Policy recommendations for managing stray dogs in Morocco

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Abstract

Background: Stray dogs pose a serious threat to health and safety in Morocco.

Aim: To explore policy options for humane management of stray dogs in Morocco.

Methods: We conducted a review of relevant literature regarding the management of stray dogs in Morocco and elsewhere and interviewed an animal management expert. Based on our findings, we developed this policy brief for the management of stray dogs in Morocco.

Results: We highlight 4 key policy options for humane management of canine populations in Morocco: the treat, neuter, vaccinate and tag method; awareness-raising and education involving community members; canine population management; and partnering with the private sector.

Conclusion: There is an urgent need for a new policy approach to managing stray dogs in Morocco, including a robust monitoring and evaluation framework with key indicators that will enhance vaccination coverage, reduction in density and reduction in incidence of rabies and hydatidosis.

Keywords: stray dog, humane management, canine overpopulation, rabies, hydatidosis, TNVT, vaccination, Morocco

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Justification and purpose

Stray dogs pose a real threat to health and safety in Morocco. Estimates show that there are 3–4 million dogs in Morocco (*1*). Darkaoui et al estimated the dog population to be about 2.8 million in 2017 (*2*), and this overpopulation of dogs has been attributed to the abundance of food in Morocco (*3*). Stray dogs pose a threat to humans and wildlife, causing injury, fear due to their aggressive behaviour, noise, environmental pollution from their excrement, traffic accidents, and transmission of diseases like rabies and hydatidosis, which are on the increase (*4*).

In Morocco, 451 cases of human rabies were documented in 2000–2022, with an annual average of 20 cases in 2000–2021 (*5–7*). The highest number of 31 cases in one year was reported in 2007 (*8*). Between 2000 and 2010, an annual average of 391 cases of animal rabies was reported (all species combined) (*9*).

Worldwide, rabies constitute a significant economic burden of US$ 8.6 billion per year (*10*), and in Morocco, the main costs associated with dog-transmitted rabies include US$ 2.8 million for prevention of exposed individuals, US$ 2000 for dog vaccination and US$ 14 154 for dog culling (*11*).

Hydatidosis is still endemic in Morocco. In spite of efforts made to control the disease in the last 3 decades, its incidence has not decreased, and it remains a major public health problem associated mainly with the increasing number of stray dogs (*12,13*). The national health surveillance data shows that 456 cases of hydatidosis were reported in 2019, with estimated mortality of 2% of diagnosed cases (*12,14*). Between 1980 and 2008, 23 512 cases were recorded, with an annual increase in the number of cases and consequent surgical treatment; 3.6 and 5.2 per 100 000 inhabitants in 1980 and 2008, respectively) (*15*).

The global burden of hydatidosis has been estimated at 1.2 million, with over 3.5 million Disability-Adjusted Life Years (DALYs) lost every year (*16*). The medical costs of hydatidosis in Morocco are estimated to be at least 15 000 dirhams (≈US$ 1500) per patient, with a total of 25 million dirhams (≈US$ 25 000) (*16*). Hydatidosis caused an estimated 10 million dirhams (≈US$ 10 000) in 1992 (*12*) and 0.06–0.07% of the country's annual Gross Domestic Product (GDP) (i.e. US$ 16–18 million) through a decrease in animal production and organ contamination (*17*).

Management of stray dogs in Morocco has consisted mainly of elimination, which has currently been replaced with upgrade of slaughterhouses and fencing of public dumps, in addition to vaccinating dogs as part of the national rabies control programme which targets an immunization coverage of at least 70% but has not exceeded 20% (*18*).

The WHO Expert Committee on Rabies discourages dog culling because it is very costly and has no positive impact on the incidence of rabies (*19*). In 2019, a quadripartite agreement was signed between the Moroccan Ministry of Health and Social Protection, the

Ministry of Interior, the National Council of Veterinary Doctors, and the National Office of Food Safety (ONSSA) for the use of trap-neuter-vaccinate-return (TNVR) solution and shelters (20). TNVR is strongly recommended by WHO and the World Organization for Animal Health (WOAH). However, implementation of the agreement has been delayed because of the COVID-19 pandemic.

Management of stray dogs remains an urgent and multidisciplinary issue, with challenges extending beyond health to include the economic and tourism sectors. The development of sustainable solutions, such as TNVR, is not only humane but also necessary for addressing the multidimensional impact of stray dogs. Dog population management must be implemented through a multidisciplinary approach. Therefore, we developed this policy brief to assist policymakers in humanely managing stray dogs while addressing the health, economic and societal dimensions.

Key messages

- Stray dogs in Morocco pose a health and safety threat to humans and animals, with serious socioeconomic impact.
- Rabies and hydatidosis are the main health issues related to high canine populations in Morocco.
- Current control strategies consist mainly of vaccinating stray dogs against rabies, however, cases of human and animal rabies and hydatidosis continue to be reported every year.
- Awareness-raising with the involvement of community members and the use of TNVT have been proven to be effective in stray dogs management.
- Mapping canine population dynamics is a cornerstone for successful management.
- Improving infrastructure, investing in shelters and integrating animal control into urban planning are essential to create an environment that supports sustainable stray dog control.

Key policy options

Adopting the TNVR method

The most effective way to reduce stray dog populations is neutering and identification and the only way to control the spread of communicable diseases through dogs is through treatment and vaccination. The TNVR method is based on these 2 principles. TNVR is one of the most effective and humane approaches to managing stray dog populations (*21*), with proven success in multiple countries. The method reduces the number of stray dogs through neutering and addresses public health risks by vaccinating against rabies and treating for internal and external parasites. Studies from India (*22*), Thailand (*23*) and Brazil (*24*) have demonstrated significant reductions in stray dog populations and rabies cases following implementation of TNVR.

In Morocco, TNVR is also referred to as treat, neuter, vaccinate and tag (TNVT). It consists of *treat* against internal and external parasites for the benefit of humans and dogs, *neuter* to reduce dog population in a humane way and avoid unnecessary suffering, *vaccinate* against rabies and with each vaccinated dog build herd immunity, and *tag* (ear tag) each dog with identification number. Then return the neutered vaccinated dog to their environment. A healthy local dog population, naturally territorial, prevents other untreated dogs from moving in to exacerbate the problem.

Awareness-raising and education involving community members

Educating dog owners using posters, flyers, game books for children, school lessons, training workshops, and behaviour change communication, as well as improving access to veterinary services, will empower the community, thereby reducing dog abandonment. This should be done alongside pet breeding regulation through legislation and licensing of breeders. Involving nongovernment organizations and the community in education and awareness-raising can help change community attitudes towards dogs, as well as counter misconceptions and increase understanding of the public health benefits of TNVR/TNVT.

Canine population management

An assessment and monitoring of the dog population, including through the use of GPS trackers, is crucial for canine population management. It is important to know their demographic (sex ratio, mean age and life expectancy) characteristics to be able to understand their dynamics (*25*). To limit stray dog activity, it is important to improve infrastructure and sanitation services, including proper management of household waste and cleanliness of the surroundings of landfills and slaughterhouses.

Partnering with the private sector

It could be very useful to involve private veterinarians in free dog vaccination and neutering campaigns and to collaborate with animal protection associations for impounding stray dogs. Cleaning of ponds, landfills and slaughterhouses could be delegated to the private sector (*2*).

Methods

We conducted a scoping review of published and grey literature up until December 2024, with no language restrictions, using databases such as PubMed, Scopus and Google Scholar, alongside local and regional health repositories. We searched government publications, technical reports, research articles, evaluation reports, conference abstracts, and doctoral theses. Inclusion criteria were research identifying humane methods for canine population management and epidemiological profiling of rabies and hydatidosis in Morocco. To evaluate policy options, we referred to internationally recognized guidelines, including those of WHO, World Society for

the Protection of Animals' Guidelines for Dog Population Management, ICAM's Guide to Humane Dog Population Management, and WOAH's recommendations (*3,4,26,27*). We also interviewed the founder of SFT Animal Sanctuary Morocco to gain practical insights.

Further important considerations

To ensure success of the proposed policy options, a robust monitoring and evaluation framework is essential. Key indicators should include vaccination coverage, reduction in stray dog population density and reduction in incidence of rabies and hydatidosis. To overcome barriers relating to public resistance and coordination in implementing this across sectors, it is important to involve the nongovernment organizations, gain international support and integrate the initiative with existing public health programmes. There is a need to develop a centralized data platform and produce advocacy materials for engaging stakeholders.

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Recommandations de politiques pour la gestion des chiens errants au Maroc

Résumé

Contexte : Les chiens errants représentent une grave menace pour la santé et la sécurité au Maroc.

Objectif : Explorer les possibilités de politiques pour la gestion éthique des chiens errants au Maroc.

Méthodes : Nous avons réalisé une analyse exploratoire de la littérature pertinente concernant la gestion des chiens errants au Maroc et ailleurs, et nous avons interrogé un expert en gestion animale. Sur la base de nos conclusions, nous avons élaboré une note d'orientation pour la gestion des chiens errants au Maroc.

Résultats : Nous mettons en avant quatre politiques principales pour une gestion éthique des populations canines au Maroc, à savoir l'adoption de la méthode « soigner, stériliser, vacciner et identifier » ; la sensibilisation et l'éducation en impliquant les membres de la communauté ; la gestion de la population canine ; et la collaboration avec le secteur privé.

Conclusion : Il est urgent d'adopter une nouvelle approche politique pour la gestion des chiens errants au Maroc, assortie d'un cadre rigoureux de suivi et d'évaluation incluant des indicateurs clés qui permettront d'améliorer la couverture vaccinale, de réduire la densité canine et de diminuer l'incidence de la rage et de l'hydatidose.

توصيات سياساتية للتعامل مع الكلاب الضالة في المغرب

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الخلاصة

الخلفية: تشكِّل الكلاب الضالة تهديدًا خطيرًا للصحة والسلامة في المغرب.

الأهداف: هدفت هذه الدراسة الى البحث عن خيارات سياساتية بشأن تعامل الإنسان مع الكلاب الضالة في المغرب.

طرق البحث: أجرينا استعراضًا استكشافيًّا للمصنفات ذات الصلة المتعلقة بالتعامل مع الكلاب الضالة في المغرب وأماكن أخرى، وأجرينا مقابلة مع أحد الخبراء في مجال التعامل مع الحيوانات.

النتائج: نسلط الضوء على 4 خيارات رئيسية في مجال السياسات بشأن تعامل الإنسان مع تجمعات الكلاب في المغرب، وهي: اعتماد طريقة العلاج والتعقيم والتطعيم والوسم؛ وإذكاء الوعي والتثقيف من خلال مشاركة أفراد المجتمع المحلي؛ والتعامل مع تجمعات الكلاب؛ والشراكة مع القطاع الخاص.

الاستنتاجات: هناك حاجة مُلحَّة إلى وضع سياسات للتعامل مع تجمعات الكلاب الضالة في المغرب من خلال إطار قوي للرصد والتقييم يشمل مؤشرات رئيسية مثل التغطية بالتطعيم، والحد من الكثافة، وخفض معدلات الإصابة بداء الكَلَب وداء المشوكات العداري.

Table 1 **Policy options for canine population management in Morocco (*continued*)**

Policy options	Description	Main advantages	Main disadvantages	Cost and feasibility	Equity considerations	Key stakeholders
Adopting the TNVT approach	• Treat, neuter, vaccinate, tag (TNVT) approach to control stray dog population and prevent rabies: • Treat: against internal and external parasites • Neuter: to reduce the dog population in a humane way • Vaccinate: against rabies • Tag: an ear tag with identification number for each dog	• Ensure compliance with international guidelines to humane canine population management • Promotes the "One Health" approach • Contribute to rabies elimination under the vision of zero human deaths due to rabies by 2030 • Significant cost reduction in the long-term for rabies and hydatidosis	• Requires sustained funding and political will • May face resistance from communities unfamiliar with TNVT • Logistics challenges in rural/remote areas	• **Moderate to high cost:** Requires sustained funding for medical supplies, training and logistics • **Feasibility:** High in urban areas with existing veterinary infrastructure; lower in rural zones without access to services • **Acceptability:** Generally high among nongovernment organizations (NGOs) and international partners; may face scepticism from communities unfamiliar with the method • **Organizational factors:** Requires inter-ministerial coordination, local government support and a centralized tracking system	• Reduces health risks in underserved areas • Promotes equitable access to services	• Ministry of Health and Social Protection • Ministry of Interior • Ministry of Agriculture, Maritime Fishing, Rural Development and Forestry • National Council of Veterinary Doctors • National Office of Food Safety
Education and awareness-raising involving the community	• Community education, school programmes, media campaigns, and licensing breeders: • Education programmes and workshops • Posters and flyers, game books for children • Behaviour change communication • Facilitating access to veterinary services • Licensing breeders and legislation • Involving NGOs and community leaders, as stakeholders, in education to change community's attitude	• Increases use of veterinary services with greater access to canine population • Increases dog owners' involvement in the TNVT method • Promotes responsible ownership • Reduces dogs' abandonment, especially future puppies from unwanted litters	• Difficult to measure short-term impact • Risk of misinformation or low engagement • May not reach illiterate or rural populations effectively	• **Low to moderate cost:** Mainly involves content creation, media airtime and training educators • **Feasibility:** High, due to existing education and media networks • **Acceptability:** High across all sectors; aligns with public interest • **Organizational factors:** Requires collaboration between ministries, NGOs and media outlets; integration into school curricula may take time	• Ensures inclusive outreach through schools, media and community leaders and empowers marginalized communities through education	• Ministry of National Education, Preschool and Sports • National television channels and media • Private sector veterinarians

Table 1 **Policy options for canine population management in Morocco (*concluded*)**

Policy options	Description	Main advantages	Main disadvantages	Cost and feasibility	Equity considerations	Key stakeholders
Managing canine population	• Demographic tracking, sanitation improvements and impounding stray dogs: • Demographic and dynamic evaluation (sex ratio, mean age and life expectancy) using GPS trackers • Improvement of infrastructure (sanitation of towns and villages through proper management of household waste, cleanliness of landfills and slaughterhouses) • Impounding stray dogs	• Informs long-term strategy • Supports infrastructure development • Understanding the dynamics of dog populations will help determine which tools would be most effective and work over the long-term	• Infrastructure-dependent • Risk of inhumane treatment if impounding is poorly regulated • May be perceived as punitive by communities • Data collection may be inconsistent	• **High cost:** Infrastructure upgrades (e.g. shelters, sanitation), staff training and data systems are expensive • **Feasibility:** Moderate; more viable in cities with existing facilities • **Acceptability:** Mixed; may be seen as punitive or ineffective if not well communicated • **Organizational factors:** Requires strong oversight, legal frameworks and consistent data collection	• Helps target high-risk zones • Improves sanitation in poor areas	• Ministry of Interior • General Directorate for Territorial Collectivities
Partnering with the private sector	• Involving private veterinarians, NGOs and outsourcing services: • Involve private veterinarians • Collaborate with animal protection associations • Delegate the cleaning of ponds, landfills and slaughterhouses to the private sector	• Facilitates herd immunity • Efficient service delivery • Scalable: involving the private sector veterinarians is a key step to facilitating the vaccination process, aiming to achieve herd immunity	• Risk of profit-driven motives overriding animal welfare • Potential lack of accountability • May exclude small or rural providers	• **Moderate cost:** Involves contracting, monitoring and digital platform development • **Feasibility:** Moderate; depends on legal clarity and private sector capacity • **Acceptability:** High among NGOs and businesses; may raise concerns about profit motives • **Organizational factors:** Requires clear roles, accountability mechanisms and incentives for participation	• Expands access to veterinary services in remote or underserved regions	• NGOs • Private-sector veterinarians • Cleaning companies

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