

Supplementary information

Table S1. Key words and combinations. The columns represent the key word categories (separated by "AND" in the search) and rows display word variations (separated by "OR" in the search).

Key word	1	2	3	4
	AND		AND	AND
	"Dog"	Stray*	Kill*	"Population"
	"Dogs"	"Feral"	Cull*	Control*
	"Canine"	Untame*	Euthan*	Restrain*
	"Canines"	Undomesticat*	Destroy*	Constrain*
		"Street"	Extermin*	Limit*
		Free-roam* (free-roaming)	Execut*	Restrict*
		Roam* (roaming)	Slaughter*	Manag*
		Unrestrict*	Terminat*	Dynamic*
		Free-rang*	"Lethal"	"Ecology"
		Rang*	Shelter*	Demograph*
		Abandon*	Rehom*	
		Unrestrain*	"Sanctuary"	
		Unconfin*	Adopt*	
			Rescue centre	
			Neuter*	
			Sterili* (sterilise)	
			Infertil*	
			Fert* (fertility)	
			Reproduc*	
			Breed*	
			Desex*	
			Castrat*	
			Contracept*	
			Birth*	
			Spay	

Inter-observer reliability:

The inter-observer reliability check resulted in 97% (146/150) agreement in stage one; and 60% (18/30) agreement at stage two.

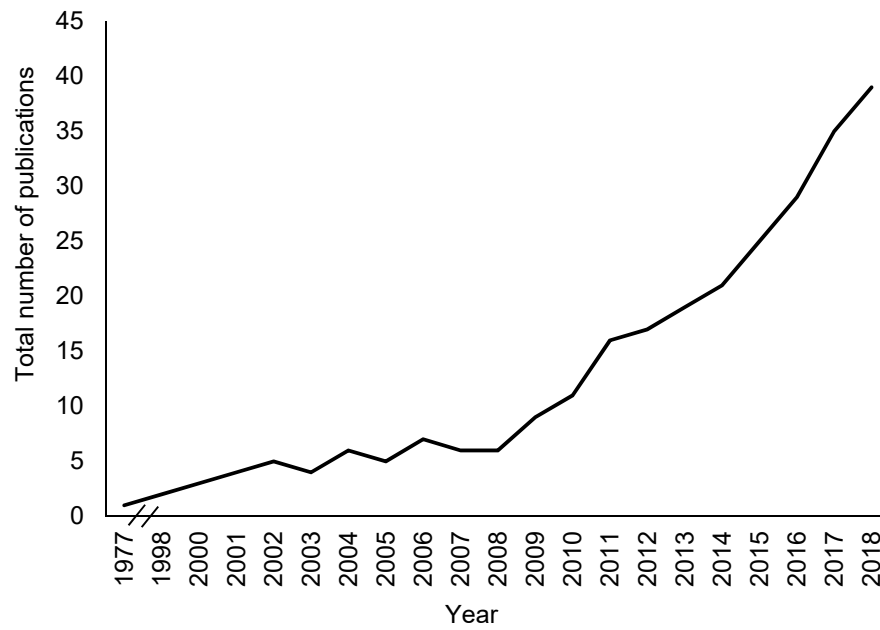


Figure S1. Cumulative number of publications in the final corpus per year between 1977 and 2018.
Note the break in year from 1977 to 1998.

Table S2. Papers in the final corpus by subject, dog population management method, country, economic status of that country, and funding organisation.

Author	Dog population management method	Country	Continent	Geographical Region	Economy status*	Funding type/driving organisation**
[1]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Charity and University
[2]	Neutering (CNR) and Culling (indiscriminate)	USA	North America	North America	High income	Government and University
[3]	Neutering (CNR) and neutering (owned) and sheltering (rehoming)	Multiple	Multiple	Multiple	Multiple	Government and University
[4]	Neutering (owned)	Brazil	South America	South America	Upper middle income	Charity, Government, and University
[5]	Neutering (CNR) and sheltering	Italy	Europe	European Union	High income	Not reported
[6]	Neutering (CNR) and sheltering	Brazil	South America	South America	Upper middle income	Government and University
[7]	Culling (indiscriminate)	Multiple	No specific	No specific	No specific	University
[8]	Neutering (CNR) and sheltering	Canada	North America	North America	High income	Government and University
[9]	Immunocontraceptive & culling (indiscriminate)	Multiple	No specific	No specific	No specific	Government and University

[10]	Neutering (CNR)	Brazil	South America	South America	Upper middle income	University
[11]	Sheltering (rehoming)	Turkey	Europe/Asia	Europe	Upper middle income	University
[12]	Neutering (undefined) and Culling (indiscriminate)	Cyprus	Europe	European Union	High income	Government
[13]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Charity, Government and University
[14]	Neutering (CNR) and neutering (owned) and sheltering (rehoming)	USA	North America	North America	High income	Charity
[15]	Neutering (CNR)	Brazil	South America	South America	Upper middle income	Charity, Government and University
[16]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Charity
[17]	Neutering (CNR) and sheltering	Italy	Europe	European Union	High income	Government and University
[18]	Culling (indiscriminate)	China	Asia	Asia	Upper middle income	Government and University
[19]	Sheltering	Spain	Europe	European Union	High income	Government
[20]	Neutering (owned) and owned dog confinement	Mexico	South America	Central America	Upper middle income	University
[21]	Neutering (CNR) and Culling (indiscriminate)	Sri Lanka	Asia	Asia	Upper middle income	Government

[22]	Culling (indiscriminate)	No specific	No specific	No specific	No specific	University
[23]	Taxation	No specific	No specific	No specific	No specific	University
[24]	Culling (infected dogs)	Brazil	South America	South America	Upper middle income	Government and University
[25]	Neutering (undefined) & Sheltering	Thailand	Asia	Asia	Upper middle income	Government and University
[26]	Neutering (owned) and Culling (indiscriminate)	Cyprus	Europe	European Union	High income	Government
[27]	Neutering (CNR) & Sheltering (transportation of dogs)	Serbia	Europe	Europe	Economy in transition	University
[28]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Charity
[29]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Government and Charity
[30]	Neutering (owned) and sheltering	Canada	North America	North America	High income	Charity and University
[31]	Neutering (CNR)	Bangladesh	Asia	Asia	Lower middle income	Charity and Government
[32]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Charity and University
[33]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Charity and University
[34]	Neutering (CNR)	India	Asia	Asia	Lower middle income	Charity and University
[35]	Neutering (CNR) and Culling (indiscriminate)	India	Asia	Asia	Lower middle income	Charity and University

[36]	Neutering and waste management	India	Asia	Asia	Lower middle income	University
[37]	Culling (infected dogs)	Brazil	South America	South America	Upper middle income	Charity and University
[38]	Culling (indiscriminate)	China	Asia	Asia	Upper middle income	Government and University
[39]	Culling (indiscriminate)	Chad	Africa	Africa	Low income	Charity and Government

* Economy status defined by The World Bank 2019 country income classification [40].

** Includes funding organisation and author affiliations.



Table S3. Number (and ratio) of published articles from the final corpus that measure the impact of the management method(s) studied.

Impact Measure	No. Papers	
Dog Health & Welfare		
Fertility control	4	(10.3%)
Fertility control and sheltering	1	(2.6%)
Sheltering	1	(2.6%)
Dog Demographics		
Fertility control	4	(10.3%)
Fertility control and culling	2	(5.1%)
Fertility control and movement restriction	1	(2.6%)
Fertility control and sheltering	5	(12.8%)
Taxation	1	(2.6%)
Public Attitude		
Fertility control	1	(2.6%)
Fertility control and sheltering	2	(5.1%)
Public Health		
Culling	7	(17.9%)
Fertility control	3	(7.7%)
Fertility control and culling	4	(10.3%)
Fertility control and sheltering	1	(2.6%)
Sheltering	1	(2.6%)
Wildlife		
Fertility control	1	(2.6%)
Total Papers		39 (100%)

Table S4. Number of papers investigating combinations of dog populations.

Dog population under investigation	Number of papers from final corpus investigating dog population
Only free-roaming owned dogs	1 (2.6%)
Only free-roaming unowned dogs	5 (12.8%)
Free-roaming unowned and free-roaming owned	19 (48.7%)
Free-roaming unowned, free-roaming owned and restricted owned	7 (17.9%)
Free-roaming unowned, free-roaming owned, restricted owned and shelter dogs	3 (7.7%)
Free-roaming unowned and shelter dogs	1 (2.6%)
Free-roaming owned and restricted owned	1 (2.6%)
Undefined	2 (5.1%)

Table S5. Summary of the reporting of study quality indicators in final corpus (excluding modelling studies). X indicates no metric was reported, ✓ indicates metric was reported and – indicates metric was not applicable for the study type.

Paper	Reporting of power calculation	Reporting of sample size calculation	Control population included	Reporting of inter-observer reliability	Reporting of baseline characteristics	Reporting quality indicator score
[19]	X	X	X	-	X	0% (0/4)
[32]	✓	✓	✓	-	-	100% (3/3)
[28]	X	X	X	-	X	0% (0/4)
[33]	X	X	X	X	✓	20% (1/5)
[34]	X	X	✓	✓	-	25% (1/4)
[31]	-	-	X	-	-	0% (0/1)
[21]	X	X	X	-	✓	25% (1/4)
[6]	-	-	✓	X	✓	67% (2/3)
[1]	X	X	X	✓	✓	40% (2/5)
[16]	X	X	X	-	-	0% (0/3)
[29]	X	X	X	✓	✓	40% (2/5)
[10]	✓	✓	X	✓	✓	80% (4/5)
[11]	X	X	X	-	-	0% (0/3)
[12]	X	X	X	-	✓	20% (1/4)
[26]	X	X	X	-	✓	20% (1/4)
[5]	X	X	X	-	-	0% (0/3)
[30]	X	X	X	-	✓	20% (1/4)
[25]	-	-	X	-	X	0% (0/2)
[8]	X	X	X	✓	-	20% (1/4)
[27]	X	X	X	-	-	0% (0/3)
[15]	-	-	X	-	✓	50% (1/2)
[24]	X	X	X	-	✓	20% (1/4)

[37]	X	X	✓	-	✓	50% (2/4)
Percentage reporting study quality indicators ^a	11%	11%	17%	71%	80%	

^a Calculated as a percentage of those studies where this quality indicator is applicable.

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