



# Humane Dog Population Management

3rd International Conference



*Improving livelihood of Kenyans!*

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## **The William and Charlotte Parks Foundation for Animal Welfare**

The Foundation was established to improve the status of animals worldwide through studies of the science of philosophy of animal welfare/rights and to reduce, through practical efforts and initiatives, the suffering and harm inflicted on animals by human beings.

For more information, visit the website at: <https://www.parksfoundation.org/>

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For more information, visit the website at: <http://royalcanin.com/>

## **Michelson Prize & Grants**

Founded by philanthropist Dr Gary Michelson, Found Animals is a privately funded foundation whose mission is to save pets and enrich lives. In 2008, Found Animals launched the \$75M Michelson Prize & Grants in Reproductive Biology program to incentivize research through prize philanthropy and grant funding to rapidly develop a single-dose, nonsurgical sterilant for male and female cats and dogs. We envision a world in which this product is widely available to shelters, animal welfare organizations, and public health groups so as to eliminate shelter euthanasia of healthy, adoptable companion animals and reduce populations of feral and free-roaming cats and dogs.

For more information, visit the website at: <https://www.michelsonprizeandgrants.org/>

## **Alliance for Contraception in Cats & Dogs**

ACC&D's mission is to advance non-surgical sterilants and contraceptives for cats and dogs and to promote their global accessibility. ACC&D envisions a world in which cat and dog populations are effectively and humanely managed, improving the lives of dogs and cats and the people who care about them. Related ACC&D projects to be shared at this conference cover ethical decision making and new visible marking ID, of relevance for a range of dog population management programs.

For more information, visit the website at: <https://acc-d.org/>

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## A warm welcome from the International Companion Animal Management Coalition

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Greetings! Welcome to Mombasa and the 3<sup>rd</sup> International Humane Dog Population Management Conference. We are proud to bring together, once again, this vibrant community of veterinarians, policymakers, scientists, students, educators, community leaders and hands-on humane program practitioners. We welcome an incredibly diverse audience, with unprecedented representation from Africa. However far you had to travel, we're so glad you're here.

Reflecting on the progress of our field in the past 10 years, I couldn't help but feel incredibly proud of the progress we've made. Not so long ago, it seems, we spent most of our time responding to rabies outbreaks and threats to cull stray dogs all over the world. As a field, we were poorly organized, a collection of small charity programs, mostly managing shelters, overwhelmed and with little evidence to support our advocacy.

But today, we come together as policymakers, scientists and practitioners to talk about humane dog population management, armed with a nuanced understand of rabies epidemiology, human and dog population dynamics and myriad ways to collect and organize the data to support our work. Governments and international bodies formally recognize that culling dogs is an ineffective tool to combat rabies or manage stray dogs, and governments and NGOs now regularly work together as partners to create the comprehensive, humane and lasting dog management programs we see all over the world today.

This week, we will dive into learning from data-driven programs, and share with one another new ways to set up and collect outcome data via apps, deepen our relationships with the communities where we work, and support the professional veterinary practitioners whose high standards and continued learning support so much of the work we do: the words "indicators" "community" "technology" and "innovative" sprinkled liberally throughout our program.

Most importantly, we come together with an understanding that humane dog management means good dog welfare, and good dog welfare impacts positively on community welfare. We stand committed to improving outcomes for people and animals, here in Kenya and all over the world.

We hope that you make new friends, learn something new, and find camaraderie in this deep dive into a topic we have, collectively, transformed from a fringe topic to one of global importance.

Welcome!



Kate Atema  
Chair,  
International Companion Animal Management Coalition (ICAM)

18 September, 2019



With sincerest thanks to our local conference organiser, Connect Experiential, for their kind and professional assistance. In particular

David Chabeda  
Ann Kabinga  
Molly Wambui  
Tracy Atieno

*We could not have done this without you!*

**CONNECT**  
People • Transformation • Results

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## About the International Companion Animal Management (ICAM) Coalition

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Our mission is to support the development and use of humane and effective companion animal population management worldwide. Our goals are to share ideas and data; to discuss issues relevant to population management and welfare; to agree definitions and hence improve understanding and to provide guidance as a collegial and cohesive group. We are made up of eight international organisations: International Fund for Animal Welfare; Humane Society International; World Animal Protection; FOUR PAWS International; RSPCA International; Global Alliance for Rabies Control; World Small Animal Veterinary Association; International Cat Care. You can find out more about our work by visiting our website: <https://www.icam-coalition.org/about/>

This is our 3<sup>rd</sup> International Conference on Humane Dog Population Management. To find out about our previous conferences please visit: <https://www.icam-coalition.org/conference-archives/>

Follow the latest updates about the 3<sup>rd</sup> International Humane Dog Population Management Conference:

Facebook: <https://www.facebook.com/HDPM2019/>

Twitter: [@ICAMcoalition](https://twitter.com/ICAMcoalition)

Website: <https://hdpmconference2019.org/>

Conference organisers on behalf of ICAM:

### ICAM Coalition

Dr Elly Hiby (Conference Lead)

### International Fund for Animal Welfare

Kate Natrass Atema (ICAM Chair)  
Melissa Liszewski

### Humane Society International

Tamara Kartal

### World Animal Protection

Pankaj KC

### FOUR PAWS International

Ariel Brunn  
Katherine Polak

### RSPCA International

Alexandra Hammond-Seaman

### Global Alliance for Rabies Control

Deepashree Balaram

### World Small Animal Veterinary Association

Tess Kommedal  
Natasha Lee



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## About the Kenya Veterinary Association

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The Kenya Veterinary Association (KVA) is a membership organization of Veterinarians and is duly registered under the Societies Act, Cap 108 of the Laws Kenya. Its mandate is primarily to promote the economic development and welfare of its members as well as to safeguard the health and welfare of animals. The Association also acts as a resource Centre for the veterinary profession, providing leadership, advocating for proper management and high level of professionalism in the delivery of veterinary services so as to move the Animal Resource Industry to greater heights of development. As a veterinary profession, the KVA stands high in the push for knowledge, skills and best practices in the service for mankind.

Since the Association's inception in 1966 and subsequent registration as an Association in 1967, it has expanded in terms of membership as well as diversity, ranging from basic animal welfare to quality assurance of veterinary professional services and overall leadership in the Animal Resource Industry where members are responsible for certification and technical competence.

**Our mission:** Is to influence the establishment of a highly motivated veterinary profession in Kenya which will deliver quality veterinary services, positively contributing to the continued improvement of animal welfare and support growth in the animal resource industry.

**Our vision:** Is to become an organisation of excellence, spearheading and advocating the provision of quality veterinary services to cater for animal welfare and mankind

You can find out more about our work by visiting our website: <https://www.kenyavetassociation.com/>

Warm thanks are due to the KVA and local organising committee members

**KVA NEC members:**

**Dr Samuel Kahariri**

Dr Abraham Sangula

Dr Joseph Gichomo

Dr Lilyan Mathai

Dr Purity Kiunga

Dr Kevin Osore

Dr James Ogachi

Prof Charles Kimwele

Dr Solomon Onyango

Dr John Muchibi

Dr Andrew Matole

Dr Victor Yamo

Dr Nazaria Nyaga

**Local organising committee members:**

Dr Derrick Chibeu

Dr Emily Mudoga

Dr Wilson Kenga

Ms Mary Malonza



*Improving livelihood of Kenyans!*

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## Scientific committee members

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With thanks to our scientific committee who reviewed over 90 abstracts submitted for the conference!

Harry Eckman (Coordinator)	International Animal Welfare Specialist; Co-founder, Director of Change for Animals Foundation
Suzanne Rogers (Coordinator)	International Consultant Animal Welfare and Human Behaviour Change; Co-founder, Director of Change for Animals Foundation; Co-founder, Director of Human Behaviour Change for Animals CIC
Dr Heather Bacon	Veterinary Welfare Education and Outreach manager, Jeanne Marchig International Centre for Animal Welfare Education, University of Edinburgh, Scotland
Dr Melania Gamboa Cortés	Global Advisor, Animals in Communities, World Animal Protection, Cost Rica
Dr Willy Mwangi Edwin	Lecturer, Department of Clinical Studies, Deputy Head of Veterinary Teaching and Referral Hospital, University of Nairobi, Kenya
Rosangela Ribeiro Gebara	Campaign Manager, Animals in Communities, Programme Coordinator, Animals in Disaster, World Animal Protection, Brazil
Dr Andy Gibson	Director of Strategic Research, Mission Rabies
Samantha Green	CEO, Founder of Dogstar Foundation, Sri Lanka
Dr Elly Hilby	Scientific Coordinator, International Companion Animal Management Coalition
Becky Johns	Animal Welfare Consultant
Tamara Kartal	Research and Development Manager, Co-lead (MEIA), Companion Animals and Engagement Department, Humane Society International
Prof Charles N Kimwele	Expert Representative for East Africa - Coordinating Committee for African Platform for Animal Welfare; Chair, Scientific Committee, Kenya Veterinary Association; Chair, Board of Trustees Communities and Livelihoods Foundation
Dr Gilbert Kirui	Tutorial Fellow, Department of Clinical Studies, University of Nairobi, Kenya; Kenyan Veterinary Association
Dr Natasha Lee	Animal Wellness and Welfare Committee Member, World Small Animal Veterinary Association
Prof Louis H Nel	Executive Director, Global Alliance for Rabies Control; Professor, University of Pretoria, South Africa
Dr Dominic Omosa Ochwang'i	Lecturer, Department of Veterinary Anatomy and Physiology, University of Nairobi, Kenya
Praveen Ohal	Founder, Trustee of Helping Organisation for People Environment (HOPE) and Animal Trust
Dr Andrew N Rowan	President, Chief Program Officer for WellBeing International
Dr Lou Tasker	Animal Welfare Consultant

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## Keynote and invited speaker biographies

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**Dr Samuel Kahariri**  
National Chair,  
Kenya Veterinary  
Association

Dr Samuel Kahariri, holds a Masters in Veterinary Epidemiology and Economics (MVEE), and a Bachelor of Veterinary Medicine (BVM), from the University of Nairobi. Dr Kahariri has also undertaken various courses whose span ranges from aspects of animal welfare, spatial epidemiology, leadership and senior management and many more. Dr Kahariri is currently the National Chair of the Kenya Veterinary Association. He has served in the KVA leadership in various positions for the last 8 years where he successfully managed various programs in advocacy, animal welfare, food safety and security, advancement of veterinary science and coordination of stakeholders in various aspect of improving veterinary service delivery in Kenya. Dr Kahariri also has 8 years working experience with the State Department of Livestock in disease control and economics. In particular, Dr Kahariri has rich knowledge on animal health information management systems including Livestock Identification Systems.



**Dr Andrew Rowan**  
President and Chief  
Program Officer,  
WellBeing International

Dr Andrew Rowan has served in numerous board, advisory and consultative roles for government bodies (e.g. NIH, NIEHS, ILAR), private corporations (e.g. Shell, Iams) and non-profits. Before WellBeing International, Andrew was the Chief Scientific Officer of the Humane Society of the United States and CEO of Humane Society International. Before his stint with the HSUS, he was the founder and director of the Tufts University Center for Animals and Public Policy and started the first graduate degree program in animal policy (1995). He was the founding editor of *Anthrozoos*. He is the recipient of a Rhodes Scholarship (1968), the Russell and Burch award (1996) for his advancement of alternatives to animal testing, and a number of other awards for his work in international animal protection, animal population management and veterinary ethics. Dr Rowan has authored and co-authored many books on animals used in research and alternatives, wildlife conservation, and companion animal management and population control. He was born in Zimbabwe and raised in Cape Town, South Africa. He received a BSc (1968) from Cape Town University and an M.A. (oxon) and D.Phil (1975 – biochemistry) from Oxford University.



**Prof Louis Nel**  
Executive Director,  
Global Alliance for Rabies  
Control;  
Professor, University of  
Pretoria

Prof Louis Nel is based at the University of Pretoria in South Africa where his research over the last 25 years has been primarily focused on a better understanding of lyssaviruses and the control of rabies. Professor Nel also assisted the Global Alliance for Rabies Control (GARC), a leading international nonprofit organization dedicated to rabies) in various capacities since 2008. In July 2014, he took over the leadership of GARC. With his team at the University of Pretoria and his global collaborators (including Universities, Institutes, Intergovernmental agencies, NGO's and Industry), GARC then founded the Pan African Rabies Control Network (PARACON) in 2015, the Asian Rabies Control Network (ARACON) in 2018 and the Middle East, Eastern Europe and Northern African Rabies Control Network (MERACON), also in 2018. In this context his work ultimately remains focused on achieving elimination of dog rabies from those regions of the world that continue to be plagued by the disease, including the entire continental Africa and most of Asia. Following the synthesis of a Global Framework for the Elimination of Dog-Mediated Human Rabies and the formation of the United Against Rabies collaboration (UAR = FAO, OIE, WHO and GARC) in 2016, he continues to serve on the steering committee for the development and implementation of the UAR Global Strategic Plan, entitled ZERO by 30.



**Dr Samuel Wakhusama**  
Sub-Regional  
Representative for Eastern  
and Horn of Africa, World  
Organisation for Animal  
Health (OIE)

Dr Samuel Wakhusama is a Kenyan Veterinarian with post-graduate training up to PhD level in Medical Microbiology. He has over 37 years working experience in the public sector, NGO sector and International Organisations in the Eastern Africa region. He worked with the *Kenya Agricultural Research Institute* (KARI) from September 1981 to September 2000 on various topics including bacteriology and helminthology rising through the ranks from *Research Officer* (RO) to *Chief Veterinary Research Officer* (CVRO). Thereafter, he worked for Regional and International Organisations such as *International Service for the Acquisition of Agri-biotech Applications* (ISAAA) as the *AfriCenter* Director; Terra Nuova-COOP-UNA Consortium in Somalia under the auspices of the *Somali Animal Health Services Project* (SAHSP) as an Advisor on Technical Training and Capacity Building; Consultant for FAO on assessing laboratory capacity for Highly Pathogenic Avian Influenza (HPAI) response in Burundi, Somalia and South Sudan; Regional Coordinator for USAID HPAI project in Eastern Africa; Coordinator for various African Union Interafrican Bureau for Animal Resources (AU-IBAR) projects including the “*Vaccines for the Control of Neglected Animal Diseases in Africa*” (VACNADA) and as the AU-IBAR’s Regional Coordinator for the Intergovernmental Authority on Development (IGAD) on “*Reinforcing Veterinary Governance in African*” (VET-GOV). He joined the OIE in September 2015.



**Dr Bernadette Abela-Ridder**  
Lead, Department for the  
Control of Neglected  
Tropical Diseases,  
World Health Organization

Dr Bernadette Abela-Ridder works at World Health Organization (WHO) in charge of those diseases with a human animal interface at the Department for the Control of Neglected Tropical Diseases (NTDs). Previously she worked in the WHO Department of Food Safety and Zoonoses, with the US Food and Drug Administration on antimicrobial resistance, the Institut de recherche pour le développement (IRD) in Cameroon on emergence of simian immunodeficiency viruses from non-human primates including bushmeat, the Food and Agriculture Organization of the U.N. on veterinary public health, and in clinical veterinary practice.



**Dr Eric Brum**  
**Country Team Leader,**  
**Bangladesh,**  
**Food and Agriculture**  
**Organization of the United**  
**Nations (FAO)**

Dr Eric Brum, a Country Team Leader for the Food and Agriculture Organization of the United Nations (FAO) and adjunct Assistant Professor at Tufts Cummings School of Veterinary Medicine, has managed the FAO Emergency Centre for Transboundary Animal Diseases (ECTAD) Programme in Bangladesh since 2015. He previously served in FAO Indonesia from 2006 to 2015 as the Chief Technical Advisor for emergency projects on avian influenza and rabies control. As part of the growing role of veterinary medicine in the One Health approach to complex public health challenges, he has facilitated the development and implementation of avian influenza surveillance and control programmes which are both effective and readily translatable into field action. Dr Brum also assisted the Indonesian Government to design and implement an effective control programme on Bali for progressive control of rabies, including the development of systematic methods for achieving rapid and efficient vaccination of roaming dogs, and has provided technical advice on rabies control in Bangladesh, Sri Lanka, and Vietnam. Most recently, he has developed novel intervention programmes for establishing a cost-effective system for monitoring antimicrobial resistance in livestock production systems and improving responsible usage of antibiotics in human and veterinary medicine in Bangladesh. He is a former Fulbright Fellow to Mozambique with Bachelor of Science degrees in both Biology and Environmental Studies from Tufts University (USA), a Doctor of Veterinary Medicine (DVM) degree with Certificate in International Veterinary Medicine from Tufts University School of Veterinary Medicine (USA), and a Master of Science in Veterinary Epidemiology and Public Health from the Royal Veterinary College of London (UK). In his spare time, he enjoys coaching football and mentoring young veterinarians in companion animal medicine and surgery.

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## Workshops

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### Humane Community Development for DPM

Kate Natrass Atema

ifaw

[katema@ifaw.org](mailto:katema@ifaw.org)

Ifaw's Humane Community Development (HCD) is a community-centered approach to creating humane, sustainable solutions to dog welfare and management. Recognizing that communities need to be fully invested in building their own plans, rather than merely taught skills, the HCD process utilizes participatory tools to generate engaged citizen groups with realistic plans to address dog welfare in their community. HCD is not a "model", but rather a roadmap and suite of tools, which could be employed by anyone with experience working to improve communities. Based on successful pilot projects in North America and Eastern Europe, ifaw has created an e-learning to allow any interested group to utilize this novel approach to addressing community and animal welfare. Ifaw's HCD e-learning allows users to walk step-by-step through the process. Each module examines a different element of the process - from community assessment, planning, implementation and monitoring and evaluation as well as supplemental modules that cover adult learning, human behaviour change principles, coaching and mentoring and a range of additional tools that support HCD within a community. This workshop will introduce ifaw's HCD e-learning tool and offer participants a walkthrough of the course modules. Feedback is encouraged, as we are eager to learn more about the needs of potential users and help them establish their own successful HCD projects.



Kate Natrass Atema is the Director of Community Engagement at the International Fund for Animal Welfare (ifaw). Her team develops, supports, trains and mentors community-based animal welfare projects and disaster response around the world. Kate is Chairperson of the International Companion Animal Management Coalition (ICAM) and has served on the OIE Animal Welfare Advisory group. Her particular interests lie in participatory community engagement and the role of animal welfare in community wellbeing. Kate has been a cheerleader for the Alliance for the Contraception of Cats and Dogs (ACC&D) for many years and was honoured to serve on the Ethics working group in early 2017. She lives in Cape Cod, Massachusetts, with her family, one dog and a flock of companion chickens.

## Selecting and measuring indicators of DPM impact

Dr Elly Hiby  
ICAM Coalition  
[ellyhiby@gmail.com](mailto:ellyhiby@gmail.com)

Many of us dedicate our time and energy to improving the welfare of stray dogs and preventing more dogs from becoming stray through dog population management (DPM) interventions. But how do we know our efforts are making a difference? Should we be looking for ways to improve our impact? And how can we prove to ourselves and others that the lives of dogs and the people they live amongst are changing?

ICAM's 'Are we making a difference?' guide aims to help those working on DPM to measure their progress objectively. This workshop will be a deep dive into this guide and associated online tool, exploring how you can develop a monitoring and evaluation plan for DPM and exploring one particular method of measurement that is relevant for many locations; street surveys of roaming dogs.

### Objectives:

1. To feel able to develop a monitoring and evaluation (M&E) plan for your own DPM intervention, using the ICAM Co 'Are we making a difference?' guidance for support.
2. To feel confident to start running street surveys of roaming dogs in order to monitor change in roaming dog density.



Dr Elly Hiby is Scientific Coordinator to the International Companion Animal Management (ICAM) Coalition and an independent animal welfare consultant. Previously she worked at Dogs Trust as International Director, and before that, at the World Society for the Protection of Animals (WSPA; now World Animal Protection) for eight years, including leading on the companion animal welfare programme and advising on humane dog population management and rabies control internationally. She has also worked as a technical expert with the World Animal Health Organisation (OIE), the World Health Organisation (WHO), and the Food and Agriculture Organization (FAO) on dog population management. It was through her work with WSPA that she first came into contact with the Alliance for Contraception of Cats and Dogs (ACC&D) and subsequently joined their board of directors. The ACC&D works as a catalyst for the successful introduction of methods to non-surgically sterilise dogs and cats.

**Shelter medicine workshop**  
**Dr Natasha Lee<sup>1</sup> & Dr Katherine Polak<sup>2</sup>**  
<sup>1</sup>WSAVA; <sup>2</sup>FOUR PAWS International  
[dr.natasha@gmail.com](mailto:dr.natasha@gmail.com) & [katherine.polak@four-paws.org](mailto:katherine.polak@four-paws.org)

**What is Shelter Medicine?**

Shelter medicine is an exciting, growing field of veterinary medicine dedicated to the care and needs of underserved animals. This growing field combines individual animal health care with the needs of the larger population, with the primary goal of preventing disease rather than just treating it. Shelter medicine must therefore balance the physical and behavioral needs of individual animals with the overall health of the herd without jeopardizing the welfare of either one, while also promoting public health and increasing shelter lifesaving.

**Purpose of workshop:**

- Engage local veterinarians, animal welfare practitioners and other stakeholders on practical issues in shelter medicine
- Educate on best practices and share resources in shelter medicine and animal welfare for shelters and clinics
- Inspire all to meet or exceed minimum welfare and medical standards
- Introduction to essential shelter medicine principles including capacity for care, herd health and preventive medicine
- Give the participants basic tools to better be able to assess shelter conditions and ways to improve animal welfare
- Discuss the challenges faced in implementing shelter medicine and how to overcome it
- The workshop will include lectures and group discussions



Dr Natasha Lee is a veterinarian from Malaysia with over 14 years of experience in animal welfare. She also holds an MSc in International Animal Welfare, Ethics and Law from the University of Edinburgh. Dr Lee has experience managing a sustainable high-volume, high-quality neuter clinic in Malaysia. She had also managed several companion animal projects across Asia for World Animal Protection, including large-scale dog population and rabies control in India, Nepal, Sri Lanka and the Philippines. She has experience advocating animal welfare to many Asian governments and organisations on humane approaches using science-based, comprehensive, and participatory methods.



Dr Katherine Polak currently serves as the Head of Stray Animal Care – Southeast Asia for FOUR PAWS International where she manages a variety of companion animal programs in Thailand, Cambodia, Vietnam, and Indonesia. Dr Polak's interests include veterinary training, high-volume, high-quality spay/neuter, humane stray dog management, and combating the cruel dog and cat meat trade in Southeast Asia. She is a Diplomate of both the American College of Veterinary Preventative Medicine and the American Board of Veterinary Practitioners in Shelter Medicine. Following veterinary school, Dr Polak completed both a residency and internship in Shelter Medicine, and maintains courtesy faculty status at the University of Florida teaching in the online Maddie's® Master of Science in Shelter Medicine program. She is also the co-editor of the book, *Field Manual for Small Animal Medicine*, a comprehensive guide to improving veterinary medical practices in limited-resourced settings

HSI mobile technology for rabies control and sterilization clinics  
Dr Amit Chaudhari & Tamara Kartal  
HSI  
[achaudhari@hsi.org](mailto:achaudhari@hsi.org) & [tkartal@hsi.org](mailto:tkartal@hsi.org)

As program managers we not only need to make sure that programs are evidence based but we also need to be able to keep donors and partners informed and up-to-date on our progress. Humane Society International has developed state of the art mobile phone-based applications (both Android and iOS) to use in Rabies Vaccination Programs and Spay/ Neuter Programs. They are simple to use but yet very effective applications developed to meet the needs of a field based program, informed by our years of experience of mass vaccinating dogs and mass sterilizing dogs. It captures all the required details programs need to evaluate their impact and to create sharable reports for program partners.

**Objectives:**

- Work offline while Vaccination and upload data when you get internet/ Wi-Fi
- Draw your own area boundary for vaccination - Geo Fencing
- Live Monitoring of all vaccinations – when internet is available in the field
- Collect photos of the dog/cat, location, street name and dog/cat details
- Generate several types of required reports
- Conduct post vaccination coverage survey



Amit Chaudhari is the Senior Manager of HSI's global Monitoring, Evaluation and Impact Assessment (MEIA) department for the Companion Animals and Engagement program. Amit has designed, trained personnel and conducted dog population surveys across the world. He has been instrumental in developing mobile phone applications for capturing accurate data for mass dog vaccination and sterilization. He is a veterinarian and has done over 20,000 surgeries himself in his 10 years in the field of animal welfare. He has been a first responder in many disasters and continues to break new grounds in the space of data and technology for animal welfare.



Tamara Kartal is the Research and Development Manager for Humane Society International's Companion Animals and Engagement Department and co-leads the MEIA (Monitoring, Evaluation and Impact Assessment) department. With an M.S. in Animals and Public Policy Tamara focuses on exploring and understanding the dynamics of the various relationships humans have with dogs (and other animals) and what influences how we relate to dogs and behave towards them. In her role she surveys and analyses the human and dog (both owned and street dog) communities/ populations HSI is working with to create and inform dog management program approaches as well as to evaluate and improve the impact HSI's programs have on dogs, humans and the human-dog bond. She is also ICAM's secretary.

Organisation and strategic planning  
Melissa Liszewski  
ifaw  
[mliszewski@ifaw.org](mailto:mliszewski@ifaw.org)

**Why your organisation needs a strategic plan and a simple, practical, step-by-step guide on how to create one**  
I know what you're thinking... even just the words "strategic plan" are enough to make anyone want to stop reading any further. This doesn't sound like it's going to be a particularly exciting workshop, does it? But with this new ifaw resource we'll show you just how valuable and worthwhile making a strategic plan can be for you and an organisation and how simple and straightforward a strategic planning process can actually be. So now, here's a question... Do you always seem to find yourself working reactively? Constantly feeling like you are putting out fires, solving problems, dealing with issue after issue and never being able to get ahead of yourself or having the time to do all the other things that you know are important? If the answer to that question is yes, always, sometimes... or even just occasionally, then this workshop is for you. This ifaw workshop and workplan has been designed specifically for small animal welfare organisations as a simple, practical, step-by-step guide through the strategic planning process. An eight-step workplan that, by the time you have finished, will have allowed you create a strategic plan for your organisation.



Melissa Liszewski is Community Engagement Program Manager at the International Fund for Animal Welfare (ifaw), a global non-profit organization that protects animals and the places they call home. Working with communities and partners around the world, Melissa's work focuses on engaging local people in improving animal health and welfare systems, disaster risk reduction and mitigation of human-wildlife conflict. Prior to ifaw Melissa worked for Brooke, providing global strategic oversight, technical support, and capacity building for international projects involving communities in improving working equine welfare alongside human livelihoods. Melissa's background is in animal science (behaviour and welfare), international development and social science, focusing on understanding how and why people think and feel the way they do about animals in order to positively influence behaviour towards them. Melissa has worked on a range of other animal welfare projects and programmes around the world since 2005 including farm animal policy in the United States, outcomes assessment of animal welfare education in Austria, on-farm welfare assessment in Costa Rica, community conservation and rehabilitation of rescued gibbons in Thailand and a community-based project for working horses in southern Brazil.

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## List of talks

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### Keynote and invited speakers

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- Samuel Kahariri Linking sustainable humane dog population management initiatives to eradication of rabies in developing countries
- Samuel Wakhusama Tools and opportunities in humane dog population management
- Bernadette Abela-Ridder Organising, harmonising... to reach ZERO human rabies deaths by 2030
- Andrew Rowan Evolution of human-dog interactions in the world over the last 50 years
- Louis Nel Global Strategic Plan for the elimination of dog-mediated human rabies
- Eric Brum The epidemiological principles of rabies control and the RACE against rabies

### Perceptions of dogs

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- Yao Yue Exploring attitudes and behaviour towards roaming dogs around the world
- Elly Hiby 2019 Update to ICAM's Humane Dog Population Management (DPM) guidance

### DPM tools and strategies

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- John Boone New collaborative planning tools to improve rabies and dog population management outcomes and cost efficiencies
- Lauren Smith A systems modelling approach to investigate sustainable dog population management
- Oswaldo Santos Baquero In search of validity and prioritization to guide dog population management in Brazil
- Heather Bacon Dog population management – developing tools to improve dog welfare

### DPM case studies

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- Melania Gamboa Cortés Dog population management in rabies programmes in Latin America
- Luisa Margarita Ramirez Suarez Learnings and experiences from the Animal Friendly Cities Prize 1<sup>st</sup> place winner
- Liat Morgan Dog population management - Israel's unique system
- Abdul-Jalil Mohammadzai Engaging effectively with government to control and eliminate canine mediated rabies in Kabul
- Sangita Sapkota Significant achievement in DPM: The outcome of mandate of Local Government with well defined stakeholders roles and recognized public participation

### Rabies and DPM

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- Andre Coetzer Capacity building towards rabies elimination: Training professionals, educating children and building community awareness with multiple stakeholders and limited resources
- Terence Scott The Rabies Epidemiological Bulletin: A comprehensive digital surveillance platform supported by a custom-developed data capture device
- Amit Chaudhari Evidence-based rabies programs: How innovative mobile technology has changed the rabies elimination programs in two major rabies areas, Cebu City and District II in Quezon City, Philippines
- Darryn Knobel Should we be including puppies younger than 12 weeks in mass rabies vaccination campaigns? New evidence raises safety concerns in females
- Emmah Kwoba Dog health and demographic surveillance survey in Siaya County: Implications for rabies control
- Lieza Swennen Innovative approaches to achieving rabies elimination in Malawi by 2025
- Martin Mboloi Makueni County rabies elimination program: A pilot program for the rabies elimination in Kenya
- Karma Rinzin Dog population management strategy in Bhutan: Past, present and future
- Tamara Kartal Successful dog management programs across India
- Sanjay Singh Human health benefits of ABC work in Jaipur, India
- Ali Mohammed Elkony Integrated Bite Case Management, a step forward to eliminate dog mediated human rabies - Egypt, 2018
- Andrea Britton Southern African regional collaborations and capacity building for dog-mediated rabies elimination by 2030

### DPM case studies – Europe and DPM tools

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- Samantha Gaines Comparing the welfare of dogs in two different rehoming centres: England vs Malawi
- Elly Hiby Evaluation of DPM: Learnings since publication of the ICAM "Indicators" guide and future tools
- Melania Gamboa Cortés Barkyard: Mobile app to promote responsible ownership – a case study from Latin America
- Samantha Green Using mobile phone apps to project manage and assess impact of a dog population management program in Negombo, Sri Lanka

#### Non-surgical fertility control and dog-wildlife conflict

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- Valerie Benka **An update on non-surgical fertility control for dogs and a new tool for ethical decision making in field projects**
- Adriana Pisano Beaumont **Exploring dog-human relationships in First Nations communities: A decolonizing framework**
- Jess Bracks **Ethical management of human-derived conflict with wild and domestic dogs: Case studies from Oceania**
- Liz Campbell **Feral dogs as predators of wildlife, competitors with native canids, and sources of conflict with humans in the Moroccan Middle Atlas Mountains**

#### Perceptions and human behaviours in DPM

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- Katherine Polak **Public attitudes and behaviors towards dog meat consumption in Cambodia – A risk to public health, animal welfare, and humane dog population management**
- Quixi Sonntag **Changing perceptions about dogs and rabies in a rural community in South Africa**
- Adrienne Olivier **A holistic approach to improving animal welfare and changing people's attitudes towards dogs in South Africa**
- Melissa Savage **Understanding how people make decisions (and how your organization can ease the friction)**

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## Presentation abstracts

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### Keynote and invited speakers

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#### Linking sustainable humane dog population management initiatives to eradication of rabies in developing countries

Samuel Kahariri

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Rabies is a neglected zoonotic disease which is almost invariably fatal in humans, livestock and other mammals. It kills up to 60,000 people a year, most of them (95%) in Africa and Asia. It is estimated that up to 2,000 human deaths due to rabies occur annually in Kenya. In Kenya, rabies has been ranked as one of the top five priority zoonotic diseases with the goal of eliminating human dog-mediated rabies in the country. Rabies has been endemic in Kenya since the first reported case in 1912. In the recent past, efforts to prevent the rabies infections has mostly been restricted to treating individuals after a dog bite and random dog vaccinations, with little investment in sustainable prevention and control plans. This was partly cured in September 2014 by establishment and Launch of a national strategy for controlling and eliminating human rabies in Kenya. However, there has been little emphasis on identification of effective humane dog population management initiatives in most developing countries which has seen rise in stray and mostly free-roaming dog populations which tend to experience uncontrolled breeding and consequently increases the risk of rabies and other dog-community conflicts in these African countries. This conference is therefore timely as it forms a good reference point to development pragmatic strategies to tackle the issues responsible dog ownership and stray dog population control towards achievement of a rabies free country.

**Tools and opportunities in humane dog population management**  
**Samuel Wakhusama**  
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Established in 1924, the mandate of the World Organisation for Animal Health (OIE) is *“to improve animal health, animal welfare and public health protection world-wide.”* It achieves this mandate by developing International Standards in a responsive, science-based and transparent process and publishes them in the OIE *Terrestrial Animal Health Code* (TAHC) and *Aquatic Animal Health Code* (AAHC), after being adopted by its Member Countries.

Animal welfare became a strategic priority for the OIE as early as 2002, under the mandate granted by all Member Countries through resolution n° XIV of the 70<sup>th</sup> OIE General Session, (May 2002). Animal welfare standards relating to stray dog population control are found in Chapter 7.7 of the TAHC. This presentation acknowledges that human health, including the prevention of zoonotic diseases, notably rabies, is the main priority in humane dog population management. It provides an overview of the OIE standard-setting process and the tools available for the management of stray dog population control including education and legislation; licensing; reproductive control; removal and handling capture and return; rehoming or release; environmental controls; international and local control of movement; and – as a last resort - euthanasia as described in Article 7.7.6. Where appropriate, the presentation highlights the benefits and drawbacks of the tools and possible opportunities.

The vision enshrined in the OIE's 2017 global animal welfare strategy is *“a world where the welfare of animals is respected, promoted and advanced, in ways that complement the pursuit of animal health, human well-being, socio-economic development and environmental sustainability.”*

The OIE Animal Welfare strategy is based on four pillars namely: (i) Development of animal welfare standards; (ii) Capacity building and education; (iii) Supporting the implementation of animal welfare standards and policies; and (iv) Communication with governments, organisations and the public. This presentation lists some activities undertaken by the OIE under each pillar, highlighting the objectives of the recently established OIE *Global Animal Welfare Global Forum* and the challenges OIE faces during the development of international animal welfare standards.

For further information: <http://www.oie.int/en/animal-welfare/animal-welfare-at-a-glance/>

## Organising, harmonising... to reach ZERO human rabies deaths by 2030

Bernadette Abela-Ridder

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I have great optimism for the future of rabies elimination in the world. No one sector can do it alone, more needs to be done especially on the prevention front – humane dog population management and vaccination. We are more formally organising and harmonising by coming together as a community through the *Zero by 30: the global strategic plan to end human deaths from dog-mediated rabies by 2030*. It is now time to scale up its implementation.

I have no illusions that we will need to work hard to reach this goal. Our progress in giving people and animal's health and wellbeing a central place has opened new opportunities. We must not stand still; the time has come to make change and see that rabies no longer devastates lives.

Health, in general and rabies more specifically, is not an abstract issue at global and national levels, but a concrete reality that touches individuals, households and communities.

Reducing the burden of disease is important; Improving the strength of public and animal health systems is important; Reducing the threat of risk factors for disease is important. Addressing management of especially roaming and stray dog populations is important.

However, what is of driving importance is that together we can stop the ruinous consequences of animal bites and rabies on people: death, catastrophic expenses and already disadvantaged people spiralling deeper into poverty. We must focus our attention on the people in greatest need.

Today celebrates the achievements on Humane Dog Population Management of the International Companion Animal Management Coalition and adopting countries which also brings us closer to rabies elimination. By bringing this community's plans and commitments under the United against Rabies banner in pursuing the work ahead of us and keep us accountable.

Our vision is a world in which:

- people do not suffer and die simply because they are poor;
- rabies, a neglected tropical disease is no longer neglected;
- rabies mortality is stopped through cross-sector and -partner efforts and strengthened health systems;
- support communities and countries to manage their dog populations humanely; and
- that rabies vaccination of dogs that protects people from rabies becomes the main preventative way to stop rabies.

That's the vision for which we're working.

And that's the vision that we can only achieve together.

## Evolution of human-dog interactions in the world over the last 50 years

Andrew N Rowan

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There are somewhere between 750-950 million dogs in the world today (around 100-125 per 1,000 people) but they are not spread evenly among the countries nor are they all closely managed pets ("private" dogs). There is considerable evidence that human-dog interactions have changed substantially in developed countries with most dogs being more closely controlled today than they were fifty years ago. In developing countries, it is commonly assumed that most of the dogs observed on the streets are unowned strays, but new research indicates that this is an error. In fact, human-dog relationships in developing countries also appear to be changing with more dogs being kept more closely or under closer control and less likely to be allowed to roam at will. This presentation will review some of the data from around the world on the variances in relative dog populations (from around 10 to 400 dogs per 1,000 people in different countries) in different parts of the world and also review how the human dog relationship has changed in a few selected countries (the USA, Costa Rica and India) since 1970.

## **Global Strategic Plan for the elimination of dog-mediated human rabies**

**Louis Nel**

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In 2016 the WHO, OIE, FAO and GARC joined forces, as United Against Rabies (UAR), to develop and coordinate the implementation of a Global Strategic Plan (GSP) to eliminate dog-mediated human rabies by 2030. The GSP has three fundamental objectives: (1) Effective use of vaccines, medicines, tools and technologies (2) To generate, innovate and measure impact and (3) To sustain commitment and resources. In the operational plan, elements of dog ownership, dog welfare and dog population control are recognized as critically important. Also, from an animal welfare perspective, a global intervention that would bring an end to rabies will be hugely beneficial to arguably the most significant victims of the disease, viz. the dog populations from rabies-endemic African and Asia.

This plan, Zero by 30, is country-centric, identifies the critical success factors and prioritizes the societal changes needed to reach the elimination goal. It is emphasized that an investment in rabies elimination saves human and animal lives and strengthens public health and veterinary health systems. The plan also seeks to minimize duplication and improve efficiencies by pooling resources and developing strong health service networks in order to make the most of limited resources.

The UAR therefore aims to leverage existing tools and expertise in a coordinated way to empower countries to lead efforts and to support the creation of sustainable institutional capacity to end human deaths from dog-mediated rabies. The UAR endeavors to engage partners across countries and sectors, bringing together public and private development partners and catalysing communities, nations and regions to implement and own the contribution of their own ideals and strategies towards the eventual elimination of dog rabies.

## **The epidemiological principles of rabies control and the RACE against rabies**

**Eric Brum**

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Considering both the low basic reproductive rate of the rabies virus in dogs and the availability of highly efficacious, affordable, and thermo-stable rabies vaccine, viral elimination is readily achievable through a comprehensive dog vaccination programme. The most challenging aspect is that dog subpopulation with the highest probability of encountering the rabies virus (and hence the most important to vaccinate) is also subpopulation which is the least vaccinated in traditional canine rabies vaccination programmes. Vaccination of outside roaming dogs, both owned and unowned, is paramount for successful rabies elimination, and a number of techniques have been developed to increase the efficiency of roaming dog vaccination. Additionally, animal surveillance must be improved to increase detection of the virus in animal populations so that vaccination effort can be better targeted and monitoring progress toward viral elimination can be improved. Significant improvement in animal rabies surveillance has been recently achieved through adoption of a One Health-inspired strategy known as Integrated Bite Case Management (IBCM), in which animal and human health professionals work together to follow-up on humans bitten by potentially rabid animals.

With funding support from FAO, the “Rabies Action Centre of Excellence” (RACE) is intended to serve as a resource for developing and implementing effective dog vaccination programmes. Strategic development support, work plan design assistance, and deployment of monitoring and surveillance tools, including IBCM, particular emphasis will be provided in addition to strengthening core capacity to vaccinate roaming dogs as this is the most common competency limiting rate of progress in mass dog vaccination programmes. The country selected to host the RACE will have the privilege of holding rabies control and dog vaccination trainings at the centre of excellence for international visiting teams from other countries, agencies, and NGOs, will increase its regional vaccination capacity with expert support, be the host of a universal monitoring and surveillance system (MOSS) and initiate Rapid Street dog Vaccination Protocol (RSVP). Capacity will be built for different levels of participants who will be trained in the key competencies needed for achieving progressive rabies control. Skills and knowledge areas developed will include rabies epidemiology, programme design and management, data analysis, cross-sectoral bite case investigation and surveillance, canine rabies diagnosis and risk levels, dog catching and vaccination, treatment of human bite cases, and communication. Participants from partner countries and NGOs will be not only trained in dog catching and vaccination, but also on a scientifically sound approach to canine rabies control. Both animal health and human health participants will be trained in a One Health approach to bite case investigation through IBCM. Simply put, the RACE will be a place committed countries and organizations can go to work together and help each other to learn how to best eliminate rabies as efficiently as possible.

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## Perceptions of dogs

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### Exploring attitudes and behaviour towards roaming dogs around the world

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Dog-human issues may vary from region to region, country to country. As a result, it can be challenging to decide on a global campaign that will have relevance globally. In 2018 we commissioned a global insight survey to explore the attitudes and behaviors towards roaming dogs in five countries: Brazil, Kenya, India, Thailand, and China. These countries were chosen to represent as wide a context as possible when it comes to the status of roaming dogs and dog population management. Wide range of topics such as the number of dogs owned, attitudes to culling, the percentage of vaccination, sterilization, collaring, tagging and microchipping rate were explored, as well as reasons why people did not implement the elements of responsible ownership. How people perceive owned dogs vs roaming dogs was also studied. The paper presents the findings of this survey and explores how it can inform the campaign to improve lives of dogs in the given country.

## **2019 Update to ICAM's Humane Dog Population Management (DPM) guidance**

Elly Hiby  
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Shortly after ICAM was founded in 2006, we released our first publication: Humane Dog Population Management Guidance (2007). A 2019 update to this guide will be launched at the 3<sup>rd</sup> International Conference on Humane DPM.

There is no single DPM intervention 'model' that will work everywhere, DPM will need to be tailored to suit the location; this concept is common to the original 2007 guide and this 2019 update. DPM aims to have a sustained influence on dog population dynamics in order to change the population in a targeted way to reduce associated problems. To do that, we need to understand our dogs, what problems they are associated with and their population dynamic processes. These dynamic processes include birth and death, but also abandonment/ adoption and roaming/confinement, all of which are strongly influenced by human behaviour which can differ greatly between locations. Hence all DPM systems must strive to understand why people behave as they do and encourage responsible and compassionate actions. Chapter 1 introduces a basic concept of dog population dynamics. Chapter 2 outlines how to assess a dog population in order to design an evidence based DPM system.

Chapter 3 outlines the DPM system. This includes all the interconnected Foundations, Services, Outcomes and Impacts for humane and effective dog population management. Foundations are those elements we identified as supporting sustainable DPM systems, including legislation and enforcement, a leading task force, advocacy for political support and community engagement in planning, implementation and evaluation. DPM services includes 'fundamental' services that are critical to all effective DPM systems, such as access to reproduction control and promoting responsible behaviour; and 'context dependent' services that are not always required but there will be a time and place when they become important to implement, such as rehoming centres and identification & registration systems. Assessing your local dog population allows you to select the most suitable DPM services and implement these wisely.

The DPM guide is principally designed for governments and NGOs involved in designing and implementing DPM systems. Chapter 4 is a new chapter for this 2019 update, it describes what national governments and regional bodies can do to create an enabling environment for effective local implementation.

The 2019 updated guide is free to download as a pdf from [www.icam-coalition.org](http://www.icam-coalition.org) and will be accompanied by a growing number of narrated presentations/videos exploring aspects of the guide. ICAM's (2015) 'Are we making a difference? A guide to monitoring and evaluation of DPM interventions' is considered as a companion guide to the DPM guide.

### **New collaborative planning tools to improve rabies and dog population management outcomes and cost efficiencies**

**John D Boone<sup>1</sup>, Amit Chaudhari<sup>2</sup>, Michael Reed<sup>3</sup>, Philip Miller<sup>4</sup>, Joann Lindenmeyer & Ryan Wallace<sup>5</sup>**

<sup>1</sup>Great Basin Bird Observatory; <sup>2</sup>Humane Society International; <sup>3</sup>Tufts University; <sup>4</sup>Conservation Planning Specialist Group; <sup>5</sup>Centers for Disease Control and Prevention

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Because there are limited resources available to undertake large-scale rabies and dog population management (DPM) programs, it is important to maximize their impacts, cost-efficiency, and long-term effectiveness. Program planning plays a critical role in achieving these goals, and stochastic simulation analyses can provide useful insights and planning tools that are difficult to obtain by empirical means. Furthermore, simulations that are linked to map-based animations of likely outcomes as a function of program parameters can provide a common framework for negotiating and designing effective and realistic programs in collaboration with governmental and NGO partners. We are developing new simulation tools that allow planners and partners to visual how different types of DPM interventions perform with regard to end-points, cost-efficiency cumulative expenditures, and preventable dog mortalities over time. Several of these measures of effectiveness and efficiency – especially the examination of cumulative premature deaths - have been little explored to date. In addition, simulations will examine rabies prevalence and herd immunity outcomes and their associated cumulative costs as a function of program parameters. All of these outcomes will be ported into map-based simulations that can be used to illustrate to collaborators and funders the expected outcomes and cost profiles of various intervention options over time. Development of these tools is in progress, and beta versions will be demonstrated during the presentation. Program guidance will also be developed as part of this process. One critical element of guidance already emerging from early iterations of simulation development is that early “front loading” of effort is far more effective and cost-efficient at achieving program goals than spreading costs and efforts out more evenly over time. This recommendation is relevant to rabies control and also relevant to the humane goal of minimizing premature dog deaths, which can be best achieved at a comparatively low cumulative cost by suppressing most reproduction as quickly as possible within a defined program area. In contrast, suppressing reproduction more gradually over time results in far more preventable deaths over time and greater expenditure, even if the population end points for the rapid vs. gradual approaches are the same.

## **A systems modelling approach to investigate sustainable dog population management**

**Lauren M Smith<sup>1</sup>, S Hartmann<sup>2</sup>, A Munteanu<sup>2</sup>, P Dalla Villa<sup>3</sup>, R Quinnell<sup>1</sup> & LM Collins<sup>1</sup>**

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Free-roaming dogs make up a significant proportion of the worldwide domestic dog (*Canis familiaris*) population. Where free-roaming dogs exist in high densities, there are important implications for public health and the environment, as well as issues for the welfare of the dogs themselves. In order to control this population, the management methods applied involve culling, reproductive control and the use of shelters to house unowned or unwanted dogs. Assessing the impact of each of these interventions is important to determine whether these methods are effective and efficient, and to evaluate their long-term sustainability. The impact of interventions is often evaluated by considering the direct effect on dog population size. Dog population size is commonly estimated using simple counts or mark-recapture methods that fail to consider the influences of dog movement (e.g. migration), reproduction or mortality. The Pollock's Robust Design is a mark-recapture method that allows for incorporation of information about the rates of recruitment to the population (including births, abandonment and immigration) and removal from the population (deaths, adoption and emigration). Understanding the relative rates of recruitment and removal are important for identifying the dominant factors that maintain population size. Although applied to other species, this mark-recapture method has not been applied to free-roaming dog populations.

Using the Pollock's Robust Design in free-roaming dogs for the first time, we present the results of our photographic mark-recapture study conducted in Italy and Ukraine between April 2018 and July 2019. We identify the dominant factors that maintain or change the dog population size and discuss the implications for the efficacy of dog population management methods. Building on this, we address how conducting mark-recapture in this way allows us to feed data into a systems model investigating how different dog population management methods impact: (i) free-roaming dog population size over time, (ii) public health risk (including zoonotic pathogens, dog-bites and traffic accidents), (iii) free-roaming dog welfare and (iv) costs associated with each management method. Using a systems modelling approach, we elucidate patterns of behaviour and information that enable the overall sustainability of different interventions to be evaluated. In this presentation, we discuss the components and structure of this systems model addressing the sustainability of the different dog population management methods. This work forms part of the STRAYS project developed under the coordination of the University of Leeds (UK), the Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale" (IT) and VIER PFOTEN International.

### **In search of validity and prioritization to guide dog population management in Brazil**

**Oswaldo Santos Baquero**, Dafne Fontoura de Lima, Aluísio Pereira da Silva Filho, Stefanie Sussai, Marcos Amaku, Ricardo Augusto Dias, José Soares Ferreira Neto, José Enrique Hildebrand Grisi-Filho & Fernando Ferreira  
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Evidence-based dog population management is widely recognized as an approach to guide effective and efficient interventions. However, it is not so widely recognized that multiple sources can bias the evidence and misguide conclusions and interventions. This can be detrimental for animal and human health. In Brazil we are evaluating multiple sources of data and some results confirm the biases and the misleading character of information that is being used to support decision making. We are also developing methods and instruments to foster the production of valid evidence, quantify the unavoidable error, and guide prioritization. Regarding the problems of validity we have found, two studies deserve mention. In one of them, we evaluated survey data collected over 13 years in São Paulo city. The comparison of owned-dog population sizes estimated from these surveys showed that some estimates have large errors that avoid to conclude if the population size have increased or decreased. Other estimates showed high variations hardly explained by demographic processes but compatible with methodological pitfalls. In the other study we evaluated a national survey and demonstrated that the simple extrapolation of the human:dog ratio, widely used to estimate dog population sizes, results in large errors, sometimes greater than 250% of the reference population size. Regarding our efforts to reduce biases and support sound conclusions and interventions, we have: validated sampling designs to estimate the owned-dog population size; proposed and exemplified how to evaluate sampling designs through the estimation of the human population size; demonstrated how to improve the precision of estimates using the human population size to calibrate survey weights; developed and tested, as a substitute for the simple extrapolation of the human:dog ratio, predictive algorithms for the owned-dog population size of the 5,570 Brazilian cities; and developed open source software to support a population management workflow based on peer-reviewed methods. Our work to advance prioritization is being based on population dynamics modeling to find the most influential determinants that must be targeted by interventions, and to quantify the expected effect of interventions. It should not be assumed that all measures are relevant and representative of true demographic processes or states. Any measure should be reported together with a measure of its error and the sources of potential bias should be carefully identified and evaluated.

### **Dog population management – developing tools to improve dog welfare**

**Heather Bacon**, Louise Connelly, Roxanne Woodrow, Hayley Walters, Jess Davies & Cathy Dwyer  
Jeanne Marchig International Centre for Animal Welfare Education, The Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Scotland  
**Heather.Bacon@ed.ac.uk**

Catch-neuter-return (CNR), also known as trap-neuter-return (TNR) or animal birth control (ABC), is the capture, surgical sterilisation, and return of free-roaming street dogs. CNR is recognized as being an essential tool in the control of global dog populations and is often recommended as a welfare-friendly method of dog population control. But, the potential for injury, disease transmission and even death exists within CNR programmes, and may be significant in programmes which are not run with a primary concern for animal welfare<sup>1</sup>. Commonly, dogs may experience distress, discomfort, pain, thirst, disorientation or surgical complications<sup>1</sup>. Whilst a number of indicators exist for evaluating the success of DPM programmes, the assessment of dog welfare in CNR programmes is not yet widely practiced<sup>2</sup>. Recognising the importance of CNR in the control of global dog populations, this presentation will outline evidence-based tools developed by the Jeanne Marchig International Centre for Animal Welfare Education to safeguard dog welfare in CNR programmes, and support the training of staff involved in CNR programmes to optimise their CNR programmes, both in terms of population control and dog welfare.

Through collaborations with dog population management projects and animal welfare charities, we have developed tools including a data collection mobile 'app' and a comprehensive suite of video tutorials focussed at addressing gaps in knowledge identified through scientific research<sup>3</sup>. Both of these tools are freely available and may be accessed by any CNR programmes looking to monitor and improve the welfare of dogs in their programme, train new or existing members of staff, or share 'best practice techniques' in CNR. This presentation will outline the research and development of these tools and suggest ways in which they may be used to enhance delivery and data collection in CNR programmes.

For further information: <https://www.ed.ac.uk/vet/jeanne-marchig-centre/cpd/dog-welfare>

<sup>1</sup>BACON, H., VANCIA, V, WALTERS, H AND WARAN, N 2017. Canine trap-neuter-return: A critical review of potential welfare issues. *Animal Welfare*.

<sup>2</sup>HIBY, E., ATEMA, K. N., BRIMLEY, R., HAMMOND-SEAMAN, A., JONES, M., ROWAN, A., FOGELBERG, E., KENNEDY, M., BALARAM, D., NEL, L., CLEAVELAND, S., HAMPSON, K., TOWNSEND, S., LEMBO, T., ROONEY, N., WHAY, H. R., PRITCHARD, J., MURRAY, J., VAN DIJK, L., WARAN, N., BACON, H., KNOBEL, D., TASKER, L., BAKER, C. & HIBY, L. 2017. Scoping review of indicators and methods of measurement used to evaluate the impact of dog population management interventions. *BMC Veterinary Research*. 1746-6148.10.1186/s12917-017-1051-2

<sup>3</sup>BACON, H., WALTERS, H, VANCIA, V, AND WARAN, N (In Press). The recognition of canine pain behaviours, and potentially hazardous Catch- Neuter-Return practices by animal care professionals. *Animal welfare*.

**Dog population management in rabies programmes in Latin America****Melania Gamboa Cortés**

World Animal Protection, Heredia, Costa Rica

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Latin America is one of the regions in the world which most recently has managed to control human rabies transmitted by dog bites. Even though there are still a few countries that have small number of cases, human rabies has decreased by more than 95% since the 1980's. World Animal Protection commissioned a research project that analyzed the achievements in rabies elimination in Latin America as well as how Dog Population Management is used in these programmes. This paper analyzes information and lessons learnt from Argentina, Chile, Guatemala, Haiti, Peru, Mexico, and Bolivia on this topic. Elements of DPM are important for Latin American countries when controlling zoonoses and these are included, to a certain extent, in various national programmes. In general, most countries consider mass dog vaccination, PEP, surveillance as vital for rabies elimination programmes. Elements of DPM, such as education, legislation, sterilization, vaccination, responsible dog ownership, interdisciplinary collaboration, and training are used by most countries as part of their rabies elimination strategy. In conclusion, different elements of DPM have been crucial for successful rabies control in different countries in Latin America.

**Learnings and experiences from the Animal Friendly Cities Prize 1<sup>st</sup> place winner**  
**Luisa Margarita Ramirez Suarez**  
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The *Animal Friendly Cities Prize – Best practices in dog and cat population management*, seeks to identify and recognize the best strategies used by local governments to manage dog and cat populations in Latin-America. This prize was created by World Animal Protection and is supported by six collaborating organizations: World Animal Health Organization (OIE), Pan-American Health Organization (PAHO), Technical Institute for Animal Control and Education (ITEC), World Small Animal Vet Association (WSAVA), Federal Council of Vet Medicine from Brazil (CFMV) and the OIE Animal Welfare Collaboration Center from Uruguay-Chile-Mexico. In this first edition of the prize more than 50 local governments participated and the 1st place went to the Greater Municipality of Bogotá, Colombia.

In this conference, Bogotá will be presenting the programs, successes and impact that won them this award, including free sterilization, veterinary emergencies, community education, and the fight against cruelty with its Anti-Cruelty Squad. They will talk about creating engagement with their citizens through the mobile app: Distrito Appnimal, the actions that they carry out for stray dogs, as well on-the-ground projects in communities. Finally, it will mention the good management of its animal custodial center and the work done with interdisciplinary teams that allow it to achieve its goals efficiently.

## **Dog population management - Israel's unique system**

**Liat Morgan<sup>1</sup>, Boris Yakobson<sup>2</sup> & Tal Raz<sup>1</sup>**

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Dog overpopulation is a major problem due to negative impacts on animal welfare, public health and the possible harm to wildlife. Rabies is a deadly virus which may infect people and animals. According to the World Health Organization, dogs are the main source of human rabies deaths. As many other countries, Israel is endemic to rabies disease and therefore, yearly rabies vaccination and dog ownership registration are mandatory by law. In order to control and monitor the dog population in Israel, since 2002, a unique governmental dog database is managed, in which dogs must be registered by their owners every year at the time of rabies vaccination. In addition, since 2012, a unique online searchable database has been gathering most homeless pets offered for adoption from non-profit organizations and municipal shelters, aiming to increase adoption rates (<http://Yad4.co.il>). Recently, in order to build a broad plan for the Israeli government to combat the dog overpopulation problem in Israel, a two-year multi-parts study has been focusing on the following objectives: (1) to characterize the registered dog population, also in comparison to the abandoned dog population; (2) to reveal the risk factors for a dog to be adopted or to stay at the shelter; (3) to explore and characterize the diverse attitudes towards dog overpopulation and the possible solutions, among the general public, animal welfare organizations as well as municipal veterinarians; and (4) to evaluate the influence of new governmental initiatives that have been taking place in 2018-2019 to encourage responsible ownership, adoptions and sterilizations. Analyses of more than 800,000 dogs and 1,000,000 people in Israel, revealed valuable new information regarding dog population management at a national level. The results of this study indicate that a national governmental database is a valuable tool for dog population management, which can potentially be used to predict the number of abandoned dogs, as well as to enforce and control rabies yearly vaccination. Furthermore, the study indicates that developing responsible ownership is an essential part of this, and it can be enforced by specific governmental initiatives. The risk factors for dogs to stay at the shelter and the means to decrease it were also investigated. The presentation at the ICAM meeting would include updates regarding these important results, from several ongoing parts of this research.

## Engaging effectively with government to control and eliminate canine mediated rabies in Kabul

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How to build an effective and sustainable strategy for Kabul with support and buy-in from the national and local government authorities.

Afghanistan is a high risk country for canine-mediated rabies. Between 2002-2016 Kabul Municipality carried out mass culling of dogs, with reports showing more than 140,000 poisoned over 8 years, in an attempt to control rabies and reduce the number of free-roaming dogs. The culling was implemented indiscriminately, without cross-collaboration with other relevant government departments, and was completely ineffective – no decrease in human rabies deaths or the number of dogs on the streets – in fact the opposite. The authorities worked in silos with no accurate reporting system and no information sharing.

Mayhew's long-term animal welfare objectives for Afghanistan are to control & ultimately eliminate canine mediated rabies from Kabul city, humanely contain and control the free-roaming dog population engaging all the relevant stakeholders, provide training and capacity-building to enable the Afghan authorities, veterinary profession and local communities to deliver effective maintenance health and welfare programmes and use the Kabul experience as a model for other cities and regions in the country. This process was initiated in 2015 and the first practical work was started in 2017.

This presentation will cover the work carried out by Mayhew to date:

- preparation and design of an initial 3-year mass canine rabies vaccination programme, including
- establishing baseline data
- getting national and local government buy-in for the programme
- preparatory work and training of local staff & volunteers for the implementation of the programme
- programme implementation in the field – how the practical work was delivered
- ensuring information-sharing and positive engagement by all parties in project delivery
- on-going data collection and surveying methodologies used and adapted to local needs
- experiences in the field: challenges, achievements, human behaviour change evidence and real - time adjustments to the programme
- impact and learning outcomes 2 years in
- are we on track and what are the next steps?

**Significant achievement in DPM: The outcome of mandate of Local Government with well defined stakeholders roles and recognized public participation**

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Manumitra –The Humane dog population management program of Kathmandu Metropolitan city is the well accepted concept among the citizens of Kathmandu. The pioneer program lead by KMC with firsthand involvement of Local government along with Non government organization and general public has set a route for systemic way of DPM in community of developing country like Nepal. The framework of Manumitra is well designed where the leadership of Local government recognizes the available resources on ground level and utilizes the expertise and finance in very sustainable way. Animal Management Committee (AMC) on ward level and the Animal Management Assistance (AMA) recognized by Local Government is the foundation pillars of DPM. Local Government with mandate to work in public concerns are strategically fitted within Manumitra framework where they can formulate plan, design the roadmap and implement the action plan in accord with the need of community relevant to global trends, national laws and international treaties.

DPM of KMC now has been accepted by the local level representative as the foremost need of community. The public complains, dog related problems either regarding welfare or diseases now are being resolved by AMC where active participation of AMA's who are trained under the Agriculture Department of KMC plays the vital role. Keeping updates with ground scenario, prompt action in case of need is now possible with the engagement of multi stakeholder like KMC itself, technically supporting team from NGO-The Jane Goodall Institute and ward level Mechanism.

Sensitization and education session to AMA and AMC, involvement of AMA and guidance of AMC during school education sessions and leading role of ward representative in AMA formation process has established the fruitful working ground for DPM. Furthermore, representation of AMC in the Board of KMC has provided the authentic platform where DPM agenda can get the surplus opportunity for discussion, planning, monitoring, evaluation and improvisation. Constant consultation with community people, peer review of techniques and methodology with expertise and continual coordination with government authority builds up equal responsibility sharing on cause and supports for improvement. The learning, challenges and achievement sharing of Manumitra will be another supporting tool for establishing sustainable DPM in local as well as global context.

**Capacity building towards rabies elimination: Training professionals, educating children and building community awareness with multiple stakeholders and limited resources**

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One of the principal goals of the Global Alliance for Rabies Control (GARC) is to equip professionals and communities with the training and education needed to prevent rabies and animal bites, improve human and animal health and promote responsible pet ownership/guardianship.

The online GARC Education Platform (GEP) has a growing series of free courses, each culminating in a certificate of completion. The courses currently available provide knowledge and training to i) engage community members on rabies prevention (Rabies Educator Certificate, REC); ii) ensure humane handling and vaccination of animals (Animal Handling and Vaccination Certificate, AVC); iii) empower community members to become rabies focal points (Community Coordinator for Rabies Certificate, CCC) and; iv) update human health professionals on rabies prevention and treatment in a clinical setting (Rabies Healthcare Certificate, RHC). These courses are applicable in all geographical locations and are accessible to everyone, including people with no previous knowledge of rabies.

GARC has also been instrumental in creating and implementing a number of in-country education/ awareness initiatives, as well as developing educational resources for adults and children. These initiatives have been developed with government, education and NGO partners, and include incorporation of rabies prevention education into the national school curriculum, early childhood initiatives and projects targeting parents and out-of-school youth.

This presentation will outline how the GARC educational/awareness courses, initiatives and resources have been used in different countries and will highlight the transferable elements that can benefit other rabies vaccination and DPM programmes.

**The Rabies Epidemiological Bulletin: A comprehensive digital surveillance platform supported by a custom-developed data capture device**

**Terence Scott<sup>1,2</sup>, Andre Coetzer<sup>1,2</sup>, Deepashree Balam<sup>1</sup>, Louis Nel<sup>1,2</sup>**

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Accurate and timely surveillance data is critical to the understanding and monitoring of any programmatic activity, be it for disease control or for animal welfare. Health and health-related issues of low priority suffer from the cycle of neglect, whereby poor surveillance results in a poor situational understanding, leading to low prioritisation and an absence of funding to address the issue. Improved surveillance is the most feasible means to break the cycle of neglect, as with accurate data the issue can be objectively evaluated, and the best means to address the challenge determined. Decisions can, and should, be based on data and not estimates or unsubstantiated claims, while the impact of intervention is demonstrated, and the use of financial resources justified through positive outputs.

For rabies, most endemic countries have surveillance systems, but these systems are typically incapable of providing timely, accurate and high-resolution data that can help stakeholders make informed decisions. Therefore, the Global Alliance for Rabies Control (GARC) has developed a toolbox of digital surveillance solutions for governments and non-governmental partners to use towards not only addressing rabies surveillance challenges, but also those challenges faced by other disciplines such as animal welfare.

The Rabies Epidemiological Bulletin (REB) is a comprehensive rabies surveillance solution that addresses all aspects of rabies data collection and analysis. The REB has several specialised components that address critical surveillance aspects *viz.* the Rabies Case Surveillance component – that focuses on tracking and mapping laboratory diagnosed cases; the Community-Based Rabies Surveillance component – a detailed integrated bite case management system that includes human and animal case reporting, feedback and automated SMS notifications and; the GARC Data Logger component that tracks and analyses dog vaccination campaigns in near real-time (*vide infra*).

GARC developed the Data Logger (GDL) device – a custom-developed device for field data capture. The device was developed to overcome many of the shortcomings of collecting data on mobile phones and has direct compatibility with the REB. Apart from rabies interventions, the GDL device has been designed to be easily customised for any data capture, including for dog population surveys, dog population management activities and for other diseases.

We describe these tools and provide case studies where they have been implemented for rabies, but also discuss the versatility of these tools for rabies prevention and control, animal welfare challenges, and their use for other diseases.

**Evidence-based rabies programs: How innovative mobile technology has changed the rabies elimination programs  
in two major rabies areas, Cebu City and District II in Quezon City, Philippines**

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The Philippines has consistently been included among the top 10 countries with the highest number of human rabies deaths (DOH, 2011). Deray (2015) reports that there are on average 200 reported deaths annually, the vast majority caused by dog bites. In 2014 for example 96% of the 234 probable cases of human rabies were a result of a dog bite (Deray, 2015). Achieving 70% vaccination coverage for an entire population is often difficult and it has been recommended that anti-rabies initiatives start by targeting strategic areas of higher rabies incidence to break existing transmission cycles (WHO & OIE, 2016). The default methodology to estimate the number of dogs in the Philippines was to assume that there is one dog for every 10 humans. Surveys have shown that there are up to three-fold more dogs in some areas. In Cebu City we estimate about 167,263 owned dogs (the government estimates 92,261 dogs), which translates to 18.13 dogs per 100 humans and in Quezon City we estimate about 177,289 owned dogs across all Barangays, resulting in a mean dog distribution of 25.45 dogs per 100 people. Vaccination programs using new mobile phone technology have confirmed the dog density estimates. Based on the findings of dog population surveys and the introduction of the new HSI technology to the program in Cebu City and Quezon City's district 2, 97,392 dogs were vaccinated in Cebu City in 2018 compared to 34,031 dogs in 2017, and 98,307 dogs and cats were vaccinated in 2018 in District 2 of Quezon City compared to 27,982 dogs and cats in 2017. In both project areas program strategies were changed according to the dog densities but also making use of the mobile application features such as geo-fencing and surveys.

## Should we be including puppies younger than 12 weeks in mass rabies vaccination campaigns? New evidence raises safety concerns in females

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Rabies vaccines recommended by the World Health Organization (WHO) and the World Organization for Animal Health (OIE) for the control of rabies in dogs in endemic areas are injectable inactivated cell-culture vaccines. Primary vaccination with these vaccines is recommended by manufacturers as a single dose at around 12-13 weeks of age, followed by a repeat dose one year later and subsequent revaccination every three years. The basis for recommendation of primary vaccination no earlier than 12 weeks is not clear from published literature, but may be an assumption of inhibitory effects of maternal antibody, which was a concern for the efficacy of earlier live rabies virus vaccines. International and many national guidelines allow for the adaptation of the vaccination schedules recommended by manufacturers, including vaccination of dogs younger than 12 weeks without regard for maternal immune status, on the basis of scientific consensus of safety and efficacy of vaccines in this age group. Several field studies have demonstrated either absence of maternal antibodies in puppies, or lack of interference of any maternal immunity on development of protective levels of rabies virus neutralizing antibodies, a reliable indicator of protection against infection. Moreover, cost-effectiveness studies support inclusion of puppies in mass rabies vaccination campaigns due to the relatively low cost with which puppies can be contacted for vaccination. However, few studies have looked at safety of rabies vaccines in this age group. We recently undertook a randomized controlled trial in puppies at 6 weeks of age, examining the effect on overall survival rates over 7 weeks of an injection of rabies vaccine compared with an injection of sterile water. In this high-mortality population, we found that rabies vaccine increased mortality rates in females by 3 times, but did not have a significant effect on male mortality rates (hazard ratio in females 3.09 with 95% confidence intervals 1.24 to 7.69; hazard ratio in males 0.79 with 95% confidence intervals 0.41 to 1.53). Intriguingly, this pattern mirrors that reported in children in high-mortality settings with diphtheria tetanus and pertussis (DTP) vaccine, which like rabies is an inactivated adjuvanted vaccine. Further randomized controlled trials should be conducted in other high-mortality dog populations to test the hypothesis of a detrimental effect of rabies vaccine in female puppies.

## Dog health and demographic surveillance survey in Siaya County: Implications for rabies control

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**Background:** A good understanding of dog population size and dynamics is the key initial step in any rabies control Programme. This study estimates key health, ecological and demographic factors that underlie rabies transmission.

**Method:** Over 2400 dogs in 1444 households were enrolled in the longitudinal study. Dogs were followed once every month for 15 months collecting information related to household demographics, dog ownership, age and sex ratios, confinement/feeding, health and reproductive indices.

**Findings:** Dog ownership was stable (38.4%) with 0.6 dogs/household, 1.6 dogs/dog-owning household and a dog:human ratio of 1:7. The dog population was young, 49% of dogs were 1 year and below. The population was dynamic replaced through births, deaths, give away and disappearances. Dogs were predominantly local breed (99%), mainly kept for security purposes, almost (97%) left to scavenge for leftovers while 61% roamed freely. Fecundity rate was high 1.5 (0.7-2.3). Rabies vaccination was not common (5-36%). Castration (12%) and spayed (5%) was rare. Younger dogs ( $\leq 12$  months) had a lower survival probability. Increase in age by 12 months reduced the risk of dying by 43% ( $P < 0.001$ , CI 0.6165-0.6915). Being female increased the risk of dying by 23% ( $P < 0.001$ , CI 1.13-1.404). Vaccinating dogs reduced mortality by 76% ( $P < 0.001$ , CI 0.3071-0.7099). Males had a higher (4.0 years) life expectancy at birth compared to females (3.0 years). The commonest syndromes were gastrointestinal (47.2%) and skin (31.1%).

**Conclusion:** Low vaccination coverage, unrestricted dog movement and high dog population turnover support rabies endemicity. Improving dog health and life expectancy could reduce population turnover rates hence prolonged herd immunity. Integration of dog population management programs into rabies control programs could supplement the goal of breaking rabies transmission cycle with the goal of stabilizing dog populations.

## **Innovative approaches to achieving rabies elimination in Malawi by 2025**

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In Malawi, rabies has been ranked as one of the top five priority zoonotic diseases, with the goal of eliminating human dog-mediated rabies in the country by 2025. It is estimated that up to 500 human deaths occur in Malawi annually due to rabies, but this is likely a significant under-estimate.

Progress in preventing human rabies through control of the disease in dogs has been slow due to a number of barriers including: Low awareness on rabies prevention, control and treatment amongst professionals and the public; inadequate surveillance and reporting of rabies; inadequate testing of suspected animals; lack of inter-sectoral collaboration and partnerships; limited supply of vaccines for dogs and people and low compliance with treatment regimes.

Mass vaccination statistics of easy to reach dogs could provide a false sense of achievement. Despite consecutive, annual mass rabies vaccination of an estimated 80% of Lilongwe's dog population, rabies samples continue to test positive and people are sadly still dying from rabies. Community surveillance and feedback loops are key to support national efforts of rabies control through mass vaccination. Top down directives to vaccinate dogs leaves a gap in rabies control measures and community surveillance and demand driven vaccination are key to filling this gap. Increased surveillance, including mapping of outbreaks and remedial vaccinations, follow-up on bite cases and rabies-suspected dogs are all necessary to control the spread of rabies. Using peer-to-peer awareness, information exchange and continuous vs annual rabies control will form the basis of finding the reservoirs and eliminating the spread of rabies.

The institutionalisation of the One Health approach in Malawi has created a unique opportunity to bring together Government and NGOs across veterinary and public health to launch a strategy to achieve rabies elimination in Malawi ahead of the global 2030 target.

In April 2019 Malawi launched the Rabies One Health Platform. This Platform brought together medical and veterinary experts, government departments, policy makers and rabies champions, local and international NGOs from across the country to agree a set of recommendations to complete Malawi's first national rabies elimination strategy. The key strategies and innovations to achieve the ambitious 2025 target will be presented along with case studies from Malawi highlighting the current challenges and the successes achieved so far.

## **Makueni County rabies elimination program: A pilot program for the rabies elimination in Kenya**

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**Background:** Although rabies is 100% preventable, it is estimated to kill 59,000 people per year globally with majority of these deaths happening in Africa. In Kenya, rabies is estimated to kill over 2,000 people. Domestic dogs are responsible for over 99% of all human rabies deaths transmitting the disease through bites or scratches. Treating rabies exposure is difficult due to unavailability and high cost of rabies post-exposure prophylaxis. Mass dog vaccination has been identified as the most epidemiologically feasible and cost-effective tool for rabies control with 70% immunization of the dog population recommended as sufficient to prevent rabies outbreak.

**Methodology:** After the launch of the Kenya national elimination program in 2014, Makueni County conducted a dog census to be a basis for the vaccination coverage. Site identification was then done following consultation with the National administration (Chief's and village elders) with an average of 2km radius from one another. So far three complete cycles of mass dog vaccination have been done with publicity done a week to the vaccination exercise. Programs are distributed to schools, churches, public notice boards and market centers.

Teachers are also selected and trained as rabies champions on the importance of dog vaccination, behavioral ways to avoid being bitten by a dog, responsible dog ownership and population management. This information on rabies was to be disseminated to school going children.

Post Exposure Prophylaxis (PEP) was availed in two main hospitals, human health workers trained on rabies and its management and several interdepartmental consultations were done on the One Health Concept. A strong rabies surveillance system was established to monitor and evaluate the burden of rabies, preparedness and response to outbreaks strengthened with contact tracing done and sampling for confirmation of suspect cases. Community awareness on rabies and its prevention enhanced, community participation targeted with coordination committees held at various levels.

**Findings:** A total of 256,001 dogs have been vaccinated since 2014. In 2014, 5,413 dogs were vaccinated, 2015 – 15,174 dogs, 2016 - 81,425 dogs (64.8%), 2017-79,263 dogs (63.1%), 2018- 74,726 dogs (59.1%). Two hundred and forty (240) rabies champions have been trained on rabies. 37 samples were collected for laboratory diagnosis with 32 testing positive (Canine – 19, Cats – 1, Donkey -1, Goats -6, Sheep – 1 and Cattle – 4). 614 animal bite cases were reported, 749 animal bite victims visited the health facility for PEP and only 38% of them completed the dosage.

**Conclusion:** To control and eliminate rabies disease, programs should ensure a recurrent annual vaccination campaign that achieves 70% coverage. Concurrent surveillance activities at the health facilities and contact tracing will also help monitor the burden of rabies.

## **Dog population management strategy in Bhutan: Past, present and future**

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Considering the number of problems associated with increasing free-roaming dogs in Bhutan, several control measures have been attempted since 1970s to control rabies and reduce dog population in Bhutan. This include shooting and poisoning in 1970's and early 1980's; translocation in 1990's; and impounding in mid 2000's. The past control measures were not successful due to number of animal welfare issues and poor acceptance of the Bhutanese people. In 2009, the Department of Livestock, Royal Government of Bhutan and Humane Society International (HSI), USA embarked on a long term project titled the "National Dog Population Management and Rabies Control Programme in Bhutan" (NDPM & RCP). Through this project the capture-neuter-vaccinate-release (CNVR) programme has been carried out with dogs being captured, neutered, vaccinated and released back to their place of origin. From 2014 onwards community animal birth control was initiated with the aim to involve the local communities and relevant stakeholders. As of December 2018, about 95,000 dogs were sterilized and vaccinated covering all the districts. As part of the dog population management program, a number of cross sectional household and field population surveys were conducted to understand the community perceptions and the population dynamics of the free-roaming dog population in Bhutan. The findings of the surveys were used to enhance the humane dog population management programme in the country.

Based on the 10 years of successful collaboration between the Royal Government of Bhutan and Humane Society International, we developed National Dog Population Management Guidelines. All the relevant stakeholders were consulted during the preparation of the DPM guideline as the successful implementation of DPM activities will fully rely on the cooperation and active participation of the parties through one health approach. These guidelines aim to formally institute and mainstream dog population management (DPM) in the country; encourage community engagement; create conducive policy and legislation framework for DPM; reinforcing CNVR program; and continuous monitoring and evaluation of the DPM program. Through implementation of these strategies we aim to improve the welfare of dogs; reduce the dog population to acceptable and manageable level; and achieve zero dog mediated human death due to rabies by 2023.

## Successful dog management programs across India

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The number of street dogs in India is estimated to be around 30 to 40 million. Since 2001, legislation has outlawed culling in favour of sterilization programs to manage street dogs in India. The Animal Birth Control (ABC) approach involving the method of sterilizing and returning street dogs to their environments is favoured in India (e.g. Reece & Chawla, 2006; Krishna, 2010b; Totton, 2009; Totton, Wandeler, Kachhawaha, Suman et al., 2010; Yoak, Reece, Gehrt, & Hamilton, 2014). Programs across the Country are of different scale and implemented by different organizations following different protocols and approaches, however mostly in cooperation with the local authorities. Over the past decade Humane Society International has monitored and evaluated its own dog management and municipal ABC programs across India. While dog population dynamics vary greatly between states our main findings include that female centric programs can not only stabilize but also decrease the total street dog population significantly in as little as 2 years under the right circumstances. Street dogs are well tolerated in most parts of India and food is provided to them on a daily basis, however KAP (Knowledge, Attitude and Practices) surveys have shown that while people do not support culling of street dogs they are generally not opposed to having no dogs on the streets either. In rural areas where dogs are kept for protection such as mountain stations (e.g. Nainital, Uttarakhand) private dogs have shown significant influence on the street dog populations' composition as male dogs are preferred over females. However, they are usually not a contributing factor in cities. Dehradun, a city in the state of Uttarakhand, has been implementing a high volume, high welfare CNR (Catch, Neuter, Return) or ABC program since November 2016 with a focus to sterilize as many females as possible and has achieved a street dog density reduction of 35.6% (May 2019). Similarly, we surveyed the city of Ahmedabad, in the state of Gujarat, which has been implementing ABC for over a decade. Comparing two surveys in 2010 and 2019 as well as estimating dogs using survival estimates, we saw a total dog population decline by 34.1% which translates to 4.3 dogs per 100 people in 2010 to 2.0 dogs per 100 people in 2019. A density decline by 52.4% over 9 years. Other programs in cities like e.g. Vadodara in Gujarat have reached sterilization proportions of over 70% and are maintaining a stable street dog population now, while focusing on changing human behaviour around street dogs and a positive community development.

**Human health benefits of ABC work in Jaipur, India**  
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Human dog bites are a major public health problem in countries with large free-roaming or street dog populations. In addition to the direct problems of dog bites, up to 99% of human deaths from rabies are caused by dog bites. In Jaipur, Rajasthan a dog population management programme of sterilization and vaccination has been conducted since 1995. The programme concentrates on the sterilisation of female dogs. We analysed data from this programme and we obtained the human dog bite data from the main government medical hospital in Jaipur. We found that human dog bites in Jaipur followed a seasonal pattern with a peak of dog bites in February, about 10-12 weeks after the peak of street/free roaming dog breeding in the city. Street dog breeding in Jaipur is highly seasonal. Between 1993 and 2018 the incidence of dog bites fell consistently from 7.2 bites per 1000 people to 2.2 bites per thousand people [according to independently collected data which was obtained from main government medical hospital]. We conclude that some of human dog bites are due to the maternal behaviour of bitches protecting their puppies. Children are known to be at higher risk of bites because they often play with young pups in the street. Our data suggests these bites can be reduced by a programme of sterilization and vaccination of street dogs and thus the programme reduces the public health burden of human dog bites, possibly in part by reducing maternal behaviour of street/free roaming dogs.

## **Integrated Bite Case Management, a step forward to eliminate dog mediated human rabies - Egypt, 2018**

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**Background:** Rabies is an infectious viral zoonotic disease, although it is one of the oldest diseases known to mankind it remains without treatment available once development of symptoms, 99% of human cases caused by dog bites. Globally it is estimated to cause one death every 9 minutes, mostly affecting poor rural communities in Asia and Africa, 40% of victims are children under 15 years, alternatively rabies incidence rate in Egypt didn't exceed 0.065/100,000 population despite of country's continuous increase in animal bite cases reaching about 480,000 case/year, almost three quarters of them attributed to dog bites, ensure administering Post-exposure prophylaxis (PEP) to this massive number annually causes major economic burden specially for rabies immunoglobulin (RIG). National effort carried out to achieve the goal of zero case of dog mediated human rabies by 2030 through three pillars Community awareness, (PEP) for animal bite cases and controlling dog rabies. Here, we focused on applying Integrated Bite Case Management (IBCM) as a new perspective to optimize the (PEP) and its impact on (RIG) use and number of rabies cases recorded nationally during 2018.

**Methods:** By April 2017 two meetings were conducted to update the national guidelines for Rabies (PEP) in collaboration with stakeholders medical, veterinary and academia staff members to include (IBCM) approach such as timely reporting to veterinary surveillance officers, victim bite investigation, ensure (RIG) given to those exposed to potentially rabid animal, identify additional bite victims and accurate data gathering. A training of trainers (TOT) was conducted for health care workers from all 27 governorates. A standard data collecting tools distributed to all animal bite care clinics.

**Results:** Overall, 108 Health care worker were trained in (TOT), a total of 600 record were delivered all over Egypt. During 2018 recorded rabies cases decreased by 50.7%, (RIG) use decreased by 36.4 % than recorded in 2017, cost reduction estimated to be about \$460,000. Additionally communication between the animal and human health sector improved.

**Conclusions:** Applying (IBCM) succeeded to decrease the economic impact of using (RIG) with positive impression on recorded rabies cases in 2018. Controlling human rabies cannot be achieved without controlling dog rabies.

**Recommendations:** More attention towards animal rabies risk assessment. Additional efforts for accretion of dog rabies vaccination.

## **Southern African regional collaborations and capacity building for dog-mediated rabies elimination by 2030**

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The Southern African Development Community (SADC) countries are progressing at different rates to achieve the 'Zero by 30' goal of eliminating dog-mediated human rabies by 2030. The OIE facilitated a regional rabies workshop in April 2018, where participants from both human and animal health sectors discussed progress towards eliminating dog-mediated rabies and recommendations for the Tripartite Alliance and Global Alliance for Rabies Control. Responsible dog ownership has been highlighted as a key element of National Rabies Elimination programmes though the contribution the control of dog populations play in dog-mediated rabies elimination remains unknown.

The Namibian Government is working collaboratively with the OIE and *Friedrich Loeffler Institute* in order to achieve dog-mediated rabies elimination in the SADC region by 2030. Activities to-date include the launch of the Namibian National Rabies Control Strategy in 2015 and the successful dog-mediated rabies elimination project 2015-2018 in the Northern Communal Area (NCA). Improved rabies diagnostic and surveillance capacity across and between both human and animal sectors will lead to faster case detection and timely actions for control. Cross-border collaborations will further assist in controlling dog-mediated rabies given the transboundary nature of this zoonotic disease. The targeted and strategic vaccination of local dog populations will be important as demonstrated in Botswana following the closure of a large mine near Selibe Phikwe where abandoned dogs became feral dogs leading to increased transmission of rabies. The 2018 World Rabies Day event was held in this region to increase awareness and political support.

The OIE twinning project for animal welfare between the Faculty of Veterinary Science at the University of Pretoria and the Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale", Teramo (IZSAM) - OIE Collaborating Centre on Veterinary Training, Epidemiology, Food safety and Animal Welfare, is also building capacity in dog population management, legislation and animal welfare. This project also involved the Faculty of Veterinary Science and South African Department of Agriculture Fisheries and Forestry as well as the OIE animal welfare Focal Points from Namibia, Botswana, Zimbabwe, Mozambique, Zambia and Eswantini. The Enhancing Research for Africa Network (ERFAN) was born as an extension of the OIE Twinning projects with the aims to provide technical support to Regional Centers of Excellence, and to all the African Institutions partners through networking activities, strengthening of local capacities through training, technology transfer and research programmes in this area. Through collaborations with international organisations and research institutions, an increased capacity in dog population management and rabies elimination can be supported in the Southern African region.

### Comparing the welfare of dogs in two different rehoming centres: England vs Malawi

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Rehoming centres are important facilities for dog population management providing a place for dogs that need to be removed from the streets as well as those relinquished by owners and for many dogs, offer the opportunity of a good home.

Being housed in a rehoming centre is likely to ensure shelter, reliable access to food and water and veterinary treatment thus providing for a dog's environmental, dietary and health needs. However, providing for the social and behavioural needs of dogs can be much more challenging, difficult to achieve and can result in compromised welfare and a poor quality of life. For example, a lack of stimulation, restricted exercise and space allowance can influence strongly motivated behaviour resulting in dog's experiencing negative emotional states.

Ensuring the physical and psychological well being of dogs in shelter environments is important not least for their capacity to suffer but poorly run facilities can lead to the development of abnormal behaviour which can result in individuals appearing undesirable or difficult to rehome. This can lead to overcrowding and the inability to take in any additional unwanted dogs.

The design and layout of centres as well as the housing and husbandry vary greatly and are influenced by a range of factors including geographical location, land space, cost and dog demographics. In many cases centres have been designed largely according to reasons of hygiene, cost or the requirements of people - with insufficient consideration for animal welfare.

In this presentation the welfare of two dogs awaiting rehoming will be considered, each located in very different animal centres. One at a rehoming centre managed by the Royal Society for the Prevention of Cruelty to Animals (RSPCA) in England and the other at the Lilongwe Society for the Protection and Care of Animals (LSPCA) in Malawi. The five domains model will be used to explore each dog's welfare state. This model has a specific focus on the subjective experiences of animals which collectively contribute to an animal's overall welfare state. Differences in welfare likely experienced by the two dogs will be discussed as well as the practices which appear to be associated with good welfare.

## Evaluation of DPM: Learnings since publication of the ICAM “Indicators” guide and future tools

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ICAM's 'Are we making a difference? A guide to monitoring and evaluation of DPM interventions' was launched at the 2<sup>nd</sup> International Conference on Humane DPM in 2015. This provides practical guidance on measuring indicators of eight impacts common to DPM; improved dog welfare, improved dog care, reduced dog density/turnover, reduced risks to public health, improved public perception, improved rehoming performance, reduced impacts on wildlife and reduced impacts on livestock. Since then we have tested this guidance in partner projects and gathered input from other users; we see the 3<sup>rd</sup> International Conference as an opportunity to hear more from users, so please share your thoughts with us.

Testing the effectiveness of individual indicators outlined within this guide requires time as changes to DPM impacts may take years to become apparent. However, early impressions can suggest which indicators are performing well, including which are the most efficient and resource light to measure and which are the most meaningful to DPM stakeholders. This will clearly vary between locations dependent on what dog related problems are prioritised, but in general, indicators that appear to be performing well include: The density and visible welfare state of roaming dogs measured along standard routes through public streets; health outcomes including the number of reported dog bites; and the perceptions of local citizens/key informants relating to dog problems and roaming dog health and behaviour. For the future, more emphasis is needed in developing methods for measuring changes in human behaviours relating to dogs.

Further learning can be drawn from apparent challenges to implementing M&E. This includes lack of time and money to spend on monitoring, especially when training in how to carry out methods of measurement is needed. DPM projects may develop organically and in response to times of crisis, and then struggle to find the time and impetus to pause to clarify the purpose of their work, becoming action focused rather than goal oriented so M&E of impacts has little relevance. Some organisations diligently collect monitoring data over many years but leave themselves no time or opportunity to use this for evaluation and learning, leaving data unused.

We identified that one challenge was a lack of simple tools to support monitoring and analysis of data. To support organisations to action M&E, ICAM will be launching an app in 2020 for surveying roaming dogs. This will have the added functionality of the user being able to design the layout to suit their needs - recording observations of whatever animal and details are desired. There will also pre-designed survey layouts available in a 'library', plus simple real-time analysis of data, so you can instantly see how dog (or other animal) density is changing over time.

## **Barkyard: Mobile app to promote responsible ownership — a case study from Latin America**

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In World Animal Protection we move the world to protect animals. We believe that educating the public on responsible dog ownership is vital to creating a harmonious coexistence between humans and our canine friends. An online survey carried out in 2017 with 10,000 World Animal Protection supporters and followers from Latin America showed that most consider their dog is a family member. The survey provided us with valuable insights, for example, the majority of dogs are vaccinated against rabies but only some are sterilized. Most are dewormed but only some of them are identified (either tagged or microchipped). The respondents were offered a space to ask us any question and they ranged from nutrition, to behaviour, to health care, and how to take care of them in emergencies. The tendency in Latin America is for an increasing use of the internet, particularly through mobile phones. All of this information led to the creation and design of Barkyard, a mobile app for android and iphone that focuses on improving dog ownership and the dog-human bond. Barkyard has various features (that were informed by the survey result), amongst them dog library, trivia style game with prizes, first-aid section etc. Barkyard was launched as a pilot project in Mexico in May of 2018. This paper presents the results of that pilot and objectively examines the role that app technology can play in creating better lives for dogs.

## Using mobile phone apps to project manage and assess impact of a dog population management program in Negombo, Sri Lanka

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During a rabies mass vaccination program conducted in Negombo city, in January 2015 data was captured via the WVS app about the age, gender, confinement status, body condition, skin condition of 5327 dogs. This baseline data was used from March 2014 to inform a Catch Neuter Vaccinate Return (CNVR) program for male and female owned and unowned dogs across the city's 33 wards via a series of mobile "pop up" clinics. Teams were deployed to catch roaming dogs via Balinese nets, owners were also encouraged to bring in dogs or hand them to catching teams.

Dividing the region of work in to "Working zones" displayed on catching team phones enabled tight direction of catching teams to focus on specific regions of interest. The GPS locations of all roaming / collected dogs were entered via the App to ensure the catching teams work within the predetermined zones each day and that dogs were returned to the correct location.

At the clinic each dog's record included a grouping based on ownership and confinement. Additionally, sex, age skin condition, body condition score and health status were recorded via the app alongside any additional actions taken by staff.

Each dog in the programme was permanently identified in two ways; by subcutaneous microchip and by ear-tipping (removing the tip of the pinna in a "V"). The microchip numbers were recorded in the App. Dogs handled in the future for treatment or vaccination will be scanned for a microchip, enabling the monitoring of repeat vaccination, dog movements or relocation and estimation of population turnover. Ear tipping enabled identification of neuter status to catching teams and estimation of the proportion of sterilized dogs via post-clinic dog-sight surveys.

A survey feature in the App enabled comprehensive and thorough population surveys to be conducted before, during and after the intervention to monitor measures of impact, such as reproductive capacity, ownership practices and health status. The data capture fields of the App could be readily adapted to suit the data collection needs of the specific project.

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## Non-surgical fertility control and dog wildlife conflict

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### An update on non-surgical fertility control for dogs and a new tool for ethical decision making in field projects

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The Alliance for Contraception in Cats & Dogs (ACC&D) envisions a world in which dog and cat populations are effectively and humanely managed, improving the lives of animals and the people who care about them. With this vision in mind, we work to advance non-surgical methods of fertility control, and also to launch projects to help ensure that, as new non-surgical technologies become available, they are studied and implemented as effectively, humanely, and ethically as possible. This presentation will offer an overview of limited non-surgical fertility control (NSFC) options being used in the field at this time, and a glimpse at the most promising projects still in a research phase. We will also introduce a project underway to provide new tools for ethical decision-making in field projects.

**Non-surgical fertility control for dogs:** Surgical sterilization is central to dog population management. However, despite expansion of subsidized sterilization and ABC/CNVR programs, countries worldwide struggle with managing dog numbers. NSFC has the capacity to contribute to animal welfare as well as community health and well-being. Its value is arguably most dramatic in areas without abundant surgical and postoperative recovery facilities, without inhaled general anesthesia, with limited veterinary surgeons, and where there is resistance to surgical sterilization.

Current products include: *Suprelorin*® a Gonadotropin-releasing hormone (GnRH) agonist implant manufactured by Virbac Animal Health, is labeled for long-term contraception of male dogs. It has regulatory approval in Australia, New Zealand, and the European Union. It has been studied in female dogs and used successfully in females in select Canadian First Nations communities under an Emergency Drug Release. *Calcium chloride* is a compounded  $\text{CaCl}_2$  solution administered via intratesticular injection to sterilize male dogs. Because it is compounded, it does not have regulatory approval in any country. ACC&D feels the most promising research is in the area of gene delivery, with several studies underway. Initial pilots for cats being conducted in the United States will be discussed.

**Ethical decision making in field projects to help dogs:** Advancing non-surgical fertility control requires conducting “real world” field studies, which inherently involve numerous ethical considerations. When seeking resources to help our decision-making, ACC&D determined that little was available to veterinarians, researchers, and animal welfare professionals to guide field studies intended to help animals. We sought to fill this gap, in doing so collaborating with a diverse panel of experts to create a guidance document and online tool to aid decision making for field studies or novel field-based programs aiming to help dogs and communities. The resources are intended to be relevant to those conducting “research,” as well as those conducting field-based projects—for these, too, benefit from thoughtful implementation and careful data collection. The new resources will be shared at this conference. ACC&D is currently seeking to transition this resource to an organization with a broader mission to ensure maximum reach in the animal welfare field.

## Exploring dog-human relationships in First Nations communities: A decolonizing framework

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There is a current knowledge gap in understanding the relationships that exist between humans and free-roaming dogs in First Nations, particularly when dog health and welfare are compromised. Against the backdrop of colonialism, the lives of dogs in many Indigenous communities are mutually entangled with those of their human counterparts, the historical trauma and cultural erosion extending beyond the species line and recapitulated in their shared hardships. It is an event that has created welfare implications in a more-than-human context, impacting the physical and psychological wellbeing of entire communities.

Without strategies in place to mitigate overpopulation, the dogs can pose a significant risk to health and wellness and may become a nuisance or danger to vulnerable individuals such as children and the elderly. However, collaborative partnership with First Nations communities requires cross-cultural insights and a deep reflection on the influences that have shaped our own attitudes about pet-keeping. It also requires an acknowledgement of the potential for harm that may come to communities in an already politically-charged animal welfare milieu. Since attitudes and experiences in one community are not necessarily generalizable to others, the development of a research and relationship framework that allows an honest sharing of information helps us in our understanding of the landscape of human-dog relationships in a way that is relevant and informative in managing dog populations.

Community-based participatory research (CBPR) is a decolonizing approach that is based on the sharing of power and resources in the pursuit of improved welfare outcomes for both humans and dogs within these communities. Given the importance of oral tradition in First Nations communities, using conversations as a primary form of knowledge-gathering mobilizes local Indigenous knowledge and encourages reciprocal and collaborative engagement. The information shared through conversations can be organized into community profiles and it then becomes possible to develop responsive humane education initiatives that are responsive to the unique needs of each community.

A qualitative exploration of residents' attitudes towards dogs in five First Nations communities in northern Quebec and Ontario was undertaken in 2016. The resulting narratives have provided valuable insights about attachment, the changing role of dogs in modern on-reserve families and how owned and unowned dogs are viewed within each community. The analysis has been used to provide meaningful information for programs that address the welfare of both canine and human members of each community.

## Ethical management of human-derived conflict with wild and domestic dogs: Case studies from Oceania

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Dogs and their wild ancestors are highly valued in human society. However, wild canids and roaming domestic dogs can pose a threat to human health and safety, native wildlife, livestock and industry. Human influences also impact canid populations. Anthropogenic food subsidisation can create overabundant populations, often with poor animal welfare outcomes. Hybridisation with domestic dogs is also the primary threat to the persistence of ancient canids, such as the dingo (*Canis dingo*), which is listed as vulnerable by the IUCN. Conservation of ancient canids is a high priority, and managing conflict must be done in a way that ensures their survival. In the case of the dingo, this is complicated by the species being ambiguously listed as protected, unprotected or pests in different jurisdictions.

We provide case studies from diverse systems across Oceania that articulate different human-dog conflicts. While similarities exist, such as artificially inflated populations associated with human resources, different contexts and scales means that each is managed differently.

A population of dingoes around a mine in arid Australia was inflated because of access to anthropogenic food, resulting in aggressive dingo behaviour. Largely due to dingoes being listed as pests in this state, the issue was historically managed with population-level lethal control.

Dingoes on a World Heritage island off Australia also habituate to people, which has led to several high-profile and serious attacks on visitors. Dingoes are protected and highly valued in this area, and direct management is limited to targeted euthanasia of problematic individuals.

A large population of roaming domestic dogs on a small oceanic island in the Pacific creates human and animal health issues, threatens wildlife and causes a serious hazard at the airport. Historic management had human safety implications, poor animal welfare outcomes, and did not effectively mitigate risk. The solution requires an island-wild program with integration across the Air Safety, Public Health, Veterinary and Environmental sectors, and a focus on community engagement and capacity building.

These case studies demonstrate there is no 'one-size-fits-all' solution, and highlight the need for ethical management specific to location and context. We conclude that "One Health" cross-disciplinary management approaches that prioritise education and capacity building are essential. They provide the best chance of sustained conflict reduction and ultimately the best opportunity to preserve the genetic integrity of unique canids like the Australian dingo.

## Feral dogs as predators of wildlife, competitors with native canids, and sources of conflict with humans in the Moroccan Middle Atlas Mountains

Liz AD Campbell<sup>1,2,3</sup>, Claudio Sillero-Zubiri<sup>2,4</sup>, Imad Cherkaoui<sup>5</sup>, Mohammed Znari<sup>6</sup>, Terry Burke<sup>7</sup> & David Macdonald<sup>2,4</sup>

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The largest remaining carnivores in the Moroccan Middle Atlas Mountains are two canids: feral domestic dogs (*Canis familiaris*) and African golden wolves (*C. anthus*). Data on these species were collected from 2015-2018 in Ifrane National Park using camera trapping and social surveys with local communities. Results show that feral dogs are the most abundant carnivore, which act as predators of wildlife, competitors with native canids, and sources of conflict with humans. Though most of dogs' diet derives from anthropogenic sources, occasional predation on wildlife (hare, *Lepus capensis*, and hedgehogs, *Atelerix algirus*) combined with high dog abundance can negatively impact prey populations and compete with native predators. Bayesian modelling suggests competition between dogs and golden wolves is reduced by niche-partitioning of time, microhabitat, and diet, though dogs may competitively exclude golden wolves from resource-rich areas. Dogs are also a source of conflict and fear for locals: 60% of 131 interviewed shepherds reported conflict with feral dogs, with 13% reporting conflict to be severe or moderate, and 52% reporting negative attitudes towards feral dogs. We tested for evidence of "contagious conflict" from dogs, i.e. whether conflict with dogs exacerbates conflict with golden wolves, as human-predator conflict is one of the greatest conservation threats to golden wolves in Morocco. Bayesian ordinal regression on reported conflict with dogs and golden wolves did not find evidence of contagious conflict: the interaction between dog conflict and wolf conflict did not affect attitudes towards wolves or dogs. These results indicate the need for humane management of dog populations in the Moroccan Middle Atlas Mountains and we propose potential strategies to reduce the negative impacts of feral dogs on prey, predators, and people.

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## Perceptions and human behaviours in DPM

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### **Public attitudes and behaviors towards dog meat consumption in Cambodia – a risk to public health, animal welfare, and humane dog population management**

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While Vietnam is fairly well known for its robust dog and cat meat trade, the trade and consumption of dogs in neighboring Cambodia has received little attention. Aside from serving a threat to animal welfare and public health due to rabies, the trade also undermines humane dog population management (DPM) programs. Given the country's limited spay/neuter capacity, the dog meat trade indirectly serves as the primary means of DPM in Cambodia.

In November 2018, FOUR PAWS International and local partner Animal Rescue Cambodia began nationwide undercover investigations which revealed extensive trading of dogs for meat, involving 2-3 million annually, many of which are sold by their owners, stolen, or traded for cookware. Investigations documented severe cruelty inherent in all stages of the trade including sourcing, transport, and slaughter. To better understand the factors driving this trade, FOUR PAWS commissioned a large-scale market research study to determine current levels of dog meat eating, main drivers for consumption, and opportunities to curtail consumption. The research was divided into three phases: (1) quantitative incidence check survey using completely randomized sampling, (2) usage and attitude survey with consumers, and (3) qualitative deep dives of the individual drivers of consumption consisting of focus group discussions with consumers and in-depth interviews with sellers.

Results of the study indicate that in the capital city of Phnom Penh, consumption rates of dog meat are quite high; 53.6% have ever tried dog meat (72.4% of males and 34.8% of females). A total of 12.2% of respondents consume it regularly (defined as having consumed within the past 1 month and more than 10 times before). When adjusting for age, results indicate that the average consumer is male, 18-29 years old, and has a personal income of 200-300 USD per month. Most commonly cited reasons for consumption include the delicious taste, reasonable price, compliments drinking, and treats medical conditions.

Tackling this issue requires a genuine understanding of public motivators, and tailored messaging to drive human behavior change. Concepts created with the purpose of making consumers re-consider eating dog were tested and met with mixed results. For the older, more frequent consumers, little seemed to sway their opinion of dog meat at all. The concepts which were most effective were: proving that the meat contained diseases that could make the consumer sick, passage of a law making dog meat illegal, appealing to the consumers sentimentalities towards the animals, and making the meat unpopular amongst their friendship group.

## Changing perceptions about dogs and rabies in a rural community in South Africa

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This study involved a participatory engagement (participatory reflection and action) in a rural community in South Africa with the purpose of facilitating awareness of rabies and rabies control. Findings indicate that, in spite of significant prior veterinary involvement in this community, rabies awareness was initially not a priority for the participants. This was mainly due to more pressing socio-economic issues and limited existing knowledge of human and animal diseases and rabies in particular. In addition, participants were initially hesitant to contribute due to power dynamics, group dynamics and language barriers. Cultural beliefs and superstitions presented additional barriers to learning about rabies. Dogs were mainly viewed as having practical utility and were generally not valued as companions. Over time, participants' self-confidence grew and rabies control was brought to the fore. Topics related to vaccination of dogs, dog bite prevention and post-exposure prevention were covered in detail. A variety of learning resources were utilised. Participants were subsequently able to identify and mobilise personal and community strengths and assets, resulting in the execution of a community rabies awareness project. They assisted with the design of an informative rabies pamphlet for distribution in the community and were furthermore successful in disseminating the message of rabies control within their community through educational drama presented to primary school learners. Towards the end of the study, their attitude towards dogs changed from one of indifference towards having empathy. They reported feeling empowered particularly with regards to speaking English and sharing their views and new-found knowledge. As such, findings of this study indicate that trust and confidence built through repeated participatory engagements can result in changed perceptions and actions, which in turn has the potential to reduce prevalence of rabies in humans and animals while simultaneously empowering individuals and communities and promoting One Health.

## **A holistic approach to improving animal welfare and changing people's attitudes towards dogs in South Africa**

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The traditional approach to animal welfare in Africa is to promote sterilisation and rabies vaccination campaigns, together with a limited distribution of educational material. In 2009 the founding members of Funda Nenja, (which translates from isiZulu to "learning with the dog") decided to deal with humane education and dog population management with a more hands-on approach by using dog training classes as the vehicle towards these goals, and as a portal into the larger community of Mpophomeni, a semi-rural township in the KwaZulu Natal Midlands.

Our vision is to develop the values of kindness, respect and compassion nurtured through the practical element of the program which develops a bond between children and dogs. By changing children's attitudes and emotional response towards their dogs, we are investing in the future and not just applying a "band aid" approach to animal welfare. These children become agents of change and role models of responsible, caring dog owners in their communities.

Our programs see us reaching approximately 400 children per annum. These programmes include weekly dog training classes with an average attendance of 80-100 children and their dogs, a primary veterinary health clinic, a sterilisation program, a family support program and an animal welfare outreach program which includes home visits to the families of the dog school participants.

The dog training classes are taught by young people who have themselves gone through the program with their own dogs and who share their acquired knowledge on humane handling of dogs, canine behaviour and basic animal welfare to their young learners.

Our animal welfare program also includes the supply of dog food, collars and leashes as well as dog houses to the local people, who are mostly underprivileged, for a nominal cost as we seek to avoid a culture of handouts and rather one of responsible pet ownership.

The outcome of our approach has been a marked improvement in the physical condition and health status of the local dogs. The dogs are easier to handle resulting in an environment where dogs and humans can co-exist harmoniously. The attitudes of the general population of Mpophomeni towards dogs has greatly improved since the start of this initiative, resulting in humane dog population management and higher levels of responsible dog ownership, primary health care, including sterilisation, and humane handling of their dogs.

## Understanding how people make decisions (and how your organization can ease the friction)

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**Learning objective:** Attendees will learn about the decision making process and come away with tangible actions they can implement to help support decision makers in their community.

**Overview:** Decision making is a limited resource. This means that the parts of our brain responsible for thinking through decisions can get tired after a while, leading to poor decisions being made or, in some cases, no decision at all. It is important and beneficial for organizations to understand the stages of decision making so they can help the decision maker at each stage.

When making decisions and walking through the process, people often look at the requirements through both a functional and emotional lens, and emotional decisions can be broken down into two general buckets: social and personal (adapted from the Jobs to Be Done framework).

We will discuss the seven stages of the decision making process, and step into the mind of the decision maker to understand where we can step in to support them. We will understand both the functional and emotional aspects of decision making, focusing primarily on the personal emotional aspects.

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## List of posters

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### Achieving rabies elimination by 2030

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1. **Chuchu Mbaire** Dog ecology and its implication to rabies control: A case of Makueni County
2. **Jens Fissenebert** Achieving Zero by '30: Opportunities and obstacles in East Africa
3. **Sara Blake** Rabies eradication in Meibae Conservancy in northern Kenya
4. **Nicolette Wright** Development of recombinant immunocontraceptive vaccines for use in domestic dogs
5. **Artem Metlin** Rabies and stray dog population control in Moscow Oblast

### One Health and DPM – benefits to animal welfare, public health and the environment

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6. **Andrea Britton** One Health approach to dogs and people projects in the South Pacific island countries of Nauru and Kiribati

### Innovative tools and approaches in real-life DPM projects

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7. **Katherine Polak** Spayathon™ for Puerto Rico: A unique, collaborative approach to improving spay/neuter accessibility
8. **Matt Backhouse** Before it's too late – the importance of mental health care in DPM
9. **Helen Guy** Dog population management (DPM) in a stateless community in Thailand
10. **Veronica Nel** Cape Town (South Africa) mass animal sterilisation projects: A collaboration between various animal welfare organisations and the Municipality
11. **Ivan Kurajov** Creating and implementing effective DPM program in challenging conditions
27. **Janerose Mutura** A model for high volume sterilisation operations: A case study of Machakos County, Kenya

### Using data in DPM design, monitoring and evaluation

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12. **Abi Collinson** Identifying research priorities for canine surgical sterilisation programs: What are the unanswered questions?
13. **Rita de Cassia Maria Garcia** Unowned dog population estimation in a city of Paraná/Brazil
14. **Rita de Cassia Maria Garcia** Comparison between the corporal score of owned and dogs un-owned
15. **Oswaldo Santos Baquero** Size, spatial and household distribution, and rabies vaccination coverage of the Brazilian owned-dog population
16. **Oswaldo Santos Baquero** Can sterilization help to prevent roaming in dogs and cats?
17. **Oswaldo Santos Baquero** Companion animal demography and population management in Pinhais, Brazil
18. **Oswaldo Santos Baquero** Validity of a two-stage cluster sampling design to estimate the total number of owned dogs
28. **Oswaldo Santos Baquero** Owned-dog population dynamics in São Paulo city, Brazil: demographic processes or methodological artifacts?
29. **Oswaldo Santos Baquero** Downscaling predictions for the owned-dog population size in Brazilian cities
19. **Prem Lal Mahato** Demography, health status and public attitude of owned dog in Bharatpur, Nepal
20. **Liat Morgan** Risk analysis for a dog to be adopted or wait for a longer time at the shelter
21. **Boris Yakobson** Governmental initiatives for fighting dog overpopulation in Israel
22. **Kuo Hsuan** Dog population management in the Taipei-Keelung Metropolitan Area: A model for realizing DPM in an urban and diverse region
23. **Karma Rinzin** Size and demographic pattern of the domestic dog population in Bhutan: Implications for dog population management and disease control
24. **Tomislav Mikuš** Attitudes of shelter visitors regarding companion animal welfare

### Community engagement and human behaviour change

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25. **Alanna Collicutt** Free-Roaming DPM in Indigenous communities in Canada

### Resolving conflicts with wildlife and livestock

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26. **Erika Flores** Using dog houses as a tool in jaguar conservation in a Mayan community in Quintana Roo

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## Poster presentation abstracts

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### Achieving rabies elimination by 2030

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#### 1. Dog ecology and its implication to rabies control: A case of Makueni County

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**Background:** Dog demographic and ecological factors can determine the success of dog rabies elimination programs. High dog population turnover makes it difficult to maintain a high proportion of vaccinated dogs and may be influenced by many ecological factors including availability of food, water and shelter, and health. Here we present a study of the dog demographic and ecological factors underlying rabies transmission in Makueni County.

**Method:** A cross sectional survey was conducted in 4,213 and 3,337 compounds in Kathonzweni and Kilungu wards respectively. Data on dog ownership, demographics, dog management practices and rabies awareness among dog owners was collected in September 2018.

**Findings:** We found 75% of the households in Kathonzweni and 50% of the households in Kilungu owned dogs. The human:dog ratio was approximately 1:4 and 1:7 in Kathonzweni and Kilungu wards respectively. In both wards male dogs were fewer than female dogs with a male:female ratio of 1:1.9 in Kathonzweni and 1:2.1 in Kilungu ward. More than a third of the respondents in both study areas reported their dogs scavenged for food. Less than 20% of the households had fenced compounds but these could not completely restrict dog movement. We found only 8% and 31% dog owning compounds provided shelter for their dogs in Kathonzweni and Kilungu respectively. Most of the participants (89%) were aware of rabies disease and would identify rabies signs in humans, dogs and livestock with excessive salivation, unprovoked aggressiveness and abnormal vocalization reported as the major clinical signs observed in rabid dogs, humans and livestock. About three-quarter of households in Kilungu and 61% in Kathonzweni reported to have vaccinated their dogs in the mass dog vaccination campaign conducted by the County government. More than half of the respondents reported they would call veterinary technicians if their dogs were sick.

**Conclusion:** The study shows opportunities for educating dog owners on responsible dog ownership that can aid rabies elimination program. Educating the community on responsible dog ownership through provision of food, water, shelter, health care, and opportunity for natural behaviors would minimize any risk of dog bites and disease transmission that dogs may pose to the community, other animals and the environment.

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#### 2. Achieving Zero by '30: Opportunities and obstacles in East Africa

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Tanzania is a rabies endemic country where the virus is responsible for an estimated 1500 human deaths every year (Sambo et al 2013). Since 2015 Mbwa wa Africa, a Tanzanian not-for-profit organisation, have been conducting rabies vaccination campaigns within the Arusha region. To-date over 33,000 canine rabies vaccines have been administered by Mbwa wa Africa, achieving a sustained 70% vaccination coverage in areas where campaigns have taken place. Within the time that Mbwa wa Africa have been conducting vaccination campaigns, the "Global Framework for the Eradication of Dog-Mediated Human Rabies" has been launched. Developed by the OIE, WHO, FAO and GARC, the framework reflects feedback gathered at the 2015 conference, *Global eradication of dog-mediated human rabies: The time is now*. The framework is comprised of "five pillars" of rabies eradication which include; socio-cultural factors, technical requirements, organisational structures, political climate and resource availability. This poster presentation will use the Global Framework as a structure through which current progress towards achieving "Zero by '30" in Tanzania will be analysed. In 2017 co-author of the poster, Lucy Marsh, visited Tanzania in order to analyse the sustainability and scalability of rabies eradication projects as part of her post-graduate studies. Lucy used the work of Mbwa wa Africa as a case study and data gathered from this research will be used within the poster.

Research showed that there are three main obstacles currently hindering the sustainability and scalability of rabies eradication in Tanzania. These include; varying levels of government 'buy-in' and support for rabies prevention activity, a lack of dog handling training for vaccination within the veterinary and livestock professions, and poor levels of community engagement and participation, resulting in varying levels of rabies awareness within the general public. At

the same time, an incredible amount of positive data was also gathered during this research. Tanzania is home to numerous change-makers who have the vision and motivation to improve the lives of animals and people in Tanzania. These individuals have immense potential to become 'rabies champions' within their local area and could play a pivotal role engaging local communities in rabies eradication activities. Alongside illustrating data gathered during this research period, recommendations on 'next steps' will also be made, in order to secure deliberate progress towards achieving "Zero by '30" in Tanzania.

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### 3. Rabies eradication in Meibae Conservancy in northern Kenya

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Rabies is a viral illness affecting the central nervous system and is one of the world's most threatening zoonotic diseases. Rural populations, especially children, are at the greatest risk of rabies exposure, with 98% of human rabies transmitted by dog bites. An estimated 2,000 human deaths due to rabies occur annually in Kenya. Elimination of rabies is achievable through mass dog vaccination and awareness campaigns and a pilot of rabies eradication was launched by the Kenya Government in 2015. Annual regional vaccination of 70% of the domestic dog population can essentially wipe out rabies risk to humans and wildlife in five years. While decreasing risk of human rabies, the vaccination of domestic dogs also reduces the risks to wildlife and other domestic stock. Disease evaluation in the Meibae Conservancy in Samburu County found that illnesses in dogs ranged from mild parasites to herpes and distemper. This poster will display results of three rabies interview campaigns conducted between 2015 and 2018 and will show the results of combining awareness and vaccination campaigns in a small area. During a third year of rabies vaccinations the project will collect samples from sick and healthy dogs to evaluate effectiveness of the vaccination campaign. Educational materials developed from the interview results will be distributed in the community on disease types and preventative actions. The diseases present in dogs will provide a baseline for the health of wildlife in the region.

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### 4. Development of recombinant immunocontraceptive vaccines for use in domestic dogs

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In 2017, it was estimated that the global dog population is approximately 687 million dogs. Domestic dogs are the most important reservoir for rabies, and rabid dogs are the source for the vast majority of human rabies cases. To eliminate rabies from a given population, two components are crucial, namely mass vaccination of dogs and provision of post-exposure prophylaxis to bite victims. Achieving and maintaining the recommended 70% vaccination coverage can be difficult in developing countries where the burden of rabies is also most significant. High population turnover in free-roaming dogs is a major factor that influences the efficiency and cost of vaccination programmes. As a population management intervention, surgical sterilization is cost-prohibitive in developing countries while chemical sterilization presents many difficulties associated with safety and acceptance of such practices. Immunocontraceptives may offer an ideal, non-permanent mechanism to interrupt breeding cycles and contribute to population management.

We have therefore developed 6 candidate immunocontraceptive vaccines expressing gonadotropin-releasing hormone (GnRH) along with immune-stimulatory motifs. Two human adenovirus type 5 (HAd5) vaccines and four DNA-based vaccines were constructed. Expression of the GnRH-gene from all inserts was confirmed in cell culture and vaccines were evaluated for immunogenicity in a murine model. No animals developed anti-GnRH antibody responses after 2 intramuscular doses of the DNA vaccines. In a heterologous prime-boost strategy all animals that received DNA vaccines also received a booster dose of one HAd5 vaccine but failed to develop any anti-GnRH antibodies. After 2 intramuscular vaccinations with the respective HAd5 constructs, mice from both groups developed significant GnRH-specific antibody responses that remained until the end of the study period.

Despite the development of some effective synthetic protein-based immunocontraceptive vaccines that are utilised in wildlife species, there has to date been little success with regards to effective contraceptive measures for use in domestic dogs. Towards the development of an effective immunocontraceptive vaccine for use in domestic dogs, this study has demonstrated the potential of recombinant viral vectored vaccines to induce antibody responses against GnRH. A next step would be to correlate immunogenicity and contraception in domestic dogs.

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### 5. Rabies and stray dog population control in Moscow Oblast

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Stray animals serve as reservoirs and vectors of highly dangerous diseases such as rabies, microsporidia, trichophytia, toxoplasmosis, toxocarosis, leptospirosis, listeriosis and dipylidiasis. The number of animals owned by citizens of Moscow Oblast is increasing. According to the data of the Moscow Oblast Veterinary Service, more than 160,000 dogs

and over 70,000 cats were vaccinated in 2009, and in 2010 around 180,000 dogs and 77,500 cats. The number of stray animals with no owner, roaming free in the settlements and left without control by owners is also on the rise. According to the Russian Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor), 23,178 bites of people by animals were reported in 2018; 460 of them were bites by wild animals (foxes, hedgehogs, etc.) and 22,718 bites stood for domestic animals. Monitoring data provided by Moscow Oblast local authorities demonstrate that for 2019 the factored approximate number of animals with no owner stands at 11,453 animals, of which: dogs – 8,933 heads; cats – 2,520 heads. An estimated population is 20,000 heads. In 2018, 191 rabies cases were reported in animals in the Moscow Oblast with 83 cases accounting for dogs and cats (46 cases in dogs, 37 cases in cats), 30 of which were stray animals (36,2%).

Main factors contributing to emergence, appearance and reproduction of stray animals in Moscow Oblast are as follows:

- availability of feed (biological wastes, citizens feeding the animals);
- absence of control and disregard of rules of animal keeping by owners when walking with their pets (free-roaming without a leash);
- permanent replenishment of their number due to animals abandoned by the owners, migration and introduction of animals from neighbouring territories.

The Moscow Oblast is actively implementing measures to manage the stray dog population. Digitalisation in the veterinary field allows citizens to promptly file a complaint regarding the appearance of stray animals in different municipal units in the on-line system on the official portal of Moscow Oblast government «Dobrodel». To prop up the effectiveness of regulatory measures for stray animals, it is necessary to foster responsibility of animal owners. Overall registration of animals with attribution to each pet of an individual number (tattoos, tagging, microchipping) would allow obtaining data on the owner and his/her pet as well as identifying the animal.

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## One Health and DPM – benefits to animal welfare, public health and the environment

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### 6. One Health approach to dogs and people projects in the South Pacific Island countries of Nauru and Kiribati

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Dogs play an integral part in island life throughout the Pacific as they clean up waste, help control vermin population, act as security for family and property, and are pets. However, uncontrolled breeding and increased urbanisation has resulted in large dog populations in some towns and villages with significant adverse impacts on public health, biodiversity and animal welfare. Until 1975, Nauru maintained a dog-free ecosystem. Following the introduction of dogs and the increasing human population on this small South Pacific island country, dogs have emerged as a significant social and public health issue within communities. Negative biodiversity impacts are also evident with dogs disrupting nesting birds.

Nauru hosts a large and unquantified population of free-roaming dogs, both owned and feral, with mixed breed and American pit-bull terrier dogs. Most families keep dogs for security and to protect property. The large numbers of dogs have had negative impacts on the communities and maybe contributing to Nauru having one of the poorest health indicators for non-communicable diseases in the region. The incidence of cardiovascular disease, obesity and type-2 diabetes is very high. Human health has been impacted both directly from dog bites, and indirectly by restricting movement to avoid harassment by dogs and this is a problem cross the Pacific region. Significant improvements in public health can be expected as a by-product of improved dog population management due to humans being able to participate more freely in outdoor activity; and reduced trauma (mental and physical) associated with dog attacks and road traffic incidences.

In areas significantly impacted by climate change such as South Tarawa, Kiribati, where the water table is high, dogs appear to carry very high worm burdens. This may be contributing to zoonotic parasitic disease in humans, particularly women and children given women are the primary carer of pet dogs, and children are in daily contact with their dogs.

Stable populations of healthy dogs can have a positive impact on human health, and this is best achieved through One Health dog programs where human, animal and environmental health sectors coordinate activities and integrate policies associated with dogs. Community consultation and engagement has been essential in Nauru and Kiribati to ensure the success and sustainability of pilot projects, and the use of in-kind and collaborator resources have helped to reduce the project costs. Sustainable One Health dog control programs are needed across the Pacific where dog population management is an issue and associated physical inactivity is contributing to the non-communicable diseases crisis. Additionally sustainable dog population control is particularly needed where the effects of climate change are greatest.

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## Innovative tools and approaches in real-life DPM projects

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### 7. Spayathon™ for Puerto Rico: A unique, collaborative approach to improving spay/neuter accessibility

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While the US mainland has made significant strides in improving companion animal welfare, the commonwealth island of Puerto Rico has been largely left behind. Puerto Rico suffers from crippling poverty, limited veterinary services, and a large stray dog population. Animal shelters in Puerto Rico are overcrowded and under-resourced, with euthanasia rates frequently exceeding 90%. In 2017, Hurricane Maria delivered a devastating blow to the island, causing increased emigration, pet abandonment, and stray animal suffering.

Spayathon™ for Puerto Rico was initiated to provide desperately needed sterilization services to address uncontrolled dog reproduction while simultaneously building local veterinary capacity and facilitating responsible pet ownership. In a collaborative effort led by the Humane Society of the United States, international organizations specializing in high-quality, high-volume spay/neuter (HQHVSN) surgery pair with local animal welfare groups in simultaneous quarterly week-long, multi-site, high-volume surgical clinics for owned animals. Intervening events target free-roaming and shelter animals. Initiated with a goal of 25,000 surgeries over 1-year, overwhelming demand led to an expansion to 85,000 surgeries planned over 3 years. Spayathon™ offers immediate impact in a region of extreme need, but long-term solutions require local capacity building. Partnerships to provide hands-on surgical training for local veterinary teams and the donation of all equipment and supplies acquired for Spayathon™ to the Puerto Rican veterinary community at the conclusion of the campaign will support sustainability and the establishment of permanent HQHVSN clinics.

There is a paucity of published data on spay/neuter services in both traditional veterinary practices and specialized HQHVSN programs against which to benchmark the success of new initiatives. To address this void, an independent international research team is analyzing patient data to document access to veterinary care, the condition of animals attending the high-volume clinics, and their clinical outcomes. Interim analysis of 21,444 animals (15,111 dogs and 6,333 cats) sterilized and vaccinated in the first 3 rounds revealed 56% of animals had never been to a veterinarian before, 38% of females over 11 months had already produced at least one litter, and 71% of animals 5 months and older in this rabies-endemic island had never been vaccinated against rabies. Clinics upheld the highest levels of surgical and medical standards with a perioperative mortality rate of 1.3/1,000, redefining the standards for high-volume field-type sterilization clinics.

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### 8. Before it's too late – the importance of mental health care in DPM

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Throughout the world, countless numbers of companion animals are suffering, and they rely on compassionate and selfless humans to improve their welfare. Sadly, for animal welfare professionals, the nature of this work can often mean confronting terrible cruelty, enduring harsh working conditions and long hours, both in the field and in more traditional office environments. Recently the concept of compassion fatigue has gathered momentum within our industry, but this is often highlighted as a final outcome, when animal welfare and rescue professionals have 'burnt out' and need temporary or permanent retreat from their roles. Conversely, for many of those who 'stick it out' and continue to work through their personal suffering, this can have severe detrimental effects on their personal lives and relationships, while also negatively affecting the very work they care so deeply about.

We need to acknowledge, empower and support people before they reach a critical mass, in keeping with the One Health approach of recognizing that human health, animal health and ecosystem health are inextricably linked. A key aspect of this is to re-write our definitions of what conditions are acceptable with and without mental health support – to learn that 'self-care' is not 'selfish', and that prevention is better than cure. Pre-emptive strategies to assist in creating more emotionally-stable employees include the employment of counsellors in larger organisations; the normalization of compassion fatigue education and training; recognition of the role differing personality types play in terms of stress management and 'recharging'; ensuring that those working on the frontlines of intense environments, such as undercover DMT investigators, shelter workers and first responders, have sufficient time to access appropriate support. With a deeper focus on how we care for and empower the human heroes in our organisations, we can cultivate a more impactful and efficient work force who truly can do the best for the animals, and themselves.

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## 9. Dog population management (DPM) in a stateless community in Thailand

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The islands of Koh Payam and Koh Lao on the Andaman coast are home to the Moken, a marginalised sea gypsy community. As sea nomads, The Moken used to spend most of their lives on houseboats. Post tsunami the Moken were exposed to modern life with few of the benefits. A lack of citizenship and legal rights, and the commercial depletion of marine life pushed many to the fringes of society. Their inshore settlements became heavily polluted by plastic and other rubbish, and as a result, dogs proliferated.

All For Villages and Mercy Foundation are registered charities dedicated to improving the lives of The Moken through school education, healthier food and human healthcare. They identified the island's mass overpopulation of dogs as not only a significant human health risk, but also as negatively impacting their environment. With no access to veterinary care or government assistance, animal welfare was also severely compromised with dogs dying of starvation, disease or malicious poisoning.

In 2017, in collaboration with the mentioned charities, Lanta Animal Welfare began a sterilisation and rabies vaccination programme in order to improve both human and animal welfare long-term. The estimated baseline population was 600 dogs. Given the travel distance from our centre, clinics could only be performed over 4-day period every 6 months. We recruited a team of dedicated local volunteers who raised awareness of the project through leaflets and door-to-door calls, and identified and transferred animals for sterilisation. With no cars on the islands, animals were carried or transported by trolley to the community centre where we set up a makeshift clinic. For rapid impact, we prioritised adult female dogs for sterilisation. To date, we have sterilised, and rabies vaccinated 421 dogs and 123 cats. We have provided veterinary treatment for 40 dogs. Through our collaboration we have reduced the number of roaming dogs and contributed to improving the lives of the Moken community.

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## 10. Cape Town (South Africa) mass animal sterilisation projects: A collaboration between various animal welfare organisations and the Municipality

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**Objectives:** To control and curb the increase in dog and cat populations and to improve the welfare of animals in the Western Cape (WCape), through municipal funded interventions, and for the WC to remain a rabies-free zone.

**Methods:** In 2012, the WCape Premier hosted a summit with WCape Animal Welfare Organisations, as part of an effort to ensure an integrated and coordinated approach to promoting animal welfare. The Animal Welfare Summit was a consultative engagement platform, aimed to forge strategic partnerships and multi-stakeholder commitment to joint action to address challenges when it comes to the care and welfare of domestic animals, underpinned by the Western Cape Government's philosophy that effective progress and results are achieved "better together", i.e. when all role-players – government, municipalities, public, private and non-profit - are mobilised to work together in successful partnerships. Central to achieving this is controlling owned, stray and feral animal population sizes through sterilisation.

In 2013, the Cape Town Municipality provided the first grant-in-aid funding to the Cape Animal Welfare Forum and its animal welfare members to sterilise dogs and cats in identified areas. The Department of Agriculture Forestry and Fisheries supplied the Rabies vaccines to be administered to all animals sterilised. Members of CAWF developed and implemented the mechanics of the mass sterilisation projects.

**Results:** City Health has provided funding of more than R2,7 million for projects in various poverty-stricken communities in Cape Town. Various welfares, such as People's Dispensary for Sick Animals, Animal Rescue Organisation, SPCA, Animal Welfare Society, CVC and others have worked together on these projects and sterilised around 9,000 animals. Since 2013, approximately 1,500 animals were sterilised each year over a 14-week period.

**Challenges and improvements in the model since 2013:** Various factors posed challenges, in particular the lack of supportive by-laws, resourcing, additional costs incurred by welfares, as well as physical support from authorities in crime and gang ridden areas.

An Internationally recognised Impact Assessment tool must be implemented to measure the successes of these projects. The first such impact assessment will be conducted in 2019, using the ICAM impact assessment model and tools.

**Conclusions:** Such partnerships between welfares and municipalities are key components to implement and achieve results in the area of animal welfare and pet population management.

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## **11. Creating and implementing effective DPM program in challenging conditions**

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The aim of the presentation is to show the connection of global influences in animal welfare and protection to the local and national level and to underline changes of behavior towards animals through positive models and their implementation in the local environment, which is very specific and sensitive in developing countries like Serbia. Our organization has developed our own positive model under such a global influence, trying to adapt best practices and make them work for both people and animals.

The key stage was the preparation and maintenance of continuous actions and campaigns that have influenced our society which has moved from animal poisoning and mass killing mindset to a caring environment where such negative practices became not just illegal, but also a rare exception. Actions undertaken for resolving negative image that abandoned animals had in the local and regional community have been planned according to the acquired knowledge about the basic, but also very complex systems of animal control and management, social management and use of available tools to reach changes in the society.

We have formed animal protection working group together with the local municipality and all reliable stakeholders. This official working group has proposed changes in local laws and strategic documents. One of them was a program for the humane abandoned animal control. Under this program, we have created different tools that we can use for further sustainable changes. Our organization has undertaken numerous actions and campaigns which aim to promote, support and develop this program, some of them are:

- hosting educative and motivating seminars for street animal caregivers and responsible owners
- organized educational events for municipal officers, public shelter managers, animal welfare organizations, animal control officers and handlers
- together with regional media, we were issuing weekly educative articles
- promoted street animal houses construction - building and placing temporary animal houses through the CNVR program
- drafted street animal bites control act that was accepted by the municipal government
- stricter control of the animal shelters - introducing better animal handling and care
- promoted first animal-friendly secondary school - the first school of this kind in Serbia.

Positive changes occurred after the first two years of running constant activities on different levels. These changes have become apparent and clearly visible after 7 years in both the general public, media, political structure and official agencies.

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## **27. A model for high volume sterilisation operations: A case study of Machakos County, Kenya**

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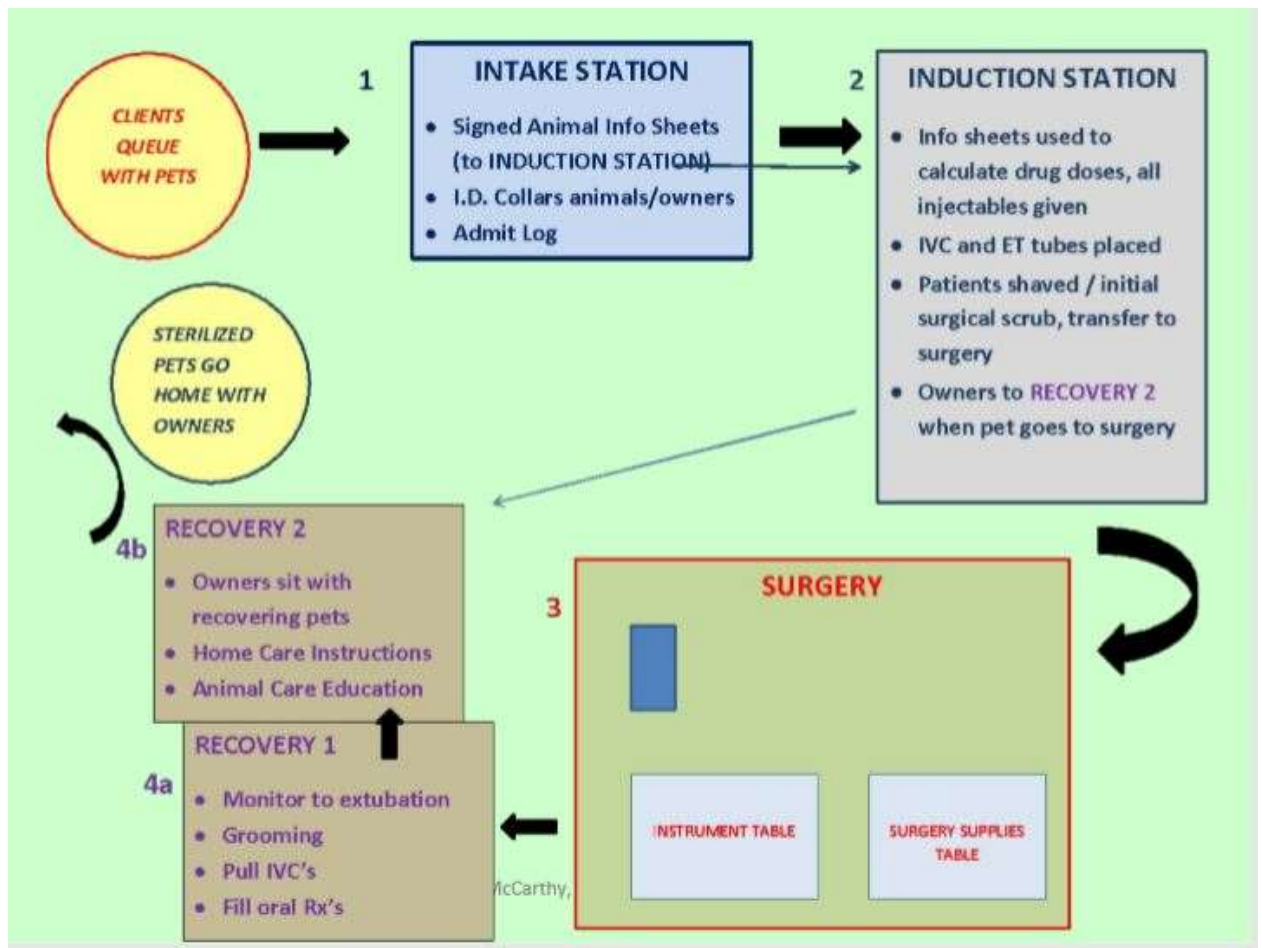
Kenya launched the National Rabies Elimination Strategy in 2014 with a clear focus of eradicating the disease by the year 2030 with key approaches being outlined. The strategy provides a guide for systematic reduction of rabies risk through sustained mass dog vaccinations, pre- and post-exposure prophylaxis and public education until the country is completely free of human dog-mediated rabies. In addition, Dog Population Management (DPM) strategies comprising education, legislation, registration, sterilization, holding facilities, euthanasia and controlling access to garbage and left overs are to be instigated to ensure achievement of the same outcome.

Africa Network for Animal Welfare through robust collaborations with VetTreks Foundation (USA), the Machakos County Department for Veterinary Services, Kenya Society for the Protection and Care of Animals (KSPCA) and the Faculty of Veterinary Medicine, University of Nairobi has in the past two years conducted high volume sterilization campaigns within Machakos County with a cumulative total of 352 dogs and cats being spayed/neutered. Such successful operations have been attributed to sophisticated and highly skilled personnel as well as adoption of a well-planned and coordinated strategy to ensure maximum number of procedures are conducted.

The sterilization model comprises of four distinct but interconnected sections:

- Intake Station
- Induction Station
- Surgery

- Recovery 1 and 2



This paper outlines the adoption of a key innovative approach for maximum dog population control in rabies endemic areas as well as lessons learnt in regard to community perceptions and acumens on companion animal sterilization. This approach can be implemented on a large scale scenario with possible replication in other counties in the country as a solution to the stray dog menace.

## Using data in DPM design, monitoring and evaluation

### 12. Identifying research priorities for canine surgical sterilisation programs: What are the unanswered questions?

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Canine surgical sterilisation programs are widespread throughout the world. They are implemented for different reasons including improving animal welfare, reducing human-dog conflict and the elimination of canine-mediated rabies. However, as there are few published studies reporting the outcomes of such programs, it is difficult to assess their overall impact. In medicine, researchers have begun working with both doctors and patients in setting research agendas, to improve the impact of subsequent research. The James Lind Alliance (JLA) framework was developed to allow end-users to be engaged in developing and prioritising research questions. The aim of this study was to adapt this method to create a shared, relevant, prioritised list of research questions relating to the impact of canine surgical sterilisation programs.

An initial scoping survey was distributed online via email and social media. The survey asked people working in the field of dog population management what questions they had about the impact of sterilisation programs. 110 responses were received from 47 countries. The questions asked were grouped into themes and formed into answerable research questions. The main themes concerned impact of sterilisation on longevity, free-roaming dog health and welfare, dog behaviour, attitudes and behaviour of local communities, as well as logistics of implementing programs and time frames for impact. Previous literature will be searched to ensure that the identified questions have not already been answered

by prior research. The next stage will be an interim prioritisation using a second online survey. Respondents will be asked to rank the questions in order of importance. A final priority setting workshop will then be held in order to agree a shared consensus of the top 10 priorities for research.

Asking the right question is the first step in practising evidence-based veterinary medicine. By using a priority setting methodology we can identify directions for future research that will be directly applicable to the organisations who are planning and implementing dog population management programs.

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### 13. Unowned dog population estimation in a city of Paraná/Brazil

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The stray dog population represents risks of disease transmission, accidents, aggression, environmental contamination and welfare of the dogs themselves. Although this is a frequent situation in many urban centers, there are few studies regarding unowned dog estimation. It is essential to implement an animal population management program and, to guide and evaluate these actions, a previous roaming dog's estimation is necessary. In this context, this study aimed to estimate the unowned dog population in Campo Magro, a city in the state of Paraná, Brazil. The methodology used was based on the World Animal Protection (WAP) guideline through the app StraysID®, developed by the platform Animal.id.info. The urban area of the city was divided in 58 contiguous blocks within 1km<sup>2</sup> each and 30 blocks were selected by random sampling. The counting happened in 3 consecutive days on February 2019, between 7am and 9am, period in which the traffic of both people and dogs is busier. Eighteen volunteers were divided into pairs and conducted by cars through the block at 20km/h maximum speed. They registered the coordinates, sex and pictures of each dog seen on public road and unattended by its owner. Also, a questionnaire survey was applied with the passersby at the time of the counting to classify each animal as: owned, unowned or community dog. The survey included the answers of 3 people including volunteer's opinion. The data was compiled using Excel and results in the estimation of 559 unattended dogs in the urban area of the city, considering standard deviation of 15% used by the platform, resulting in a gap of 475 to 643 animals. It was found the ratio of 23 dog per 1000 people and that the dog's population density is proportional to the urban density. About the profile, 47.2% was classified as "owned", 28.9% as "community dog" and 23.9% as "unowned", meaning that more than half of the dog population (52.8%) does not have a tutor. It was registered more males (63.8%) than females (27.1%) and there were 9.1% undefined. The results evidence the need of a DPM, including awareness campaigns about responsible guardianship. Besides that, it indicates the importance of public politics directed to the community dogs, since they configure a relevant percentage of the canine population. Also the amount of unowned and community dog indicates the urgency of campaigns to eliminate the abandonment of animals.

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### 14. Comparison between the corporal score of owned and dogs un-owned

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Stray dogs are those free of a physical barrier that contains their movement, which may or may not have a guardian. Those are exposed to suffering, as physical injuries, caused by accident or abuse, or due to illness or malnutrition. In Brazil, their physical condition is still unknown. This study aimed to evaluate and compare the body score of wandering dogs with guardian, and of wandering dogs without a guardian, in a city in the state of Paraná, Brazil. During estimation of stray dogs in the municipality of Campo Magro/ PR from February 13 to 15, 2019, using a sampled methodology of previously divided urban areas (90%) and rural areas (10%), and using the Animal application ID® and data collection cards, the guardianship of the animal (with guardian, community or abandoned) was identified, through interviews with residents and passers-by, and the body score (BC) of each animal using a scale of 1 to 5; 240 dogs were counted, 46.7% (112/240) of whom were guardians, 29.2% (70/240) were considered as community dogs, and 24.1% (58/240) were characterized as abandoned dogs. Among the dogs with the owner, 83.92% (94/112) presented BC 3, while among the abandoned dogs, 65.52% (38/58) presented the same index, with the normal body score correlation with the guardianship ( $P = 0.006$ ), although in both cases it represented the greater part of the population. The BC 2 was demonstrated by 8.93% (10/112) and 22.43% (13/58) of dogs owned and un-owned, respectively, so that dogs without guardian were more likely to be "lean" ( $P = 0.01$ ). On the other hand, BC 4 was observed in 8/112 (7.15%) of the dogs with guardians, and in 6/58 (10.34%) of abandoned dogs, with no significant differences between the two categories ( $P = 0.47$ ). BC 1 was visualized in only one dog without a tutor, representing 1.52% (1/58) of its class; among dogs with guardians, there were no dogs with a body score index 1 ( $P = 0.16$ ). No dogs with body score 5 were observed in the study. It is concluded that the wandering dogs of the municipality of Campo Magro/ PR, Brazil, are mostly animals of healthy body score, although the dogs without owner are more likely to be below the ideal weight.

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## 15. Size, spatial and household distribution, and rabies vaccination coverage of the Brazilian owned-dog population

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Dog rabies and human rabies transmitted by dogs can be prevented through adequate dog vaccination coverage. For surveillance purposes, this coverage must be calculated using accurate population size estimates to avoid misleading conclusions. We used data from a Brazilian national survey comprising 64,348 households, to calculate point estimates and confidence intervals of the size, household density, and rabies vaccination coverage of the owned-dog population in Brazilian federative units. We also evaluated the precision of owned-dog population size estimates, based on the extrapolation among different areas, of the mean number of dogs per household and the human:dog ratio. The estimated owned-dog population in Brazil was 52,198,324 (95% CI = 51,028,583-53,368,066) and the dog vaccination coverage was 80.09% (95% CI = 79.09-81.09%). Both estimates had marked variation across Brazilian federative units and urban/rural strata. Only two of the 27 federative units had a confidence interval in rural vaccination coverage above 70% and six did not pass this threshold in their urban stratum. For the first time, we reported probabilistic estimates for an entire country and its main administrative areas. The estimated coverage for the country was high because the most populated federative unit also had high coverage. The mean number of dogs per household and the human:dog ratio were useful as survey estimates to characterize owned-dog density. However, the simple extrapolation of these parameters resulted in estimates of owned-dog population sizes with large errors (up to 254%) that must be interpreted with caution to avoid misleading conclusions. To evaluate the dog population size, we recommend the use of probabilistic sampling designs instead of simple human:dog ratio extrapolations, and the inclusion of animal-related questions in censuses and national surveys to obtain reliable estimates to support improvements in animal and human health.

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## 16. Can sterilization help to prevent roaming in dogs and cats?

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Roaming dogs and cats might comprise the largest fraction of stray dog and cat populations in many places, making the prevention of roaming a key intervention to reduce the size of these populations. Sterilization is another key intervention and it is unclear if, apart from its effects on birth rates and on animal behavior, it can also affect the roaming status. We formulated a directed acyclic graph to represent a causal link between sex, age, sterilization and roaming in dogs and cats, recognizing potential confounders. The conceptual framework was tested with survey data and Bayesian multilevel logistic regressions. The odds of roaming were significantly higher in male dogs and cats. The odds was lower in sterilized animals but only significantly in dogs. Age did not have any significant effect (nonlinear or linear) on roaming. The association between sterilization and roaming might have been causal or confounded by management practices. Sterilization might contribute to the reduction of roaming and this effect should be further explored.

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## 17. Companion animal demography and population management in Pinhais, Brazil

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We used a two-stage cluster sampling design to estimate the population sizes of owned dogs and cats in Pinhais, Brazil. For dogs, we simulated the population dynamics using a compartmental model of coupled differential equations, incorporating uncertainties in a global sensitivity analysis and identifying the most influential parameters through local sensitivity analysis. The calibration with the known human population improved precision in population size for dogs but not for cats. Population pyramids had a wide base, and the apparent population turnover was lower than the net population gain. Most immigrants came from the state capital. Projected dog and human growth rates between 2017 and 2027 were positive and similar, while the projected proportion of sterilized dogs decreased over the same period. The main reason provided for not sterilizing animals was the cost of the procedure, even though there were free alternatives. The demographic characterization made in the present study will serve for future comparisons and as a reference in epidemiological contexts. The simulations indicated what to expect in specific scenarios and stressed the need to increase current sterilization rates.

**18. Validity of a two-stage cluster sampling design to estimate the total number of owned dogs**  
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Estimates of owned dog population size are necessary to calculate measures of disease frequency and to plan and evaluate population management programs. We calculated the error and bias of estimates of the total number of owned dogs using a two-stage cluster sampling design. The estimates were conditioned on sample composition as well as on size and heterogeneity of the spatial distribution of owned dog populations. For this, we simulated nine cities that differed systematically in size (number of census tracts) and heterogeneity (variance of the number of dogs per census tract). Then, we defined 16 scenarios to calculate the sample composition using an algorithm that incorporated data from a pilot sample, estimates of cost, and prior specifications of the expected error and confidence level. In three additional scenarios of predefined sample composition, the numbers of primary and secondary sampling units were:  $30 \times 30$ ,  $50 \times 20$  and  $65 \times 15$ . Finally, for each city and sample composition, we selected primary sampling units (census tracts) with probability proportional to its size and with replacement, and secondary sampling units (households) by simple random sampling. For each city and composition, we selected 500 samples, totaling 85500 samples. The distribution of errors conditioned on the sample composition and city showed that estimates were accurate (average mean bias = 0.006%, maximum mean bias = 0.3%). All sample compositions resulted in errors between 4% and 7% in cities with low heterogeneity. In cities with high heterogeneity, the errors for the various compositions ranged as follows: 8-11% (calculated), 11-13% ( $65 \times 15$ ), 12-14% ( $50 \times 20$ ) and 15-17% ( $30 \times 30$ ). The sample size of predefined compositions was between 33% and 87% lower than the sample size of calculated compositions. Therefore, the predefined compositions have an operational advantage (reduced sampling effort) and simplify the sampling design (calculation of sample composition is not needed). Furthermore, the expected error of estimates under different scenarios is known for each predefined composition. In the absence of information about the heterogeneity of the cities, the  $65 \times 15$  is the more conservative composition.

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**28. Owned-dog population dynamics in São Paulo city, Brazil: demographic processes or methodological artifacts?**

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São Paulo is the largest Brazilian city and in 2018 had an estimated human population size of 12,176,866 persons. The owned-dog population size in the São Paulo city urban area was estimated in four years: 2003, 2008, 2013, and 2015. However, error measures were not reported. In the present study, we recalculated these estimates and their errors from original data to evaluate their reproducibility and population dynamics. The estimates of 2008 and 2015 could not be reproduced due to post-sampling sources of bias. The new estimates showed that even when errors were taken into account, the 2008 estimate was significantly higher than the others: it was 65%, 29%, and 28% higher than 2003, 2013 and 2015 estimates, respectively. Such variation resulted from a drastic demographic process, selection and/or information biases, or both. We found no reasons to support the drastic demographic process hypothesis and we think that the population size reduction from 2008 to 2013 had a low probability of occurrence, considering that São Paulo has a high growth rate in the real state (there are new households and if some has dogs, the dog population size would increase even if dog density per household do not increase). Furthermore, the non-linear trend without 2008 had a gradual increase from 2003 to 2013 which seems more plausible and raised suspicion of bias in the 2008 estimates. The variation of population size between 2003 and 2008 and between 2008 and 2013 could be used to argue in favor of or against population management interventions and affected the planning and evaluation of the rabies vaccination campaign. Dog population estimates should be reported with their errors and critically evaluated to avoid misleading conclusions. The possible sources of bias should be explicitly considered in all study phases (sampling unit selection, information record, data preparation, and statistical analysis).

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**29. Downscaling predictions for the owned-dog population size in Brazilian cities**

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The lack of reliable estimates of dog population size has been widely addressed by the simple extrapolation of the human/dog ratio (HDR) estimated at a given location to other locations. In a previous study, we showed that simple extrapolations of the HDR can result in large errors (up to 254%) that might misguide decision-making. In that study, we

estimated the owned-dog population size in all Brazilian states but due to the sampling design, we could not calculate estimates for the 5,570 Brazilian cities. In the present study, I used the estimates of that previous study as targets for machine learning algorithms to predict the owned-dog population size in all Brazilian cities. The predictors in these algorithms were census variables aggregated at the state-level. After training the algorithms, I predicted the owned-dog population sizes of all Brazilian cities, using predictors aggregated at the city-level. This procedure is known as downscaling prediction and is used in meteorology. To evaluate the predictive performance, I compared the estimated national population size (sum of original estimates at the state-level) with the predicted national population size (sum of predictions at the city-level) and calculated the train relative errors. The estimated and predicted national population sizes differed by 6%. It should be noted that this small error reflects the overall lack of systematic over-estimation or sub-estimation but does not rule out biases in predictions at the city-level, which cancel each other in the sum of predictions to obtain the national population size. The train relative errors had the following quantiles: 0.5 = 4%, 0.9 = 11.2%, 0.95 = 13%, 1 = 17.6%. This implied a significant reduction in error sizes when compared to the 254% that resulted from simple HDR extrapolations. The proposed methodology allowed the identification of predictors stronger than the human population and their use resulted in a better predictive performance. The methodology is not intended to replace survey estimates but it can replace the use of HDRs as estimators.

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## 19. Demography, health status and public attitude of owned dog in Bharatpur, Nepal

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Dogs play an important role as companion and guard animals. In Nepal, most dogs are free to roam and only few of household keep the dog as owned-dog. This study was carried out at Bharatpur Metropolitan City, Chitwan where 95 dog owning families, who owned 119 dogs, were purposefully surveyed with well-structured pretested questionnaire to collect baseline data on owned dog demographics, assess knowledge, attitudes and practices of dog owners concerning dogs. In the study, the sex ratio was found 1:1 in the population. Median age of population was found to be 2.5 years and range from 1 month to 12 year. Respondents showed no specific preference for keeping dogs i.e. 39.5% for male, 23.5% for female, and 37% were not concerned about the sex; most animals were kept for companionship (52.9%). Of those surveyed: mixed dogs, of no definable cross, were most common, followed by Japanese Spitz (23.5%) and German Shepherd (11.8%). Among the respondents, 62.2 % had received knowledge about zoonosis and their management. Results show that 92.1% of respondent have knowledge on vaccination schedule, while 94% of dogs were vaccinated and 82.4% dogs were routinely dewormed. Study findings revealed that the majority of owners reported their dogs were not facing any major problem (84.9%), while some are facing ecto-parasite problem (7.5 %), followed by dermatological problem (2.5%), endo-parasite problem (2.4%) and viral disease (1.6%). Whereas, uro-genital problem was not reported under present study. Among the total population only in 15.1% neutering was done. Thus, based on the findings of present study, it is concluded that focus should be given to animal birth control program (ABC) and above-mentioned problems while in developing health management strategies. Meanwhile, further study covering wider geography and considering the major risk factors is recommended.

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## 20. Risk analysis for a dog to be adopted or wait for a longer time at the shelter

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Abandonment of dogs is a global concern as it results in increasing numbers of free-roaming dogs and unwanted dogs in shelters. This problem is associated with impaired animal welfare as well as serious public health risks, which also carry high economic consequences to animal welfare organizations, governments and individual who deal with this situation. Until 2012, animal welfare organizations worked independently in Israel in order to spay, neuter and find adoptive families, claiming that only one out of 10 dogs were adopted. In 2012, an online searchable database of animals that need homes was established (<http://Yad4.co.il>). Yad4 is a unique initiative aiming to rescue the lives of abandoned animals by increasing adoption rates. The website offers a friendly search engine that includes pets from organizations and municipal shelters across Israel. The study objectives were to reveal the risk factors for a dog to be adopted or wait for a longer time at the shelter. Data analyses included records of 22,545 adoptable dogs, 1,236,532 online searches, 11,118 online adoption requests and 796 feedback forms, in 2016-2017. Yad4 dog adoption rate was 94%. Results indicated that the significant risk factors for dogs to stay at the shelter were when described as; "Mix-breeds", "male", and "suitable for athletic families". In contrast, sizes "small/tiny", and "suitable for kids", significantly predicted adoptions ( $P < 0.05$ ). Unexpectedly, color was not a significant risk factor not to be adopted, but significantly changed the interval until adoption. For every additional year of the dogs' age, the predicted interval until adoption significantly increased by  $6.6 \pm 0.5$  days. When a dog was described as "suitable for an apartment" or "for allergic people", the interval to adoption decreased by  $-12.7 \pm 4.5$  and  $-20.3 \pm 6.4$  days, respectively ( $P < 0.05$ ). The most significant predictor of a shorter interval to adoption was the dogs' size, "small", by  $-34.5 \pm 2.6$  days. Regarding online

searches, age and geographical area were the most important parameters for potential adopters; 73.2% of the searches were for puppies (<1 year age). In conclusion, a national database successfully improved dog adoption rate in Israel. Dog characteristics detailed online have a significant impact on the chances for adoption, as well as the interval to adoption. The results of this study should be considered as they can lead to better decisions and regulations when dealing with abandoned dogs at a national level.

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## **21. Governmental initiatives for fighting dog overpopulation in Israel**

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Dog overpopulation and dog abandonment are worldwide problems. The outcome of dog overpopulation is euthanasia and free-roaming dogs on the streets. In endemic countries to rabies, like Israel, free-roaming dogs are a huge risk for public health. In Israel, by law, dogs must be registered on owners' name and microchipped, in order to be identified by the authorities at all times. Free-roaming is also forbidden by law, therefore dogs are being kept in municipal shelters. In 2018, additional 1.2 million US dollars were invested by the government in order to fight dog overpopulation in Israel, aiming to reach a NO-KILL policy. The initiatives include: 1) Providing free sterilization for registered dogs which were registered as "not sterilized" at least in the previous year; 2) A two-steps reward for municipalities for finding homes for dogs which are registered at least two years in a row; 3) Funding regional adoption days for shelters and organizations across the country; 4) Funding students' scholarships for being foster families for stray dogs, in order to prepare them for successful rehoming. The objective of this study was to investigate the influence and contribution of these initiatives to decreasing dog overpopulation and the euthanasia of healthy dogs in Israel. Data analyses included 70 municipalities which were accepted for participating. Results showed that these initiatives significantly encouraged responsible ownership, increased sterilization rate and successfully rehomed thousands of dogs. Those initiatives also encouraged community involvement and public awareness. In conclusion, these practical initiatives can enhance adoption rate, sterilization rate, as well the local community engagement. Therefore, it can be implemented around the globe and should be considered by other governments and states. The results of this study, as well as the detailed initiatives' methodology would be presented at the ICAM meeting.

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## **22. Dog population management in the Taipei-Keelung Metropolitan Area: A model for realizing DPM in an urban and diverse region**

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The Taipei-Keelung metropolitan area is the political and economic center of Taiwan, consisting of three cities: Taipei, New Taipei, and Keelung, with an estimated population of 7 million. During 2008-2018, over 360,000 dogs were taken into municipal shelters within this metropolitan area, ranging from 15,958-49,852 annually. A large number of free-roaming dogs, with or without owners, have been found to live there. Inadequate dog sterilization rate and overpopulation has caused tremendous dog-human conflicts for decades.

Faith for Animals (FFA) was founded in 2016 aiming at initiating a DPM model that can be later applied to every city and county in Taiwan. In 2017, FFA has set up a project to reach an 80% sterilization rate in the Taipei-Keelung metropolitan area by the end of 2019. A dog population survey was conducted, and corresponding resources were prepared to fulfill the target.

There are 31 administration districts in this metropolitan area. The practical approach of this DPM project is to run district by district. For every district FFA established a "dog distribution database", from which the current female sterilization rate could be calculated. Once all 31 districts reached 80% sterilization rate, the project is completed.

A "dog distribution database" is an exhaustive list of free-roaming dogs, including GPS, number of dogs, and sterilization status. There are many input sources for the database. FFA receive reports from feeders, municipalities, and via the internet. But the most important and systematic source is home visits. FFA arranges home visits to find out unsterilized dogs, using Google Map to divide each district into 20-30 separate routes. By ensuring all the routes are visited, the exhaustive list of dogs could be created. All the dog information was recorded electronically, which is convenient for all FFA workers/volunteers to view or edit while executing subsequent dog catching/picking-up missions.

At the end of 2018, the database was completed for 18 districts. The free-roaming dog population ranged from 61 to 2,583. Total population of 18 districts was 20,542. The pre-project sterilization rate ranged from 37.34% to 73.51%, and the post sterilization rate ranged from 76.19% to 92.45%. There are dramatic geographic differences between districts, thus the fluctuating statistics among them. This is a still ongoing and promising DPM project.

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### 23. Size and demographic pattern of the domestic dog population in Bhutan: Implications for dog population management and disease control

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Understanding the demography of domestic dogs is essential to plan the dog population management and rabies control program. In this study, we estimated the owned and stray dog population and the proportion of owned dogs that are free-roaming in Bhutan. For this, cross-sectional household surveys were conducted in six districts (both urban and rural areas) and two border towns in southern Bhutan. The population estimation was done by extrapolation of the mean number of dogs per household and dogs per person, whilst mark-resight survey was conducted to estimate the proportion of owned dogs that were free-roaming.

A total of 1,301 (rural:585; urban:716) respondents (one per household) were interviewed, of which 173 households (24.4%) in urban areas owned 237 dogs, whilst 238 households (40.8%) in rural areas owned 353 dogs. The mean number of dogs per dog owning household was estimated to be 1.44 (urban:1.37 dogs; rural:1.48 dogs) and dogs per household was estimated to be 0.45 (urban:0.33; rural:0.60). The dog:human ratio was 1:16.30 (0.06 dogs per person) in urban areas and 1:8.43 (0.12 dogs per person) in rural areas. The total owned dog population based on the mean number of dogs per household and dogs per person were estimated to be 65,312 and 71,245 in the country, respectively. The male:female ratio of the owned dog was 1.31:1 in urban areas and 2.05:1 in rural areas. Majority of the dogs were local non-descript breeds in both urban (60.8%) and rural (78%) areas, and the most common source was acquisition from friends or family (44.7%). The stray dog population in Bhutan was estimated to be 48,379 (urban:22,772; rural:25,607). Of the total estimated owned dog population in the two border towns, the proportion that were found free-roaming was estimated to be 31%. The different dog population estimation methods were compared and discussed in this paper. This study generated baseline data on the demographic patterns of the owned and stray dogs in Bhutan which will be useful for planning and monitoring dog population management and rabies control program in the country.

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### 24. Attitudes of shelter visitors regarding companion animal welfare

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The relationship between an animal and its owner is one of the strongest emotional experiences known to humans, sometimes even deeper than the one between two persons. Many owners report that with dogs they simply feel better and that they have a company when they are lonely. Nonetheless, this relationship can be easily broken and consequently dogs are often admitted to the animal shelters, where they await their new home.

Public concern regarding animal welfare in general is rising, and even more so on issues related to companion and farm animals. Many studies have been conducted regarding general public opinion or opinion of different stakeholders (i.e. students, consumers) towards animal welfare. The purpose of our research was to examine the attitudes of shelter visitors towards animal welfare of companion animals (CA), and to get a better insight on how potential future owners contemplate these issues.

A total of 50 surveys were carried out in the Shelter for Abandoned Animals – Zagreb. The questionnaire was developed and pre-tested on a sample of 10 random people and afterward corrected according to suggestions. The survey consisted of 21 questions, divided into two parts. The first group of questions requested information on demographic of the visitors, and the second part contained a series of five-point Likert scale questions (1: full disagreement to 5: full agreement), and Yes-No-I don't know, questions.

Results show that average visitors were female (68%); finished high school (62%); from an urban background (57%); completely familiar with the term of animal welfare (98%). Participants strongly agreed that pets have a benefit for human health ( $\bar{x}$ =4.59;  $SD \pm 0.78$ ) and that children need to be educated regarding pet care and handling as early as kindergarten ( $\bar{x}$ =4.90;  $SD \pm 0.37$ ), but they are more reserved regarding the possibility of bonding and care for more than three pets ( $\bar{x}$ =3.02;  $SD \pm 1.55$ ). Shelter visitors also stated that owners sometimes not to their knowledge can do harm to their pet ( $\bar{x}$ =4.12;  $SD \pm 0.97$ ), but also that sometimes owners are doing harm on purpose ( $\bar{x}$ =3.86;  $SD \pm 1.20$ ). The majority of participants think that routine castration is justified (72%), and that ear cropping, and tail docking are cruel (90%) practices.

In conclusion, participants are well familiar with term of animal welfare and they completely understand major welfare problems regarding CA. Based on their attitudes we can conclude that as future owners they would take good care of their pets.

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## Community engagement and human behaviour change

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### 25. Free-roaming DPM in Indigenous communities in Canada

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Some people may be surprised to learn that Canada has large populations of free-roaming dogs. These populations are primarily found in First Nations communities across Canada. This session will introduce the audience to some of these communities and will explore examples of population demographics. Miss Collicutt will share some of the emerging trends in DPM strategies in Canada and the resulting impacts on community members and the animals. Using statistical and anecdotal evidence, Miss Collicutt will review what makes these populations similar to those in other countries and what makes them unique.

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## Resolving conflicts with wildlife and livestock

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### 26. Using dog houses as a tool in jaguar conservation in a Mayan community in Quintana Roo

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Jaguars are the largest American wild felid: they are threatened everywhere where they live. Jaguar census 2018 in Mexico identified that from 4,800 individuals, half of them live in the Yucatan Peninsula. This is the second largest population of jaguars second to Amazonia. Unfortunately, numbers decrease rapidly as well, from the various threats they face which experts have identified as: habitat destruction, car accidents, poaching and conflicts with dogs!

Jaguar attacks are more frequently observed as the human population growth disturbs the natural habitat or splits the natural corridors animals have. Many fear that dogs won't be the only prey and fear for their children, although no human attack by a jaguar has ever been documented.

By providing dog houses to local communities in need, after jaguar attacks to dogs, our Blue dog houses and blue hen coops project reduces dog diseases, collaborates on the efforts towards One Health, mitigates human-wildlife conflict, and supports the local economy by engaging local carpenters or community members in the construction.

In May 2018 Dr Francisco Remolina, member of the jaguar experts in the Mexico called Ifaw so we could help with the dogs that were attacked and killed by a jaguar in the Mayan community of Nuevo Durango. We don't have experience with jaguars directly but we have had a similar conflict and community engagement project after jaguars attacked dogs in another large community in the outskirts of Playa del Carmen 4 years ago.

After bringing back to health the only dog that survived the attack, setting up light deterrents, Dr Remolina's giving a deterrent in the carcass of the last dog victim, and lot of community engagement. A year after the attack, we can say the community feels safe, their dogs are healthy and have shelter. The community also adopted some dogs in need of homes.

The community has benefited with over 40 dog houses and 16 predator proof chicken coops. Less predator attacks have been documented; light deterrents have been a tool when attacks happen. The chicken coops guarantee families have a safe food source, we trust that the need to hunt wild animals as they are used to, will decrease and therefore jaguars' natural prey will be higher in numbers therefore decreasing conflict.

The community work with them has been extensive, and not easy. Some of the challenges included building trust in us after a distemper outbreak, and some dog deaths due to the outbreak in the early stage of our intervention. A very big one: language and cultural barriers. After 1 year we all have respect for each other's work and way of life, hoping that our efforts will thrive and pass on to other communities. We hope that people within the city and Mayan communities are able to coexist with wild animals. Conserving the land and the great jaguar warrior who keeps us from living in an eternal night according to the Mayan legend.

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