

Table 1 (Supplementary): Included studies investigating dog bite prevention strategies

Study, Design, Aims	Participants, Intervention	Outcomes measured	Findings	Quality
LEGISLATION				
<p>Häsler, B., 2014 [57]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the economic value and effect on animal and human welfare of a rabies intervention programme</p>	<p>Participants: 47 sub-districts in Colombo city, Sri Lanka (n=650,000) 2007 – 2011</p> <p>Intervention: One Health approach:</p> <ul style="list-style-type: none"> • Stopped mass culling roaming dogs • Public area dog control • Targeted sterilisation • Education public • Public education • Mass vaccination 	<p>4-year study period</p> <ul style="list-style-type: none"> • Incidence dog bites from randomised household surveys in 2007 and 2011 • Monthly number of hospital presentations for a dog bite 	<p>Dog bites:</p> <ul style="list-style-type: none"> • Household Surveys (n=31/1,622): 34% non-significant reduction from 0.0216 per person (23/1,063) in 2007 to 0.0143 per person (8/559) in 2010 (p=0.31) • Presentations to hospital (n=291): Increase from 131 (11%) in 2006 to 160 (12%) in 2011 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Use of hospital records and household survey • Incidence rates reported for survey • Comprehensive intervention <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • Statistical analysis and method of incidence calculation not reported for hospital data • Unknown if increase in hospital presentations due to improved treatment seeking or an increase in dog bite injuries • Response bias in house-hold survey • Introduction of new intervention concurrently with ending mass culling stray dogs. • No control group • Did not study level of enforcement
<p>Dhillon, J., et al, 2016 [65]</p> <p>Design: No specific information given on study design</p> <p>Aim: Investigate how a dog control program can be introduced into a small indigenous community</p>	<p>Participants: Indigenous community in Canada, 2009-2013 (sample size not reported)</p> <p>Intervention:</p> <ul style="list-style-type: none"> • Dog control officer visited every school, community group and household. • Addressed dog welfare • Built a shelter 	<p>5-year study period</p> <ul style="list-style-type: none"> • Dog bites reported (did not specify who to) • Dog population data (not defined how they gained this) 	<p>Dog Bites (n=19)</p> <ul style="list-style-type: none"> • Number of reported dog bites decreased from 6-10 per year to 1 per year for three years • Dog population reduced by 50%, and roaming dog population reduced by 90% • Elders and children reported feeling safer • Increase in dog population after termination of programme 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Programme implemented in a small indigenous community • Used feelings of safety as an outcome • Reported effects of stopping intervention <p>Limitations:</p> <ul style="list-style-type: none"> • Unknown population size, small sample size • No control group • Unknown method of data collection

	<ul style="list-style-type: none"> • Ticketing or euthanasia for stray dogs • Sterilisation • Community patrols • Encouraged reporting of stray dogs 			
<p>Schurer, J.M., 2015 [74]</p> <p>Design: Pre-post interventional study</p> <p>Aim: To investigate the effect of a community based dog control programme on dog welfare and dog bites</p>	<p>Participants: Two rural indigenous communities in Saskatchewan, Canada (n=1,050)</p> <p>Intervention: One Health approach:</p> <ul style="list-style-type: none"> • Dog control (including 32%, n=124/382 dogs rehomed outside the community) • Community discussions • Dog welfare (including deworming and vaccination) • Free sterilisation clinics 	<p>1-year study period</p> <ul style="list-style-type: none"> • Dog bites presenting to medical attention 	<p>Dog Bites (n=11):</p> <ul style="list-style-type: none"> • Nine dog bites in 2012 and two in 2013 • Home-owners noticed children felt safer playing outside or walking to school. 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Programme implemented in small indigenous communities • Culturally sensitive with strong community engagement • Also noted feelings of safety as outcome <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • No control group • Substantial reduction in dogs during study
<p>Riley, T., et al 2020 [45]</p> <p>Design: Pre-post interventional study</p> <p>Aim: To investigate the effect of a community animal welfare intervention on dog bite rates</p>	<p>Participants: Remote Indigenous community in Wadeye, Northern Australia (n=approx. 2,280)</p> <p>Intervention: One Health approach: Free Vet visits (259):</p> <ul style="list-style-type: none"> • Sterilisation • Medication • Vaccination • Owner directed education on animal health (with translations) 	<p>4-year study period</p> <ul style="list-style-type: none"> • Quarterly incidence of dog bites presenting to health clinics 	<p>Dog-bites:</p> <ul style="list-style-type: none"> • No change in quarterly incidence of dog bites from 4.7 per 1,000 people in 2016 to 4.2 per 1,000 people in 2019 • Small reduction in dog population (598-532) 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Appropriate statistical analysis • Appropriate study period • Indigenous engagement <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • No control group
<p>Ma 2020 [44]</p> <p>Design: Non-random interventional study</p>	<p>Participants: Remote Indigenous communities in Northern Australia (n=approx. 4,000)</p>	<p>7-year study period</p> <ul style="list-style-type: none"> • Council reported dog attacks (rushes at, attacks, bites, harasses or chases any person or 	<p>Dog-attacks:</p> <ul style="list-style-type: none"> • 33-66% reduction in reported dog attacks from 2.5 per 1,000, 1.5 per 1,000 and 1.5 per 1,000 in the pre-intervention year of each community, to 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Tailored interventions to indigenous communities with strong engagement

<p>Aim: Investigate effect of community intervention on dog bite rates</p>	<p>Intervention: Free:</p> <ul style="list-style-type: none"> • Sterilisation • Registration/Microchips • Vet visits (assistance w transport) • Unwanted dogs euthanized or rehomed • Education at local schools on dog safety/hygiene 	<p>animal, whether or not injury has occurred)</p>	<p><1 per 1000 for all three communities in 2018/19 (p=0.035)</p> <ul style="list-style-type: none"> • No change in control community (4 per 1,000 in 2015/16 and 8.1 per 1,000 in 2018/19) 	<ul style="list-style-type: none"> • Control group • Appropriate statistical analysis <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • Many communities had unreported results • Dog population change not reported • Definition of dog attacks is likely to have greater variation than dog bites alone
<p>Marsh, L., et al, 2004 [46]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Describe the extent of dog bite injuries in New Zealand</p>	<p>Participants: NZ population (n=3.7 million) 1989 - 2001</p> <p>Intervention: Dog Control Act, 1996:</p> <ul style="list-style-type: none"> • Ticketing • Registrations • Leash laws • Muzzling • Sterilisation • Prohibited owners • Euthanasia • Breed Specific Legislation (BSL) 	<p>12-year study period</p> <ul style="list-style-type: none"> • Incidence dog bite hospitalisations 	<p>Dog Bites (n=3119)</p> <ul style="list-style-type: none"> • Rising incidence prior to legislation (from graph) from 4 per 100,000 per year in 1989 to 7.5 per 100,000 in 1996 • Rates dropped to 5.5 per 100,000 in 1999 after introduction of legislation • Rates returned to 6.8 per 100,000 in 2001 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Study length • Reliable data source • Use of incidence rates • Use of hospitalisation data • Large sample size <p>Limitations:</p> <ul style="list-style-type: none"> • Changes to coding may have over-estimated rates before legislation was introduced • No statistical analysis • No control group • Did not study level of enforcement
<p>The City of Calgary Animal & Bylaw Services, 2006 [50,86]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of dog control legislation on the incidence of dog bites</p>	<p>Participants: Calgary, Canada population (n=1,195,000) 1984 - 2014</p> <p>Intervention: Pet Ownership bylaw 2006:</p> <ul style="list-style-type: none"> • Strict leash laws • Directly returning strays • Reduced registration rates • Increased ticketing, muzzling, caging and sterilisation of dogs causing an injury to a person or animal • Education on the laws 	<p>30-year study period</p> <ul style="list-style-type: none"> • Incidence dog bites reported to Animal Management 	<p>Dog Bites (n=4193)</p> <ul style="list-style-type: none"> • 80% reduction in reported bite incidence from 99 per 100,000 per year in 1984 to 20 per 100,000 in 2014 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Study length • Use of incidence rates • Large sample size <p>Limitations:</p> <ul style="list-style-type: none"> • Reported bites likely an underestimation • Changes to reporting guidelines within study period • No statistical analysis • No control group

	<ul style="list-style-type: none"> • No BSL 			<ul style="list-style-type: none"> • Rates declining prior to legislation being introduced • Did not study level of enforcement
<p>Clarke, N.M., et al, 2013 [84]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of dog control strategies on rates of reported dog bites</p>	<p>Participants: 36 jurisdictions in British Columbia Canada (n=10.1 million) 2003 – 2005</p> <p>Interventions:</p> <ul style="list-style-type: none"> • Ticketing • Licensing • Education • BSL • Financial investment into animal control 	<p>3-year study period</p> <ul style="list-style-type: none"> • Incidence dog bites reported to animal management in different jurisdictions (per 100,000 people per year) 	<p>Dog Bites (n=not reported)</p> <p>Lower dog bite rates in areas with:</p> <ul style="list-style-type: none"> • High ticketing rates (p<0.01) • High licencing rates (p<0.10) <p>No difference in dog bite rates in areas with:</p> <ul style="list-style-type: none"> • Higher budget allocation for dog control • Higher staffing allocation for dog control • More public education • BSL (170 vs 180 in Non-BSL areas) 	<p>Study Quality: High</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Excellent statistical analysis. Incidence rates used. • Described that dog ownership rates (per person) not substantially different by area • Assesses legislative strategies separately • Large sample size likely • Control groups • Accounts for the impact of ticketing and licensing on likelihood of reporting • Investigated levels of enforcement of legislation <p>Limitations:</p> <ul style="list-style-type: none"> • Reported bites likely an underestimation • Confounding bias: Likely other differences in policy, dogs, owners, victim or environment • Reporting bias (response rate 22/36 areas)
<p>Glosser, J., et al, 1970 [75]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of a national dog control strategy, implemented as a response to a rabies epizootic</p>	<p>Participants: Guam population (n=95,000)</p> <p>Intervention: Mass poisoning of stray dogs and cats (>15,000), the introduction of leash laws, and adult education</p>	<p>3-year study period</p> <ul style="list-style-type: none"> • Number of animal encounters (predominantly dog bites or contact with saliva) 	<p>Animal encounters</p> <ul style="list-style-type: none"> • 75% reduction in encounters from 995 in 1967 to 252 in 1969 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Large sample size • Clear intervention: reduction in stray dog population <p>Limitations:</p> <ul style="list-style-type: none"> • Unclear method of data collection • Included all animals, not just dogs • No statistical analysis done • No incidence rates calculation • Unacceptable intervention in some societies
<p>Villalbí, J.R., et al, 2010 [51]</p>	<p>Population: Catalonia, Spain population (n=7.2 million) 1997-2008</p>	<p>11-year study period</p> <ul style="list-style-type: none"> • Incidence dog bite hospitalisations 	<p>Dog Bites (n=1103)</p> <ul style="list-style-type: none"> • 38% reduction from 1.80 per 100,000 (n=332, 95% CI 0.87, 1.36) in 1997-99, to 	<p>Study Quality: Moderate</p> <p>Strengths:</p>

<p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of dog control legislation on dog bite injuries</p>	<p>Intervention: Dangerous Animals Act 1999 & 2002</p> <ul style="list-style-type: none"> • Restrictions for dangerous dogs (breed, behaviour, size and other physical characteristics) • Leash laws • Microchips • Owner licencing 		<p>1.11 per 100,000 (n=241, 95% CI 0.87, 1.36) in 2006-08</p>	<ul style="list-style-type: none"> • Long study period • Large sample size • Incidence rates used <p>Limitations:</p> <ul style="list-style-type: none"> • No control group • No statistical analysis • Hospitalisation data only • Rates declining prior to intervention • Did not study level of enforcement
<p>Klaassen, B., et al, 1996 [52]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of the Dangerous Dogs Act 1991 on dog bite injuries</p>	<p>Participants: Aberdeen, Scotland population (n=200,000) 1991-1994</p> <p>Intervention: Dangerous Dogs Act 1991</p> <ul style="list-style-type: none"> • Ticketing • Registrations • Stray dog control • Leash laws • Restrictions for dangerous dogs (breed/behaviour) 	<p>4-year study period</p> <ul style="list-style-type: none"> • Emergency department (ED) presentations of dog bite injuries over 3 months 	<p>Dog Bites (n=268)</p> <ul style="list-style-type: none"> • No difference in dog bite presentations to ED pre and post legislation (134 in 1991 and 134 in 1994) 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Allowed enough time (2 years) to see impact • Broad outcome measure (ED presentations) <p>Limitations:</p> <ul style="list-style-type: none"> • No incidence rate or statistical analysis reported • No control group • Moderate sample size • Does not show seasonal term effects • Did not study level of enforcement
<p>Raghavan, M., et al, 2013 [83]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of banning pit-bull breeds on dog bite injuries</p>	<p>Population: 19 jurisdictions in Manitoba, Canada (n= 26 million), 1984-2006</p> <p>Intervention: Banning of Pit-bull breeds</p>	<p>23-year study period</p> <ul style="list-style-type: none"> • Incidence of hospitalisations for dog bite injuries 	<p>Dog Bites (n=838)</p> <ul style="list-style-type: none"> • Areas with BSL had 19% significantly less dog bite hospitalisations (2.92 per 100,000, 95% CI 2.66, 3.19) than non-BSL areas (3.62 per 100,000, 95% CI 3.25, 3.99, p=0.002) • Areas with BSL had a 9.6% non-significant reduction over time. 3.14 per 100,000 pre-BSL (n=144, 95% CI 2.65, 3.69), to 2.84 per 100,000 post-BSL (n=331, 95% CI 2.53, 3.15), p=0.319 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Long study period • Includes controls without legislation • Uses incidence rates and statistical analysis • Focused intervention <p>Limitations:</p> <ul style="list-style-type: none"> • Likely many confounding factors • Hospitalisation data only • Did not study level of enforcement • Unclear outcomes: all areas versus two cities • Control areas had other forms of pit-bull legislation

				<ul style="list-style-type: none"> • Unclear time-periods compared between exposure and control • Non-BSL areas not studied over time • Two cities compared instead of all areas • Did not account for differences in dog-ownership rates between areas
<p>Mariti, C., et al 2015 [49]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effects of breed-specific legislation on the trend of dog bites</p>	<p>Participants: Florence, Italy population (n= 355,000)</p> <p>Intervention: Breed Specific Legislation (banning 92 breeds) 2003-04</p>	<p>4-year study period</p> <ul style="list-style-type: none"> • Aggregate of dog bites from three sources including ED presentations, reports to canine registry and observational reports for prophylaxis in Florence: -Pre-BSL: 2002-03 -Short term: 2003-04 -Long term: 2004-05 	<p>Dog Bites (n=556)</p> <ul style="list-style-type: none"> • 17-18% reduction from 210 pre-BSL to 172 in short term, and 174 in long term 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Focused intervention • Long study period • Large sample size • Broad outcome measure <p>Limitations:</p> <ul style="list-style-type: none"> • Three different data-sources used • Decreasing trend prior to study period (1986-2001) • No incidence or statistical analysis • Did not report increased rate of decline post-BSL • No control group • Moderate sample size
<p>Nilson, F et al, 2018 [48]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of breed-specific legislation on the number of dog bite injuries</p>	<p>Participants: Odense, Denmark population (n=188,000)</p> <p>Intervention: Breed Specific Legislation 2010 (11 breeds banned and euthanised)</p>	<p>13-year study period</p> <ul style="list-style-type: none"> • Average 6-monthly number of dog bites presenting to an ED: -Pre-BSL: 2002-10 -Post-BSL: 2010-15 	<p>Dog Bites (n=2622)</p> <ul style="list-style-type: none"> • Non-significant 15% reduction pre-BSL: 103 per six months (n=1748, 95% CI 98, 108) to 87 per six months post-BSL (n=874, 95% CI 82, 93) • Non-significant 14% reduction pre-post BSL, in private spaces: 75 per six months (n=1269, 95% CI 71, 79) to 61 per six months (n=610, 95% CI 56, 66), or 7% reduction in public spaces: 28 per six months (n=480, 95% CI 26, 31) to 26 per six months (n=264, 95% CI, 56, 66) 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Investigated private and public spaces separately • Long study period • Large sample size • Statistical analysis appropriate • Broad outcome measure (ED presentations) <p>Limitations:</p> <ul style="list-style-type: none"> • Decreasing trend prior to intervention • 6-monthly rates do not account for seasonal variation • No control group • No incidence calculated

				<ul style="list-style-type: none"> • Two breeds already banned in 1991
<p>Rosado, B. et al, 2007 [47]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of the Dangerous Animals Act on the incidence of dog bites</p>	<p>Participants: Aragón, Spain population (n=1,204,215)</p> <p>Intervention: Dangerous Animals Act 1999 (non-BSL) and BSL 2002</p>	<p>9-year study period</p> <ul style="list-style-type: none"> • Mean incidence of dog bites recorded in Public Health Department: <p>-Pre non-BSL: 1995-99 -Post non-BSL: 2000-01 -Post BSL: 2003-04</p>	<p>Dog Bites (n=4186)</p> <ul style="list-style-type: none"> • No difference in dog bite incidence pre-post BSL (total rates not reported) • Low-populated area: 1.7% significant increase: 71.8 per 100,000 (SE 3.8) before and 73.0 per 100,000 (SE 3.3) after • High-populated area: 50% significant reduction: 18.6 per 100,000 (SE 3.9) before and 9.3 per 100,000 (SE 3.0) 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Investigates low-populated vs high-populated areas separately • Long study period • Large sample size • Incidence calculated <p>Limitations:</p> <ul style="list-style-type: none"> • Reported bites likely an underestimation • Limited statistical analysis • Confounding likely • No control group
STERILISATION				
<p>Byrnes, H., et al, 2017[58]</p> <p>Study design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of a One health rabies prevention programme</p>	<p>Participants: Sikkim, India population (n=610,000)</p> <p>Intervention: SARA (One Health) rabies prevention programme 2006:</p> <ul style="list-style-type: none"> • Stray dog sterilisation, medical care, and return to owners if known • Animal welfare education 	<p>13-year study period</p> <ul style="list-style-type: none"> • Number of bites provided by Dept of Health. Unknown method data collection 	<p>Dog Bites</p> <ul style="list-style-type: none"> • Increased from 853 in 2005/06 to 3,315 in 2012/13 • Bi-annual increases during breeding seasons 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Long study period • Large sample size • Culturally sensitive interventions <p>Limitations:</p> <ul style="list-style-type: none"> • Unknown data collection, missing data • No statistical analysis • Multiple interventions • No control group • Primarily rabies prevention • Intervention aimed to increase presentations of animal bites to medical care
<p>Kamoltham, T., et al, 2003 [82]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of sterilisation as part of a</p>	<p>Participants: Phetchabun, Thailand population (n=1.04 million)</p> <p>Intervention: Rabies prevention:</p> <ul style="list-style-type: none"> • Public education for rabies prevention 	<p>5-year study period</p> <ul style="list-style-type: none"> • Number of Animal bites from potentially rabid animals reported to Health Office 	<p>Animal Bites (93% dog bites):</p> <ul style="list-style-type: none"> • 66% increase in presentations of bites in intervention years, from 1,692 in 1996 to 2,816 in 2000, with a drop to pre-intervention levels of 1,693 in 2001 • Increase in total dog population from 91,190 in 1996 to 105,272 in 2001 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Long study period • Large sample size <p>Limitations:</p>

rabies prevention programme	<ul style="list-style-type: none"> • Sterilisation of dogs, particularly targeting strays around temples or schools 1997-2001 			<ul style="list-style-type: none"> • Intervention aimed to increase presentations of animal bites to medical care • Bites only included if potentially from rabid animal, and only if reported to public health • No control group • No statistical analysis • Large annual variability in rate – percentage rate change over time not reported • Primarily rabies prevention
<p>Reece, J.F., et al, 2013 [64]</p> <p>Design: Pre-post Interventional study</p> <p>Aim: Determine if a relationship exists between canine reproductive behaviour and human dog bites, through sterilisation of stray dogs</p>	<p>Participants: Jaipur, India population (n=3 million)</p> <p>Intervention: Surgical sterilisation and release of stray dogs from 2003 – 2011</p>	<p>8-year study period</p> <ul style="list-style-type: none"> • Annual number of dog bite injuries presenting to the dog bite unit of the city hospital 	<p>Dog Bites (n=167,000, approx)</p> <ul style="list-style-type: none"> • 48% reduction in dog bites injuries from 11,500 in 2003 to 6,000 in 2011 • Increase in bites 3 months after a peak in canine pregnancies in January, possibly due to protecting young 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Broad outcome measure (unit presentations) • Large sample size • Long study period • Investigated seasonal variation <p>Limitations:</p> <ul style="list-style-type: none"> • No control group • Likely confounding • No incidence rates or statistical analysis
<p>Garde, E., et al, 2016 [81]</p> <p>Design: Randomised Controlled Trial</p> <p>Aim: Investigate changes in behaviour following sterilization in a free-roaming male dog population</p>	<p>Participants: Free roaming dogs in Chile (n = 119)</p> <p>Intervention: Randomly assigned to either surgical (n=39) or chemical sterilisation (n=36) or control (no treatment, n=44)</p>	<p>6-month study period:</p> <ul style="list-style-type: none"> • Independent scale of aggression from videos of dogs in a session 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • An increase in aggressive behaviour in chemically sterilised dogs (p = 0.001) • No change in aggressive behaviour in dogs that were surgically sterilised or control group. 	<p>Study Quality: High</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Mostly randomised (3 dogs changed groups) • Adequate sample size • Control group • Independent blinded aggression scores • Well defined and described aggression scores <p>Limitations:</p> <ul style="list-style-type: none"> • 14% loss to follow up (17/119) • Aggression testing done in different seasons • Does not report dog bites • Behaviours had varying degrees of aggressiveness • Limited to free-roaming dogs only.
<p>Neilson, J.C., et al, 1997 [63]</p>	<p>Participants: Male household dogs in</p>	<p>Unknown study period</p>	<p>Dog Aggression:</p>	<p>Study Quality: Low</p>

<p>Design: Pre-post interventional study</p> <p>Aim: Determine whether surgical sterilisation can reduce problem behaviours in adult male dogs</p>	<p>California, USA, aged 2-7yrs with a behavioural issue (n = 57)</p> <p>Intervention: Surgical sterilisation</p>	<ul style="list-style-type: none"> Percentage improvement in dog behaviours based on report by owners (aggressive or non-aggressive) 	<ul style="list-style-type: none"> 20-25% of dogs showing aggression toward other dogs or family members had a 90% improvement 10-15% of dogs who showed aggressive behaviours toward unfamiliar dogs or human intruders had a 90% improvement 	<p>Strengths:</p> <ul style="list-style-type: none"> Follow up questions to owner made by a Vet Some statistical analysis <p>Limitations:</p> <ul style="list-style-type: none"> Small sample size No control group Young dogs and females not included Confounding likely Owner reported aggression scores Non-validated measures of behaviour problems Likely more motivated dog owners in study
<p>Maarschalkerweerd, R.J., 1997 [59]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the effect of orchiectomy on dog behaviour</p>	<p>Participants: 23 male dogs with aggression problems, castrated 6-12 months prior to study, Netherlands</p> <p>Intervention: Surgical sterilisation</p>	<p>12-month study period</p> <ul style="list-style-type: none"> Percentage of owners reporting an improvement in dog aggression 	<p>Dog aggression:</p> <ul style="list-style-type: none"> 26% (6/23) dogs decreased aggressive behaviour inside the house, and 52% (12/23) outside the house 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> Dogs with a number of behavioural issues <p>Limitations:</p> <ul style="list-style-type: none"> Small sample size No control group Owner reported aggression improvement Non-specific measures aggression No appropriate statistical analysis Likely motivated dog owners in study
ALCOHOL REDUCTION				
<p>West, C., et al, 2019 [43]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of alcohol restrictions on the incidence of dog bites and other types of injury</p>	<p>Participants: Three remote indigenous communities in Far North Queensland, Australia, 2006-2011 (n=2,262)</p> <p>Intervention: Community Alcohol Management Plans:</p> <ul style="list-style-type: none"> Community A (n = 1,063) and C (n = 621) strict alcohol zero carriage restrictions 	<p>5-year study period</p> <ul style="list-style-type: none"> Incidence of dog bites presenting to primary care clinics 	<p>Dog-bites (n=229):</p> <ul style="list-style-type: none"> Community A: 61% significant reduction from 12.4 per 1,000 people in 2006/08 to 4.8 per 1,000 in 2009/11 (IRR 0.4, 95% CI 0.2, 0.7, p=0.001) Community C: 30% significant reduction in community C from 40.0 per 1,000 to 27.9 per 1,000 (IRR 0.7, 95% CI 0.5, 1.0, p=0.033) Community B: 29% non-significant reduction, from 12.90 per 1,000 to 9.20 per 1,000 (p = 0.317) 	<p>Study Quality: High</p> <p>Strengths:</p> <ul style="list-style-type: none"> Good sample size Control group with partial intervention Community based intervention Broad outcome measure (primary care) Incidence rates calculated Appropriate statistical analyses Other injury outcomes also measured Strategy directed towards an indigenous population

	<ul style="list-style-type: none"> Community B (n = 578) restricted to limited personal alcohol consumption 		All communities: 0.6 times (60%) less likely to occur in 2011 (95% CI 0.4, 0.9, p=0.024) compared with 2006	<p>Limitations:</p> <ul style="list-style-type: none"> Unknown relationship between alcohol and dog-bites Controversial intervention, with potentially poor long-term engagement
GENERAL PUBLIC EDUCATION				
<p>Masthi, R.N.R., et al, 2014 [77]</p> <p>Design: Non-random interventional study</p> <p>Aim: Estimate the incidence of rabies and animal bites, investigate the efficacy of a rabies prevention programme, and assess the safety of vaccination</p>	<p>Participants: 6 rural villages in South India (n=16,243):</p> <ul style="list-style-type: none"> 3 received intervention (n=10,220) 3 controls (n=6,023) <p>Intervention: One Health approach:</p> <ul style="list-style-type: none"> Intensive Public Adult Education on rabies prevention, including responsible pet ownership and how to avoid animal and dog bites 	<p>2-year study period:</p> <ul style="list-style-type: none"> Incidence of dog bites measured through random survey of 20% of the village populations, at the start of the study, and at one year 	<p>Animal Bites (n=138/1735):</p> <ul style="list-style-type: none"> 30% reduction in animal bites in intervention villages from 2.7% (47/1,735, all dogs) to 1.9% (33/1,735: 27 dogs and 6 cows), p = 0.0398 No significant change in all animal bites in control villages, from 2.8% (31/1,080) to 2.5% (27/1,080, p=0.5501). Proportion caused by dogs not reported 	<p>Study Quality: High</p> <p>Strengths:</p> <ul style="list-style-type: none"> Comprehensive and culturally sensitive community-based education Control group Statistical analysis Broad outcome measure (Household Survey) <p>Limitations:</p> <ul style="list-style-type: none"> Small sample size Education may increase reporting of bites In context of rabies prevention Proportion of animal bites caused by dogs not reported for the control group
<p>Cleaveland, S., et al, 2003 [79]</p> <p>Design: Non-random interventional study</p> <p>Aim: Investigate the effect of a rabies prevention programme on number of dog bites from potentially rabid dogs</p>	<p>Participants: Rural Tanzanian Communities. Intervention: Serengeti District. Control: Two Neighbouring Districts (n=unknown)</p> <p>Intervention: Public education on rabies prevention and dog-vaccination 1996 – 2001</p>	<p>5-year study period</p> <ul style="list-style-type: none"> Annual incidence of dog bites from potentially rabid dogs, presenting to district hospitals 	<p>Dog-bite incidence:</p> <ul style="list-style-type: none"> 79% significant decrease in bites within intervention areas, from 28.8 per 100,000 people per year (95% CI 20.7, 39.1) pre-intervention, to 6.02 per 100,000 post-intervention (p<0.001) 60% non-significant increase in bites within control areas from 11.7 per 100,000 people per year (95% CI 8.6, 15.5) pre-intervention period to 29.4 per 100,000 (95% CI not reported) post-intervention period (p=0.06) 	<p>Study Quality: High</p> <p>Strengths:</p> <ul style="list-style-type: none"> Rural communities studied Long study period Monthly incidence calculated Excellent statistical analysis Appropriate control group Demographics compared between intervention and control areas through random household sampling, including number of household dogs and people <p>Limitations:</p> <ul style="list-style-type: none"> Used bites from potentially rabid dogs (uncertain if only non-vaccinated) Rabies prevention and vaccination dogs

<p>Mpolya, E.A., et al, 2017 [71]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of a rabies prevention programme on dog bite incidence</p>	<p>Participants: Southern Tanzania population (n=unknown)</p> <p>Intervention: Public education on rabies prevention and dog vaccination from 2010 to 2015</p>	<p>5-year study period</p> <ul style="list-style-type: none"> • Incidence of dog bites reported to researchers by livestock field officers and health care workers 	<p>Dog-bite incidence</p> <ul style="list-style-type: none"> • An initial increase in bite incidence from 1.8 per 100,000 per quarter (n=1,600) in 2011 to 2.8 per 100,000 (n=2,700) in 2012. Then, with monthly fluctuations there was a general decline to zero by 2016. 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Monthly and annual incidence calculated • Broad data collection method <p>Limitations:</p> <ul style="list-style-type: none"> • No control group • High variability in data collection method • No statistical analysis • Did not investigate pre-intervention rates • In context of rabies prevention
<p>Mudoga, E., et al, 2014 [69]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of a rabies prevention programme on dog bites</p>	<p>Participants: Unguja, Zanzibar population (n=900,000)</p> <p>Intervention: Rabies prevention 2009 to 2013:</p> <ul style="list-style-type: none"> • Intensive adult education, including vets, local leaders and dog-owners 	<p>5-year study period</p> <ul style="list-style-type: none"> • Dog bites presenting for medical attention (unknown data collection method) 	<p>Number dog-bites:</p> <ul style="list-style-type: none"> • Reduced by almost 65% from 2009 to 2013 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Developing country, not often studied • Appropriate outcome measure • Large sample size <p>Limitations:</p> <ul style="list-style-type: none"> • No control group • Data collection methods limited in Zanzibar • No statistical analysis, numbers not reported • Did not investigate pre-intervention rates • In context of rabies prevention
<p>Valenzuela, L.M., et al, 2017 [70]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of a rabies prevention programme on dog bites</p>	<p>Participants: Ilocos Norte, Philippines (n=593,081)</p> <p>Intervention: Rabies prevention 2012 to 2016:</p> <ul style="list-style-type: none"> • Community education to adults and children • Vaccination of dogs 	<p>8-year study period</p> <ul style="list-style-type: none"> • Animal bite consultations from eight animal bite treatment centres 	<p>Number of Animal bites:</p> <ul style="list-style-type: none"> • Animal bite consultations (83-89% by dogs) increased from 2,015 in 2011 (pre-intervention) to a peak of 5,908 in 2014 (post-intervention), then fell to 5,520 in 2015 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Broad data collection method • Large sample size <p>Limitations:</p> <ul style="list-style-type: none"> • No control group • No statistical analysis • Numbers were increasing pre-intervention • In context of rabies
EDUCATION OF CHILDREN				
<p>Deray, R., et al, 2018 [62]</p>	<p>Participants: Children aged 5-14 years (n = 5,764) in 27</p>	<p>2-year study period</p>	<p>Dog bites to children aged 5-14yrs:</p>	<p>Study Quality: High</p>

<p>Design: Pre-post interventional study</p> <p>Aim: Evaluate the impact and economics of education and pre-exposure prophylaxis on rabies and animal bite incidence in school children</p>	<p>Public Elementary schools in El Nido, Philippines</p> <p>Intervention: Rabies prevention: • Education on dog-bite prevention 2012-2013</p>	<p>• Incidence of dog bites in children aged 5-14 years: • Follow up interviews every 3 months over 18 months (per 1,000) • Presentations to bite centre at local hospital</p>	<p>• Interviews: No significant difference from 26.4 per 1,000 (124/4,700) in 2011 to 24.7 per 1,000 (114/4,700) in 2012 (p=0.46) • Hospital Presentations: No significant difference in presentations to hospital from 8.6 per 1,000 (79/9,211) in 2011 to 7.5 per 1,000 (69/9,211) in 2012 (p=0.65) • Decrease in the proportion of Category III bites, (11% of bites in 2011 to 3% in 2012 (p<0.05))</p>	<p>Strengths:</p> <ul style="list-style-type: none"> • Single intervention - education children • Dog bite rates measured in the same population • Broad outcome measure (interviews and hospitalisations) • Recall bias reduced by surveying at regular intervals • Large sample size • Statistical analysis appropriate • Investigated wound depth • Appropriate study length • Low loss to follow up (3.5%) <p>Limitations:</p> <ul style="list-style-type: none"> • No control group • Lower response rate for urban areas • Children at-risk not included in study (37% of children are not enrolled in a school)
EDUCATION OF DOG OWNERS				
<p>Gazzano, A., et al, 2008 [78]</p> <p>Design: Non-random interventional study</p> <p>Aim: Assess the effect of educating owners early in puppy management for the prevention of undesirable behaviours in adult dogs</p>	<p>Participants: Puppy owners, Pisa, Italy (n=89)</p> <p>Intervention: Advice on the importance of early socialisation, and positive behavioural techniques, from a veterinary behaviourist during first vet visit Non-randomly assigned: • 46 received intervention • 43 control</p>	<p>1-year follow up: • Owner reported dog behaviour</p>	<p>Dog Aggression: • Dogs in the intervention group were significantly less likely than controls to show aggressive behaviour toward unknown people and dogs (2% vs 16%, p<0.05), with a non-significant difference in aggression toward known people (0% vs 9%, p=0.051)</p>	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Appropriate follow up time • Control group • Balanced characteristics of owners and dogs <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • Owner reported aggression scores • Non-validated and unclear measures of undesirable behaviour • Degree to which advice was implemented unknown • Loss to follow-up not reported • Aggression may not occur until a later age
DOG TRAINING				

<p>Hutson, H.R., et al, 1997 [53]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate how a change in K9 police training method influences police dog bites</p>	<p>Participants: Police dogs in Los Angeles from 1988-1995 (n=unknown)</p> <p>Intervention: Dog training method, changed in 1992 from “Bite and Hold” to “Find and Bark”</p>	<p>8-year study period:</p> <ul style="list-style-type: none"> • Number of dog bites (and severity) to incarcerated patients in the jail ward ED (≥ 16 years age) <p>-Pre: 1988-91 -Post: 1992-95</p>	<p>Dog bites (n=705)</p> <ul style="list-style-type: none"> • 90% decrease in number of bites from 639 ‘Pre’ to 66 ‘Post’ (no p-value) <p>Bite severity:</p> <ul style="list-style-type: none"> • Decrease in people with ≥ 3 bites (Pre:58.4% to Post:45.5%; OR 1.68, 95% CI 0.98, 2.89, p=0.04) • Decrease in fractures (Pre:2.4% to Post:0%), vascular complications (Pre:7.5% to Post:1.6%), hospitalizations (Pre:52.0% to Post:33.8%) • No difference in overall complication rate (Pre:19.7% vs Post:15.6%; OR 1.32, 95% CI 0.64, 2.99, p=0.4) 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Investigates severity of bites • Long study period • Relevant training methods <p>Limitations:</p> <ul style="list-style-type: none"> • Size of police dog population unknown • No incidence rate (proportion of prison population) • No statistical analysis on primary outcome • Dogs likely already trained in old method prior to new method implemented • No control group • Potential bias of referrals of injured inmates to ED • Unknown adherence to training • Police dogs not representative of general dog population • Loss to follow-up (10.8%)
<p>Mesloh, C., 2006 [54]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: Investigate the impact of a new police dog training method on police dog bites (2001)</p>	<p>Participants: Police dogs in Florida, USA (n = 181)</p> <p>Intervention: New ‘bark and hold’ method</p> <ul style="list-style-type: none"> • 45 received intervention • 135 control (standard ‘bite and hold’ method) 	<p>1-year study period</p> <ul style="list-style-type: none"> • ‘Bite ratio’ (% of arrests where a bite was involved), measured by a survey (2002) to police dog handlers 	<p>Bite-Ratio:</p> <ul style="list-style-type: none"> • New method had higher mean bite ratios than the standard method (22.4% vs 15.7%, no p-value) 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Adequate sample size • Control group • Relevant training methods <p>Limitations:</p> <ul style="list-style-type: none"> • Inadequate statistical analysis reported • No allocation to each group, retrospective study • Dogs likely already trained in old method prior to new method implemented • Dog trainers (white males) and police dogs not representative of general population • Unknown adherence to training • Response bias (48% did not return survey)

				<ul style="list-style-type: none"> • Short study period
<p>Tortora, D.F., 1983 [76]</p> <p>Design: Non-random interventional study</p> <p>Aim: Investigate behavioural characteristics and efficacy of treatment of avoidance aggression in dogs</p>	<p>Participants: Household dogs in New Jersey, USA, referred to a vet with signs of aggression (n = 36)</p> <p>Intervention: Dog training programme (over 2.5 years) reinforced with an electric dog collar. Non-random assignment:</p> <ul style="list-style-type: none"> • 36 received intervention • Controls (waiting list, n=not specified) 	<p>4.5-year study period:</p> <ul style="list-style-type: none"> • Trainer reported measure: frequency of biting attempts within sessions 	<p>Bite Attempts:</p> <ul style="list-style-type: none"> • Significant decrease in bite attempts with training ($p < 0.001$), remaining at zero at a two-year follow-up • No change for controls ($p > 0.05$) 	<p>Study Quality: High</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Variety of dog breeds included • Control group • Two people independently measuring outcome • Good follow up period (2.5 years) • Statistical analysis • Focused outcome • Detailed description of intervention <p>Limitations:</p> <ul style="list-style-type: none"> • Intervention requires high-input/cost • Electric dog collars are considered to be unethical by some • Did not report size of control group, or if loss to follow-up • Follow-up data collected via survey/owner videos
<p>Dodman, N.H., et al, 1996 [85]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of positive training methods to treat dogs with dominance aggression</p>	<p>Participants: House-hold dogs with a history of owner-directed aggression (n = 10), Massachusetts, USA</p> <p>Intervention: A 1.5hr behavioural consultation followed by an individualised 8-week non-confrontational behaviour modification programme</p>	<p>8-week study period:</p> <ul style="list-style-type: none"> • Owner reported dog aggression 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • 9/10 aggressive dogs experienced a decrease in aggressive responses ($p < 0.05$) 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Use of non-aversive technique an acceptable strategy to many people <p>Limitations:</p> <ul style="list-style-type: none"> • Very small sample size • No control group • Short study period, no further follow-up • Measures of aggression not validated • Inconsistent intervention (altered for individual dogs) • Owner reported aggression scores • Intervention requires high-input/cost • Unknown adherence to training
<p>Knol, B.W., 1987 [60]</p>	<p>Participants: House-hold dogs with behavioural</p>	<p>Study period unknown</p>	<p>Dog aggression:</p>	<p>Study Design: Low</p>

<p>Design: Pre-post interventional study</p> <p>Aim: Summarise information on behavioural problems and the efficacy of treatment options</p>	<p>problems (n = 133), Netherlands</p> <p>Intervention: Owner-implemented successive approximation training (mixed rewards and leash/collar punishment system)</p>	<ul style="list-style-type: none"> • Owner satisfaction with the programme in changing dog behaviour (aggressive and non-aggressive): Good, Fair, Moderate, Bad 	<ul style="list-style-type: none"> • Owner reported satisfaction with the programme to change dog behaviour as 'good' or 'fair' in 42% of cases, moderate in 11% and bad in 41% 	<p>Strengths:</p> <ul style="list-style-type: none"> • Adequate sample size <p>Limitations:</p> <ul style="list-style-type: none"> • 5 dogs also received medications (methyl-progesterone and methyl-testosterone) • No control group • Different strategies for different behavioural problems • Mixed aversive and non-aversive training • Unknown time-period of intervention / follow-up • Owner satisfaction a proxy measure of dog behavioural change • Intervention requires high-input/cost • Unknown adherence to training • No statistical analysis on outcome
<p>Dinwoodie, I.R., et al, 2021 [55]</p> <p>Design: Observational retrospective cohort study</p> <p>Aim: To investigate the proportion of dog owners seeking help for behavioural issues, who they sought help from, which treatment plan worked best (behavioural or medication strategies), and the effect of treatments</p>	<p>Participants: House-hold dogs with at least one form of aggressive behaviour (n = 963), Connecticut USA</p> <p>Intervention: Owner-implemented behavioural modification (19 different types) or medication</p>	<p>Study period up to 2yrs</p> <ul style="list-style-type: none"> • Owner-reported improvements in aggression 	<p>Interventions accessed:</p> <ul style="list-style-type: none"> • 98% (943) engaged in behaviour training • 56% (542) sought help from professional trainer • 21% (202) received at least one of 11 kinds of medication <p>Dog Aggression:</p> <ul style="list-style-type: none"> • 82% (790/963) of owners reported an improvement in aggression • 25% (245/963) reported an improvement of at least 75% • No medication or alternative treatment improved aggression • Behavioural techniques associated with improvements were: communication technique, habituation, relaxation, and the use of short, frequent training sessions 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Variety of dog breeds included • Statistical analysis <p>Limitations:</p> <ul style="list-style-type: none"> • Low sample size medication groups • No control groups • 91% of dogs were neutered • Owners asked retrospectively • Owners initiated a heterogenous group of interventions • Owner-reported improvements, and non-validated measures • Interventions likely require motivated owners, were not standardised or well defined, and were of unknown duration • Unknown adherence to interventions
<p>Line S, et al 1986 [72]</p> <p>Design: Pre-post interventional study</p>	<p>Participants: House-hold dogs with owner directed aggression (n=24), USA</p>	<p>Study period: 12 months</p>	<p>Dog aggression:</p> <p>4/24 had >90% improvement</p> <p>6/24 had 70-90% improvement</p> <p>5/24 had 50-70% improvement</p>	<p>Study Quality: Low</p> <p>Strengths:</p>

<p>Aim: To investigate the effect of strategies to treat dog aggression</p>	<p>Intervention: Behavioural techniques, progestin, and surgical or chemical sterilisation</p>	<ul style="list-style-type: none"> • Owner-reported improvements in aggression 	<p>4/19 had <50% improvement 2/19 euthanised due to aggression, 2/19 died of other causes and 5 were lost to follow-up</p>	<ul style="list-style-type: none"> • House hold dogs with aggression <p>Limitations:</p> <ul style="list-style-type: none"> • Low sample size • No control group • Multiple different interventions • Owner-reported improvements • Interventions likely require motivated owners • Unknown adherence to behavioural interventions • No intention to treat analysis • High loss to follow-up
<p>Uchida Y, et al, 1997 [73]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of a behavioural modification programme on dogs with dominance aggression</p>	<p>Participants: House-hold dogs with dominance aggression, presenting to a behaviour clinic (n=20), USA</p> <p>Intervention: Non-confrontational behaviour management advice</p>	<p>8-week study period:</p> <ul style="list-style-type: none"> • Owner-reported response to treatment 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • 20% (n=4) 'cured' • 35% (n=7) marked or moderate improvement • 15% (n=3) slight improvement • 30% (n=6) no improvement 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • House hold dogs with aggression • Non-aversive training techniques • No concurrent medication use <p>Limitations:</p> <ul style="list-style-type: none"> • Low sample size • No control group • Owner-reported improvements • Interventions likely require motivated owners • Unknown adherence to behavioural interventions
MEDICATION AND DIET				
<p>Chutter, M., et al, 2019 [67]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Assess the effect of fluoxetine and behavioural modification therapy in the treatment of canine behavioural disorders</p>	<p>Participants: House-hold dogs with behavioural issues including aggression, presenting to a behaviour clinic (n=88), USA</p> <p>Intervention: Fluoxetine with a behaviour modification plan at some point in a 4-year period</p>	<p>4-year study period:</p> <ul style="list-style-type: none"> • Owner-reported response to treatment (positive, neutral, or negative) 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • Response to treatment: 55%, 32% neutral, 13% negative 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Range of doses used <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • No control • Other medications also prescribed • Duration of treatment not reported • Intervention likely requires motivated owners • Owner-reported improvements

				<ul style="list-style-type: none"> • High loss to follow up (n=41/134). Potentially treatment failure/non-compliance
<p>Virga, V., et al, 2001 [80]</p> <p>Design: Cross-over interventional study</p> <p>Aim: Investigate the effect of amitriptyline to assist behavioural modification in the management of aggressive behaviours in dogs</p>	<p>Participants: House-hold dogs with chronic aggression, USA (n=39)</p> <p>Intervention: Amitriptyline with behaviour modification plan</p> <ul style="list-style-type: none"> • 12 randomly assigned (prospectively) to either: -4wks drug then 4wks none • -4wks none then 4wks drug • 27 had drug for 4 weeks (retrospectively) 	<p>8-week study period:</p> <ul style="list-style-type: none"> • Owner-reported improvement in dog aggression 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • No difference in owner-reported improvement between weeks of receiving amitriptyline: 83% (95% CI 51, 97), and weeks receiving Placebo: 75% (95% CI: 44, 94, p=1.0) • No difference in owner-reported improvement between dogs receiving Amitriptyline in retrospective phase 70% (95% CI 50, 86), and weeks when prospectively treated dogs were receiving placebo 75% (95% CI 44, 94) (p=1.0) 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Double blinded, placebo control, cross-over • Statistical analysis <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • 12/24 prospective participants excluded • Unknown compliance with medication or behaviour modification plan • Unknown effect of behaviour techniques • No washout period • Owner-reported measures of improvement
<p>Odore, R., et al, 2020 [68]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the behavioural effects of Fluoxetine in dogs affected by dominance aggression</p>	<p>Participants: Dogs referred due to owner-directed aggression (n = 8), Italy</p> <p>Intervention: Fluoxetine and positive behavioural techniques for 6 months</p>	<p>6-month study period</p> <ul style="list-style-type: none"> • Owner-reported dog-aggression scale 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • Aggressive behaviour decreased from pre-intervention to 6 months 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Valid treatment • Focused outcome <p>Limitations:</p> <ul style="list-style-type: none"> • Very small sample size • No control group • Unknown compliance with medication or behaviour modification plan • Unknown effect of behaviour techniques • Owner-reported measure of aggression
<p>Dodman, N.H., et al, 1996 [61]</p> <p>Design: Cross-over interventional study</p> <p>Aim: Investigate the use of fluoxetine for the treatment of dominance aggression in dogs</p>	<p>Participants: House-hold dogs with owner-directed dominance aggression (n = 9), USA</p> <p>Intervention: Fluoxetine: 1 week of placebo, followed by 4 weeks of medication</p>	<p>5-week study period:</p> <ul style="list-style-type: none"> • Owner-reported aggression score: (growling, lip curling, snapping, biting) 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • Significant reduction in aggression score (p = 0.01), but not in any specific behaviour • 8/9 owners reported some level of improvement 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Cross over design • Partial blinding (week of placebo unknown to owners) • Use of an aggression score • Compliance to medication was checked <p>Limitations:</p>

				<ul style="list-style-type: none"> • Very small sample size • Owner-reported measure aggression • Non-validated measure aggression • Uses continuation of medication as a measure of success • Post-study analysis uncertain accuracy
<p>Rosado, B., et al, 2010 [66]</p> <p>Design: Pre-post interventional study</p> <p>Aim: Investigate the effect of fluoxetine on aggressive behaviour and biochemical markers</p>	<p>Participants: House-hold dogs with behavioural aggression, Valencia, Spain (n = 22)</p> <p>Intervention: Fluoxetine for 30 days</p> <ul style="list-style-type: none"> • 22 received intervention • 9 non-aggressive dogs also received intervention 	<p>30-day study period</p> <ul style="list-style-type: none"> • Owner-reported aggressive behaviour 	<p>Dog aggression</p> <ul style="list-style-type: none"> • All owners reported an improvement in aggressive episodes (authors did not specify by how much, or which group) 	<p>Study Quality: Low</p> <p>Strengths:</p> <ul style="list-style-type: none"> • Also investigates biochemical markers <p>Limitations:</p> <ul style="list-style-type: none"> • Small sample size • No appropriate control group • Owner-reported measure of aggression • Non-validated measure of aggression • Main objective of study was to measure biochemical markers
<p>DeNapoli, J.S., et al, 2000 [56]</p> <p>Design: Crossover interventional study</p> <p>Aim: Investigate the effect of protein or tryptophan diet on dog aggression and biochemical markers</p>	<p>Participants: House-hold dogs with aggression, Boston, USA (n=33). Grouped by aggression type: dominance, territorial, hyperactivity</p> <p>Intervention: Four diets: high or low protein, with or without tryptophan. Random allocation to 1 week of each</p>	<p>4-week study period</p> <ul style="list-style-type: none"> • Owner-reported aggression (average score) 	<p>Dog aggression:</p> <ul style="list-style-type: none"> • No significant improvement in behaviour with any groups for any diet • Dogs with dominance aggression fed a high-protein + Tryptophan diet had higher aggression scores 	<p>Study Quality: Moderate</p> <p>Strengths:</p> <ul style="list-style-type: none"> • 3-day washout period between diets • Exclusion of recent medications • Randomisation and blinding of diet weeks • Well defined measure of aggression • Appropriate statistical analysis <p>Limitations:</p> <ul style="list-style-type: none"> • Potential conflict of interest with Pet-Food company sponsorship • Exclusion of pregnancy or severe aggression • Small sample size • 5 dogs lost to follow-up • Owner-reported aggression score • Further analysis done on whole sample (no crossover/randomisation)