

Animal Welfare Assessment at Four Dog Shelters in Central Uganda: A Cross-Sectional Study using the Shelter Quality ® Protocol.

Additional file 2: Descriptions and scoring indications of welfare measures; ABMs, RBMs and MBMs as indicated in the Shelter Quality® Protocol.

SECTION 1: MANAGEMENT-BASED MEASURES (MBMs)

1. Social Housing

Social housing assessed whether dogs were housed individually or in social groups. The assessor recorded the overall number of pens in the shelter housing dogs individually, in pair or in group (less than or equal to 5 or over 5 dogs) the day of the visit. Percentages of each type of housing at the shelter (%).

2. Exercise

Small enclosures not only discourage exercise because there is no possibility of travelling to another location, but they also restrict the type of locomotion and the ability of dogs to control their social interactions and express natural specie-specific behavior. The assessor asked the manager of the shelter about dogs' outdoor access and exercising and recorded whether dogs were left in an outdoor fenced area; Daily (> 3 hours), Daily (< 3 hours), Weekly or not all. We also recorded whether dogs were walked on leash by shelter personnel or by volunteers; Daily, Weekly, or not at all.

3. Training and Rehabilitation

Training and rehabilitation assessed whether shelters implemented behavioral enrichment, training programs, or structured rehabilitation for dogs displaying fear, aggression, or other behavioral concerns. The assessor recorded the presence of trained personnel for activities of training with shelter dogs (e.g. walk at leash, basic education, learning activities) and the presence of specialized personnel in the behavioral rehabilitation of problematic or potentially problematic dogs.

4. Surgeries and Pain Control

Surgeries included sterilization, castration and other clinical manipulations. After clinical intervention, dogs may suffer from pain associated with actual or potential tissue damage. To reduce pain, analgesic intervention might be needed. The shelter manager was asked about presence of operating procedures for post-surgical monitoring, presence of hospital pens and presence of protocols of analgesia.

5. Feeding

Food with sufficient nutritional value will allow an animal to be healthy and maintain a normal body weight. Diet-specific factors include the safety and appropriateness of the diet fed to the animals. We asked the shelter manager about the feeding regimen including the frequency (once/day, twice/day), type of diet (cooked, dry/pellets, wet/canned) and whether special diets were available for puppies, old animals and sick ones. We also recorded the method of feeding (group or individual).

SECTION 2: RESOURCE-BASED MEASURES (RBMs).

1. Space Allowance

An excessive spatial restriction could limit expression of normal behavior, increasing probability of showing active repetitive behavior (i.e. stereotypies). Dogs are reluctant to urinate and defecate in the same space where they rest; should be guaranteed the necessary space to maintain three different areas: feeding space, resting space and litter space. Space allowance was expressed in m² per kg dog. The number and weight of animals in each pen and the dimensions of the pen were recorded and adequacy of space calculated.

We measured the area of the pen using a tape measure and determined space adequacy per animal depending on the weight of the dog; each dog weighing at least 20kg required 8m² while those weighing less than 20kg required 4m² of living space. We then calculated the proportion of pens with inadequate space allowance on the total of assessed in shelters (%).

2. Sharp edges

We checked for any sharp or protruding edges inside the pen (i.e. in walls, partitions, floor) or along the fence, that could be harmful for the animals. The assessor recorded either presence or absence of sharp edges and calculated the Proportion of pens with sharp edges on the total of the assessed in shelter (%).

3. Bedding

Any warm, dry, draught-free area to ensure sufficient comfort during resting and sleeping. Ideally, off the ground, readily cleanable, and be safe (i.e. no harmful edges, no ingestible parts or filling). We assessed the presence and type of bedding material available in each enclosure. Under types; kennel (close movable shelter, often of plastic or wood, it protects from mild adverse weather condition, it allows the animal to hide), basket (isolate from the ground, open on the top, usually of plastic), other (includes fabric, mattress, carpet, any solution not listed). If no bedding was present, we scored absent for bedding type.

Bedding was scored as adequate or inadequate. The assessor recorded; if the bedding was present, it's type, if present in sufficient number for all dogs present in the pen (that is one bed per dog), if the bedding was safe (i.e. without sharp edges or parts or padding to be ingested), and if bedding was dry/clean, including materials that ensure isolation from wet floor (i.e. absence of splits on the base of the bedding or blanket used directly on the floor). Bedding was considered adequate only if there was at least one bedding per dog, if it was safe and if it is dry/clean. If one of these was negative, the score was considered inadequate.

4. Water supply

Water supply was considered hygienic when the drinker places were without feces and without mold. The drinkers should be safe (e.g. no sharp edges, no rusty areas) and functioning; if the containers (e.g. bowl, bucket) were filled manually by shelter staff, the assessor considered them functioning if they are full, and not functioning if they were empty at the moment of the assessment.

Water supply was scored as adequate or inadequate. The assessor recorded the type of drinker, if they were functioning or not and the cleanliness of the water. Water facilities will be considered adequate if drinkers are functioning, clean and safe, if one of these is negative, the score was considered inadequate. If there were no water facilities, the type of drinkers was recorded as absent and other requisites left blank.

5. Shelter from adverse weather

It was fundamental that each pen could provide an adequate thermal comfort, allowing the animal to maintain the body temperature. Housing in shelters can be very different and the assessor observed the presence of elements that could ensure an adequate shelter from adverse weather condition (extreme temperature, excessive exposure to sun, wind and rain). Indoor areas (area with closed vertical walls and a roof) should have been insulated, screened from adverse weather condition and ensured air circulation (natural or artificial) i.e. by windows. Outdoors areas, i.e. fenced pens should have ensured shelter from adverse weather by the presence of roof and its slope, extension and direction, gutters, lateral barriers, hedges or similar.

Shelter from adverse atmospheric conditions was considered adequate if a pen offered adequate shelter from wind, rain, sun and offered adequate air circulation (especially for indoor pens). Any negatives aspect such as damaged roofs, lack of lateral barriers, poor ventilation for indoor pens and/or direct sunlight reaching dogs resulted in an inadequate score.

SECTION 3: ANIMAL-BASED MEASURES (ABMs)

A. ABMs at Pen Level

During the development of the SQP, some ABMs had a very low prevalence at individual level and a consensus was reached to assess them at pen-level since they were too relevant to exclude entirely from the protocol.

1. Thermoregulation

Thermal comfort was assessed by observing visible behavioral indicators of heat or cold stress among the dogs within each pen. Panting was recorded when a dog exhibited sustained open-mouth breathing with visible tongue protrusion and increased respiratory rate that could not be attributed to recent physical activity but instead appeared linked to environmental warmth. Shivering was identified through observable involuntary muscle tremors or repeated body shaking suggestive of cold exposure. In some cases, cold discomfort was also inferred when dogs adopted huddling postures, such as curling tightly or pressing their bodies against other dogs or enclosure structures to conserve heat.

For each pen, the number of dogs panting and the number shivering or huddling were recorded, and these were later expressed as the proportion of affected animals relative to the total assessed in the shelter.

2. Abnormal Behavior

Abnormal behavior was assessed as an indicator of compromised welfare associated with stress, frustration, or environmental restriction. The assessor observed whether any dog in the pen displayed repetitive, unvarying, and apparently functionless behavioral patterns during the observation period. These included repetitive circling along fixed routes, pacing continuously along the fence line, spinning or tail chasing without interruption, and repeatedly jumping against walls and rebounding. Compulsive behaviors directed toward the self or environment were also considered, such as excessive licking or chewing of enclosure surfaces, bedding, or fencing, persistent digging or scratching without obvious stimulus, or self-mutilation leading to visible skin damage.

If at least one dog in the pen exhibited such behavior, the pen was scored as positive for abnormal behavior. The final output was calculated as the proportion of assessed pens in which abnormal behavior was recorded.

3. Signs of Diarrhea

Diarrhea was assessed indirectly through inspection of the pen environment rather than individual dogs. The presence of liquid feces or visibly watery manure on the pen floor was taken as evidence of diarrhea within the group. Because dogs were often group housed, diarrhea could not be reliably attributed to a specific individual and was therefore recorded at pen level.

The assessor marked whether visible liquid manure was present or absent, and the outcome was expressed as the proportion of pens showing evidence of diarrhea.

4. Coughing

Respiratory health was assessed by observing whether dogs within the pen displayed episodes of coughing during the observation period. Coughing was defined as a sudden, forceful expiratory

vocalization indicative of airway irritation or respiratory disease. If one or more dogs were observed coughing, the pen was recorded as positive for coughing. The measure was subsequently expressed as the proportion of pens in which coughing was observed.

5. Evidence of Pain

Pain was assessed by identifying behavioral and postural signs suggestive of discomfort or suffering. Dogs showing pain often appeared withdrawn, depressed, or reluctant to move, and may have remained recumbent and non-responsive to environmental stimuli. Some dogs avoided interaction, while others exhibited defensive behaviors such as growling when approached. If any dog in the pen displayed signs consistent with discomfort or pain, the pen was marked as positive. The final score was reported as the proportion of pens in which evidence of pain was observed.

B. ABMs at Individual Level

Individual animal-based measures focused on the physical condition, behavior toward humans, and clinical health indicators of selected dogs within sampled pens.

6. Reaction Toward Human

The human–animal relationship was assessed using a brief standardized interaction test conducted in two stages. First, the assessor stood in front of the pen and ignored the dog for thirty seconds, observing its spontaneous reaction. Second, the assessor crouched and spoke gently to the dog for an additional thirty seconds.

The dog's response was categorized into three scores. A score of zero was assigned when the dog showed no signs of fear or aggression and maintained a neutral, relaxed, or friendly posture, including approaching or greeting behavior. A score of one was given when the dog displayed signs of fear without aggression, such as lowered body posture, tail tucked, ears back, avoidance, or attempts to increase distance. A score of two was assigned when the dog exhibited signs of defensive or offensive aggression, including body tension, raised hackles, growling, baring teeth, forward weight shift, or threatening posture. Results were expressed as the proportion of dogs showing fear or aggression within the assessed population.

7. Body Condition

Body condition was evaluated visually without palpation. Dogs were classified as too thin when bony prominences such as ribs, pelvis, or lumbar vertebrae were clearly visible, accompanied by muscle loss and a pronounced abdominal tuck. Dogs were classified as adequate when no excess fat covering was apparent and a natural waistline and abdominal tuck were visible. Dogs were considered too heavy when ribs were not visible or palpable, fat deposits were evident on the neck or limbs, and abdominal distension or absence of waistline was observed. The proportion of dogs with inappropriate body condition, defined as either too thin or too heavy, was calculated.

8. Cleanliness

Cleanliness was assessed by visually inspecting one side of the dog's body while standing. A dog was considered clean if its coat was dry and free from visible contamination. A dog was recorded as dirty or wet if splashes of urine, feces, or persistent wet areas were observed on the coat. The measure was reported as the proportion of dogs showing dirt or wetness.

9. Skin Condition

Skin condition was evaluated by observing one side of the dog's body for evidence of dermatological abnormalities. Wounds were recorded when the skin was visibly torn, cut, or punctured and either bleeding or larger than two centimeters in diameter, excluding healed lesions. Hair loss was noted when areas of missing fur or dermatitis were present. Swelling was recorded when abnormal enlargement of a body region suggestive of inflammation or abscess was visible. If none of these conditions were observed, the dog was scored as having no skin issues. The final result was expressed as the proportion of dogs with altered skin condition.

10. Lameness

Lameness was assessed by observing the dog while standing and walking. A score of zero was assigned when the dog moved normally without gait abnormality. A score of one was given when the dog was visibly lame but still able to walk. A score of two was assigned when the dog was severely lame, showing marked difficulty bearing weight or being almost or completely unable to walk. Dogs with well-healed amputations that did not compromise movement were scored as zero. The proportion of lame and severely lame dogs was calculated separately.