terriers) are different breeds. The distinction between these similar sounding breeds highlights the need for precision in legal ordinances, otherwise, the ordinance may not achieve the intended result. While the vast majority of ordinances use specific language to indicate which breeds are banned, and many even give a detailed description of what constitutes that breed, ordinances with ambiguous language can create confusion. The most ambiguous ordinance in regard to the breed being regulated is Saginaw, Michigan which in paragraph C of their dangerous dogs sections declares dangerous and places restrictions on “[a]ny dog of a breed that appears consistently in the top five (5) of the breeds on credible, analytical listings of ‘Most Dangerous Dogs’ as verified and supplemented by local data and records for Saginaw County.” Although the breed-specific ordinance only applies to the

city of Saginaw, and not the entire county, it is likely that the county is referenced because animal control and bite records are kept at the county level. A news article about the ordinance lists bull Mastiffs, German shepherds, pit bulls, Rottweilers, and Presa Canarios as the restricted breeds.<sup>118</sup> However, the list of banned breeds could theoretically change from year to year, and is supposed to be available at the clerk's office and online.<sup>119</sup> While a copy of the list was not sought from the City Clerk's office, review of the city website failed to find the list posted.

#### Unusual Ordinances

The majority of ordinances had many commonalities, but some ordinances held unique or unusual provisions. For example, Waller, Texas, includes a definition for what is considered a pit bull in the definitions section of Chapter 10, which regulates animals and fowl, but has no other breed-specific language throughout the ordinance. It is likely that the ordinance once contained breed-specific language which has since been removed, and that somehow the definition was overlooked, however, this could not be confirmed. In Ashtabula, Oregon, pit bulls are banned and are only allowed if they are adopted from the local humane society. This ordinance was enacted in 2012 and does include a grandfather clause, so theoretically grandfathered dogs could be obtained by the humane society and re-adopted. However, it is common for animal shelters to transfer animals to other cities,<sup>116</sup> and there are no prohibitions to prevent the humane society from acquiring pit bulls from animal shelters in other areas. It is probable that



policy makers never considered this possibility, but simultaneously banning a breed, while allowing for banned animals to be brought in from other areas seems illogical. Many ordinances contained elements that applied to dog parks, while several ordinances contained breed-specific language that exclusively pertained to dog parks. For example, in St. John, Indiana, LaGrange, New York, Johnston, Rhode Island, Mt. Juliet, Tennessee, and Nashville, Tennessee, the only regulatory action is that pit bulls are prohibited from dog parks. In Marietta, Georgia, the only prohibition is that pit bulls and Rottweilers are not allowed in dog parks and off-leash areas. Finally, in Canal Fulton, Ohio, the only BSL in place prohibits Presa Canarios from being off-leash in dog parks.

#### Legal Challenges to Breed-specific Legislation

Previous court challenges to BSL largely consist of two types of claims: 1) BSL is unconstitutional, 2) BSL is too vague. Both of these challenges have repeatedly failed, and the right of municipalities to restrict particular breeds has been upheld.<sup>78,101</sup>

Courts have consistently found that BSL is constitutional.<sup>79</sup> The rationale for this is that animals are treated as property under the law.<sup>101</sup> As such, they do not have inherent rights against discrimination like people do. Additionally, since there is no constitutionally guaranteed right to own a pet, courts have almost universally found that municipalities have the right to legally restrict ownership of certain dog breeds, as long as there is a legitimate reason to do so.<sup>101</sup>

Although court challenges to BSL on the grounds of constitutionality have mostly failed, there have been some cases that prevailed on the grounds of vagueness.<sup>101</sup>

Criteria established by courts for an ordinance to be specific, and thus not vague are:

1) adequate notice to citizens, and 2) adequate standards to prevent arbitrary enforcement.

In most cases, the adequate notice provision can be met by publication of the ordinance in a newspaper and/or on the city's website. Thus, the main challenges have centered on whether or not there were adequate standards to prevent arbitrary enforcement. While discussing the requirement for adequate standards, in *Seattle v. Huff*, the court forbade "statutes that contain no standards and allow police officers, judge, and jury to subjectively decide what conduct the statute proscribes."<sup>101(p. 1554)</sup> They continued, stating that the best standard is whether or not an ordinance "invites an inordinate amount of police discretion."<sup>101(p. 1554)</sup>

One of the main arguments used to claim that all ordinances regulating pit bulls lack adequate standards, and thus must be vague, is the idea that there is no way to discern a pit bull. Proponents of this specific allegation have relied on two major arguments: 1) pit bull is not a breed, but a composite term, and 2) visual inspection is not a reliable method of breed identification.

It is true that pit bull is not a breed in and of itself, but rather is a class of dog composed of three breeds: 1) American pit bull terrier, 2) American Staffordshire terrier, and 3) Staffordshire bull terrier.<sup>120</sup> Dogs which are mixes of any of these three breeds are also considered pit bulls. American pit bull terrier is a recognized breed by the

United Kennel Club (UKC), American Staffordshire terrier is a recognized breed by American Kennel Club (AKC), and the Staffordshire bull terrier is recognized as a breed by both the AKC and the UKC. Breed standards which describe the physical characteristics of these breeds have been developed by the AKC and the UKC.<sup>121-124</sup> Although available DNA tests can determine the breed of a dog,<sup>125</sup> DNA or other scientific testing is not used by the AKC or the UKC to make decisions about whether or not a dog can qualify for competitions or be registered as a member of a particular breed.<sup>126,127</sup> Rather, these decisions are based on lineage and visual inspection of whether or not the dog conforms to the published breed standards.<sup>127-129</sup> In fact visual inspection for conformity to established breed standards is the *industry standard*, and is used by both the AKC and the UKC. The AKC uses visual inspection for conformity to breed standards to determine whether or not a dog is eligible to compete in conformation events,<sup>128</sup> while visual inspection for conformity to breed standards is the sole criterion used by the UKC to determine whether or not a dog is eligible to be registered as a member of a particular breed if lineage information is not available.<sup>129</sup> Except for in a few circumstances, DNA testing of dogs remains voluntary and has only been used by the AKC to determine the parents of registered dogs, or to identify individual dogs in the case of consumer disputes.<sup>126,130-132</sup> Visual identification has also been accepted by courts, who have ruled that a dog owner of reasonable intelligence could recognize a pit bull based upon its unique physical appearance.<sup>133</sup>

The argument that you cannot identify a pit bull by visual inspection, and thus ordinances regulating them are too vague to be enforceable, does not conform to

existing legal standards. There is a misconception that there must be incontrovertible scientific proof that a dog is of the regulated breed in order for an ordinance to be enforceable. Such a standard would require something along the lines of a DNA test. Although DNA testing has been used in some legal challenges of breed-specific ordinances, it may be cost-prohibitive in some situations, and is not required. In fact, courts have found that “impossible standards of specificity are not required” <sup>101(p. 1554)</sup> in order for an ordinance to be enforceable. Rather, the ordinance must merely be “sufficiently definite so that a person of ordinary intelligence can reasonably tell what is prohibited.” <sup>101(p. 1554)</sup> Ordinances which provide detailed descriptions of the breeds that are regulated and/or reference the breed standards published by the AKC and UKC clearly meet this requirement.

In the case of *American Dog Owners Association v. City of Yakima*, the City of Yakima, Washington’s breed-specific ordinance was challenged on the grounds that the ordinance was too vague. However, the court found that the criteria for specificity was met by the ordinance, since the Yakima ordinance used professional breed standards and illustrations that would enable law enforcement officers to make non-subjective decisions.<sup>101</sup>

The ordinances reviewed and categorized for this chapter vary greatly in both the detail and definitions for breeds that are being regulated. For example, Denver Colorado’s ordinance defines a pit bull as “as any dog that is an American Pit Bull Terrier, American Staffordshire Terrier, Staffordshire Bull Terrier, or any dog displaying the majority of physical traits of any one (1) or more of the above breeds, or any dog

exhibiting those distinguishing characteristics which substantially conform to the standards established by the [AKC] or [UKC] for any of the above breeds.” They further note that the “[AKC] and [UKC] standards for the above breeds are on file in the office of the clerk and recorder, ex officio clerk of the City and County of Denver, at City Clerk Filing No. 89457.”

This definition is very detailed and gives specific standards for people to compare an individual dog to. However, some ordinances, such as ordinance 10-28 in Henderson, Tennessee simply state “[i]t shall be unlawful for any person to keep, confine, or allow to run at large within the city limits any pit bull dog.” This statement is the entirety of the ordinance banning pit bulls, and no further definition or explanation is given about what constitutes a pit bull, when the law becomes effective, or what happens to dogs who are already in the city.

Ordinances which do not provide specific descriptions of the breeds affected or standards by which decisions will be made are subject to court challenges and confusion on the part of residents. As such, cities who are considering adopting breed-specific ordinances should consider the criteria for specificity previously established by the courts, and ensure that their ordinance provides: 1) notice, and 2) a sufficient description of the affected breeds, and standards by which decisions about whether or not an individual dog is of the regulated breed will be made. Municipalities who are considering enacting ordinances with breed-specific language should consult ordinances that have already withstood legal challenges and been upheld. Precise terminology,

standards, and definitions will help prevent future legal challenges, and prevent confusion by enabling residents to reasonably comply with the ordinance provisions.

## V. SYSTEMATIC REVIEW OF THE EFFECTIVENESS OF BREED-SPECIFIC LEGISLATION

### Background

#### Breed-specific Legislation

The first recorded BSL was enacted in 1869, when Sacramento, California passed a law to prevent bull dogs (pit bulls) from running loose. Since its inception, BSL has been controversial, with some touting it as an effective method to reduce dog bite injuries, while others claim it is ineffective and have even labelled it “canine racism”.<sup>12</sup> The use of charged language, such as “canine racism” is indicative of the deeply held personal beliefs many people have about BSL. A search of Google Scholar for breed-specific legislation returns 91,800 results, but even a cursory review shows the vast majority rife with non-scientific opinion and anecdotal evidence. Despite the myriad opinions about the efficacy of BSL, very few studies have utilized data to answer this question. Professional opinion can be important in guiding treatment decisions and developing guidelines, but opinion is no substitute for evidence.<sup>134</sup> The Cochrane Collaboration, a group dedicated to organizing medical research in a systematic way,<sup>135</sup> suggests that the quality of evidence that informs professional opinions be evaluated and rated, rather than rating the opinions themselves as a type of evidence.<sup>134</sup>

Furthermore, preliminary searches revealed no studies conducted in the USA that used data to analyze the effectiveness of BSL. Due to the apparent sparse nature of the published literature on the effectiveness of BSL, a systematic search and review of the effectiveness of BSL is warranted.

### Systematic Reviews

A systematic review is the process of appraising and synthesizing evidence from a compiled body of literature to answer a research question of interest. In a systematic review, a formal protocol is developed and followed, encompassing the following steps:

*Step 1:* Formulate a question

*Step 2:* Systematically search for relevant studies

*Step 3:* Evaluate the quality of studies

*Step 4:* Summarize the evidence

*Step 5:* Interpret the findings<sup>136</sup>

Systematic reviews are distinguished from traditional approaches by their explicit and systematic approach.<sup>136</sup> Because of their rigorous approach to answering research questions, systematic reviews are an important element of developing evidence-based policies.<sup>136</sup>

A systematic review may include a meta-analysis component.<sup>137</sup> A meta-analysis encompasses all of the steps of a systematic review, with the addition of statistical techniques to synthesize the data from different studies into a single estimate of effect



size.<sup>138</sup> The computation of a single estimate of effect size aids in quantitatively interpreting the results and answering the research question being explored.

Developing a detailed protocol is essential to conducting a scientifically sound systematic review.<sup>138</sup> Although a standalone protocol can be developed and followed, several reputable published guidelines guide the development of protocols and the systematic review process. These include the Preferred Reporting Items for Statistical Reviews and Meta-analysis (PRISMA) Statement,<sup>139</sup> and the Cochrane Collaboration Handbook for Systematic Reviews of Interventions.<sup>140</sup> The PRISMA Statement<sup>139</sup> guides protocol development and reporting standards, while Cochrane Collaboration Handbook for Systematic Reviews of Interventions,<sup>140</sup> as well as other materials published by the Cochrane Collaboration provide a structured framework for assessing the results and interpreting the results. In order to conduct a methodologically sound systematic review, accepted guidelines such as these should be employed where appropriate.

### Objectives

The specific objectives of the systematic review of the effectiveness of BSL are:

- i. Locate all studies published in peer-reviewed journals or as a thesis that utilized empirical data to evaluate the effectiveness of BSL
- ii. Assess the quality of the studies
- iii. Synthesize current knowledge on the effectiveness of BSL
- iv. If possible, perform a meta-analysis on the effectiveness of BSL

- v. Answer the question: is BSL effective at reducing dog bite injuries?
- vi. Identify gaps in the scientific knowledge regarding BSL
- vii. Delineate the challenges to empirically evaluating BSL
- viii. Develop a framework for future research on the effectiveness of BSL

## Methods

### Data Sources

Studies were located by querying the CABI, CINAHL, PAIS Intl., PubMed, SCOPUS, and WorldCat Theses databases. After consultation with veterinary medicine librarians, these databases were chosen, because they span the academic fields of health, medicine, veterinary medicine, policy, global health, injury prevention, and academic theses. A search string to be utilized was also developed in consultation with veterinary medicine librarians. The keywords used in the search string were selected to return relevant items, while reducing as many spurious items as possible. The search string used to conduct the query was:

(dog\* or canine) AND (law or legislation) AND (breed).

Additional articles were sought from the reference section of included articles.

Detailed search methods and results for each database are presented in appendix B.

### Inclusion Criteria

Studies which utilized empirical data to analyze the effectiveness of BSL and were published in a peer-reviewed journal or completed as part of a thesis after 1980 were eligible for inclusion. To evaluate the effectiveness of the legislation in reducing dog bite injuries, studies must include data related to dog bite injuries from two time periods (pre-BSL and post-BSL) and/or from two comparison groups (one with BSL and one without BSL). Since BSL was popularized in the 1980s, 1980 was chosen as the beginning of the timeframe. Studies published as of the date that the search was completed in March of 2015 were eligible for inclusion. No geographic limitations were imposed.

### Exclusion Criteria

Studies without empirical data quantifying dog bite injuries were excluded. Additionally, studies which neither relate the data to the effectiveness of the legislation in reducing dog bite injuries, nor provide sufficient data to calculate measures of effect were excluded.

### Data Extraction and Synthesis

Information on the author(s), publication date, study purpose, study location, study design, how the sample was selected, comparison group utilized, outcome measures, rate, mean, standard deviation or standard error, confidence intervals (CIs),

p-value, effect size, response rate (where applicable), and study conclusions were abstracted from each included article. The summary of findings and assessment of quality were conducted according to the GRADE approach.

### Quality Assessment

The GRADE system “offers a transparent and structured process for developing and presenting summaries of evidence, including its quality”.<sup>16(p. 384)</sup> Using this approach, the quality of each individual study is not determined, but rather the quality of the entire body of literature is addressed as a whole. This is done by considering the specifics of each individual study, then drawing conclusions about the body of literature. In evaluating the quality of the body of literature, the GRADE approach specifically addresses the methodological flaws of studies, the consistency of results across studies, the generalizability of findings, and the demonstrated effectiveness of treatments.<sup>141</sup> According to the GRADE approach, the assessment of the quality of the body of literature begins with a score of four for randomized controlled trials and two for observational or non-randomized studies. The body of literature is then evaluated and possibly downgraded for risk of bias, inconsistency, indirectness, imprecision, and/or publication bias. Conversely, the quality of the evidence can be upgraded if large effect sizes or a dose-response relationship are present, and/or if the study design was conservative in controlling for possible confounding. The result of the GRADE scoring system is a numerical score on a scale of one to four, which represents the quality of the

body of evidence, with one being the lowest and four being the highest quality. The interpretation of the quality levels is depicted in Table 4. An explanation of each variable that may result in either downgrading or upgrading the quality of the evidence is presented in Tables 5 and 6 respectively, and the process for evaluating evidence according to the GRADE system is depicted in Table 7.

**Table 4.** Interpretation of GRADE Quality Levels\*

<b>Quality Level</b>	<b>Interpretation</b>
4 = High (⊕ ⊕ ⊕ ⊕)	We are very confident that the true effect lies close to that of the estimate of the effect.
3 = Moderate (⊕ ⊕ ⊕ ○)	We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
2 = Low (⊕ ⊕ ○ ○)	Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
1 = Very Low (⊕ ○ ○ ○)	We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

\*Adapted from Balshem et al.<sup>134</sup>

**Table 5.** Criteria for Downgrading Evidence

<b>Variable</b>	<b>Explanation</b>
Risk of bias	Potential sources for bias include loss to follow up, inadequate control group, sampling bias, response bias, and failure to control for confounding. Bias should be assessed for each outcome of interest.
Inconsistency	Inconsistency evaluates the similarity of direction and magnitude of effects from various studies. Differing outcomes do not automatically mean there is inconsistency. Similarity in point estimates, extent of overlap of the confidence intervals, and tests of heterogeneity can all be used to determine inconsistency.
Indirectness	Indirectness deals with the extent to which the results can be generalized to a broader population. It is determined by evaluating whether or not the study participants are representative of those of interest, and if the study was designed in such a way that it accurately evaluates what it aims to measure.
Imprecision	Imprecision evaluates the preciseness of the estimates by examining the 95% confidence intervals. Imprecision is present if the confidence intervals is overly wide or if the clinical recommendation would vary based on utilizing the upper versus lower boundary.
Publication bias	Publication bias occurs when the published literature is not representative of the studies that have been conducted. This may occur due to selective reporting, or due to studies with positive results being more likely to be selected for publication.

**Table 6.** Criteria for Upgrading Evidence

<b>Variable</b>	<b>Explanation</b>
Large effect sizes	The presence of large effect sizes across the body of evidence may be cause for rating up. However, the evidence should only be rated up if the estimate of a large effect is accurate, and not likely due to bias or a spurious result.*
Dose-response	A dose-response relationship occurs when the treatment effect is more pronounced with increasing doses. The presence of a dose-response relationship increases confidence in the effect that is seen.
All plausible confounding controlled	Evidence may be rated up if all plausible confounders were accounted for in the study designs.

\*for this study, presence of a large effect was defined as rate ratio less than 0.8

**Table 7.** GRADE Approach Scoring Process

Study design	Initial quality of a body of evidence	Lower if	Higher if	Quality of a body of evidence
Randomized trials	High →	<b>Risk of bias</b> -1 serious -2 very serious	<b>Large effect*</b> +1 large +2 large	High (four plus: ⊕ ⊕ ⊕ ⊕)
		<b>Inconsistency</b> -1 serious -2 very serious	<b>Dose response</b> +1 if evidence of a gradient	Moderate (three plus: ⊕ ⊕ ⊕ ○)
Observational/ non-randomized studies	Low →	<b>Indirectness</b> -1 serious -2 very serious	<b>Confounding considered appropriately</b> +1 may have underestimated effect  +1 would suggest a spurious effect if no effect was observed	Low (two plus: ⊕ ⊕ ○ ○)
		<b>Imprecision</b> -1 serious -2 very serious		Very low (one plus: ⊕ ○ ○ ○)
		<b>Publication Bias</b> -1 serious -2 very serious		

\*for this study, presence of a large effect was defined as a rate ratio less than 0.8, and the presence of a very large effect was defined as a rate ratio of less than 0.5

## Results

### Search Results

The search of the selected databases yielded 409 documents. An additional four articles were located from the reference section of relevant articles. This resulted in a total of 413 studies, of which 92 were duplicates, leaving 321 unique items. Review of article/theses titles excluded another 77 items, while abstract review excluded an additional 161 studies. The full text was located and reviewed for 83 studies, including 13 articles in foreign languages which could not be eliminated on the basis of the title or abstract (if available) alone. Native speakers were located and asked to provide an informal translation of these items. The distribution of languages for foreign language articles that were reviewed by a native speaker is depicted in Table 8.

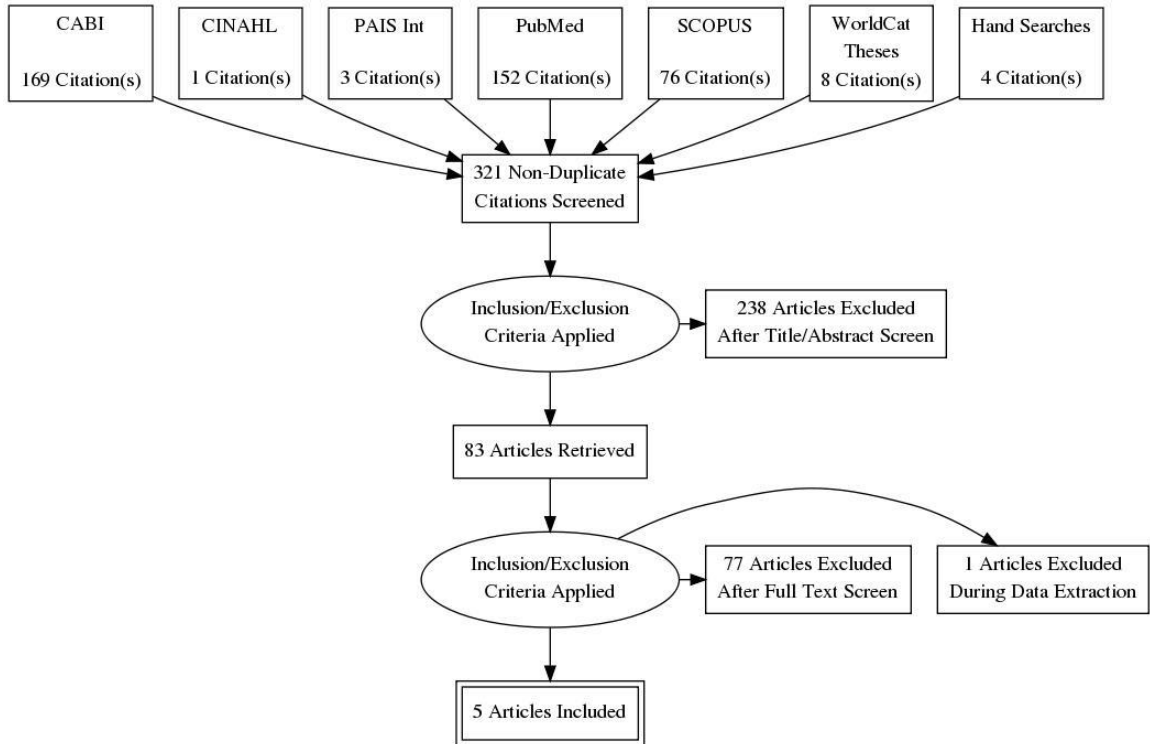
**Table 8.** Distribution of Foreign Languages Reviewed by a Native Speaker

<b>Language</b>	<b>Number of Results</b>
Danish	6
German	5
Hungarian	1
Italian	1
<b>Total</b>	<b>13</b>

While none of the foreign articles reviewed by native speakers meet the inclusion criteria, having them translated and considered was a necessary step in order to conduct a thorough search for studies which utilized empirical data to evaluate the



effectiveness of BSL. Including the foreign language articles, another 77 items were excluded during the full text review, because they did not meet the study criteria. This resulted in only 5 articles and 1 thesis which met the inclusion criteria. However, during data extraction, two of the items were determined to be based off of the same study. Clarke originally conducted a study as part of a thesis,<sup>142</sup> and subsequently prepared a peer-reviewed article from the same information.<sup>96</sup> Both items were reviewed carefully to ensure that the published article did not contain additional or updated information. Once it was determined that they both utilized the exact same data, only the published paper was retained in the analysis. This resulted in a total of five articles which met the inclusion criteria. Detailed search methods and results for each database are presented in appendix B. Additionally, the study selection process is depicted in Figure 10, while the articles which met the inclusion criteria are presented in Table 9.



**Figure 10:** Study Selection Process

**Table 9.** Articles Meeting Inclusion Criteria

<b>Authors</b>	<b>Date</b>	<b>Title</b>	<b>Journal</b>
Clarke NM, Fraser D	2013	Animal control measures and their relationship to the reported incidence of dog bites in urban Canadian municipalities.	Canadian Veterinary Journal
Klaassen B, Buckley JR, Esmail A	1996	Does the Dangerous Dogs Act protect against animal attacks: A prospective study of mammalian bites in the accident and emergency department.	Injury
Raghavan M, Martens PJ, Chateau D, Burchill C	2012	Effectiveness of breed-specific legislation in decreasing the incidence of dog-bite injury hospitalisations in people in the Canadian province of Manitoba.	Injury Prevention
Rosado B, Garcia-Belenguer S, Leon M, Palacio J	2007	Spanish dangerous animals act: Effect on the epidemiology of dog bites.	Journal of Veterinary Behavior: Clinical Applications and Research
Villalbí JR, Cleries M, Bouis S, Peracho V, Duran J, Casas C	2010	Decline in hospitalisations due to dog bite injuries in Catalonia, 1997-2008.	Injury Prevention

Since BSL is a wide-reaching topic, it was theorized that published literature could be found in a wide variety of disciplines ranging from public health, to health policy, to law, to veterinary medicine. Because of this, the search process cast a wide net, searching six databases spanning the breadth of possible topic areas. While this was

a conservative process to ensure that all relevant items were located, it was also a more time-intensive endeavor, since it resulted in more spurious and duplicate items being returned in the search. In order to refine future systematic reviews and literature reviews on BSL, it is informative to evaluate which database(s) returned the relevant items. By so doing, future reviews may be able to limit their search process to only relevant databases. Analysis of the source of included items showed that Clarke's thesis<sup>142</sup> and the article by Villalbí et al.<sup>98</sup> were only found by the WorldCat Theses database and CABI respectively, while all of the other items were found by two or more databases. All of the relevant articles except for Klaassen et al. were located by CABI. The source(s) for each included item are depicted in Table 10.

**Table 10.** Source Database(s) for Included Articles

<b>Lead Author</b>	<b>Date</b>	<b>Number of Results</b>	<b>Databases</b>
Clarke*	2009	1	WorldCat Theses
Clarke	2013	3	CABI PubMed SCOPUS
Klaassen	1996	2	PubMed SCOPUS
Raghavan	2012	4	CABI CINAHL PubMed SCOPUS
Rosado	2007	2	CABI SCOPUS
Villalbí	2010	1	CABI

\*thesis

The included articles were published between 1996 and 2013. The study locations were Canada, UK, and Spain. No studies which met the inclusion criteria were based in the USA. The primary or secondary purpose of each study was to evaluate the effectiveness of BSL at reducing dog bite injuries, but the methods of the included articles varied widely. Raghavan et al.,<sup>72</sup> Rosado et al.,<sup>143</sup> and Villalbí et al.<sup>98</sup> utilized existing data sources, while Clarke and Fraser,<sup>96</sup> and Klaassen et al.<sup>97</sup> used surveys to collect data. The outcome measures examined also varied widely with Clarke and Fraser<sup>96</sup> analyzing the number of dog bites reported to animal control, Klaassen et al.<sup>97</sup> evaluating the number of patients presenting to an ED, Raghavan et al.<sup>72</sup> and Villalbí et al.<sup>98</sup> investigating the number of DBIH, and Rosado et al.<sup>143</sup> examining the number of dog bites reported to the public health department. The lead author, publication date, study location, study design, and study conclusions for each included article are presented in Table 11, while additional information on the sample selection method, comparison groups, and outcome measures is presented in Table 12.

**Table 11.** Summary of Included Articles

<b>Lead Author</b>	<b>Date</b>	<b>Study Location</b>	<b>Study Purpose</b>	<b>Study Design</b>	<b>Conclusions</b>
Clarke	2013	Canada	To identify the urban dog bite rate, and animal control strategies that reduce incidence.	Cross-sectional	Minimal difference was detected in the bite rate between jurisdictions with and without breed-specific legislation. Reported bite rates were lower in jurisdictions with higher ticketing rates.
Klaassen	1996	Scotland, United Kingdom	To determine the effect of Dangerous Dogs Act of 1991 on the frequency and severity of mammalian bites.	Pre-test/ post-test	Total number of dog bites observed was the same in both time periods. Authors conclude that the Dangerous Dogs Act does little to reduce incidence.
Raghavan	2012	Canada	To examine the effectiveness of breed-specific legislation in Manitoba Canada.	Longitudinal	Breed-specific legislation may have resulted in a reduction of dog bite injury hospitalizations in urban populations. The effect was more pronounced in those aged <20 years.
Rosado	2007	Aragon, Spain	To assess the impact of the Spanish Dangerous Dogs Act on the epidemiology of dog bites.	Longitudinal	Reported dog bite rates in rural areas increased during the study period. Bite rates did decrease for the urban population, but this difference was not statistically significant.
Villalbí	2010	Catalonia, Spain	To analyze rates of dog bite injury hospitalizations before and after changes in legal regulations on dog ownership.	Longitudinal	During the study period, there was a 38% reduction in dog bite injury hospitalizations. The effect was more pronounced in rural areas.

**Table 12.** Methods of Included Articles

<b>Lead Author</b>	<b>Date</b>	<b>Sample Selection Method</b>	<b>Comparison Groups</b>	<b>Outcome Measure</b>
Clarke	2013	Surveys were sent to the animal control department of all Canadian municipalities with a population >30,000.	Jurisdictions with and without BSL.	Rate of dog bites reported to animal control departments.
Klaassen	1996	During two three-month time periods, patients presenting to the emergency department for a dog bite injury were surveyed regarding the circumstances of the injury. Medical staff provided information on treatment.	Number of dog bites presenting to a Scottish emergency department in time periods before and after implementation of the Dangerous Dogs Act.	Emergency department visits for dog bite related injuries.
Raghavan	2012	Hospital data was used to identify patients with dog bite injuries.	Jurisdictions with BSL were compared to themselves in the pre- and post-BSL periods; jurisdictions with BSL were also compared to areas without BSL.	Dog bite injury hospitalizations.
Rosado	2007	Data on reported dog bites was gathered from public health departments.	Number of reported dog bites before and after regulation changes.	Rate of dog bites reported to public health departments.
Villalbí	2010	Hospital data was used to identify patients with dog bite injuries.	Number of dog bite injury hospitalizations before and after regulation changes.	Dog bite injury hospitalizations.

Several of the studies had multiple outcome measures; for the purposes of this systematic review, information was abstracted for the outcome measure that would best determine the effectiveness of BSL in reducing dog bite injuries. For each study, the available information on the mean, rates, standard deviation or standard error, 95% CIs, p-value, and effect size were abstracted. Rates were presented for four of the five articles, while standard deviation was not reported by any of them. However, Rosado et al.<sup>143</sup> did report the standard error. A 95% CI was presented by Raghavan et al.<sup>72</sup> and Villalbí et al.<sup>98</sup> The exact numeric p-value for the outcome of interest was only given by Raghavan et al.,<sup>72</sup> Rosado et al.<sup>143</sup> reported the p-value as not significant, while the other studies did not include any information on the p-value. Effect size was reported by Raghavan et al.<sup>72</sup> and Villalbí et al.<sup>98</sup> as a -25.5% and -38% reduction in DBIH respectively. The other studies did not provide a measure of effect. Due to the differing outcome measures across the studies and the failure of several of them to report effect size or requisite information to calculate effect size, a meta-analysis could not be performed. Information on the lead author, publication date, rate, standard error, 95% CI, p-value, percent change, and rate ratio are presented in Table 13.



**Table 13.** Results of Included Articles

Lead Author	Date	Rate	Standard Error	95% Confidence Interval	P-value	Percent Change	Rate Ratio	
Clarke	2013	Non-BSL	1.7/10,000 persons	NR for bite rates	NR	NR	NR	
		BSL	1.8/10,000 persons					
Klaassen	1996	NR	NR	NR	NR	NR	NR	
Raghavan	2012	Non-BSL	7.09/100,000 person-years	NR	(6.19, 8.08)	0.002	-25.5%*	.75
		BSL	5.15/100,000 person-years		(4.38, 6.03)		-27.4%* <sup>†</sup>	.73 <sup>†</sup>
Rosado	2007	1995-9	<b>Rural Urban</b>	<b>Rural Urban</b>	NR	NS	NR	NR
		2000-1 <sup>§</sup>	71.8 <sup>‡</sup> 18.6	3.9 3.9				
		2003-4	77.3 14.8	5.3 4.8				
			73.1 6.0	5.2 4.8				
Villalbí	2010	1997-9	1.80/100,000 persons	NR	(1.47, 2.13)	NR	-38% <sup>  </sup>	.62
		2000-2 <sup>§</sup>	1.45/100,000 persons		(1.16, 1.75)			
		2003-5	1.24/100,000 persons		(0.98, 1.5)			
		2006-8	1.11/100,000 persons		(0.87, 1.36)			

NR = Not Reported

NS = Not Significant

\*difference in rate of dog bite injury hospitalizations in areas with BSL

<sup>†</sup>for those <20 years of age

<sup>‡</sup>rates per 100,000 persons

<sup>§</sup>Spanish Dangerous Dogs Act was enacted in 2002

<sup>||</sup>decline in dog bite injury hospitalizations during the study time period

## Quality Assessment

The quality of the body of literature was assessed using the GRADE system. Since each of the included studies were non-randomized, the rating began with a value of two. The body of evidence was then evaluated to determine if downgrading was warranted for risk of bias, inconsistency, indirectness, imprecision, or publication bias.

Potential sources of bias identified were failure to control for temporal trends, failure to have data for an adequate time period prior to BSL being enacted, recall bias, low response rates, and voluntary response bias. The majority of studies had issues with potential bias, therefore, the risk of bias was classified as serious and 1 point was subtracted from the quality score. The summary of the assessment of bias for each study is presented in Table 14.

**Table 14.** Assessment of Bias

Lead Author	Date	Control for Temporal Trends	Inadequate Time Period	Recall Bias	Response Bias	Personal Bias Evident in Discussion
Clarke	2013	H	U	H	H	H
Klaassen	1996	H	H	H	H	H
Raghavan	2012	U	L	L	L	L
Rosado	2007	H	L	H	U	H
Villalbí	2010	H	L	L	L	L

L (green) = Low Risk; U (yellow) = Unclear Risk; H (red) = High Risk

Reasons to downgrade for inconsistency include differing point estimates, CIs with little or no overlap, a significant test for heterogeneity, and a high  $I^2$  score, which quantifies the proportion of variation between estimates.<sup>144</sup> There were inconsistent

results in the point estimates between the studies, with some showing effect and others showing no effect. However, according to the GRADE system, differing results alone is insufficient to downgrade for inconsistency.<sup>144</sup> Rather, reviewers should look for differences in the study methodologies or populations that might explain the presence of differing point estimates. Although each study gave different estimates for dog bite rates, with the range being 17/ 100,000 persons<sup>96</sup> to 71.8/ 100,000 persons,<sup>143</sup> the studies were conducted in various countries with dissimilar populations. Thus the discrepancy in dog bites could theoretically be explained by the differences in population and study design. Comparing CIs was not possible, since a CI for dog bite injuries, or requisite statistics to calculate it, were not provided by Clarke and Fraser,<sup>96</sup> Klaassen et. al.,<sup>97</sup> or Rosado et al.<sup>143</sup> As such, neither a statistical test for heterogeneity, nor calculation of the  $I^2$  value were possible. The missing information ultimately made it impossible to properly assess inconsistency, thus possible downgrading for inconsistency was revisited during the development of the summary score.

All of the studies had appropriate populations and measurements to assess what they purported to measure, meaning that indirectness was unlikely. Therefore, no points were deducted for indirectness.

Imprecision is determined by computing and evaluating the pooled 95% CI, as well as whether or not the clinical determination would vary based on analysis utilizing the upper or lower limit of the 95% CI, and by determining if sample sizes were adequate.<sup>145</sup> However, a pooled CI could not be computed, since Clarke and Fraser,<sup>96</sup> Klaassen et al.,<sup>97</sup> Rosado et al.,<sup>143</sup> presented neither CIs nor requisite statistics to

calculate them. Despite the use of different sample populations, the sample sizes across the studies seemed adequate for the study design and objectives. However, the missing information ultimately made it impossible to properly assess imprecision, thus possible downgrading for imprecision was revisited during the development of the summary score.

Since BSL is such a controversial topic and there are very few published studies which utilized data to analyze its effectiveness, it is likely that any articles on this topic would be accepted for publication by a reputable journal. However, since people have deeply held personal beliefs on BSL, it is possible that authors might selectively report outcomes, meaning that if the results of their analysis did not support their personal beliefs they might not write up the results and submit them for publication. However, due to the use of different outcome measures across the studies, a funnel plot could not be developed to formally evaluate publication bias. Since there is no evidence that selective reporting has occurred, and we must give the benefit of the doubt to the academic integrity of researchers, publication bias was determined to be unlikely, and no points were subtracted.

The result of the downgrading process was one category that rated as serious and a point was deducted (bias), two categories where it was unlikely (indirectness and publication bias), and two categories where it was unclear, but there were major concerns (inconsistency and imprecision). The proponents of the GRADE system recognize that reviewers must use their judgment, and that there will be some situations where the proper action is unclear.<sup>146</sup> According to published guidelines,

reviewers must use their best judgement and if, after review, there are multiple categories of concern that did not rise to the level of deducting a point for each category, a point may be deducted from the overall score.<sup>146</sup> In accordance with these guidelines, and due to the concerns regarding the missing information for evaluating inconsistency and imprecision, one point was deducted from the total score, bringing the overall quality score for the body of literature to 0, or *very low* quality.

Up-rating the quality of evidence is rare, but may be justified if the body of evidence demonstrates large effect sizes, there is the presence of a dose-response relationship, or plausible confounding was controlled for in a way that may underestimate the presence of an effect.<sup>147</sup> Three of the studies, Raghavan et al.,<sup>72</sup> Rosado et al.,<sup>143</sup> and Villalbí et al.,<sup>98</sup> reported an effect in one or more subgroups. However, the other two studies showed either no effect or minimal effect. Additionally, according the GRADE system, the quality of evidence should not be rated up for large effect sizes if the effect sizes seen are likely to be the result of confounding or if there are concerns about other issues, such as the risk of bias or imprecision.<sup>147</sup> In this case, Raghavan et al.<sup>72</sup> was the only study which reported large effects for one or more groups and did not have one or more serious potential issues with bias. Therefore, the quality of evidence was not rated up for the presence of a large effect. None of the studies explored the presence of a dose-response relationship, therefore the evidence was not rated up for this criteria either. Only one of the studies, Raghavan et al.,<sup>72</sup> controlled for plausible confounding in a conservative way. In this study, there were several jurisdictions which had some type of BSL that placed restrictions on certain

breeds, but did not ban them. For analysis, these jurisdictions were placed into the non-BSL group, which was then compared to the BSL group. Including several jurisdictions with a type of BSL in the control group was a conservative procedure, which could possibly have underestimated the presence of an effect. However, since only one study controlled for plausible confounding in a way that may underestimate the demonstrated effect, the body of evidence was not upgraded for this criteria either.

After completing the downgrading and upgrading process, the overall score for the body of evidence was 0, or *very low*.

#### Summary of Findings

Raghavan et al.<sup>72</sup> reported lower rates of DBIH in areas of Canada with BSL; Villalbí et al.<sup>98</sup> reported that rates of DBIH in Catalonia, Spain declined after BSL was enacted; Rosado et al.<sup>143</sup> demonstrated that once BSL was implemented, the rate of reported dog bites in Argon, Spain decreased in urban, but not rural populations; Clarke and Fraser<sup>96</sup> showed minor differences in the rate of reported dog bites for Canadian jurisdictions with and without BSL; and Klaassen et al.<sup>97</sup> reported no difference in the number of patients presenting to a Scottish ED with dog bite injuries before and after BSL had been enacted. The overall question of interest for this review was: is BSL effective at reducing dog bite injuries? When the body of evidence is evaluated as whole, no consensus emerges on whether or not BSL is effective at reducing dog bite

injuries. However, considering the different outcome measures utilized across the five studies, three sub-questions (SQs) emerge:

- 1) Does BSL reduce the number of reported dog bites?
- 2) Does BSL reduce the number of dog bite injuries treated at EDs?
- 3) Does BSL reduce the number of DBIH?

The results for these SQs are as follows:

SQ1: Does BSL reduce the number of reported dog bites?

Two studies, Clarke and Fraser<sup>96</sup> and Rosado et al.,<sup>143</sup> evaluated the impact of BSL on reported dog bites. Although Rosado et al.<sup>143</sup> examined the number of dog bites reported to public health departments and Clarke and Fraser<sup>96</sup> evaluated the number of dog bites reported to animal control, these outcome measures are sufficiently similar to warrant grouping them together. Rosado et al.<sup>143</sup> showed a reduction in reported dog bite rates in urban populations, but not rural populations, while Clarke and Fraser<sup>96</sup> found nearly identical reported dog bite rates for jurisdictions with and without BSL. However, Clarke and Fraser<sup>96</sup> did not separate their analysis for urban and rural jurisdictions. No standard deviations, standard errors, CIs, or p-values were provided by Clarke and Fraser,<sup>96</sup> while Rosado et al.<sup>143</sup> reported a standard error, but no CI or exact p-value.

Using the same criteria as above, the overall quality score for the question does BSL reduce the number of reported dog bites is 0, or *very low*.

SQ2: Does BSL reduce the number of dog bite injuries treated at EDs?

Klaassen et al.<sup>97</sup> was the only study which examined the number of dog bite injuries treated in an ED, reporting the number of patients presenting to the ED during a three month time period before and after the legislation was passed. The number of patients with dog bite injuries was identical in both time periods. Only the raw number of patients was given, no general population information, means, rates, CIs, or p-values were provided.

Using the same criteria as above the overall quality score for the question does BSL reduce the number of dog bite injuries treated at EDs is 0, or *very low*.

SQ3: Does BSL reduce the number of DBIH?

Both Raghavan et al.<sup>72</sup> and Villalbí et al.<sup>98</sup> evaluated the number of DBIH over a >10 year time period, and both reported lower DBIH in groups with BSL, with -25.5% and -38% lower rates of DBIH being reported respectively. Raghavan et al.<sup>72</sup> studied cities in Manitoba Canada, while Villalbí et al.<sup>98</sup> studied Catalonia, Spain. On one hand, BSL in Canada is enacted at the city-level, and some cities have restrictions while others have bans. On the other hand, Spain has nationwide BSL which does not ban “dangerous dogs”, but does require special registration and insurance.

A more marked difference was shown in rural areas by Villalbí et al.,<sup>98</sup> while Raghavan et al.<sup>72</sup> did not report results comparing the DBIH rate for urban versus rural populations with and without BSL. When utilizing each jurisdiction as its own control to compare DBIH pre-BSL and post-BSL, Raghavan et. al.<sup>72</sup> did not find a significant effect.



The authors suggest that this particular analytic method may have had low power to detect an effect due to the small sample sizes in the rural areas. Raghavan et al.<sup>72</sup> also reported a more pronounced difference in the DBIH rate for those <20 years of age in areas with BSL, with a -27.4% lower DBIH rate for this age group. Raghavan et al.<sup>72</sup> presented means, 95% CIs, and p-values. Villalbí et al.<sup>98</sup> did not report standard deviation or standard error, CIs, or p-values.

Using the same criteria as above the overall quality score for the question does BSL reduce the number of DBIH is 2, or *low*.

## Discussion

### Search Process

Since BSL is such a wide-reaching topic, it posed unique challenges to determining which databases to search and developing a search string that would result in an accurate and efficient search. The expertise of veterinary medicine librarians proved instrumental to the process. During a systematic review, it is ideal to search only a few databases, so that the number of spurious results is reduced. However, it soon became apparent that because of the wide scope of BSL that items may be published in various specialty areas, such as health policy or law, and thus would be missed by exclusively searching traditional medical or science databases. This idea was bolstered by evidence that the inclusion of specialty databases in a systematic review can identify

additional relevant items for inclusion.<sup>148</sup> Librarians are experts at searching for records, and the valuable role that they can play in systematic reviews is recognized by both PRISMA and the Cochrane Collaboration.<sup>149-152</sup> Because of their expert knowledge, the librarians consulted for this review had a tremendous understanding of the content that each database was searching, and were able to guide the selection of databases that had a wide reach, while minimizing overlap. Ultimately the CABI, CINAHL, PAIS Intl., PubMed, SCOPUS, and WorldCat Theses databases were selected. CABI was the most fruitful database, locating four of the six items which met the inclusion criteria. The only items not located by CABI were the theses by Clarke,<sup>142</sup> and the article by Klaassen et al.<sup>97</sup> Clarke's thesis<sup>142</sup> was retrieved by WorldCat Theses, and the article by Klaassen et al. was located by both PubMed and SCOPUS. The only item located by CINAHL was the article by Raghavan et al.,<sup>72</sup> which was also found by three other databases, while PAIS Intl. did not locate any included items. Considering these results, future reviews of the effectiveness of BSL could reliably remove CINAHL, PAIS Intl., and either PubMed or SCOPUS from the search methodology. Based on this review, the most relevant databases to search for articles and theses on the effectiveness of BSL are CABI, either SCOPUS or PubMed, and WorldCat Theses. However, the number of results being returned by a database should be considered in the decision of whether or not to remove a database from the search methodology. For example, CINAHL and PAIS Intl. combined only contributed a total of four items, and review of these additional items was not overly cumbersome. On the other hand, PubMed and Scopus combined resulted in 228 results. Eliminating one of these databases could save significant time in

analyzing the results, which could potentially enable searching with a broader search string than was utilized in the present study.

The development of the search string also posed challenges, since the keywords for BSL involve some very common terms like dog, breed, and law. During pilot searches, utilization of these key words without any modifiers resulted in thousands of results. After consultation with the librarians assisting with the project, and pilot searches, the most accurate and efficient search string possible was selected as:

(dog\* or canine) AND (law or legislation) AND (breed).

After review of the search results and relevant articles, a possible shortcoming in the search string utilized is that the words “pit bull” and “ban” were not included. In pilot searches, these keywords resulted in thousands of results, however, in conjunction with the developed search string, they may add additional value. Based on these experiences, a suggested search string for future studies on the effectiveness of BSL is:

(dog\* or canine or pit bull) AND (law or legislation or ban) AND (breed).

### Summary of Findings

The reliance on anecdotal evidence<sup>153</sup> or personal opinion in debating BSL is highlighted by the present study, which located numerous items which discussed BSL, however, only five of them used data to evaluate its effectiveness. Even the articles frequently cited in discussion of BSL might not actually have sufficient data to evaluate its effectiveness. For example, an article by Cornelissen and Hopster<sup>154</sup> which discusses

dog bites and BSL is frequently cited in the discussion of BSL. However, review of this article showed data from a single time-point and no comparison group. Therefore, although this article discusses BSL and has data on dog bite injuries, there is no way from the data presented to evaluate the effectiveness of BSL at reducing dog bite injuries. The sparse number of studies utilizing data to evaluate BSL is not necessarily indicative of a lack of interest on the part of researchers. Rather, there seem to be many researchers interested in evaluating BSL. However, there are myriad challenges to obtaining suitable data for analysis, including the lack of standards in data collection and warehousing.

Doubtless, different data are being collected after a dog bite report in various nations, but the data collection is inconsistent even between municipalities in the same country. In the USA, for example, there are no standards on what information must be collected on a dog bite report form. It is up to each state or local jurisdiction to determine what information to collect. The result is that some jurisdictions have a single-page form, while others have four-page long reports. Samples of dog bite reporting forms for Macomb County, Michigan and the State of Indiana, who have one-page and three-page long dog bite report forms respectively, are provided in appendices C and D for comparison purposes. Given the discrepancy in the length of the forms, obviously these jurisdictions are collecting very different amounts of information. Two areas where dog bite report forms frequently differ are in the collection of information on: 1) the suspected breed of the dog(s) involved, and 2) an indicator of the severity of the injury. While it is helpful to have breed information, it is not crucial, since the

effectiveness of BSL could be determined by utilizing overall dog bite rates. Although it is not crucial to have information on the breed of the dog involved, it *is* crucial to have information on the severity of the bite. Under current data collection and analysis methodologies, the severity of an injury is rarely taken into account, meaning that a minor bite that does not break the skin is lumped together with an injury that requires hospitalization or reconstructive surgery. With the exception of Hollister, California, which requires mandatory spaying and neutering for Chihuahuas, the breeds regulated by BSL are large breeds or breeds capable of inflicting severe damage;<sup>155</sup> it stands to reason that restricting or banning these breeds could result in a greater reduction of severe bites.

Although most jurisdictions in the USA collect at least some information on reported dog bites, this information is frequently inaccessible to researchers. Many jurisdictions simply do not have the staff or equipment necessary to digitize the information once it is collected. Depending on local requirements, and the level of compliance, some limited information, such as total number of bites, may or may not be relayed to the state and/or to the CDC, but then the forms may merely be placed in file folders and stacked in a warehouse. Researchers have noted the need for a central storage location or national repository for dog bite data for many years.<sup>39</sup> Until such a mechanism is provided for this data to become available to researchers, it will remain difficult for necessary research to be conducted.

Given these challenges, the best sources for reliable data on dog bite injuries in the USA is primary data collection and hospitalization data. Primary data collection

would have to occur in multiple jurisdictions simultaneously, and is likely to be a time-consuming undertaking. Realistically then, the best source of data on dog bite injuries is hospitalization data. While hospitalization data would not be representative of all dog bite injuries, it would likely be representative of severe injuries. In fact, in the absence of other indicators, hospitalization can be a proxy measure for severity. Since the most severe bites cause the greatest damage to individuals and result in greater cost to the healthcare system, the reduction in severe bites is arguably the most important outcome of BSL. Although hospitalization data may be the most reliable data source to obtain, in the USA there are many different payers and laws regarding patient privacy involved in the healthcare system, which can hinder access to suitable data. A focus on evidence-based policies and data sharing is needed to make this data more accessible.

The overall question of interest for this systematic review was: is BSL effective at reducing dog bite injuries? Despite the ambiguous nature of the located studies, it does appear that BSL may be effective and that this effect may be more pronounced in subgroups, however, no substantive conclusions can be made. Additionally, given the *very low* quality of the body of evidence for the global effectiveness of BSL, we would have very little confidence in any overall estimates of effect. However, considering the numerous ways that dog bite injuries may be detected, this question may be overly broad, and the evidence should be considered according to the following emergent SQs.

SQ1: Does BSL reduce the number of reported dog bites?

Both Clarke and Fraser<sup>96</sup> and Rosado et al.<sup>143</sup> collected information on reported dog bites. Although Clarke and Fraser<sup>96</sup> utilized information provided by animal control departments and Rosado et al.<sup>143</sup> utilized information collected by public health departments, these sources are sufficiently similar to warrant grouping. As seen during the assessment of quality, both of these studies potentially had issues with bias. Clarke and Fraser<sup>96</sup> compiled their data via a survey sent out to 86 jurisdictions throughout Canada. Only 36 jurisdictions responded to the survey, and of those only 22 provided information on dog bites. While the response rate for dog bite information was not provided by Clarke and Fraser,<sup>96</sup> it can be calculated as 22.8%. While this type of a response rate would typically be considered good for survey data, it is problematic to utilize data reported by only 22.8% of your sample as your basis for determining the rate of dog bites across a country, since with surveys there may be issues with recall and response bias. For example, recall bias may impact the information being remembered accurately, while response bias may cloud the data, since jurisdictions with higher bite rates might not have responded to the survey.

Additionally, Clarke and Fraser<sup>96</sup> simply reported the average bite rate for jurisdictions with and without BSL, they did not provide standard deviation, standard error, CIs, or p-values for dog bite rates. Furthermore, although the rates of dog bites were very similar for groups with and without BSL, no analysis to evaluate if the difference, albeit small, was statistically significant was offered. Rosado et al.<sup>143</sup> failed to discuss the public health structure in Spain, and whether or not it is reasonable to

conclude that the data was representative of the actual number of bites. The data presented also raises some questions, since the dog bite for rural populations increased from 71.8/100,000 persons in 1997-1999 to 77.3/100,000 persons in 2000-2001 before going back down to 73.1/100,000 persons in 2003-2004. This increase is not addressed by the authors, but seems to indicate that external factors, such as reporting procedures or compliance may have affected the data. Legislation may increase the likelihood of reporting, and it is possible that in rural areas reporting increased after the legislation, either due to awareness or due to the availability of government funds to ensure compliance.

While Rosado et al.<sup>143</sup> did not provide a standard deviation, they did provide standard error. However, no CI was given, and p-values were simply reported as either significant or not significant. Furthermore, although Rosado et al.<sup>143</sup> did analyze data over a nine year time period, they did not control for temporal trends in dog bite rates in their analysis.

Thus, even though Rosado et al.<sup>143</sup> did find a reduction in the number of reported dog bites in urban populations, the constraints of the study design and analysis of both studies prohibit overall conclusions about the effectiveness of BSL in reducing the number of reported dog bites.



SQ2: Does BSL reduce the number of dog bite injuries treated at EDs?

The only study which evaluated the impact of BSL on the number of patients presenting to the ED for dog bite injuries was conducted by Klasssen et al.,<sup>97</sup> who evaluated the number of patients presenting to a Scottish ED for dog bite injuries during a three-month time period before and after BSL was implemented. The exact same number of patients were reported to have presented for dog bite injuries in both three-month time periods evaluated. However, only the raw value was given, neither the means, rates, standard deviation, standard error, CIs, nor p-values were reported. Furthermore, it does not appear that any type of analysis was performed, including calculating a bite rate based on the human population, which likely increased or decreased during the two years that elapsed between the study periods.

This study also had issues with recall bias, response bias, and lead-time prior to the legislation being enacted. The data was collected *via* survey, but it is unclear if researchers asked the participants the questions or the patients filled out a paper survey, and while no response rate is given, it is unlikely that 100% of the patients being seen for dog bite injuries completed the survey.

Klasssen et al.<sup>97</sup> did attempt to look at the severity of injury by having medical staff provide treatment information, and found that only one person in the pre-BSL time period and two people in the post-BSL time period required referral to a specialist. These findings are consistent with other reports that injuries requiring hospitalization occur in 1-3% of dog bites.<sup>19,20</sup> Given that only 1-3% of injuries are severe enough to warrant hospitalization,<sup>4,19</sup> and that the number of patients with dog bites in each time

period was 99, it is unlikely that there was a large enough sample of patients with severe injuries to detect a difference between the two time periods. In fact, the failure to find an effect for both the overall number of bites and the number of severe bites is possibly due to the relatively small sample size, which would indicate that the study lacked the necessary power to find a difference if one did exist.

However, the most concerning issue with the study design is the time period selected as the pre-BSL time period. The pre-BSL time period evaluated was October 1<sup>st</sup> through December 31<sup>st</sup> of 1991. It is unclear exactly when BSL was in effect in Scotland, but the DDA was passed in the UK in 1991,<sup>73</sup> and became effective in England in July of 1991,<sup>73</sup> and in Ireland in October of 1991.<sup>156</sup> Since the pre-BSL time period in this study was after other countries in the UK had already begun to enforce BSL, it is likely that behaviors in Scotland had already begun to change in anticipation of the impending legislation.

Therefore, the finding of no effect of BSL in this study could be an artifact of the pre-BSL time period being too close to the implementation of the legislation, the small sample size, or the relatively short period of time included. Given that there was only a single study which evaluated the effect of BSL on the number of dog bite injuries treated at EDs, and that this study had major flaws in both study design and analysis, no conclusions can be made about the effectiveness of BSL in reducing the number of dog bite injuries treated at EDs.

### SQ3: Does BSL reduce the number of DBIH?

Both of the studies which evaluated DBIH for groups with and without BSL showed a difference, with Raghavan et al.<sup>72</sup> and Villalbí et al.<sup>98</sup> reporting 25.5% and 38% lower rates of DBIH respectively. It is important to note that lower rates of DBIH for groups with BSL were consistently reported across these studies, even though Spain allows “dangerous dogs” with restrictions, while most Canadian areas have bans on pit bulls. However, it is unclear if the bans in Canadian cities included grandfather clauses for existing dogs or not. It was also unclear if Raghavan et al.<sup>72</sup> controlled for temporal trends in the non-BSL group and it seems that Villalbí et al.<sup>98</sup> did not control for temporal trends; these two studies had no other potential issues with bias. Additionally, Raghavan et al.<sup>72</sup> was conservative in the group allocation, which may have led to an underestimation of the effect.

Raghavan et al.<sup>72</sup> analyzed the effect of BSL on DBIH by utilizing each jurisdiction as its own control in pre-BSL and post-BSL time periods, by comparing a city with BSL (Winnipeg) to a city without BSL (Brandon), and by comparing provincial level data for a group with and a group without BSL overall as well as by age group. A 25.5% difference in DBIH was noted when comparing the BSL and non-BSL groups at the provincial level, while a 27.4% difference in DBIH was found when comparing provincial level data for those <20 years of age, finally a 14.7% difference in DBIH was reported when comparing the city of Winnipeg to the city of Brandon. These results were all statistically significant at  $p < 0.002$ . Comparing each jurisdiction to itself in pre-BSL and post-BSL time periods was the only analysis that did not yield significant effects. However, each jurisdiction

enacted BSL at different times during the 22-year time span evaluated, and some areas may not have had enough time in the post-BSL time period for any effect to become evident, since the post-BSL time periods ranged from 1-16 years. Additionally, there was likely low power to detect an effect within each individual rural area due to the small sample sizes inherent to rural areas. This point is illustrated by the fact that the authors report that there were so few cases in some of the rural areas that only aggregate data was available so as not to identify the individual patients. Grouping all of the urban and all of the rural populations together and analyzing the aggregate effects may have increased the power and yielded insight into any differences between urban and rural populations, but it is unclear if this was done. However, Villalbí et al.<sup>98</sup> did compare aggregate urban and rural population data and found a more pronounced effect for the reduction of DBIH in rural areas. Though, p-values were not reported for this result, so the statistical significance of this finding is unknown.

The only study that analyzed the effect of BSL for different age groups was Raghavan et al.,<sup>72</sup> which showed that there may be a difference based on age group. The rates of DBIH varied across the age groups, and a 27.4% lower DBIH rate was reported for those <20 years of age in areas with BSL.

Notwithstanding their limitations, both of the studies evaluating DBIH reported lower rates for groups with BSL, as well as consistent results. Interpreting these studies shows evidence that BSL may have an effect on reducing DBIH and that the effect may vary based on age group.

## Overall Considerations

Analysis of the body of literature has highlighted several areas which warrant further discussion: temporal trends, the length of the time periods analyzed, severity of injuries, the effect in subgroups, the type of BSL, and the reporting of relevant statistics.

Although four of the five studies located analyzed data over a period of time, Raghavan et al.<sup>72</sup> was the only one which properly controlled for temporal trends, in at least part of the analysis. When analyzing data over a period of time, trends may appear due to external factors. For example, dog bite injuries could be decreasing in all geographic areas, whether or not they have BSL, because of decreasing rates of dog ownership. Failure to consider the temporal trends may lead to spurious results.

Four of the five studies compared data from time periods before and after BSL took effect. However, several of them failed to include data from an extended time period before the legislation took effect. If legislation is forthcoming, people may alter their behavior in anticipation of the impending changes. This phenomenon, called anticipatory behavior, was first described in the field of economics,<sup>157,158</sup> but has since been applied to other areas, such as healthcare management and legislation.<sup>159</sup> In the case of BSL, people who own a regulated animal may move prior to the legislation taking effect, or people considering adopting an animal may choose an unregulated breed. Consequently, the finding of no effect could be an artifact of anticipatory behavior resulting from the pre-BSL time period being too close to the implementation of the legislation. Additionally, researchers need to consider the length of time needed for an effect to become observable. A lag time between cause and effect is common in public

health.<sup>160</sup> For example, the lag time between smoking cessation and a reduction in lung cancer rates can be up to 20 years.<sup>161</sup> Currently researchers tend to explore lag times only after the fact in order to explain inconsistent results.<sup>160</sup> However, future studies need to adopt a more scientific approach, and account for a potential lag time between cause and effect in both study design and analysis.<sup>160</sup> The length of the lag time for BSL will vary depending upon the type of BSL that is enacted. For example, a ban with a grandfather clause allows the existing animals to remain in the population either with or without restrictions on their keeping. Since the current population of the banned dogs remains for their natural lifespan, while some effect may become evident immediately, a pronounced effect may not become demonstrable until the population of banned dogs naturally begins to die off; a process which could take 10 or more years. The concept of an effect becoming more pronounced over time is bolstered by the fact that the only two studies located for this review which analyzed data for a decade or longer both found a reduction in DBIH over that time period.<sup>72,98</sup>

Since BSL targets breeds capable of causing more severe injuries, it is possible that BSL has a different effect on the overall bite rate and the rate of severe injuries. Klaassen et al.<sup>97</sup> was the only study which addressed severity directly, though both Raghavan et al.<sup>72</sup> and Villalbí et al.<sup>98</sup> analyzed DBIH, which is a proxy measure for severity. Although Klaassen et al.<sup>97</sup> did not find an effect in the reduction of severe injuries, this was likely an artifact of the relatively small sample size. In fact, both of the studies with large sample sizes reported lower rates of DBIH for groups with BSL. Furthermore, the difference in DBIH was consistent across these studies despite the fact

that the Canadian BSL was mostly bans, while the Spanish legislation merely placed restrictions on “dangerous dogs”. Public health frequently focuses on events which have low frequency, but high severity. Seatbelt laws and airbags to prevent fatalities in motor vehicle are prime examples.<sup>162-164</sup> In regards to dog bites, preventing infrequent but severe or fatal attacks may be of greater concern than preventing every bite from occurring. Thus although the total bite rate in an area may not go down, if the rate of severe injuries decreases, BSL may still be considered effective.

Dog bites have been shown to disproportionately affect children and rural populations,<sup>1,3,4</sup> and it is possible that BSL has a different effect for these groups. The only study which analyzed the effect of BSL by age group reported a more pronounced difference in rates of DBIH for those <20 years of age. Additionally, both of the studies which analyzed BSL based on population type found a difference for urban and rural populations. However, the effect reported differed. Even though both studies were conducted in Spain, Villalbí et al.<sup>2</sup> found a more pronounced reduction in DBIH in rural populations, while Rosado et al.<sup>143</sup> found a greater reduction in reported dog bites in urban populations. However, as previously discussed, the data presented by Rosado et al.<sup>143</sup> indicates there may have been some reporting issues in rural areas, and the p-value for this result was not significant. On the other hand, Villalbí et al.<sup>2</sup> didn't report the p-value for this or any other finding. While it is likely that the hospitalization data is representative of the patients being seen, it is possible that due to infrastructure that the percentage of dog bites being reported to the public health department may vary for urban and rural populations. An additional consideration when analyzing urban

versus rural populations is that patients from rural areas are likely to be transferred to an urban hospital for specialty treatment.<sup>165,166</sup> For example, a severe injury that occurs in a rural state like Wyoming will likely be transferred to Salt Lake City, Utah or Denver, Colorado for more advanced care. Ideally, data should be separated based on where the bite occurred, though this may not be feasible. Researchers need to be aware of the healthcare structure in the areas for which they are analyzing data, and be aware that the number of hospitalizations in urban areas may be overestimated.

There are multiple types of BSL that may be enacted: declarations, restrictions, and bans. Furthermore, with a ban there may or may not be a grandfather clause that allows existing animals to remain for the duration of their natural life. It is reasonable to assume that a restriction that requires “dangerous breeds” to wear a muzzle in public may have a different effect than an ordinance that simply declares a breed dangerous *a priori*, yet four of the five studies located for this review did not adequately consider or describe the type of BSL that was in effect. Rosado et al.<sup>143</sup> and Villalbí et al.<sup>98</sup> both took place in regions of Spain and alluded to the fact that the legislation regarding dogs had changed in 1999 and 2002. However, they did not adequately explain these changes or how they related to BSL, while Clarke and Fraser<sup>96</sup> and Klaassen et al.<sup>97</sup> did not address differing types of BSL at all. In fact, the only study which discussed differing types of BSL in more detail was Raghavan et al.,<sup>72</sup> who described that some jurisdictions imposed bans while another imposed high registration fees on owners of pit bulls. The type of BSL in place in each of the study countries, as well as the USA is presented in Table 15.



**Table 15.** Characteristics of Breed-specific Legislation in Select Countries

<b>Country</b>	<b>Nationwide or Individual</b>	<b>Year Enacted</b>	<b>Description</b>	<b>Breeds Affected</b>	<b>Studies Conducted</b>
United Kingdom	Nationwide	1991	Ban; grandfathered dogs allowed with restrictions	Pit bull terrier Japanese Tosa Dogo Argentino Fila Brasileiro	Klaassen et al.
Canada	Individual jurisdictions	Various times Winnipeg: 1990	Various Winnipeg: Ban; grandfathered dogs allowed with restrictions	Various Winnipeg: Pit bulls	Clarke and Fraser, Raghavan et al.
Spain	Nationwide	1999/2002	Restriction, owners -must be of legal age -have no convictions or sanctions for certain crimes -be physically capable of possessing the dog -have 120,000 euros of liability insurance -obtain special handlers license	Pit bull terrier Staffordshire bull terrier American Staffordshire terrier Rottweiler Dogo Argentino Fila Brasileiro Tosa Inu Akita Inu	Rosado et al., Villalbí et al.
United States	Individual jurisdictions	Various times Henderson, TN: 1976	Various types Henderson, TN: Ban	Various Henderson, TN: Pit bulls	None located

It is important to note that Spain has nationwide restrictions on eight breeds, while BSL in Canada is mostly bans on pit bulls only. Both of the studies evaluating DBIH in these countries reported lower rates of DBIH for groups with BSL, however, the study which took place in Spain reported the largest percent change. This finding raises an interesting question of whether the number of breeds restricted or the type of BSL is more important to the effectiveness of BSL. It may be that restrictions are easier to enforce and for citizens to comply with, and thus restricting ownership and management of more breeds may actually be more effective in reducing injuries than a ban on only one breed. However, as noted in the assessment of quality, none of the studies evaluated the presence of a dose-response type of relationship in the reduction of dog bite injuries. This could be accomplished by comparing dog bite rates for jurisdictions with and without different types of BSL or by comparing data from time points when legislation of varying regulatory actions was in place. Although this was not addressed by any of the studies, it would appear that Rosado et al.,<sup>143</sup> Villalbí et al.,<sup>98</sup> and Raghavan et al.<sup>72</sup> may have had data that would enable such an analysis.

Most of the studies did not report a standard deviation or standard error, and the only study which reported the mean, 95% CI, and p-value for the pertinent outcome was Raghavan et al.<sup>72</sup> The failure to report relevant statistics made it more difficult to compare results across the studies, and develop an assessment of the level of inconsistency and imprecision. In addition, the lack of adequate statistics, as well as the use of three different outcome measures across the studies precluded the completion of a meta-analysis.

### The Proliferation of Breed-specific Legislation

In order to understand the proliferation of BSL and why there are so few studies evaluating its effectiveness, it is important to appreciate the cultural and political environment of dog bite injuries in the USA at that time, as well as some of the challenges hindering more studies from being conducted.

In the 1980s, a disproportionately high number of DBRFs attributed to pit bulls captured the cultural and legislative attention of the USA. In 1989, a published article noted that the number of DBRFs in the USA attributable to pit bulls had increased from 20% in 1979-1980 to 67% in 1987-1988.<sup>40</sup> Pit bulls were also reported to be more likely to attack in conjunction with another dog, and to attack without warning or provocation.<sup>1,29</sup> These alarming figures and reports, paired with the publicity surrounding fatal attacks caused municipalities to look for a solution to what became known as the “pit bull problem”. The result was a resurgence of BSL in local and state jurisprudence. In some areas, BSL was enacted in response to a fatal attack, while in other jurisdictions it was viewed as a precautionary measure. In the 1980s and early 1990s, sundry municipalities in the USA and around the world adopted BSL. By 1994, the number of DBRFs in the USA attributable to pit bulls had fallen to 28.6%, which led many to conclude that BSL was having the desired outcome.

Policy development is generally led by practitioners who make decisions in a more practical context.<sup>87,167</sup> As such, policies tend to be developed as a practical solution to a perceived problem. The focus on evidence-based policies and the use of evidence to justify decisions has only become a popular notion as access to data has

increased.<sup>167</sup> In the 1970s and 1980s, when the increase in DBRFs linked to pit bulls and subsequent rise of BSL occurred, data was not readily available to the public, nor was there public demand or emphasis on evidence-based decisions. The development of a policy in the absence of evidence demonstrating effectiveness is not unique to BSL. For issues where it is difficult to obtain reliable data, common sense based policies are often developed rather than waiting for evidence to guide a solution. For example, spay/neuter programs have been promoted in the USA as the primary method for controlling the perceived pet overpopulation, despite lack of a scientific consensus that there is in fact a pet overpopulation or that spay/neuter programs are effective.<sup>168-172</sup>

The major challenge facing empirical analysis of BSL is the lack of suitable data. The USA has no central mechanism for collecting data on dog bite injuries, which explains the dearth of studies on the effectiveness of BSL. However, a surprising finding of this review was that only one study took place in the UK. The UK has had BSL in place for 25 years, and they have a national health care system, and thus should theoretically have access to suitable data. At minimum, data should be available on medically-attended dog bite injuries. However, there was only one study located for this review which took place in the UK. It is possible that there is no suitable data from the time period before the DDA was implemented or that they currently lack a suitable control population. The DDA was implemented in 1991, and although the concept of electronic medical records has been around since the late 1960s,<sup>173</sup> it didn't gain widespread acceptance or use until the 1990s.<sup>174</sup> Even though the UK has a nationalized healthcare system, it is possible that the data from before the DDA was enacted was paper-based

and is inaccessible. Additionally, there may not be a suitable control population for a contemporary comparison. A suitable control would need to have similar characteristics except for the BSL, typically accomplished by locating a suitable city in an adjacent area. Given that the DDA is a nationwide ban, there may not be any locations to use as suitable controls.

## VI. LIMITATIONS

Although exhaustive efforts were made to locate every ordinance with breed-specific language and every article which utilized empirical data to evaluate the effectiveness of BSL, a number of limitations make it is possible that some were missed.

Several factors limit the compilation of a comprehensive list of municipal ordinances. First, some jurisdictions, particularly rural ones, may not have their ordinances available online. It is infeasible to contact every city in the USA to inquire about whether or not they have BSL, therefore, there may be some ordinances left uncaptured. Second, legislation is ever-evolving, and some jurisdictions may have either repealed or enacted a breed-specific ordinance recently. If the codification system is out of date, the ordinances available online will not be the most up-to-date version, which could result in an ordinance being misclassified. Third, verifying the authenticity and reviewing over 1,000 ordinances was a laborious process which required 14 months to complete. Although efforts were made to recheck some ordinances, it was not feasible to reassess and reevaluate all ordinances immediately prior to the submission of this manuscript. Since legislation is ever-changing, the exact number of breed-specific ordinances will constantly be in flux. However, since no prior study has evaluated and

catalogued breed-specific ordinances in the USA, this study represents an essential first step; establishing a baseline of the amount of each type of BSL in the USA, which is necessary for proper evaluation of its effectiveness.

It is possible that some articles or theses that used empirical data to evaluate the effectiveness of BSL were not located by this review. However, exhaustive efforts were taken, including searching 6 representative databases, examining the reference section of relevant articles, and procuring native-speakers to translate 13 articles which could not be eliminated based on their title alone and for which an English abstract was not available.

## VII. FUTURE DIRECTIONS

The availability of suitable data is crucial to any scientific study. Currently, the field of BSL is plagued by the following data issues which need to be addressed on a societal level:

- a) Lack of standard methods in data collection for reported dog bites;
- and
- b) Lack of standard methods in data warehousing for reported dog bites.

The biggest prerequisite for conducting scientifically reliable data analysis is data that are accurate, reliable, and comparable. Currently, data collection methods for dog bite injuries vary across and even within countries. Since there are no standards in place, each jurisdiction is left in isolation to determine what type of information will be collected and who will collect it. Consequently there are vast differences in the amount and type of information being collected. For example, a measure of bite severity is not collected by all areas, but is essential information to analyze the effectiveness of BSL. Until reliable data from suitable populations is available, research into the effectiveness of BSL will remain problematic. This could be remedied by an international organization, such as the World Health Organization (WHO) developing standards on information that should be collected during the investigation of a dog bite. Even without an international



effort, each country could develop their own standards, so that within each country there would at least be similarities in data collection methods. In the USA this would mean that a standardized dog bite injury investigation form should be ratified and the use of it should be mandated by Congress or the CDC. The data collected utilizing standard forms could be used by researchers to evaluate the impact of BSL on rates of reported dog bites.

Another prerequisite to conducting scientifically reliable data analysis is ready access to data. There are currently no standards in place for data management and storage for dog bite injuries. Consequently, even if municipalities do collect adequate data on dog bite injuries, the information is often stored in such a way that it is inaccessible to researchers. Again this could be remedied by an international organization, such as the WHO, establishing standards on data warehousing and sharing for dog bite injuries. Within countries, this could be accomplished by establishing a national repository for dog bite injury data. Although there may not currently be adequate public funding for this endeavor, it is likely that an academic institution would be interested in developing a partnership that would include them acting as a curator and warehouse for data on dog bites.

Future research on the effectiveness of BSL needs to consider:

- a) Temporal trends in dog bite injuries;
- b) The requisite length of time to analyze in the pre- and post-BSL time period;
- c) Severity of injury;

- d) The sample size needed to detect an effect in subgroups, such as rural populations and children;
- e) The type of BSL in effect;  
and
- f) Reporting all relevant statistics.

First, temporal trends in dog bite injuries must be considered. Four of the five studies located for this review analyzed dog bite data over a period of time. However, only one study attempted to control for temporal trends in the analysis. Without controlling for temporal trends in the analysis, it will remain unclear whether the effect demonstrated is due to the legislation or due to naturally occurring trends in the population.

The second issue to be considered in studies which analyze data from time periods before and after BSL came into effect is the length of time that must be included for the pre-legislation and post-legislation analysis. This is a particular concern, since pre-BSL and post-BSL time period analysis is very common in BSL research. For example, four of the five studies located for this review examined data from time periods before and after BSL was in effect. However, if legislation is forthcoming, people may begin to change their behavior in anticipation of the impending changes. Failure to account for the possible presence of anticipatory behavior could result in a finding of no effect, when in reality people are already beginning to comply with the law prior to its official enactment. This means that the data selected should encompass a wide enough time period that the legislation in question was not yet being discussed or anticipated. The

amount of time necessary will vary based on the issue at hand, however, it is likely that a time period of at least two to three years prior to the enactment of legislation is necessary. Additionally, a lag time between cause and effect is common in public health, and researchers need to be aware of and account for the fact that the presence of an effect may not be immediately observable. Instead, it may take a prolonged period of time for the effect to develop. Four of the five studies located for this review looked at data over a period of time. However, the only two studies which analyzed data for a decade or longer time span both reported lower DBIH in groups with BSL. A lag time before the effect is demonstrable may be particularly true depending upon the type of BSL that is enacted. While the exact amount of time needed for an effect to become observable is unknown, for jurisdictions that include grandfather clauses for existing animals, it may take 10 or more years for the ban to reach full effect.

Third, since the dogs regulated by BSL are generally breeds capable of inflicting significant damage when they bite or attack, it is possible that BSL has a different effect on the overall dog bite rate and on the rate of severe injuries. Three of the five studies located had outcome measures that would indicate severe injuries. Of those, two reported an effect, while the other likely lacked adequate power to detect an effect. In order to either confirm or refute the claim that BSL is effective at reducing severe injuries, future studies which analyze BSL need to consider the severity of injuries in their design and analysis.

Fourth, since dog bites have been shown to disproportionately affect children<sup>19,35</sup> and rural populations,<sup>3</sup> it is possible that BSL has a different effect on these

subgroups. In fact, both studies which considered population size in their analysis found different rates of dog bite injuries and a different effect of BSL in urban and rural populations. Additionally, the only study which analyzed the effect of BSL by age group reported a more pronounced difference for those <20 years of age. Future research should seek to either confirm or refute the differing effects that have been seen in subgroups, such as rural populations and children. In order to have adequate power to detect differences that may exist in these groups, adequate sample sizes for subgroups are needed. Power calculations to determine the optimal sample size should be conducted prior to data collection and analysis.

Fifth, it is unclear whether the number of breeds restricted or type of BSL implemented is more important to the effectiveness of BSL. However, there are conceptual reasons to believe that a declaration, restriction, and ban may have different effects on the rate of dog bite injuries. These differences must be anticipated in study design, since failure to do so could increase the likelihood of committing a Type II error. Additionally, a well-designed study could investigate the effect of different types of BSL in more depth by examining the effectiveness of BSL based on type of legislation.

Lastly, the majority of studies did not report standard deviations or standard errors, and only one of the five studies reported rates, 95% CI, and p-value for the outcome of interest. Failure to report relevant statistics prevents comparison across studies and meta-analysis. Future research should report all relevant statistics, so that meta-analyses can be performed to synthesize the results and generate substantive conclusions on the effectiveness of BSL.

The problems with data collection, data storage, and data analysis for dog bite injuries have been perpetuated because no organization has taken ownership of the topic or worked towards developing best practices. Even if no organization comes forward to assume this vital role, it is incumbent upon each country to work towards developing better standards and methods.

Dog bites are a persistent and complex public health problem that warrant greater resources and consideration. Although the rate of serious dog bites injuries is relatively low compared to other causes of injury, it is much higher than the injury rates that have triggered recent multimillion dollar recalls.<sup>175</sup> For example, in 2014 General Motors recalled 1.37 million vehicles with faulty ignition switches based on 13 fatalities that occurred over a 10 year time period.<sup>176</sup> Currently, there are approximately twice that many DBRFs in the USA every year, yet dog bite injuries have not received much funding or attention. Traditionally public health viewed dog bites as important, because they represented a source of possible rabies exposure. This point of view is outdated, and focus needs to be redirected at preventing dog bite injuries, since they continue to be a significant source of medical expenditures and emotional trauma. Reducing the DBIH rate by 20% in the USA would represent a savings of over 34 million dollars annually. Not to mention the emotional trauma that would be prevented. Standardizing data collection for dog bite injuries and making data accessible to researchers is the first step forward towards understanding and preventing dog bite injuries.

## VIII. CONCLUSION

Despite various public health interventions and education campaigns, dog bites remain a persistent source of preventable injury<sup>21</sup> and a public health problem.<sup>1,8</sup> BSL is one strategy employed to ameliorate the impact of dog bites. Although BSL has been popular in the USA since the 1980s,<sup>58</sup> it has received little rigorous attention by the scientific community. Consequently, myriad opinions abound regarding BSL with a dearth of scientific knowledge regarding its effectiveness. Issues that must be addressed in order to properly evaluate BSL are: 1) the lack of standardized terminology, 2) the unknown number of ordinances, and 3) the absence of a scientific consensus on the effectiveness of BSL. This project addressed these shortcomings by codifying the terminology for BSL, quantifying the amount of each type of BSL in the US, and conducting a systematic review of the effectiveness of BSL in reducing dog bite injuries.

After comprehensive review of both existing terminology and ordinances with breed-specific language, the terms *declaration*, *restriction*, *ban*, and *grandfather clause* are proposed to be adopted as standardized terminology for discussing BSL. A declaration makes a statement that a particular breed of dog is dangerous, but has no consequences, while a restriction allows the ownership of the selected breed, but places limitations on how they must be kept. Finally, a ban prohibits the selected breed from

the jurisdiction. A ban may or may not include a grandfather clause which allows existing animals to remain for the rest of their natural life.

A review of all ordinances in the USA with breed specific language was conducted by reviewing and compiling existing lists from both pro-BSL and anti-BSL groups. Additionally, primary searches were conducted utilizing ordinance codification websites. These two methods identified 1,144 ordinances which were then reviewed to determine whether or not they did in fact contain breed-specific language. Once an ordinance was determined to have breed-specific language, the ordinance was classified by regulatory action(s). After exhaustive efforts, out of the 1,144 ordinances, 11 could not be classified, 5 were determined to have been erroneously reported, 44 did not pertain to municipalities, and 139 ordinances had been repealed. Of the remaining 945 ordinances, many fit into more than one category: 505 declared a breed dangerous *a priori*, 741 placed ownership restrictions, and 513 banned at least one breed. Exemptions for existing animals were included in 338 of the bans. Pit bulls were the most commonly regulated breed, and were specifically mentioned in 99% of ordinances. However, 21.1% included one or more other breeds. The other breeds regulated included Akitas, Presa Canarios, Rottweilers, and wolf hybrids. Geographic variation was evident in the distribution of ordinances, with a heavy concentration occurring in the Midwest, and ordinances from adjacent municipalities sometimes having the same unique language.

To address whether or not there is a scientific consensus on the effectiveness of BSL, a systematic review was conducted. Six representative databases were queried,

and additional items were mined from the reference section of relevant articles. Studies which used empirical evidence to evaluate the effectiveness of BSL and had been published in a peer-reviewed journal or as a thesis between 1980 and March 2015 were eligible for inclusion. Database searches identified 409 articles and theses, while another 4 articles were identified in the reference sections of relevant items. After removing duplicates and reviewing the title, abstract, or full text for each remaining item, six studies were identified which met the inclusion criteria. One thesis and one article were determined to be based on precisely the same study. To avoid redundancy, only one of the two remained in the analysis. The net result was five published articles which quantitatively assessed the effectiveness of BSL, with three of these showing some effect, and two reporting no effect.

The quality of the body of evidence and the summary of findings were assessed using the GRADE system. Due to the observational nature of the studies, the potential for bias, as well as some issues with inconsistency and imprecision, the overall body of evidence was rated as *very low*. A rating of *very low* means that the results should be interpreted with caution, and the actual effect may be different than what the body of evidence suggests.<sup>134</sup> No global findings about the effectiveness of BSL could be generated, since the quality of the body of evidence was *very low* and three different outcome measures were utilized across the five studies. Additionally, due to the lack of consistent outcome measures, and the failure of several studies to report adequate statistics, a meta-analysis was impossible.



The question to be answered by this review was: is BSL effective at reducing dog bite injuries? Considering the numerous ways that dog bite injuries may be detected, this question may have been overly broad. Thus three SQs emerged:

- 1) Does BSL reduce the number of reported dog bites?
- 2) Does BSL reduce the number of dog bite injuries treated at EDs?
- 3) Does BSL reduce the number of DBIH?

Due to constraints in study design and analysis, no conclusions could be drawn about the effect of BSL on reducing the number of reported dog bites or the number of dog bite injuries treated at EDs. However, two studies addressed SQ3: does BSL reduce the number of DBIH?<sup>72,98</sup> Although both of these studies had some methodological flaws, they both had large samples sizes, analyzed data over an extended period of time, and reported consistent results; finding a 25.5% difference and 38% difference in DIBH rates for groups with BSL respectively. Additionally, Raghavan et al.<sup>72</sup> reported a more pronounced difference in those <20 years of age. These studies show evidence that BSL may be effective in reducing DBIH, and that this effect may differ based on age group, though this finding should be interpreted in light of the fact that there were only two studies evaluating this outcome, and that they were not without limitations.

The overall poor quality of the existing body of evidence, as well as differing effects reported in subgroups, such as children, indicates that more research is needed on the effectiveness of BSL at reducing the frequency of overall and severe dog bite injuries. The findings from this project establish a research framework for BSL and will assist future researchers with designing and conducting scientifically sound studies to

evaluate the effectiveness of BSL. To properly quantify and assess the effectiveness of BSL, future efforts are needed on standardizing data collection and warehousing to make data accessible to researchers. Future studies on the effectiveness of BSL should:

- 1) use the proposed terminology,
- 2) consider temporal trends,
- 3) consider the requisite length of time prior to legislation being enacted,
- 4) consider the impact of BSL on severe injuries,
- 5) quantify and report outcomes in subgroups,
- 6) consider the type of BSL in effect,
- 7) report all relevant statistics, and
- 8) consider the length of time that may be required for an effect to become demonstrable.

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## APPENDICES



Appendix A: Active Breed-specific Ordinances in the USA

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Albertville</b>	AL	Y	Y	N	N
<b>Anniston</b>	AL	Y	Y	N	N
<b>Center Point</b>	AL	N	Y	Y	Y
<b>Clay</b>	AL	N	Y	Y	Y
<b>Fayette</b>	AL	Y	Y	N	N
<b>Fultondale</b>	AL	N	Y	Y	Y
<b>Gadsden</b>	AL	Y	Y	N	N
<b>Gardendale</b>	AL	N	Y	Y	Y
<b>Irondale</b>	AL	N	Y	Y	Y
<b>Jacksonville City</b>	AL	Y	Y	N	N
<b>Lanett</b>	AL	N	Y	Y	Y
<b>Midfield</b>	AL	Y	Y	Y	Y
<b>Tarrant</b>	AL	Y	Y	Y	Y
<b>Weaver</b>	AL	Y	Y	N	N
<b>Arkadelphia</b>	AR	Y	Y	Y	Y
<b>Batesville</b>	AR	Y	Y	Y	Y
<b>Bebee</b>	AR	Y	N	Y	N
<b>Cabot</b>	AR	Y	Y	Y	Y
<b>Caddo Valley</b>	AR	N	Y	N	N
<b>Carlisle</b>	AR	N	N	Y	N
<b>Dardanelle</b>	AR	N	Y	Y	Y
<b>De Queen</b>	AR	N	Y	Y	N
<b>Dover</b>	AR	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Gassville</b>	AR	N	N	Y	N
<b>Hot Springs Village</b>	AR	Y	Y	N	N
<b>Humphrey</b>	AR	Y	Y	N	N
<b>Jacksonville</b>	AR	Y	Y	Y	Y
<b>Lake City</b>	AR	Y	Y	Y	Y
<b>Lake Village</b>	AR	Y	Y	N	N
<b>Little Rock</b>	AR	Y	Y	N	N
<b>Lonoke</b>	AR	Y	Y	Y	N
<b>Maumelle</b>	AR	Y	N	Y	N
<b>Mayflower</b>	AR	Y	Y	Y	Y
<b>McGehee</b>	AR	N	Y	Y	Y
<b>Mineral Springs</b>	AR	N	Y	Y	Y
<b>Morrilton</b>	AR	Y	Y	N	N
<b>Mountain Home</b>	AR	Y	N	Y	N
<b>Murfreesboro</b>	AR	Y	N	Y	N
<b>North Little Rock</b>	AR	N	Y	Y	Y
<b>Paragould</b>	AR	Y	Y	N	N
<b>Pine Bluff</b>	AR	Y	Y	Y	Y
<b>Prescott</b>	AR	N	N	Y	N
<b>Russellville</b>	AR	Y	Y	Y	Y
<b>Salem</b>	AR	Y	Y	Y	Y
<b>Searcy</b>	AR	Y	Y	N	N
<b>Sherwood</b>	AR	Y	Y	Y	Y
<b>Stuttgart</b>	AR	Y	Y	N	N
<b>Trumann</b>	AR	Y	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Adelanto</b>	CA	N	Y	N	N
<b>Apple Valley</b>	CA	N	Y	N	N
<b>Banning</b>	CA	N	Y	N	N
<b>Barstow</b>	CA	N	Y	N	N
<b>Beaumont</b>	CA	N	Y	N	N
<b>Big Bear Lake</b>	CA	N	Y	N	N
<b>Blythe</b>	CA	N	Y	N	N
<b>Calimesa</b>	CA	N	Y	N	N
<b>Canyon Lake</b>	CA	N	Y	N	N
<b>Cathedral City</b>	CA	N	Y	N	N
<b>Chino</b>	CA	N	Y	N	N
<b>Chino Hills</b>	CA	N	Y	N	N
<b>Cloverdale</b>	CA	N	Y	N	N
<b>Colton</b>	CA	N	Y	N	N
<b>Corona</b>	CA	N	Y	N	N
<b>Cotati</b>	CA	N	Y	N	N
<b>Desert Hot Springs</b>	CA	N	Y	N	N
<b>Eastvale</b>	CA	N	Y	N	N
<b>Fontana</b>	CA	N	Y	N	N
<b>Gilroy</b>	CA	N	Y	N	N
<b>Gonzales</b>	CA	Y	Y	N	N
<b>Grand Terrace</b>	CA	N	Y	N	N
<b>Healdsburg</b>	CA	N	Y	N	N
<b>Hemet</b>	CA	N	Y	N	N
<b>Hesperia</b>	CA	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Highland</b>	CA	N	Y	N	N
<b>Hollister</b>	CA	N	Y	N	N
<b>Indian Wells</b>	CA	N	Y	N	N
<b>Indio</b>	CA	N	Y	N	N
<b>La Quinta</b>	CA	N	Y	N	N
<b>Lake Elsinore</b>	CA	N	Y	N	N
<b>Lancaster</b>	CA	N	Y	N	N
<b>Loma Linda</b>	CA	N	Y	N	N
<b>Manteca</b>	CA	N	Y	N	N
<b>Menifee</b>	CA	N	Y	N	N
<b>Montclair</b>	CA	N	Y	N	N
<b>Moreno Valley</b>	CA	N	Y	N	N
<b>Murrieta</b>	CA	N	Y	N	N
<b>Needles</b>	CA	N	Y	N	N
<b>Norco</b>	CA	N	Y	N	N
<b>Ontario</b>	CA	N	Y	N	N
<b>Palm Desert</b>	CA	N	Y	N	N
<b>Palm Springs</b>	CA	N	Y	N	N
<b>Perris</b>	CA	N	Y	N	N
<b>Petaluma</b>	CA	N	Y	N	N
<b>Rancho Cucamonga</b>	CA	N	Y	N	N
<b>Rancho Mirage</b>	CA	N	Y	N	N
<b>Redlands</b>	CA	N	Y	N	N
<b>Rialto</b>	CA	N	Y	N	N
<b>Ripon</b>	CA	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Riverside</b>	CA	N	Y	N	N
<b>Rohnert Park</b>	CA	N	Y	N	N
<b>San Francisco</b>	CA	N	Y	N	N
<b>San Jacinto</b>	CA	N	Y	N	N
<b>Santa Rosa</b>	CA	N	Y	N	N
<b>Temecula</b>	CA	N	Y	N	N
<b>Twentynine Palms</b>	CA	N	Y	N	N
<b>Upland</b>	CA	N	Y	N	N
<b>Victorville</b>	CA	N	Y	N	N
<b>Wildomar</b>	CA	N	Y	N	N
<b>Windsor</b>	CA	N	Y	N	N
<b>Yucaipa</b>	CA	N	Y	N	N
<b>Yucca Valley</b>	CA	N	Y	N	N
<b>Aurora</b>	CO	N	Y	Y	Y
<b>Castle Rock</b>	CO	N	Y	Y	Y
<b>Commerce City</b>	CO	N	Y	Y	Y
<b>Denver</b>	CO	N	Y	Y	Y
<b>Fort Lupton</b>	CO	N	Y	Y	Y
<b>La Junta</b>	CO	N	Y	Y	Y
<b>Lone Tree</b>	CO	N	Y	Y	Y
<b>Louisville</b>	CO	N	Y	Y	Y
<b>Bridgeville</b>	DE	Y	Y	N	N
<b>Aventura</b>	FL	Y	Y	Y	Y
<b>Bal Harbour</b>	FL	Y	Y	Y	Y
<b>Bay Harbor Islands</b>	FL	Y	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Biscayne Park</b>	FL	Y	Y	Y	Y
<b>Chipley</b>	FL	N	Y	N	N
<b>Coral Gables</b>	FL	Y	Y	Y	Y
<b>Cutler Bay</b>	FL	Y	Y	Y	Y
<b>Doral</b>	FL	Y	Y	Y	Y
<b>El Portal</b>	FL	Y	Y	Y	Y
<b>Florida City</b>	FL	Y	Y	Y	Y
<b>Golden Beach</b>	FL	Y	Y	Y	Y
<b>Hialeah</b>	FL	Y	Y	Y	Y
<b>Hialeah Gardens</b>	FL	Y	Y	Y	Y
<b>Homestead</b>	FL	Y	Y	Y	Y
<b>Indian Creek</b>	FL	Y	Y	Y	Y
<b>Key Biscayne</b>	FL	Y	Y	Y	Y
<b>Medley</b>	FL	Y	Y	Y	Y
<b>Miami</b>	FL	Y	Y	Y	Y
<b>Miami Beach</b>	FL	Y	Y	Y	Y
<b>Miami Gardens</b>	FL	Y	Y	Y	Y
<b>Miami Lakes</b>	FL	Y	Y	Y	Y
<b>Miami Shores</b>	FL	Y	Y	Y	Y
<b>Miami Springs</b>	FL	Y	Y	Y	Y
<b>North Bay Village</b>	FL	Y	Y	Y	Y
<b>North Miami</b>	FL	N	Y	Y	N
<b>North Miami Beach</b>	FL	Y	Y	Y	Y
<b>North Redington Beach</b>	FL	Y	Y	N	N
<b>Opa-locka</b>	FL	Y	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Palmetto Bay</b>	FL	Y	Y	Y	Y
<b>Pinecrest</b>	FL	Y	Y	Y	Y
<b>South Miami</b>	FL	Y	Y	Y	Y
<b>Sunny Isles Beach</b>	FL	Y	Y	Y	Y
<b>Sunrise</b>	FL	N	Y	N	N
<b>Surfside</b>	FL	Y	Y	Y	Y
<b>Sweetwater</b>	FL	Y	Y	Y	Y
<b>Tamarac</b>	FL	N	Y	N	N
<b>Virginia Gardens</b>	FL	Y	Y	Y	Y
<b>West Miami</b>	FL	Y	Y	Y	Y
<b>Armuchee  </b>	GA	Y	Y	N	N
<b>Blackshear</b>	GA	N	Y	N	N
<b>Bronwood</b>	GA	Y	Y	N	N
<b>Cave Spring</b>	GA	Y	Y	N	N
<b>College Park</b>	GA	Y	Y	N	N
<b>Dawson</b>	GA	Y	Y	N	N
<b>Fitzgerald</b>	GA	Y	Y	Y	Y
<b>Hawkinsville</b>	GA	N	Y	Y	Y
<b>Hogansville</b>	GA	N	Y	N	N
<b>La Grange</b>	GA	N	Y	N	N
<b>LaFayette</b>	GA	Y	Y	Y	Y
<b>Lawrenceville</b>	GA	N	Y	N	N
<b>Lindale</b>	GA	Y	Y	N	N
<b>Lyons</b>	GA	Y	Y	Y	Y
<b>Marietta</b>	GA	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Mount Berry</b>	GA	Y	Y	N	N
<b>Parrott</b>	GA	Y	Y	N	N
<b>Rome</b>	GA	Y	Y	N	N
<b>Sasser</b>	GA	Y	Y	N	N
<b>Shannon</b>	GA	Y	Y	N	N
<b>Silver Creek</b>	GA	Y	Y	N	N
<b>West Point</b>	GA	Y	Y	Y	Y
<b>Afton</b>	IA	Y	Y	N	N
<b>Albia</b>	IA	N	Y	N	N
<b>Alburnett</b>	IA	Y	N	Y	Y
<b>Algona</b>	IA	Y	Y	Y	Y
<b>Allison</b>	IA	Y	N	Y	N
<b>Anamosa</b>	IA	Y	N	Y	N
<b>Anita</b>	IA	Y	N	Y	N
<b>Armstrong</b>	IA	Y	U	Y	U
<b>Asbury</b>	IA	Y	Y	Y	Y
<b>Aurelia</b>	IA	N	Y	Y	Y
<b>Avoca</b>	IA	Y	N	Y	N
<b>Bedford</b>	IA	Y	N	Y	N
<b>Belle Plaine</b>	IA	Y	Y	Y	Y
<b>Brayton</b>	IA	N	Y	Y	Y
<b>Carter Lake</b>	IA	N	Y	Y	Y
<b>Cascade</b>	IA	Y	N	Y	N
<b>Centerville</b>	IA	N	Y	Y	Y
<b>Cherokee</b>	IA	N	Y	N	N



<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Coggon</b>	IA	Y	Y	N	N
<b>Columbus Junction</b>	IA	N	Y	Y	Y
<b>Conrad</b>	IA	Y	Y	Y	Y
<b>Correctionville</b>	IA	Y	N	Y	N
<b>Council Bluffs</b>	IA	N	Y	Y	Y
<b>Creston</b>	IA	Y	Y	Y	Y
<b>Dallas Center</b>	IA	Y	Y	N	N
<b>Dayton</b>	IA	Y	N	Y	N
<b>Delhi</b>	IA	Y	N	Y	N
<b>Denver</b>	IA	Y	Y	Y	Y
<b>Des Moines</b>	IA	Y	Y	N	N
<b>Dyersville</b>	IA	N	N	Y	N
<b>Edgewood</b>	IA	Y	N	Y	N
<b>Elberon</b>	IA	Y	N	Y	N
<b>Elma</b>	IA	N	Y	Y	Y
<b>Ely</b>	IA	Y	N	Y	N
<b>Emmetsburg</b>	IA	Y	N	Y	N
<b>Epworth</b>	IA	Y	Y	Y	Y
<b>Estherville</b>	IA	Y	Y	Y	Y
<b>Evansdale</b>	IA	Y	Y	N	N
<b>Fairfax</b>	IA	Y	Y	Y	Y
<b>Fairfield</b>	IA	Y	Y	N	N
<b>Fertile</b>	IA	Y	N	Y	Y
<b>Forest City</b>	IA	Y	N	Y	N
<b>Fruitland</b>	IA	N	N	Y	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Glenwood</b>	IA	N	Y	Y	Y
<b>Gray</b>	IA	N	Y	Y	Y
<b>Greenfield</b>	IA	N	Y	N	N
<b>Griswold</b>	IA	Y	N	Y	N
<b>Guttenberg</b>	IA	Y	N	Y	N
<b>Harlan</b>	IA	Y	Y	N	N
<b>Hartley</b>	IA	Y	N	Y	N
<b>Hawarden</b>	IA	Y	N	Y	N
<b>Holy Cross</b>	IA	Y	N	Y	N
<b>Hopkinton</b>	IA	Y	N	Y	N
<b>Humboldt</b>	IA	Y	Y	N	N
<b>Kimballton</b>	IA	N	Y	Y	Y
<b>La Porte City</b>	IA	Y	Y	Y	Y
<b>Lake View</b>	IA	Y	N	Y	N
<b>Laurens</b>	IA	N	Y	Y	Y
<b>Le Grand</b>	IA	Y	Y	N	N
<b>Lewis</b>	IA	Y	N	Y	N
<b>Logan</b>	IA	Y	N	Y	N
<b>Lowden</b>	IA	N	N	Y	N
<b>Manly</b>	IA	Y	Y	Y	N
<b>Maquoketa</b>	IA	N	N	Y	N
<b>Middletown</b>	IA	Y	N	Y	N
<b>Missouri Valley</b>	IA	Y	N	Y	N
<b>Monticello</b>	IA	Y	N	Y	N
<b>Muscatine</b>	IA	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Newell</b>	IA	Y	N	Y	N
<b>Osceola</b>	IA	Y	Y	N	N
<b>Otho</b>	IA	Y	Y	N	N
<b>Ottumwa</b>	IA	Y	Y	Y	N
<b>Palo</b>	IA	Y	N	Y	N
<b>Pleasant Hill</b>	IA	Y	Y	N	N
<b>Postville</b>	IA	Y	N	Y	N
<b>Randolph</b>	IA	Y	N	Y	N
<b>Robins</b>	IA	N	N	Y	N
<b>Sac City</b>	IA	N	N	Y	N
<b>Sergeant Bluff</b>	IA	Y	N	Y	N
<b>Shelby</b>	IA	Y	N	Y	N
<b>Sioux City</b>	IA	N	N	Y	Y
<b>Spirit Lake</b>	IA	Y	Y	N	N
<b>Stanwood</b>	IA	Y	N	Y	N
<b>Terril</b>	IA	Y	N	Y	N
<b>Vinton</b>	IA	Y	N	Y	N
<b>Walcott</b>	IA	Y	N	Y	N
<b>Waukon</b>	IA	Y	Y	Y	Y
<b>Wayland</b>	IA	Y	Y	Y	Y
<b>Wellman</b>	IA	Y	Y	N	N
<b>West Union</b>	IA	N	Y	Y	Y
<b>Winterset</b>	IA	Y	N	Y	N
<b>Cascade</b>	ID	Y	N	Y	N
<b>Fruitland</b>	ID	Y	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Jerome</b>	ID	N	Y	N	N
<b>Kellog</b>	ID	Y	Y	N	N
<b>New Plymouth</b>	ID	Y	Y	Y	Y
<b>Payette</b>	ID	Y	Y	Y	Y
<b>Preston</b>	ID	Y	Y	N	N
<b>Aledo</b>	IL	N	Y	Y	Y
<b>Barry</b>	IL	N	N	Y	Y
<b>Buffalo Grove</b>	IL	N	Y	N	N
<b>Ford Heights</b>	IL	Y	Y	N	N
<b>North Chicago</b>	IL	N	Y	N	N
<b>Rock Falls</b>	IL	N	Y	Y	Y
<b>Tampico</b>	IL	N	Y	Y	Y
<b>Village of Golf</b>	IL	N	N	Y	N
<b>Village of Lincolnwood</b>	IL	Y	N	N	N
<b>East Chicago</b>	IN	N	Y	N	N
<b>Fowler</b>	IN	N	N	Y	N
<b>Gary</b>	IN	N	Y	N	N
<b>Merrillville</b>	IN	Y	Y	N	N
<b>Oxford</b>	IN	Y	N	Y	N
<b>Town of St. John</b>	IN	N	Y	N	N
<b>Altamont</b>	KS	Y	N	Y	N
<b>Andover</b>	KS	N	Y	Y	Y
<b>Argonia</b>	KS	N	N	Y	N
<b>Augusta</b>	KS	Y	N	Y	Y
<b>Beliot</b>	KS	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Belleville</b>	KS	Y	Y	Y	Y
<b>Chanute</b>	KS	N	N	Y	Y
<b>Clay Center</b>	KS	N	N	Y	Y
<b>Colby</b>	KS	N	Y	N	N
<b>Columbus</b>	KS	N	Y	Y	Y
<b>Concordia</b>	KS	Y	Y	N	N
<b>Courtland</b>	KS	N	N	Y	N
<b>De Soto</b>	KS	N	Y	Y	Y
<b>Deerfield</b>	KS	N	N	Y	N
<b>Dodge City</b>	KS	Y	Y	N	N
<b>Edgerton</b>	KS	N	N	Y	Y
<b>El Dorado</b>	KS	Y	Y	Y	Y
<b>Ellinwood</b>	KS	Y	Y	Y	Y
<b>Ellsworth</b>	KS	N	Y	Y	Y
<b>Eudora</b>	KS	N	N	Y	Y
<b>Fort Scott</b>	KS	Y	Y	Y	Y
<b>Frontenac</b>	KS	N	Y	N	N
<b>Garden Plain</b>	KS	Y	Y	Y	Y
<b>Goodland City</b>	KS	Y	Y	N	N
<b>Greensburg</b>	KS	N	N	Y	N
<b>Haven</b>	KS	Y	N	Y	N
<b>Hays</b>	KS	Y	Y	N	N
<b>Herington</b>	KS	N	Y	Y	Y
<b>Hesston</b>	KS	N	Y	Y	Y
<b>Hillsboro</b>	KS	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Holton</b>	KS	N	Y	Y	Y
<b>Hope</b>	KS	N	Y	Y	Y
<b>Hugoton</b>	KS	Y	Y	N	N
<b>Humboldt</b>	KS	Y	Y	Y	Y
<b>Independence</b>	KS	N	Y	Y	Y
<b>Iola</b>	KS	Y	Y	N	N
<b>Junction City</b>	KS	Y	Y	Y	Y
<b>Kansas City</b>	KS	N	N	Y	Y
<b>Kingman</b>	KS	N	N	Y	N
<b>Kismet</b>	KS	N	Y	N	N
<b>La Cygne</b>	KS	N	N	Y	N
<b>Lake Quivira</b>	KS	N	N	Y	N
<b>Lansing</b>	KS	Y	Y	N	N
<b>Leawood</b>	KS	Y	N	Y	N
<b>Liberal</b>	KS	N	Y	Y	Y
<b>Lindsborg</b>	KS	N	N	Y	N
<b>Louisburg</b>	KS	U	U	Y	U
<b>Lyndon</b>	KS	N	Y	Y	Y
<b>Maize</b>	KS	N	Y	Y	Y
<b>Manhattan</b>	KS	Y	N	N	N
<b>Marion</b>	KS	N	Y	Y	Y
<b>McFarland</b>	KS	Y	Y	Y	Y
<b>Meriden</b>	KS	Y	Y	Y	Y
<b>Mound City</b>	KS	N	N	Y	N
<b>Mount Hope</b>	KS	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Neodesha</b>	KS	N	N	Y	N
<b>Nickerson</b>	KS	N	N	Y	N
<b>Ottawa</b>	KS	N	Y	Y	Y
<b>Overland Park</b>	KS	Y	Y	Y	Y
<b>Ozawkie</b>	KS	Y	Y	Y	Y
<b>Paola</b>	KS	N	N	Y	N
<b>Park City</b>	KS	N	N	Y	Y
<b>Parsons</b>	KS	N	Y	Y	Y
<b>Pittsburg</b>	KS	N	Y	Y	Y
<b>Prairie Village</b>	KS	N	N	Y	N
<b>Pratt</b>	KS	Y	Y	Y	Y
<b>Roeland Park</b>	KS	N	Y	N	N
<b>Rossville</b>	KS	N	N	Y	N
<b>Russell</b>	KS	Y	Y	N	N
<b>Salina</b>	KS	N	Y	Y	Y
<b>Sterling</b>	KS	N	N	Y	N
<b>Sublette</b>	KS	Y	Y	Y	Y
<b>Tonganoxie</b>	KS	N	N	Y	Y
<b>Ulysses</b>	KS	N	Y	Y	Y
<b>Waterville</b>	KS	N	N	Y	N
<b>Westwood</b>	KS	Y	N	Y	N
<b>Wichita</b>	KS	N	Y	N	N
<b>Williamsburg</b>	KS	N	Y	Y	Y
<b>Alexandria</b>	KY	N	N	Y	N
<b>Auburn</b>	KY	Y	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Augusta</b>	KY	Y	N	Y	N
<b>Beaver Dam</b>	KY	N	N	Y	N
<b>Brooksville</b>	KY	Y	N	Y	N
<b>Butler</b>	KY	N	Y	N	N
<b>Carrsville</b>	KY	N	Y	N	N
<b>Concord</b>	KY	Y	Y	N	N
<b>Covington</b>	KY	Y	Y	N	N
<b>Crescent Springs</b>	KY	Y	Y	N	N
<b>Dayton</b>	KY	Y	N	Y	N
<b>De Mossvilleb</b>	KY	N	Y	N	N
<b>Elsmere</b>	KY	Y	N	Y	N
<b>Erlanger</b>	KY	Y	Y	N	N
<b>Falmouth</b>	KY	N	Y	N	N
<b>Flatwoods</b>	KY	Y	Y	N	N
<b>Flemingsburg</b>	KY	Y	Y	N	N
<b>Fort Thomas</b>	KY	Y	N	Y	N
<b>Foster</b>	KY	Y	N	Y	N
<b>Franklin</b>	KY	Y	Y	N	N
<b>Fulton</b>	KY	Y	Y	N	N
<b>Garrison</b>	KY	Y	Y	N	N
<b>Germantown</b>	KY	Y	N	Y	N
<b>Grand Rivers</b>	KY	N	Y	N	N
<b>Hickman</b>	KY	Y	Y	Y	Y
<b>Latonia</b>	KY	Y	Y	N	N
<b>Ludlow</b>	KY	Y	N	Y	N



<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Mayfield</b>	KY	Y	Y	N	N
<b>Maysville</b>	KY	Y	N	Y	Y
<b>Morehead</b>	KY	Y	Y	N	N
<b>Morganfield</b>	KY	Y	Y	N	N
<b>Newport</b>	KY	Y	Y	N	N
<b>Paris</b>	KY	Y	Y	N	N
<b>Quincy</b>	KY	Y	Y	N	N
<b>Ribolt</b>	KY	Y	Y	N	N
<b>Salem</b>	KY	N	Y	N	N
<b>Silver Grove</b>	KY	Y	Y	N	N
<b>Smithland</b>	KY	N	Y	N	N
<b>Southgate</b>	KY	Y	N	Y	N
<b>Sturgis</b>	KY	Y	Y	N	N
<b>Tollesboro</b>	KY	Y	Y	N	N
<b>Uniontown</b>	KY	Y	Y	N	N
<b>Vanceburg</b>	KY	Y	Y	N	N
<b>Walton</b>	KY	Y	N	Y	N
<b>Waverly</b>	KY	Y	Y	N	N
<b>Williamstown</b>	KY	Y	N	Y	N
<b>Addis</b>	LA	Y	Y	N	N
<b>Bastrop</b>	LA	Y	Y	N	N
<b>Berwick</b>	LA	Y	Y	Y	Y
<b>Breaux Bridge</b>	LA	Y	Y	N	N
<b>Bunkie</b>	LA	Y	Y	N	N
<b>Crowley</b>	LA	Y	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Delhi</b>	LA	Y	Y	Y	Y
<b>DeQuincy</b>	LA	Y	Y	N	N
<b>Franklin</b>	LA	Y	Y	N	N
<b>Gretna</b>	LA	N	Y	N	N
<b>Jeanerette</b>	LA	Y	Y	N	N
<b>Kinder</b>	LA	N	N	Y	N
<b>Leesville</b>	LA	Y	Y	N	N
<b>Lincoln Parish</b>	LA	Y	Y	N	N
<b>Lutcher</b>	LA	Y	Y	N	N
<b>Mamou</b>	LA	N	N	Y	N
<b>Mandeville</b>	LA	Y	Y	N	N
<b>Marksville</b>	LA	Y	N	N	N
<b>Minden</b>	LA	Y	Y	N	N
<b>Morgan City</b>	LA	Y	Y	Y	Y
<b>New Llano</b>	LA	N	Y	Y	Y
<b>Patterson</b>	LA	Y	Y	Y	Y
<b>Rayne</b>	LA	Y	Y	N	N
<b>Sorrento</b>	LA	Y	Y	Y	Y
<b>St. Charles Parish</b>	LA	N	Y	N	N
<b>St. Francisville</b>	LA	Y	N	Y	N
<b>St. John the Baptist Parish</b>	LA	N	Y	N	N
<b>St. Mary Parish</b>	LA	N	Y	N	N
<b>Ville Platte</b>	LA	Y	Y	N	N
<b>Washington</b>	LA	Y	Y	Y	Y
<b>Westwego</b>	LA	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>White Castle</b>	LA	Y	Y	N	N
<b>Winnfield</b>	LA	Y	Y	Y	Y
<b>Berwyn Heights</b>	MD	N	Y	Y	Y
<b>Bladensburg</b>	MD	N	Y	Y	Y
<b>Bowie</b>	MD	N	Y	Y	Y
<b>Brentwood</b>	MD	N	Y	Y	Y
<b>Capitol Heights</b>	MD	N	Y	Y	Y
<b>Cheverly</b>	MD	N	Y	Y	Y
<b>College Park</b>	MD	N	Y	Y	Y
<b>Colmar Manor</b>	MD	N	Y	Y	Y
<b>Cottage City</b>	MD	N	Y	Y	Y
<b>District Heights</b>	MD	N	Y	Y	Y
<b>Eagle Harbor</b>	MD	N	Y	Y	Y
<b>Edmonston</b>	MD	N	Y	Y	Y
<b>Fairmount Heights</b>	MD	N	Y	Y	Y
<b>Forest Heights</b>	MD	N	Y	Y	Y
<b>Glenarden</b>	MD	N	Y	Y	Y
<b>Greenbelt</b>	MD	N	Y	Y	Y
<b>Hyattsville</b>	MD	N	Y	Y	Y
<b>Landover Hills</b>	MD	N	Y	Y	Y
<b>Laurel</b>	MD	N	Y	Y	Y
<b>Morningside</b>	MD	N	Y	Y	Y
<b>Mount Rainier</b>	MD	N	Y	Y	Y
<b>New Carrollton</b>	MD	N	Y	Y	Y
<b>North Brentwood</b>	MD	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Ridgely</b>	MD	Y	Y	N	N
<b>Riverdale Park</b>	MD	N	Y	Y	Y
<b>Seat Pleasant</b>	MD	N	Y	Y	Y
<b>University Park</b>	MD	N	Y	Y	Y
<b>Upper Marlboro</b>	MD	N	Y	Y	Y
<b>Alma</b>	MI	Y	Y	Y	Y
<b>Birch Run</b>	MI	Y	Y	N	N
<b>Buena Vista</b>	MI	Y	Y	N	N
<b>Center Line</b>	MI	Y	Y	N	N
<b>Claybanks</b>	MI	Y	Y	N	N
<b>Dearborn Heights</b>	MI	Y	Y	N	N
<b>Ecorse</b>	MI	N	N	Y	N
<b>Grosse Pointe Woods</b>	MI	N	N	Y	N
<b>Harper Woods</b>	MI	Y	N	N	N
<b>Hartford</b>	MI	Y	N	Y	N
<b>Hastings</b>	MI	Y	Y	N	N
<b>Hazel Park</b>	MI	Y	Y	Y	Y
<b>Highland Park</b>	MI	N	N	Y	N
<b>Kingsford</b>	MI	N	N	Y	N
<b>Lapeer</b>	MI	N	Y	N	N
<b>Melvindale</b>	MI	N	Y	Y	Y
<b>Moorland Township</b>	MI	Y	Y	Y	Y
<b>Morenci</b>	MI	Y	Y	N	N
<b>Muskegon</b>	MI	Y	Y	N	N
<b>Muskegon Heights</b>	MI	Y	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
Newaygo	MI	Y	Y	Y	Y
Norton Shores	MI	Y	Y	Y	Y
Roosevelt Park	MI	Y	Y	N	N
Saginaw	MI	Y	Y	N	N
Sylvan Lake	MI	N	Y	Y	Y
Tawas City	MI	N	N	Y	N
Waterford Charter Township	MI	N	N	Y	N
West Branch	MI	N	N	Y	N
Ypsilanti Township	MI	N	Y	N	N
Airport Drive	MO	Y	N	Y	N
Ashland	MO	N	N	Y	Y
Bellefontaine Neighbors	MO	Y	N	N	N
Berkeley	MO	N	N	Y	N
Bloomfield	MO	N	N	Y	N
Bonne Terre	MO	Y	Y	N	N
Boonville	MO	N	Y	Y	Y
Branson West	MO	Y	N	N	N
Buckner	MO	N	Y	Y	Y
California	MO	N	Y	Y	Y
Camdenton	MO	N	N	Y	N
Cameron	MO	N	Y	Y	Y
Carl Junction	MO	N	Y	Y	Y
Carthage	MO	N	Y	Y	Y
Center	MO	N	N	Y	N
Chaffee	MO	Y	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Charlack</b>	MO	N	Y	Y	Y
<b>Chillicothe</b>	MO	N	Y	Y	Y
<b>Clinton</b>	MO	N	Y	Y	Y
<b>Concordia</b>	MO	Y	Y	Y	Y
<b>Cool Valley</b>	MO	Y	Y	Y	Y
<b>Crystal Lake Park</b>	MO	N	Y	Y	Y
<b>Dellwood</b>	MO	Y	N	Y	N
<b>Dexter</b>	MO	N	N	Y	N
<b>Excelsior Springs</b>	MO	N	N	Y	N
<b>Fayette</b>	MO	N	Y	Y	Y
<b>Fenton</b>	MO	N	Y	Y	Y
<b>Ferguson</b>	MO	N	Y	Y	Y
<b>Florissant</b>	MO	N	Y	Y	Y
<b>Fredericktown</b>	MO	U	U	Y	U
<b>Gerald</b>	MO	Y	N	Y	N
<b>Gladstone</b>	MO	Y	Y	N	N
<b>Hazelwood</b>	MO	Y	Y	Y	Y
<b>Independence</b>	MO	N	Y	Y	Y
<b>Ironton</b>	MO	N	Y	Y	Y
<b>Jennings</b>	MO	Y	Y	N	N
<b>Kansas City</b>	MO	N	Y	N	N
<b>Kearney</b>	MO	N	Y	Y	Y
<b>Kirksville</b>	MO	N	Y	Y	Y
<b>Lathrop</b>	MO	Y	N	Y	N
<b>Liberty</b>	MO	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
Licking	MO	N	N	Y	N
Monroe City	MO	Y	Y	N	N
Montgomery City	MO	N	Y	Y	Y
New Florence	MO	N	Y	Y	Y
New London	MO	N	N	Y	N
New Madrid	MO	N	Y	Y	Y
Normandy	MO	N	Y	Y	Y
Northwoods	MO	N	Y	Y	Y
Oronogo	MO	N	Y	Y	Y
Pagedale	MO	N	N	Y	N
Palmyra	MO	Y	Y	Y	Y
Pilot Grove	MO	N	Y	Y	Y
Pine Lawn	MO	N	N	Y	N
Platte City	MO	N	Y	Y	Y
Pleasant Valley	MO	Y	Y	N	N
Poplar Bluff	MO	N	Y	Y	Y
Richmond	MO	N	Y	Y	Y
Salem	MO	Y	Y	N	N
Savannah	MO	Y	Y	Y	Y
Seymour	MO	Y	Y	N	N
Shrewsbury	MO	N	Y	Y	Y
Sikeston	MO	N	Y	N	N
Springfield	MO	N	Y	Y	Y
St. James	MO	N	Y	Y	Y
Sugar Creek	MO	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Sullivan</b>	MO	Y	Y	N	N
<b>Trenton</b>	MO	N	Y	Y	Y
<b>Troy</b>	MO	Y	Y	Y	Y
<b>University City</b>	MO	Y	Y	Y	Y
<b>Village of Country Club</b>	MO	Y	N	Y	N
<b>Vinita Park</b>	MO	N	N	Y	N
<b>Warsaw</b>	MO	N	Y	Y	Y
<b>Weatherby Lake</b>	MO	N	Y	Y	Y
<b>Webb City</b>	MO	N	Y	Y	Y
<b>Windsor</b>	MO	N	Y	N	N
<b>Woodson Terrace</b>	MO	N	Y	Y	Y
<b>Aberdeen</b>	MS	Y	Y	Y	Y
<b>Alligator</b>	MS	Y	Y	N	N
<b>Benoit</b>	MS	Y	Y	N	N
<b>Beulah</b>	MS	Y	Y	N	N
<b>Bolton</b>	MS	N	N	Y	Y
<b>Boyle</b>	MS	Y	Y	N	N
<b>Brandon</b>	MS	N	Y	Y	Y
<b>Byram</b>	MS	N	N	Y	Y
<b>Clarksdale</b>	MS	Y	Y	N	N
<b>Cleveland</b>	MS	Y	Y	N	N
<b>Clinton</b>	MS	N	N	Y	N
<b>Columbus</b>	MS	Y	Y	N	N
<b>Corinth</b>	MS	Y	Y	N	N
<b>Duncan</b>	MS	Y	Y	N	N



<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Edwards</b>	MS	N	N	Y	Y
<b>Florence</b>	MS	N	Y	N	N
<b>Flowood</b>	MS	N	Y	Y	Y
<b>Gautier</b>	MS	Y	Y	N	N
<b>Greenville</b>	MS	Y	Y	N	N
<b>Greenwood</b>	MS	Y	Y	N	N
<b>Grenada</b>	MS	Y	Y	N	N
<b>Gunnison</b>	MS	Y	Y	N	N
<b>Indianola</b>	MS	N	N	Y	N
<b>Itta Bena</b>	MS	Y	Y	N	N
<b>Kosciusko</b>	MS	Y	Y	N	N
<b>Learned</b>	MS	N	N	Y	Y
<b>Leland</b>	MS	Y	Y	N	N
<b>Macon</b>	MS	N	N	Y	N
<b>Mantachie</b>	MS	Y	Y	N	N
<b>Merigold</b>	MS	Y	Y	N	N
<b>Morgan City</b>	MS	Y	Y	N	N
<b>Mound Bayou</b>	MS	Y	Y	N	N
<b>New Albany</b>	MS	Y	Y	N	N
<b>Pace</b>	MS	Y	Y	N	N
<b>Pearl</b>	MS	N	Y	N	N
<b>Pelahatchie</b>	MS	N	Y	N	N
<b>Philadelphia</b>	MS	Y	Y	N	N
<b>Puckett</b>	MS	N	Y	N	N
<b>Raymond</b>	MS	N	N	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Renova</b>	MS	Y	Y	N	N
<b>Richland</b>	MS	N	N	Y	Y
<b>Ridgeland</b>	MS	N	Y	Y	Y
<b>Rosedale</b>	MS	Y	Y	N	N
<b>Schlater</b>	MS	Y	Y	N	N
<b>Shaw</b>	MS	Y	Y	N	N
<b>Shelby</b>	MS	Y	Y	N	N
<b>Sidon</b>	MS	Y	Y	N	N
<b>Terry</b>	MS	N	N	Y	Y
<b>Tupelo</b>	MS	Y	Y	N	N
<b>Utica</b>	MS	N	N	Y	Y
<b>Winona</b>	MS	Y	Y	N	N
<b>Winstonville</b>	MS	Y	Y	N	N
<b>Baker</b>	MT	N	Y	Y	Y
<b>Libby</b>	MT	N	Y	Y	Y
<b>White Sulphur Springs</b>	MT	N	Y	N	N
<b>Camp Lejeune</b>	NC	Y	Y	Y	Y
<b>Cherokee Indians Eastern Band</b>	NC	Y	Y	N	N
<b>Edenton</b>	NC	Y	Y	Y	Y
<b>Henderson</b>	NC	Y	Y	N	N
<b>Burlington</b>	ND	N	N	Y	N
<b>Cando</b>	ND	N	N	Y	N
<b>Des Lacs</b>	ND	N	N	Y	N
<b>Devil's Lake</b>	ND	N	Y	Y	Y
<b>Glenburn</b>	ND	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Kenmare</b>	ND	Y	N	Y	Y
<b>Minot</b>	ND	N	Y	Y	Y
<b>Ray</b>	ND	N	N	Y	N
<b>Rugby</b>	ND	N	Y	Y	Y
<b>Watford City</b>	ND	N	Y	Y	Y
<b>Williston</b>	ND	N	Y	Y	Y
<b>Auburn</b>	NE	N	Y	Y	Y
<b>Beatrice</b>	NE	N	Y	N	N
<b>Beaver Crossing</b>	NE	N	N	Y	N
<b>Blair</b>	NE	N	Y	N	N
<b>Ceresco</b>	NE	Y	Y	Y	Y
<b>Gordon</b>	NE	N	Y	Y	Y
<b>Loup</b>	NE	N	N	Y	N
<b>Minden</b>	NE	N	Y	Y	Y
<b>Omaha</b>	NE	N	Y	N	N
<b>Osceola</b>	NE	N	N	Y	N
<b>Rushville</b>	NE	N	Y	Y	Y
<b>Schuyler</b>	NE	Y	Y	N	N
<b>South Sioux City</b>	NE	Y	Y	N	N
<b>Wayne</b>	NE	Y	N	Y	N
<b>Atlantic City</b>	NJ	Y	Y	N	N
<b>Borough of Highland Park</b>	NJ	Y	Y	N	N
<b>Borough of Newfield</b>	NJ	Y	Y	N	N
<b>Camden</b>	NJ	Y	Y	N	N
<b>Elizabeth</b>	NJ	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Elephante Butte</b>	NM	Y	Y	N	N
<b>Tijeras</b>	NM	N	N	Y	N
<b>Hempstead</b>	NY	Y	Y	N	N
<b>Larchmont</b>	NY	N	Y	Y	Y
<b>Peekskill</b>	NY	Y	Y	N	N
<b>Town of LaGrange</b>	NY	N	Y	N	N
<b>Village of New Hyde Park</b>	NY	Y	Y	N	N
<b>Village of Spring Valley</b>	NY	Y	Y	N	N
<b>Akron</b>	OH	N	Y	N	N
<b>Amberley Village</b>	OH	N	N	Y	N
<b>Ashtabula</b>	OH	N	Y	Y	Y
<b>Barberton</b>	OH	Y	Y	N	N
<b>Bedford Heights</b>	OH	Y	Y	N	N
<b>Bellefontaine</b>	OH	Y	Y	N	N
<b>Bellville</b>	OH	Y	Y	N	N
<b>Bexley</b>	OH	Y	N	Y	N
<b>Broadview Heights</b>	OH	Y	Y	N	N
<b>Brook Park</b>	OH	Y	Y	Y	Y
<b>Brooklyn</b>	OH	Y	Y	N	N
<b>Canal Fulton</b>	OH	N	Y	N	N
<b>Canal Winchester</b>	OH	Y	Y	N	N
<b>Canfield</b>	OH	Y	N	Y	N
<b>Carlisle</b>	OH	Y	Y	N	N
<b>Chardon</b>	OH	Y	Y	N	N
<b>Cheviot</b>	OH	Y	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Cleveland Heights</b>	OH	Y	Y	N	N
<b>Columbiana</b>	OH	Y	Y	N	N
<b>Conneaut</b>	OH	Y	Y	N	N
<b>Dublin</b>	OH	Y	Y	N	N
<b>Elmwood Place</b>	OH	N	N	Y	Y
<b>Englewood</b>	OH	Y	Y	N	N
<b>Euclid</b>	OH	Y	Y	N	N
<b>Fairfield</b>	OH	N	N	Y	N
<b>Fairlawn</b>	OH	Y	Y	N	N
<b>Fairview Park</b>	OH	Y	Y	N	N
<b>Forest</b>	OH	Y	Y	N	N
<b>Gallipolis</b>	OH	N	N	Y	N
<b>Garfield Heights</b>	OH	N	N	Y	N
<b>Girard</b>	OH	N	N	Y	N
<b>Glenwillow</b>	OH	Y	Y	N	N
<b>Greenfield</b>	OH	Y	Y	N	N
<b>Greenville</b>	OH	Y	Y	N	N
<b>Hamilton</b>	OH	Y	Y	N	N
<b>Highland Heights</b>	OH	Y	Y	N	N
<b>Hudson</b>	OH	Y	Y	N	N
<b>Kenton</b>	OH	Y	Y	N	N
<b>Lakewood</b>	OH	Y	Y	Y	Y
<b>Lima</b>	OH	N	Y	N	N
<b>Lincoln Heights</b>	OH	Y	N	Y	N
<b>Lisbon</b>	OH	Y	N	Y	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Lockland</b>	OH	Y	Y	N	N
<b>Lorain</b>	OH	Y	Y	N	N
<b>Loudonville</b>	OH	Y	Y	N	N
<b>Mansfield</b>	OH	Y	Y	Y	Y
<b>Marietta</b>	OH	Y	Y	N	N
<b>Massillon</b>	OH	Y	Y	N	N
<b>Mentor-on-the-lake</b>	OH	Y	Y	N	N
<b>Miamisburg</b>	OH	Y	Y	N	N
<b>Middleport</b>	OH	Y	Y	N	N
<b>Moreland Hills</b>	OH	Y	Y	N	N
<b>Napoleon</b>	OH	Y	Y	N	N
<b>New Albany</b>	OH	Y	Y	N	N
<b>New Lexington</b>	OH	Y	N	Y	N
<b>Newark</b>	OH	Y	Y	N	N
<b>Newburgh Heights</b>	OH	Y	Y	N	N
<b>North Olmstead</b>	OH	Y	Y	N	N
<b>Norwood</b>	OH	N	N	Y	N
<b>Olmstead Falls</b>	OH	Y	Y	N	N
<b>Oregon</b>	OH	Y	Y	N	N
<b>Parma</b>	OH	N	N	Y	N
<b>Perrysburg</b>	OH	Y	Y	N	N
<b>Pioneer</b>	OH	Y	Y	N	N
<b>Plymouth</b>	OH	N	N	Y	N
<b>Poland</b>	OH	Y	Y	N	N
<b>Portsmouth</b>	OH	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Put-in-Bay</b>	OH	N	N	Y	N
<b>Reynoldsburg</b>	OH	Y	N	Y	N
<b>Richmond Heights</b>	OH	Y	Y	N	N
<b>Rocky River</b>	OH	Y	Y	N	N
<b>Rome Township</b>	OH	Y	N	Y	N
<b>Sheffield Lake</b>	OH	Y	Y	N	N
<b>Shelby</b>	OH	Y	Y	N	N
<b>Springboro</b>	OH	N	Y	N	N
<b>Springdale</b>	OH	Y	Y	N	N
<b>St Mary's</b>	OH	Y	Y	N	N
<b>Struthers</b>	OH	Y	Y	N	N
<b>Sunbury</b>	OH	Y	N	Y	N
<b>Trotwood</b>	OH	Y	Y	N	N
<b>Uhrichsville</b>	OH	Y	Y	Y	Y
<b>Union</b>	OH	Y	Y	N	N
<b>Upper Arlington</b>	OH	Y	Y	N	N
<b>Utica</b>	OH	N	N	Y	N
<b>Vermilion</b>	OH	Y	Y	N	N
<b>Village of Amberley</b>	OH	N	N	Y	N
<b>Village of Golf Manor</b>	OH	N	N	Y	Y
<b>Village of South Point</b>	OH	N	N	Y	N
<b>Village of Swanton</b>	OH	Y	Y	N	N
<b>Waite Hill</b>	OH	Y	Y	N	N
<b>Warren</b>	OH	Y	Y	N	N
<b>Warrensville Heights</b>	OH	N	N	Y	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Wauseon</b>	OH	Y	Y	N	N
<b>Willoughby Hills</b>	OH	Y	Y	N	N
<b>Xenia</b>	OH	Y	Y	N	N
<b>Youngstown</b>	OH	N	Y	Y	Y
<b>Zanesville</b>	OH	Y	Y	N	N
<b>Del City</b>	OK	N	Y	Y	Y
<b>Spiro</b>	OK	N	Y	Y	Y
<b>Adria</b>	OR	N	Y	N	N
<b>Jordan Valley</b>	OR	N	Y	N	N
<b>Malin</b>	OR	Y	Y	N	N
<b>Nyssa</b>	OR	N	Y	N	N
<b>Ontario</b>	OR	N	Y	N	N
<b>Vale</b>	OR	N	Y	N	N
<b>Borough of Glenolden</b>	PA	Y	Y	N	N
<b>Clairton</b>	PA	Y	Y	N	N
<b>Township of Marple</b>	PA	Y	Y	N	N
<b>Central Falls</b>	RI	N	Y	Y	Y
<b>Johnston</b>	RI	Y	Y	N	N
<b>Portsmouth</b>	RI	Y	Y	N	N
<b>Providence</b>	RI	N	Y	N	N
<b>Warren</b>	RI	N	Y	N	N
<b>Warwick</b>	RI	N	Y	N	N
<b>Cheraw</b>	SC	Y	Y	N	N
<b>Dillon</b>	SC	Y	Y	Y	Y
<b>Travelers Rest</b>	SC	Y	Y	N	N



<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Ware Shoals</b>	SC	Y	Y	N	N
<b>Chamberlain</b>	SD	N	N	Y	N
<b>Marion</b>	SD	Y	N	Y	N
<b>Mobridge</b>	SD	N	Y	N	N
<b>Tea</b>	SD	N	Y	N	N
<b>Adamsville</b>	TN	Y	Y	Y	Y
<b>Brownsville</b>	TN	N	Y	Y	Y
<b>Ducktown</b>	TN	N	Y	Y	Y
<b>Dyer</b>	TN	N	Y	Y	Y
<b>Estill Springs</b>	TN	N	Y	Y	Y
<b>Etowah</b>	TN	Y	Y	Y	Y
<b>Fayetteville</b>	TN	Y	Y	N	N
<b>Grand Junction</b>	TN	N	Y	Y	Y
<b>Greenbrier</b>	TN	N	Y	N	N
<b>Halls</b>	TN	Y	Y	N	N
<b>Harriman</b>	TN	Y	Y	N	N
<b>Henderson</b>	TN	N	N	Y	N
<b>Hornbeak</b>	TN	Y	Y	N	N
<b>Jefferson City</b>	TN	Y	Y	N	N
<b>Kenton</b>	TN	Y	Y	N	N
<b>Lafayette</b>	TN	N	Y	N	N
<b>Lewisburg</b>	TN	N	Y	Y	Y
<b>Lookout Mountain</b>	TN	Y	Y	N	N
<b>Manchester</b>	TN	Y	Y	N	N
<b>Middleton</b>	TN	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Morrison</b>	TN	N	Y	Y	Y
<b>Mt Juliet</b>	TN	N	Y	N	N
<b>Nashville</b>	TN	N	Y	N	N
<b>Paris</b>	TN	N	Y	N	N
<b>Red Boiling Springs</b>	TN	Y	Y	N	N
<b>Ripley</b>	TN	Y	Y	N	N
<b>Rogersville</b>	TN	N	N	Y	N
<b>Rutherford</b>	TN	N	Y	Y	Y
<b>Selmer</b>	TN	N	N	Y	N
<b>Signal Mountain</b>	TN	Y	Y	N	N
<b>Somerville</b>	TN	N	Y	Y	Y
<b>South Fulton</b>	TN	Y	Y	N	N
<b>South Pittsburg</b>	TN	N	Y	Y	Y
<b>Sparta</b>	TN	N	Y	Y	Y
<b>Springfield</b>	TN	N	Y	N	N
<b>Wartrace</b>	TN	N	Y	Y	Y
<b>Watertown</b>	TN	N	Y	Y	Y
<b>White Pine</b>	TN	Y	Y	Y	Y
<b>Childress</b>	TX	N	Y	Y	Y
<b>Forest Hill</b>	TX	Y	Y	Y	Y
<b>Garland</b>	TX	N	Y	N	N
<b>Magnolia</b>	TX	Y	Y	N	N
<b>McGregor</b>	TX	Y	Y	Y	Y
<b>Surfside Beach</b>	TX	N	N	Y	N
<b>Clarkston</b>	UT	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Southampton</b>	VA	N	Y	N	N
<b>Auburn</b>	WA	Y	Y	N	N
<b>Brewster</b>	WA	Y	Y	Y	Y
<b>Bridgeport</b>	WA	N	N	Y	N
<b>Buckely</b>	WA	Y	N	Y	N
<b>Cathlamet</b>	WA	N	Y	Y	Y
<b>Connell</b>	WA	Y	Y	N	N
<b>Coulee Dam</b>	WA	Y	Y	N	N
<b>Enumclaw</b>	WA	N	Y	Y	Y
<b>Everett</b>	WA	Y	Y	N	N
<b>Everson</b>	WA	N	Y	N	N
<b>Grandview</b>	WA	Y	Y	N	N
<b>Harrah</b>	WA	Y	Y	N	N
<b>Kennewick</b>	WA	Y	Y	N	N
<b>Othello</b>	WA	N	Y	Y	Y
<b>Pasco</b>	WA	Y	Y	N	N
<b>Prosser</b>	WA	Y	Y	N	N
<b>Quincy</b>	WA	Y	Y	N	N
<b>Rainier</b>	WA	Y	Y	N	N
<b>Royal City</b>	WA	Y	N	Y	N
<b>Seatac</b>	WA	Y	Y	N	N
<b>Selah</b>	WA	N	Y	Y	Y
<b>Sumas</b>	WA	Y	Y	Y	Y
<b>Tekoa</b>	WA	N	Y	Y	Y
<b>Tieton</b>	WA	N	Y	N	N

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Toppenish</b>	WA	Y	Y	N	N
<b>Wapato</b>	WA	N	N	Y	Y
<b>Yakima</b>	WA	N	N	Y	Y
<b>Antigo</b>	WI	N	Y	Y	Y
<b>Arpin</b>	WI	U	Y	Y	Y
<b>Augusta</b>	WI	Y	Y	N	N
<b>Bloomer</b>	WI	N	Y	N	N
<b>Bonduel</b>	WI	Y	Y	N	N
<b>Brownsville</b>	WI	Y	N	Y	N
<b>Chetek</b>	WI	N	Y	N	N
<b>Cuba</b>	WI	N	N	Y	Y
<b>Cudahy</b>	WI	Y	Y	Y	Y
<b>Dickeyville</b>	WI	N	N	Y	N
<b>Gilman</b>	WI	Y	N	Y	N
<b>Greenwood</b>	WI	N	Y	Y	Y
<b>Hewitt</b>	WI	N	Y	Y	Y
<b>Lancaster</b>	WI	Y	N	Y	N
<b>Mayville</b>	WI	Y	Y	N	N
<b>Milwaukee</b>	WI	N	Y	N	N
<b>Montello</b>	WI	N	Y	Y	Y
<b>Neillsville</b>	WI	N	Y	Y	Y
<b>New Lisbon</b>	WI	Y	Y	Y	Y
<b>Niagara</b>	WI	Y	Y	Y	Y
<b>Oconomowoc</b>	WI	Y	Y	N	N
<b>Ripon</b>	WI	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Shullsburg</b>	WI	Y	Y	Y	Y
<b>South Milwaukee</b>	WI	Y	Y	Y	Y
<b>St. Croix Falls</b>	WI	Y	Y	N	N
<b>St. Francis</b>	WI	Y	Y	Y	Y
<b>Strum</b>	WI	Y	Y	N	N
<b>Town of Ashippun</b>	WI	Y	Y	N	N
<b>Town of Goodman</b>	WI	Y	Y	Y	Y
<b>Town of Hammond</b>	WI	N	Y	Y	Y
<b>Town of Herman</b>	WI	N	Y	Y	Y
<b>Town of Leroy</b>	WI	Y	N	Y	N
<b>Town of Morrison</b>	WI	Y	Y	N	N
<b>Town of Somerset</b>	WI	Y	Y	N	N
<b>Town of St. Joseph</b>	WI	N	Y	N	N
<b>Village of Argyle</b>	WI	N	Y	N	N
<b>Village of Baldwin</b>	WI	Y	Y	Y	Y
<b>Village of Benton</b>	WI	Y	Y	N	N
<b>Village of Biron</b>	WI	Y	Y	N	N
<b>Village of Bonduel</b>	WI	Y	Y	N	N
<b>Village of Brandon</b>	WI	Y	Y	Y	Y
<b>Village of Cambridge</b>	WI	Y	Y	Y	Y
<b>Village of Clyman</b>	WI	Y	Y	Y	Y
<b>Village of Dane</b>	WI	N	Y	Y	Y
<b>Village of Dresser</b>	WI	Y	Y	N	N
<b>Village of Fall Creek</b>	WI	N	Y	Y	Y
<b>Village of Fall River</b>	WI	N	Y	Y	Y

<b>City</b>	<b>State</b>	<b>Declaration</b>	<b>Restriction</b>	<b>Ban</b>	<b>Grand-father</b>
<b>Village of Hazel Green</b>	WI	N	N	Y	N
<b>Village of Neshkoro</b>	WI	N	Y	N	N
<b>Village of Pulaski</b>	WI	N	N	Y	N
<b>Village of Somerset</b>	WI	N	Y	Y	Y
<b>Village of Stratford</b>	WI	N	N	Y	N
<b>Village of Westfield</b>	WI	Y	Y	Y	Y
<b>Village of Wittenberg</b>	WI	Y	Y	N	N
<b>Village of Woodville</b>	WI	N	Y	Y	Y
<b>Village of Wrightstown</b>	WI	Y	Y	N	N
<b>Washburn</b>	WI	N	N	Y	N
<b>Weyauwega</b>	WI	N	Y	Y	Y
<b>Windsor</b>	WI	Y	Y	N	N
<b>Yorkville</b>	WI	N	Y	Y	Y
<b>Barboursville</b>	WV	N	Y	N	N
<b>Bluefield</b>	WV	Y	Y	Y	Y
<b>Ceredo</b>	WV	Y	N	Y	N
<b>Dunbar</b>	WV	Y	Y	N	N
<b>Fayetteville</b>	WV	Y	Y	N	N
<b>Huntington</b>	WV	Y	Y	N	N
<b>Montgomery</b>	WV	Y	Y	N	N
<b>Wheeling</b>	WV	Y	Y	N	N
<b>Ranchester</b>	WY	N	N	Y	N

## Appendix B: Search Methodology

- ❖ CABI Abstracts: (searches CAB and Global Health)
  - Main Page:
    - Basic Search
    - (dog\* or canine) AND (law or legislation) AND (breed)
    - From 1980 – 2015
  - Second Page:
    - Search results: 169
  
- ❖ PubMed:
  - Main Page:
    - Basic Search
    - (dog\* or canine) AND (law or legislation) AND (breed)
  - Second Page:
    - Publication Dates
      - Custom Range
        - ◆ 1980 01 01 to 2015 03 12
    - Search results: 152
  
- ❖ SCOPUS:
  - Main Page:
    - Basic Search
    - (dog\* or canine) AND (law or legislation) AND (breed)
    - Date Range:
      - Published 1980 to Present
  - Second Page:
    - Search results: 76
  
- ❖ PAIS Intl.:
  - Main Page:
    - Basic Search
    - (dog\* or canine) AND (law or legislation) AND (breed)
  - Second Page:
    - Publication Date
    - Enter a specific date range:
      - 1980 to 2015
    - Search results: 3

- ❖ CINAHL:
  - Main Page:
    - Basic Search
    - (dog\* or canine) AND (law or legislation) AND (breed)
    - Published Date:
      - January 1980 – March 2015
  - Second Page:
    - Search results: 1
  
- ❖ WorldCat Theses
  - Main Page
    - Advanced Search
    - (dog\* or canine) AND (law or legislation) AND (breed)
    - Year: 1980 – 2015
    - Subtype Limits
      - Content: Thesis/Dissertation
  - Second Page:
    - Search results: 8



Appendix C: Macomb County, Michigan Dog Bite Report Form



**ANIMAL BITE/BAT EXPOSURE REPORT**

**Provide all information below and fax completed report to  
586-783-0906 Within 24 Hours**

**Victim/Patient Information (please print):**

Name \_\_\_\_\_ Date of Birth \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_ Zip \_\_\_\_\_  
 Phone \_\_\_\_\_ County of Residence \_\_\_\_\_  
 Type of Injury (circle one): BITE SCRATCH ANIMAL SALIVA ON WOUND/MUCOSA POSSIBLE EXPOSURE TO BAT  
 Date of Incident \_\_\_\_\_ City where incident occurred \_\_\_\_\_  
 Skin Broken (circle one): YES NO Part of body injured \_\_\_\_\_  
 Medical Treatment obtained (circle one): YES NO Treating Facility \_\_\_\_\_  
 Physician Name \_\_\_\_\_ Date of Treatment \_\_\_\_\_

**Animal and Owner Information (please print):**

Animal Species (circle one): DOG CAT BAT OTHER - PLEASE SPECIFY \_\_\_\_\_  
 Breed \_\_\_\_\_ Color \_\_\_\_\_  
 Status (circle one): DOMESTIC STRAY WILDLIFE If Stray/Wildlife, has animal been captured: YES NO  
 Sex: MALE FEMALE UNKNOWN Rabies Vaccination Current: YES NO UNK Exp. Date \_\_\_\_\_  
 Owner Name \_\_\_\_\_ Phone \_\_\_\_\_  
 Address \_\_\_\_\_ City \_\_\_\_\_ Zip \_\_\_\_\_  
 County of Residence \_\_\_\_\_ *(If other than Macomb County - you must  
 contact Animal Control in the County where animal owner resides for reporting instructions)*  
 Summary of Incident \_\_\_\_\_  
 \_\_\_\_\_  
 Reporting Agency \_\_\_\_\_ Phone number \_\_\_\_\_  
 Person Reporting \_\_\_\_\_

Health Department/Animal Control Use only	
Animal Confined: Y N	Address where confined _____
Confinement end date _____	Outcome _____
Rabies Test: Y N	Result: Neg Pos Inconclusive Result Date _____

Appendix D: State of Indiana Dog Bite Report Form

**Official Indiana Animal Bites Report**  
 Indiana State Department of Health  
 State Form 14072 (R3/4-04)

Incident Location Address _____	Reported by (name) _____	Reporting Agency Case Number _____
County _____	Reported by (phone) _____	Reporting Agency _____
Exposure Date _____ / _____ / _____	Received by (name) _____	Bite Classification _____ / _____ / _____ <small>(see reverse side of this page to classify)</small>
Reported Date _____	Reported Time _____	Incident On Off Property _____
	Release Date _____	Victim Type (circle 2) Human Animal / Juvenile Adult

	VICTIM INFORMATION	OWNER INFORMATION		
Victim	Person bitten (if animal victim, use this space for animal victim's owner): Last Name _____ First Name _____ Date of Birth _____ / _____ / _____ Sex <input type="radio"/> M <input type="radio"/> F Street Address _____ City _____ Zip _____ Telephone Home: _____ Work: _____	Owner of Animal: Last _____ First _____ Mid. _____ Date of Birth _____ Street Address _____ City _____ Zip _____ Sex <input type="radio"/> M <input type="radio"/> F Home Telephone _____ Work Telephone _____ Biting Animal Dog Cat Other Color/Markings _____ Name _____ Sex <input type="radio"/> M <input type="radio"/> F Breed _____ Neutered <input type="radio"/> Y <input type="radio"/> N	Owner	
	Parent if victim is a juvenile: Last _____ First _____ Mid. _____ Street Address _____ City _____ Zip _____ Telephone Home: _____ Work: _____	Animal's Veterinarian _____ Prior Incidents _____ Rabies Vaccine <input type="radio"/> Y <input type="radio"/> N Date _____ / _____ / _____ Rabies Tag Number _____ License Number _____ Microchip Number _____ Citation issued? <input type="radio"/> Y <input type="radio"/> N		Animal
	If animal victim: Breed/Species _____ Color/Markings _____ Name _____ Sex <input type="radio"/> M <input type="radio"/> F Vaccine Date (rabies) _____	Location of Quarantine _____ Date of Quarantine _____ Quarantined by (name) _____ Release Date _____		
(if animal victim) Quarantined? Yes No Time of bite _____ Treating Physician (or veterinarian) Name: _____ Telephone: _____ Location on Body and Extent of Injury: _____	Released from Quarantine by (name): _____ Owner release card (date received): _____ Released from shelter quarantine (date): _____ Lab #/Result: _____	Incident		
Victim's statement of incident (animal owner if animal victim): _____ _____ _____	Animal owner's statement of incident: _____ _____ _____			
State Department of Health required information (must be completed): Species (fill in the correct biting species): <input type="checkbox"/> Bat <input type="checkbox"/> Dog <input type="checkbox"/> Hamster <input type="checkbox"/> Raccoon <input type="checkbox"/> Cattle <input type="checkbox"/> Ferret <input type="checkbox"/> Horse <input type="checkbox"/> Rat <input type="checkbox"/> Cat <input type="checkbox"/> Fox <input type="checkbox"/> Mouse <input type="checkbox"/> Squirrel <input type="checkbox"/> Chipmunk <input type="checkbox"/> Gerbil <input type="checkbox"/> Rabbit <input type="checkbox"/> Other _____ If Other, specify _____ Did the animal exhibit any of the following: <input type="checkbox"/> Convulsions <input type="checkbox"/> Aggression <input type="checkbox"/> Inability to eat/drink <input type="checkbox"/> Excessive salivation <input type="checkbox"/> Paralysis <input type="checkbox"/> Depression	Circumstances: <input type="checkbox"/> Animal confined (indoors, penned, tethered, or on leash) <input type="checkbox"/> Animal not confined (stray, roaming, etc.) <input type="checkbox"/> Wild Animal <input type="checkbox"/> Provoked <input type="checkbox"/> Unprovoked <input type="checkbox"/> Unknown <input type="checkbox"/> Other _____ Action taken with animal: <input type="checkbox"/> No Action <input type="checkbox"/> Body destroyed <input type="checkbox"/> Escaped/not found <input type="checkbox"/> Head sent to ISDH Lab <input type="checkbox"/> Pet quarantined (see dates above) <input type="checkbox"/> Other _____ <small>(dog, cat, ferret only)</small> <input type="checkbox"/> Unknown			
I, the undersigned, have received a copy of the quarantine guidelines, have read them, and understand them. I agree to comply with all provisions of the quarantine guidelines and understand that noncompliance may result in seizure of my pet if it is in home quarantine or loss of my pet if it is not properly claimed at the end of the quarantine period from the quarantining agency.				
Witness _____	Date _____	Signature _____		

DISTRIBUTION: White - Enforcing Agency, Canary - Local Health Department, Pink - Owner

**Animal Bite Classification System – Proper Use**

Bites are classified alphanumerically. The alpha designation indicates the victim, geographic location, and if the animal has bitten previously. The numeric designation indicates severity with (1) the least severe and (5) the most severe.

<u>Section I – Victim</u>	<u>Section II – Confined/Stray</u>	<u>Section III – Repeat Biter</u>	<u>Section IV – Bite Severity</u>
H = Human	C = Confined at the time of the bite	R = Repeat biter, previous information on file	1. Minor Scratch
D = Other animal (domestic)	S = Stray, roaming, off property, or not legally restrained	O = No previous bites	2. Minor, punctures 4 or less
W = Other animal			3. Moderate, punctures
			4. Severe, punctures (4 or more) deep may include crushing or tears from shaking
			5. Death

Example: H/C/R/3 = A bite to a human; the animal was legally confined at the time of the bite; the animal has bitten previously, and this is a bite of moderate severity.

**Initial Owner/Victim Contact – Action for Quarantine**

Location: \_\_\_\_\_ Description: \_\_\_\_\_

Date: \_\_\_\_\_ Officer: \_\_\_\_\_ Results: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Failed Quarantine (indicate reason):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Victim contacted on the 10<sup>th</sup> day:

Date: \_\_\_\_\_

Agent contacting victim: \_\_\_\_\_

Individual spoke with: \_\_\_\_\_

\_\_\_\_\_

Reserved space for office use:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### QUARANTINE GUIDELINES AND INFORMATION

**If your animal has been quarantined at a shelter or local veterinarian, the required date to pick up the pet is \_\_\_\_\_.** If you do not reclaim your pet from (or make arrangements with) the quarantining agency by the end of the business day of the date entered above, and pay appropriate fees at the time of reclaim, the animal will become the property of the agency at that time. The disposition of the animal may be determined at that time by the quarantining agency.

### INSTRUCTIONS FOR A HOME QUARANTINE

(Location of quarantine is at the discretion of the quarantining agency.)

1. Facility used for confinement shall ensure an escape-proof environment subject to unannounced periodic spot checks by the animal control officer or local health officer. The animal shall be confined inside a structure, not on a chain or in a fenced yard. Diagrams for the construction of cat and dog isolation cages are available if such is recommended by the animal control officer or local health officer.
2. The animal shall not leave the quarantine premises for any reason. The animal shall not have contact with humans or other animals for the 10-day period, with the exception of the primary caretaker.
3. At the first sign of illness in the animal, the owner shall notify the quarantining agency. Symptoms to watch for include fever, loss of appetite, excessive irritability, unusual vocalization, change in behavior, restlessness, jumping at noises, trouble walking, excessive salivation, tremors, convulsions, paralysis, stupors, or unprovoked aggression.
4. At the end of the 10-day quarantine period, the owner is responsible for contacting the quarantining agency to report the health status of the animal.
5. If these guidelines cannot be met or are violated at any time during the quarantine, the animal will be seized and the 10-day quarantine will be completed at the department of animal control shelter or a facility designated by the local health officer.
6. **When a pet has been exposed to rabies and it is not vaccinated, euthanasia is recommended. Alternatively, the owner has the option of arranging for a six-month quarantine at the owner's expense. This is due to the special public health risks associated with these animals (i.e., those potentially incubating rabies) and the need to prevent human and other animal exposures from occurring should rabies symptoms develop.**

### MEDICAL INFORMATION FOR VICTIMS AND PET OWNERS

Questions regarding medical treatment and advice should be directed to your family physician. Concerns regarding tetanus toxoid and/or rabies prophylaxis may be addressed by your physician or the local health officer. If your pet has been injured by another animal, contact your veterinarian for appropriate treatment.

VITA



## VITA

**Felicia E. Trembath**

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**Education**

**PhD in Epidemiology**, Purdue, West Lafayette, IN. August 2016. Dissertation: "Evaluating the Prevalence and Effectiveness of Breed-specific Legislation." Research areas: Health Policy, Breed-specific Legislation, Disease Surveillance Systems. Adviser: Alan Beck

**Master of Public Health**, Purdue, West Lafayette, IN. December 2009. Thesis: "A Rhetorical Analysis of Obstetrical Recommendations for Vaginal Birth after Previous Cesarean Delivery." Adviser: George Avery

**Master of Public Health**, University of Texas Health Science Center- Dallas Branch, Dallas, TX. Concentration: Epidemiology and infectious diseases. Research interests: effect of diseases in animal population on human health, meningitis and school-aged children. Degree not completed.

**Bachelor of Science**, Community Health Education, Brigham Young University, Provo, UT. April 2000. Research interests: needs assessments, program planning, historical significance of plague, genetic mutations conferring resistance to HIV infection.

**Honors and Awards**

**Invited Member**, (2015-present), Purdue Public Health Graduate Program Advisory Team, West Lafayette, IN.

**Executive Board Member, Secretary**, (2015-present), Arizona Public Health Association, Phoenix, AZ.



**Executive Board Member**, (2014-2015), International Society for Disease Surveillance, Boston, MA.

**Outstanding Student Abstract**, (2014), International Society for Disease Surveillance Conference, Philadelphia, PA.

**Health Systems Integration Program Fellow** (2014-2015), Centers for Disease Control and Prevention, Phoenix, AZ.

**Invited Lecturer**, (March 2012) “Overview of Public Health” 4<sup>th</sup> year Veterinary Student Public Health Rotation, Purdue University, West Lafayette, IN.

**Bilsland Strategic Initiatives Fellow** (2010-2011), Purdue University, West Lafayette, IN.

**Invited Lecturer**, (April 2011) “How Guidelines Shape Policy” WALLA Health Economics Short Course, West Lafayette, IN.

**Invited Lecturer**, (September 2010) “Descriptive Epidemiology” HK 445: Principles of Epidemiology, Purdue University, West Lafayette, IN.

**Invited Lecturer**, (Fall 2008) “Genetic Diseases and Other Inborn Errors” HK 365: Principles of Community Health Promotion, Purdue University, West Lafayette, IN.

**Invited Lecturer**, (April 2008) “Infectious Disease Epidemiology” HK 445: Principles of Epidemiology, Purdue University, West Lafayette, IN.

## Research

### Publications

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**Trembath, F.E.**, Patterson-Kane, E. The effect of human-animal interaction on human cardiovascular health. HABRI Central.org. 2015. HABRI Foundation. August, 2015.  
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Trembath, F.E. Practitioner attitudes and beliefs regarding the role animals play in human health. HABRI Central.org. 2014. HABRI Foundation. February 24, 2015. <http://habricentral.org/resources/44219>.

**Trembath, F.E**, Beck, A. RE: Preventable factors associated with dog bite fatalities [editorial]. *JAVMA*. 2014;245(1):39-41.

### Select Presentations

Trembath, F. (June 2015). *Experience Using an Online Survey to Assist in a Foodborne Outbreak Investigation*, presented at CSTE annual conference. Boston, MA.

Trembath, F. (December 2014). *An Analysis of the Challenges and Possible Solutions for Dog bite Injury Surveillance*, presented at ISDS annual conference, Philadelphia, PA.

Trembath, F. (April 2014). *Breed-specific Legislation in the United States: is it Effective or is the Ban Worse than the Bite?* Presented in CPB departmental seminar, West Lafayette, IN.

Trembath, F. (March 2014). *The Importance of Context when Analyzing Data*, presented in epidemiology group seminar, West Lafayette, IN.

Trembath, F. (February 2014). *Evaluating Breed-specific Legislation*, presented in epidemiology group seminar, West Lafayette, IN.

Trembath, F. (November 2013). *Analysis of Clustered Data*, presented in epidemiology group seminar, West Lafayette, IN.

- Trembath, F. (March 2012). *Understanding Risk Assessment*, presented in epidemiology group seminar, West Lafayette, IN.
- Trembath, F. (September 2012). *An Overview and Discussion of the Phenomenon of Vaccine Refusal*, presented in epidemiology group seminar, West Lafayette, IN.
- Trembath, F. (February 2012). *Infectious Disease Epidemiology: Select concepts and a Case Study*, presented in epidemiology group seminar, West Lafayette, IN.
- Trembath, F. (November 2011). *An Explanation and Application of Dummy Coding*, presented in epidemiology group seminar, West Lafayette, IN.
- Cahill K., Avery G.H., **Trembath F.**, Beck J., Trent E. (April 2011). *Working Together: An Examination of Integrated Health Care Delivery Systems in the United States and Recommendations for Future Reform Efforts*, panel presentation at MPSA Conference, Chicago, IL.
- Trembath, F. (April 2011). *Survey Implementation and Design: Survey Results and Lessons Learned*, presented in epidemiology group seminar, West Lafayette, IN.
- Trembath, F. (April 2011). *Unintended Outcomes in Pregnancies Complicated by Diabetes: Analysis of a Local Database*, poster presented at Chronic Disease Research Poster Session, West Lafayette, IN.
- Trembath, F. (November 2010). *The Move Towards "Voluntary" Accreditation in Public Health*, presented in epidemiology group seminar, West Lafayette, IN.
- Trembath, F. (April 2010). *An Analysis of Obstetrical Recommendations for Vaginal Birth after Previous Cesarean Delivery*, presented in epidemiology group seminar, West Lafayette, IN.
- Trembath, F. (June 2009). *A Rhetorical Analysis of Obstetrical Recommendations for Vaginal Birth after Previous Cesarean Delivery*, poster presented at Academy Health conference, Chicago, IL.
- Trembath, F. (September 2008). *Analyzing the Rhetoric of Physician Oriented Literature on Vaginal Birth after Previous Cesarean Delivery*, poster presented at the RCHE conference, West Lafayette, IN.
- Trembath, F. (May 2005). *Sheridan Coordinated School Health Program's Activities and Successes*, poster presented to parents, teachers, and students at Sagebrush elementary school, Sheridan County School District #1, Sheridan, WY.

Wyoming Department of Health Epidemiology Section. (August 2003). *Syndromic Surveillance for Bioterrorism Events*, group poster presented at Centers for Disease Control and Prevention conference, Miami, FL.

Wyoming Department of Health Epidemiology Section. (August 2003). *Review of Statewide Bioterrorism Preparedness Exercises*, group poster presented at Centers for Disease Control and Prevention conference, Miami, FL.

Utah Department of Health Environmental Epidemiology Section. (March, 2000). *Preliminary Results of the Relationship between Childhood Asthma and Environmental Hazards*, group poster presented at CDC conference, Atlanta, GA.

### **Select Research Projects**

*The Role of the Centering Model for Pregnancy in the Current Healthcare Climate.* Evaluated the current climate surrounding healthcare and the role that the centering model for pregnancy might play in meeting the six aims for improving healthcare created by The Institute of Medicine as well how it may factor into the mandate for Accountable Care Organizations established by the Patient Protection and Affordable Care Act. 2013.

*Comparison of Screening Methods for Gestational Diabetes.* Evaluated the current screening methods for gestational diabetes, paying particular attention to the different diagnostic thresholds. Developed a study to evaluate the cost-effectiveness of one versus two step screening methods. 2013.

*An Evaluation of Vaccine Refusal.* Evaluated the concept of vaccine refusal by reviewing the historical background, the current literature, and identifying public health concerns. Identified key areas for future research and strategies to combat vaccine refusal. 2012.

*The Impact of Childcare Needs and Family Responsibilities on Graduate Students at Purdue University.* Analyzed the impact of childcare and family responsibilities on graduate students at Purdue. Researched and summarized available resources for students. 2011.

*Addressing Childhood Obesity in the City of Lafayette.* As part of a team, researched the issue of childhood obesity in Lafayette, Indiana and prepared a policy brief for the parks and recreation department on how they could assist in addressing the issue. 2011.

*A Review of the Current Knowledge and Attitudes Toward Public Health Accreditation.* Conducted a systematic review of the literature on public health accreditation. Identified key themes among articles that had been published and identified gaps in the current knowledge. 2010.

*Risk Perceptions and How Individual's Make Decisions in Areas of High Uncertainty.* Analyzed knowledge on risk perception and applied that to how individuals make medical decisions in the face of high uncertainty as to the outcomes. 2010

*The Moderating Effect of Severity on Estimation of Disease Frequencies.* Developed a theory for how the perceived severity of a disease may moderate a person's application of the recognition heuristic. Designed a study to test the hypothesis that the use of the recognition heuristic in estimations of disease frequencies is moderated by perceived severity of the recognized disease. 2010.

*Cesarean Sections in the United States.* Researched topics regarding cesarean sections in the United States, including reasons for the increase in the cesarean section rate, issues surrounding vaginal birth after a cesarean delivery, and professional guidelines that address cesarean sections. 2009-2010.

*Pregnancies Complicated by Diabetes.* Synthesized and analyzed local data on pregnancies complicated by diabetes. Reviewed background information and wrote a report summarizing findings. 2009.

*Applying Social Marketing Strategies to Breast Tissue Bank Donations.* Amalgamated current knowledge on two social marketing theories, and developed strategies for those theories to be applied to potential breast tissue bank donors in order to increase donations of health breast tissue. 2009.

*Myocardial infarction and EMS Response in Indiana.* Reviewed background and assisted with literature review of myocardial infarction and first responder response time and actions in Indiana. 2007.

*History of Meningitis Vaccinations.* Conducted literature review of the history of meningitis vaccinations in order to effectively evaluate the newly licensed vaccine, Menactra™. 2005

*Prevalence of Salmonella in Asymptomatic Shelter Cats.* Designed study to conduct random sample of shelter cats in Sheridan County in order to establish the carrier status of asymptomatic felines. 2005.

*Case Studies of Wyoming's Four Human Plague Cases.* Compiled records from Wyoming Department of Health and the CDC to evaluate all aspects of the four human cases of plague recorded in Wyoming. 2004.

*Aquatic Injury Reduction Project,* Texas Department of Health. Researched communities who had reduced aquatic injuries and deaths to identify effective strategies for lowering the aquatic injury rate in Texas. 2001.

## **Professional Development**

### **Certifications**

AHA First Aid and CPR Instructor, 2007 – present

### **Professional Affiliations**

AcademyHealth

Arizona Public Health Association

Council of State and Territorial Epidemiologists

Healthcare Information and Management Systems Society

Indiana Public Health Association

International Society for Disease Surveillance

National Association of City County Health Officials

Purdue Public Health Student Association

### **Service**

Purdue University, Public Health Program Advisory Team, 2015 - present

Arizona Public Health Association, Board of Directors, 2015 - present

International Society for Disease Surveillance, Board of Directors, 2015- 2016

AzPHA, Annual Awards Selection Committee Member, 2014

Sunday School Teacher, 8-9 year old class, Church of Jesus Christ of Latter-day Saints, 2014-present

Social Chair, Public Health Student Association, 2011-2012

INPHA Conference Volunteer, April 2011

HKGSO Philanthropy Committee Member, 2010-2012

Volunteer, Family Promise Organization, 2009-2014  
 Assisted with message branding, Susan G. Komen Foundation, 2009  
 Data Collection Volunteer, Susan G. Komen Foundation, 2009  
 Volunteer, Lafayette Urban Ministry, 2008-2014  
 MPH Internship, IU Arnett Health Endocrinology division, 2008-2009  
 President of Master of Public Health Student Panel, 2008-2009  
 Spearheaded development of Masters of Public Health Student Panel, 2008  
 Data Collection Volunteer, PALS program, 2008-2009  
 Teacher, Church of Jesus Christ of Latter-day Saints, 2004-2005, 2009-2013  
 Nursery Child Care worker, Church of Jesus Christ of Latter-day Saints, 2007-2009  
 Women's Organization President, Church of Jesus Christ of Latter-day Saints, 2005-2006  
 Redesigned public health information graphs, Texas Department of Health, 2001  
 Community Health Internship, Utah Department of Health, 2000

### **Continuing Education**

Online Instructional Training, Grand Canyon University, Phoenix, AZ, Fall 2015.  
 Mixed Methods Instructional Training, Grand Canyon University, Phoenix, AZ, Fall 2015.  
 Designing and Managing Public Health Information Systems, Public Health Informatics Institute, Atlanta, GA, Fall 2014  
 Summer Course in Biostatistics and Epidemiology, The Ohio State University, July 2008  
 Tickborne diseases in WY, Wyoming Department of Health, Cheyenne, WY, June 2004.  
 Grant Writing, AmeriCorps, Casper, WY, September, 2006.

### **Computer Programs, Platforms and Languages**

#### ***Proficient***

Microsoft Office Suite, Corel Word Perfect, SPSS, Qualtrics, Blackboard, Endnote

#### ***Competent***

EpilInfo, SAS, ArcGIS, LoudCloud

#### ***Novice***

SQL, Python, HL7

## Professional Experience

### Academic Teaching Positions

<b>Term</b>	<b>Course</b>	<b>Institution</b>	<b>Role</b>
<b>Spring 2016</b>	Applied Statistics for Health Care Professionals ( <i>HLT-362</i> )	Grand Canyon University	Instructor
<b>Spring 2016</b>	Biostatistics ( <i>HCD/PBH 300</i> )	Arizona State University	Instructor
<b>Spring 2016</b>	Global Health ( <i>HLT-411</i> )	Grand Canyon University	Instructor
<b>Fall 2015</b>	Applied Statistics for Health Care Professionals ( <i>HLT-362</i> )	Grand Canyon University	Instructor
<b>Summer 2010</b>	Intro to Vet School ( <i>Summer Residential</i> )	Purdue University GERI	Instructor
<b>Summer 2010</b>	Astronomy ( <i>Super Summer</i> )	Purdue University GERI	Instructor
<b>Spring 2010</b>	Stress & Human Health ( <i>HK 233</i> )	Purdue University	Instructor
<b>Summer 2009</b>	Intro to Epidemiology ( <i>Summer Residential</i> )	Purdue University GERI	Instructor
<b>Spring 2009</b>	Spies Like Us ( <i>Super Summer</i> )	Purdue University GERI	Instructor
<b>Spring 2009</b>	Super Science ( <i>Super Saturday</i> )	Purdue University GERI	Instructor
<b>Spring 2009</b>	First Aid & CPR ( <i>HK 280</i> )	Purdue University	Instructor
<b>Fall 2008</b>	First Aid & CPR ( <i>HK 280</i> )	Purdue University	Instructor
<b>Spring 2008</b>	First Aid & CPR ( <i>HK 280</i> )	Purdue University	Instructor
<b>Fall 2007</b>	First Aid & CPR ( <i>HK 280</i> )	Purdue University	Instructor
<b>Fall 1999</b>	Human Development ( <i>FAMSC 210</i> )	Brigham Young University	TA
<b>Winter 1999</b>	Human Development ( <i>FAMSC 210</i> )	Brigham Young University	TA
<b>Fall 1998</b>	Human Development ( <i>FAMSC 210</i> )	Brigham Young University	TA



### Research Positions

- 2011-2015 **Team member** on the HABRICentral project, which developed a platform to synthesize resources on human-animal bond research. School of Veterinary Medicine, Purdue University, West Lafayette, IN.
- 2010 **Lead researcher** evaluating childcare needs among graduate students. Office of Graduate Studies, Purdue University, West Lafayette, IN.
- 2008-2009 **Team member** researching best practices in worksite wellness. Technical Assistance Program, Purdue University, West Lafayette, IN.
- 2007 **Team member** researching rural cardiovascular outcomes. Health and Kinesiology Department, Purdue University, West Lafayette, IN.
- 2000 **Team member** researching the spatial relationship between childhood asthma and environmental hazards. Environmental Epidemiology Section, Utah Department of Health, Salt Lake City, UT.

### Professional Positions

- 2015-present **Consultant**, Paramount Public Health Services, Phoenix, AZ. Consult with various jurisdictions to analyze the current state of projects and prepare plans for completion. Prepare technical reports on a variety of topics from health impact assessments to disaster response plans. Conduct training and education for health departments.
- 2015-present **Adjunct Faculty**, Grand Canyon University, Phoenix, AZ. Teach various public health and statistics courses through in-person and online modalities. Apply student-centered learning, cooperative learning, active learning, and problem-based learning methods to course material in order to maximize student success. Utilize LoudCloud platform for classroom management.
- 2015-present **Associate Faculty**, Arizona State University, Phoenix, AZ. Develop course curriculum. Teach public health statistics course through in-person and online modalities. Utilize student-centered learning, cooperative learning, active learning, and problem-based learning methods in order to maximize student success. Employ Blackboard platform for classroom management.
- 2011- 2016 **Research Assistant**, Purdue University, West Lafayette, IN. Assisted with the creation of the Human Animal Bond Research Institute (HABRI) at Purdue University. Helped with the development and population of the interactive website. Compiled and indexed individually authored chapters

of relevant texts. Currently prepare technical reports on various topics dealing with the human-animal bond relationship and supervise undergraduate students working on various aspects of the project.

- 2015-2016 **Public Health Emergency Preparedness Planner**, Gila County Department of Health and Emergency Management, Globe, AZ. Review and develop emergency preparedness plans and policies. Assist with development of public health emergency preparedness website. Write press releases on various public health topics. Develop infectious disease fact sheets on a variety of infectious disease topics. Serve as subject matter expert on public health emergency preparedness, infectious diseases, and biostatistics.
- 2014- 2015 **HSIP Fellow**, Centers for Disease Control and Prevention, Phoenix, AZ. Worked on various informatics projects dealing with the integration of health systems and data. Assisted with a ROI project for the dental sealant program run by the Office of Oral health. Lead data collection and analysis for a multi-state outbreak of *Salmonella* Saintpaul and an outbreak of *Campylobacter jejuni* involving 100 persons.
- 2007-2014 **Instructor**, American Heart Association, Dallas, TX. Teach various courses, including Heartsaver® first aid and CPR for the general public and Basic Life Support for healthcare professionals. Employ problem-based learning and active learning principles to maximize student achievement. Stay abreast of latest developments and updates to first aid and CPR protocol.
- 2010-2013 **Assistant Soccer Coach**, West Lafayette High School, West Lafayette, IN. Responsible for day to day operations of JV soccer team, including planning practices, developing game strategy, and coaching during games. Supervised JV coaching staff. Assisted with day to day operations of the Varsity team, including practices and game management.
- 2010 **Instructor**, Purdue University, West Lafayette, IN. Developed and delivered classroom curriculum for various courses. Created all grading criteria including exams, quizzes, and homework assignments. Apply student-centered learning, cooperative learning, active learning, and problem-based learning methods to course material in order to maximize student success. Utilized Blackboard learning system for classroom management.
- 2008-2009 **Worksite Facilitator and Trainer**, Technical Assistance Program, Purdue University, West Lafayette, IN. Assisted with the development, facilitation, and delivery of worksite wellness trainings for local manufacturing businesses. Synthesized databases of existing worksite information. Researched various topics and helped add to existing community resources database. Prepared technical reports and

- presentations on various worksite wellness aspects, including accessing the healthcare system, health issues in shift workers, and sleep IQ. Supervised trainers who assisted with projects and training development.
- 2008-2009 **Intern**, IU Arnett Health, Lafayette, IN. In charge of synthesizing and analyzing data on pregnancies complicated by diabetes that had been collected by endocrinology staff. Synthesized databases, reviewed data for errors, consulted patient records to locate as much missing information as possible. Analyzed data using logistic regression in SPSS™. Wrote and delivered a technical report summarizing my experiences and findings.
- 2007-2009 **Instructor**, Purdue University, West Lafayette, IN. Taught 7 sections, totaling 142 students. Developed and delivered classroom curriculum. Created all grading criteria including exams, quizzes, and homework assignments. Employ problem-based learning and active learning principles to maximize student achievement. Certified eligible students in AHA Heartsaver First Aid & CPR. Responsible for supervising other instructors teaching the same course.
- 2005-2006 **Americorps Vista**, Sheridan Community Education Foundation, Sheridan, WY. Oversaw fluoride rinse program, expanded program from 20% to 85% coverage of eligible children. Supported and developed Healthy School Teams at 4 locations. Lead teams in creating School Health Improvement Plans and implementing ideas. Responsible for data storage, management and analysis in order to evaluate program outcomes. Prepared program plans and operations guides to direct future program development.
- 2002-2004 **Field Epidemiologist**, Wyoming Department of Health, Sheridan, WY. Followed up on reports of Rocky Mountain Spotted Fever, Colorado tick fever, tularemia, Hepatitis A, strep group A, viral meningitis, and West Nile virus for the entire state of Wyoming. Conducted outbreak investigations as necessary, including a salmonella outbreak at a dormitory school and a Norwalk outbreak in Yellowstone national park. Researched the history of tickborne diseases in Wyoming to identify historical trends.
- 2001 **Aquatics Director**, YWCA of Dallas, Dallas, TX. Supervised all pool operations and aquatic staff. Developed new programs to offer the community, including water exercise classes and CPR classes. Managed data systems for aquatics related events.

- 1996- 2000     **District Supervisor**, City of Austin Aquatics, Austin, TX. Supervised summertime operation of nine aquatic facilities and close to 100 staff members. Responsible for all aspects of pool operations, including staff scheduling and pool safety. Conducted ongoing employee training on a weekly basis. Certified to teach lifeguarding, CPR for the professional rescuer, and First Aid. Taught swimming lessons, and coached competitive swimming team.
- 2000            **Epidemiology Intern**, Utah Department of Health, Salt Lake City, UT. Researched and prepared reports on a wide array of topics, including soil contamination and rabies. Provided infectious disease information to the public. Abstracted, compiled, maintained, and analyzed data on the relationship between childhood asthma cases and the location of environmental hazards using GIS.
- 1998-1999     **Teaching Assistant**, Brigham Young University, Provo, UT. Assisted with 5 sections of class totaling over 1,000 students. Conducted review sessions, helped with classroom instruction, and taught class when necessary. Created and evaluated examinations. Graded written assignments. Supervised and trained other teaching assistants.