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Dourine surveillance in the AHS Surveillance Zone: June & December 2021

J. Grewar & C Weyer

The following article has been adapted from the full surveillance report available on the myHorse website

Introduction

Since 2018, active dourine surveillance has taken place in the Western Cape province in the form of the testing of either sentinel horses (that make up the African horse sickness (AHS) sentinel program) in 2018 and 2019 or formal surveys of randomly selected horses in the AHS free zone (2020). The scope of the surveillance is to provide evidence for freedom of dourine within the same area where active surveillance is undertaken for AHS. The intent has been to perform surveillance in sentinel animals at 6- monthly intervals. The program in 2018 and 2019 was only performed in the first half of these years respectively. In 2020, the targeted AHS free zone survey was performed in the first half of the year as well. In 2021 (the period reviewed in this report) the biannual target was achieved with sentinels tested from both the June and December cohorts. An introduction to dourine, and the reason surveillance is required, has been thoroughly described in previous reports, available through links above or at https://www.myhorse.org.za.

Surveillance parameters

A goal of 60 serological sentinels per month is the requirement for AHS sentinel surveillance testing for direct exports from South Africa to the European Union (EU). Over and above this, South Africa samples another 90 horses in the AHS surveillance zone to test approximately 150 horses in the zone using PCR testing. Given that serum samples are taken from all 150 horses, the sampled horses for the dourine surveillance were targeted from the remaining horses sampled that were

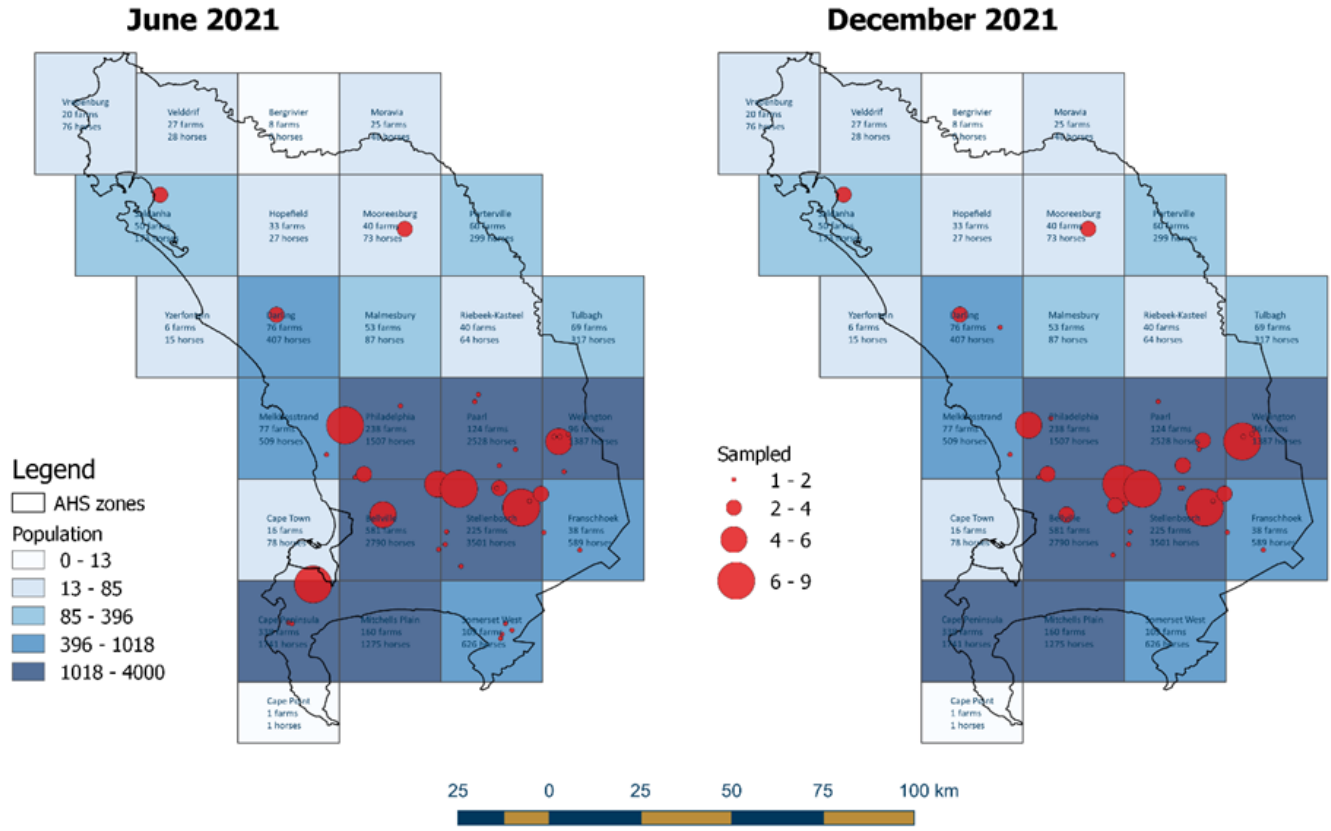

Figure 1: Dourine survey locations showing proportional circles for number of horses tested per location in June and December 2021 respectively. The underlying population at risk is shown as a light to dark blue gradient, to show that locations were chosen to reflect the relative underlying population at risk.

Table 1: Surveillance parameters used in design and evaluation of the surveillance event

Parameter	Value	Comments
Population at risk	16000	All horses in the surveillance and free zones. 16000 is an estimate; there are currently 16795 and 476 horses registered in the AHS surveillance and free zones respectively although data is captured only for horses entering the area.
Design Prevalence	~5%	Minimum expected prevalence in the population should dourine occur; parameter taken from the serological survey requirements of the EU for AHS sentinel surveillance given that the same population was used for the dourine sampling.
Test Sensitivity	90%	Estimate based on best scientific guess. The sensitivity of the complement fixation test (CFT) has not been established, although given the false positive rates (see specificity) the sensitivity is likely to be relatively high. The CFT is seen as a gold standard for individual horse testing prior to export and this also supports a test with relatively good sensitivity.
Test Specificity	Unknown but system specificity of 100% assumed	The CFT test is prone to false positives and probably does not have a particularly good specificity. However, given that any positive CFT result will be investigated to establish a final diagnosis a specificity of 100% was used in establishing the outcome of the sensitivity of the surveillance.
Type 1 error	5%	Used to provide a final probability of 95% that Dourine was not present if it was not detected using the surveillance parameters.

not tested serologically for AHS. Samples were taken in June and December for the two surveillance periods respectively.

Results

A total of 100 horses were sampled at 39 locations across the AHS surveillance zone in June 2021. In December, 100 horses were sampled at 36 locations. Proportional numbers of horses sampled across the surveillance zone are shown in Figure 1. The AHS sentinel surveillance program makes every effort to sample horses in proportion to their relative underlying population at risk using a gridded surveillance system. Most samples were thus taken from an area of approximately 50 km around the Kenilworth Quarantine Station, from which horses are exported.

In June, 98 samples tested negative for dourine antibody using the complement fixation test (CFT), with two animals having anti-complementary results, which cannot be interpreted. In December two results were suspect and one was positive, on three different holdings. As per protocol, the January 2022 serum samples from these animals (two horses and one donkey) were then tested. The two suspect horses tested negative. Samples from January 2022 and May 2022 were submitted for the positive animal, with negative results. With follow up negative tests and negative clinical signs in these animals, they are considered negative. Efforts will however be made to include them in future surveillance events.

The sensitivity (and resulting probability of freedom) of the surveillance program is shown in Table 2. This evaluation is independent of any prior surveillance. While the sentinel surveillance program is based on a single stage sampling strategy (column 2 of Table 2), we have estimates of the underlying number of herds in the surveillance zone as well as estimates of the herd sizes of the sampled herds. This allows an estimate of surveillance sensitivity in a more realistic setting (column 3 of Table 2). Note that in this latter analysis we reverted to an effective population design prevalence of 2% (within herd design prevalence of 20% and herd level prevalence of 10% throughout the population). This is in an effort to depict a reasonable minimum expected prevalence with so few cases of dourine reported in the prior 20 years in the AHS surveillance zone (Figure 3).

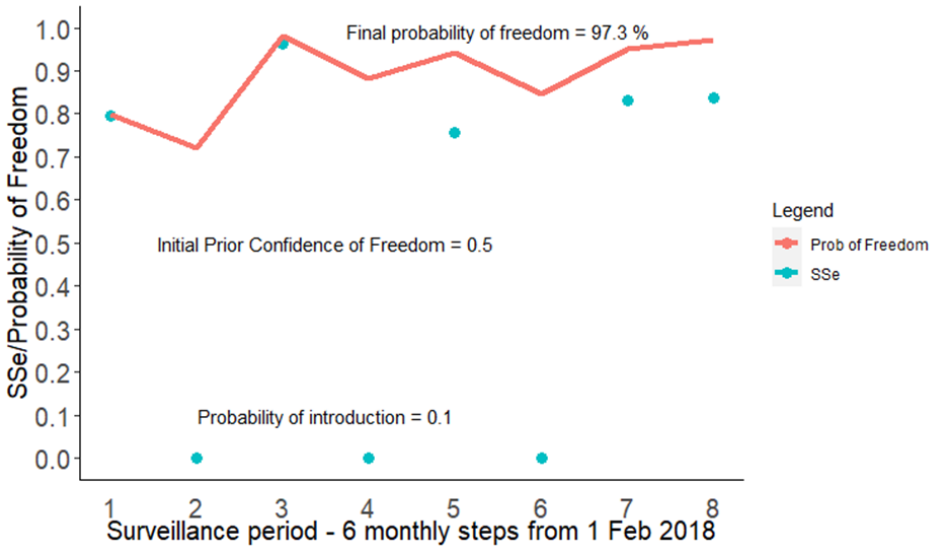

Figure 2: Surveillance system sensitivity and probability of freedom assuming an introduction probability of 10%, an underlying herd and animal prevalence of 20 % and 10% respectively and an uninformed prior probability of 50% in period 1.

With surveillance evaluation it is also appropriate to evaluate probability of freedom outcomes given prior surveillance events. Figure 2 shows the evaluation of all 5 surveillance events undertaken to date in the AHS surveillance and free zones. Where surveillance was missed (second half of 2018, 2019 and 2020), a zero sensitivity is assumed. Note also that the

Table 2: Design prevalences with resulting surveillance sensitivity and probability of freedom outcomes for two different scenarios independently analysed: the sentinel program design prevalence and the generic values used given the history of cases in the AHS controlled area. NOTE: This evaluation is for a single point in time and does not consider previous surveillance outcomes.

Parameter	Descriptions and values based on varying data sources			
	Single stage population sensitivity		Generic prevalences to result in effective design prevalence of 2% with 2-stage analysis	
Animal level prevalence (P^*_U)	0.05		0.2	
Herd level prevalence (P^*_c)	n/a		0.1	
Effective population prevalence (P^*_U x P^*_c)	0.05		0.02	
	June 2011	December 2011	June 2011	December 2011
***MeanSSH* - Mean herd level surveillance sensitivity**	n/a		0.449	0.5
***SeP* - Population surveillance sensitivity**	0.989	0.989	0.83	0.838
***PFreeU* - Confidence of population freedom – uninformed prior**	0.987	0.987	0.828	0.834

surveillance in 2020 (period 5) was targeting the AHS free zone only, but the evaluation below assumes a population at risk across the AHS free and surveillance zone.

The dourine probability of freedom in the AHS free and surveillance zone in 2021, given the 2021 surveillance efforts, ranges between 82.8% and 98.7%, depending on the analysis used. An overall probability of freedom, taking prior surveillance into account, is 97.3%.

Discussion

Stand-alone surveillance efforts like the one described here supplement the current clinical passive surveillance and Thoroughbred pre-breeding dourine surveillance efforts in South Africa. While the scope is limited to the AHS free and surveillance zone, we believe this will assist in export protocols that require dourine freedom statements where horses are exported from AHS free zone quarantine facilities such as Kenilworth Quarantine Station.

Figure 3 shows all dourine cases reported in South Africa from 1993 through Jan 2018 (data accessed May 2022 from www.dalrrd.gov.za and collated to South African local municipalities). The last case in the Western Cape, in 2012, occurred in a working mule in the Bredasdorp region. Details of that case can be found on the VetEpi website.

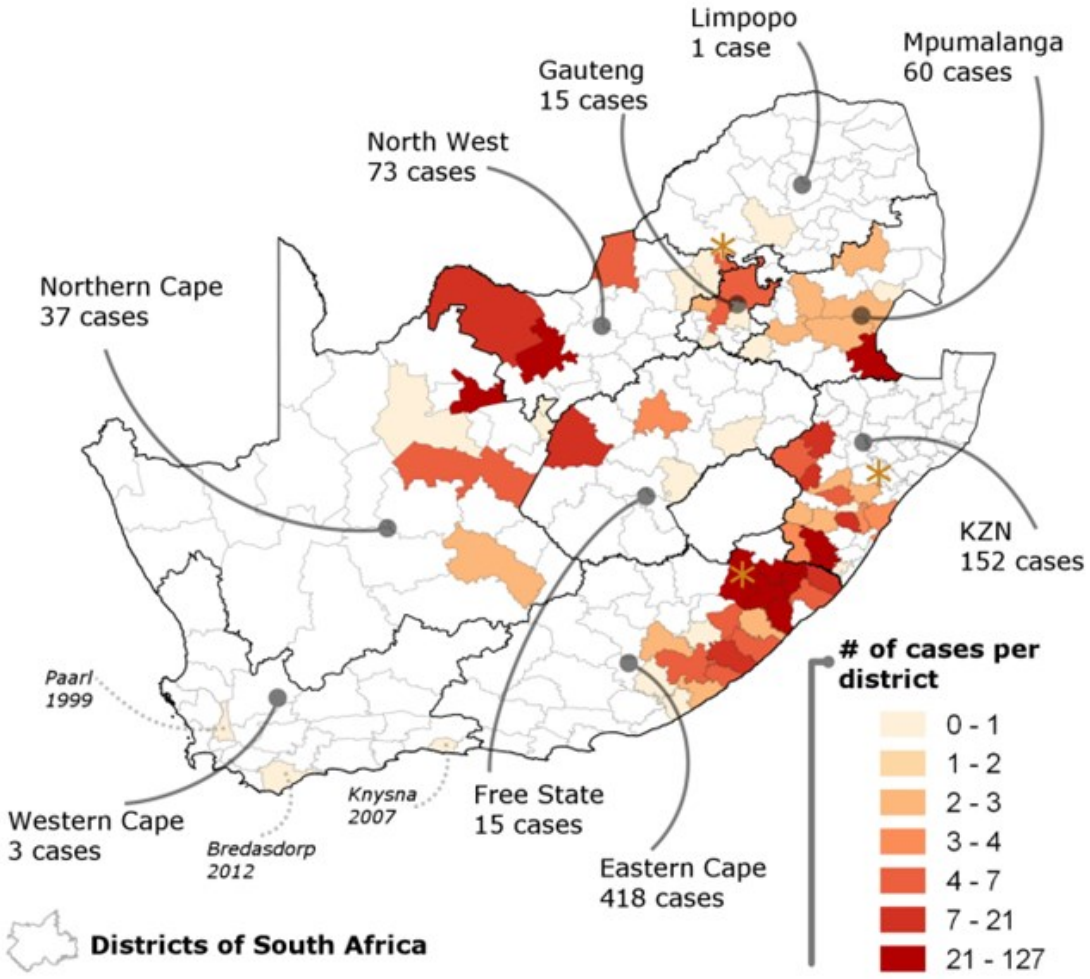

Figure 3: Historical dourine cases reported to DALRRD from 1993 through Jan 2018 (the last case as reported by DALRRD) to date. Cases have been aggregated by district while case totals per province are labelled. The three cases reported in the Western Cape are also labelled specifically with the last case reported in 2012.

Outbreak events

Two **cattle** died on a farm near **Herbertsdale** and one tested positive for **wildebeest-associated malignant catarrhal fever** virus. There are wildebeest on a game farm in the vicinity but not adjacent to the cattle farm.

A farmer near **Nieuwoudtville** had borrowed a **ram** and he had it tested for ***Brucella ovis*** before returning it. Unfortunately, *B. ovis* antibodies were detected.

The carcass of a **pig** from a farm near **Saron** was condemned at the abattoir for lesions indicating **erysipelas of swine**.

A farmer near **Darling** had noticed **sheep** losing condition for a number of years. A private vet euthanised one sheep and took samples post-mortem. Culture of *Mycobacterium avium* subspecies *paratuberculosis* led to a diagnosis of **Johne's disease.**

Sheep scab was diagnosed by a private vet on a farm south of **Darling**. There had been contact with another farm, which also had to be treated.

Wild doves from **Stellenbosch** tested positive for **Newcastle disease virus**. Pigeon paramyxovirus infection is suspected but has not been confirmed.

A **galah** (Fig. 4) chick's liver sample tested positive for chlamydiaceae species and was diagnosed with **psittacosis** (avian chlamydiosis). The other three chicks from the nest had died.

Ten **ostrich** farms in the **Oudtshoorn, Mossel Bay** and **Heidelberg** areas received positive **avian influenza** test results. Six were tested as part of disease investigations on another ostrich farm in the area. Eight farms had positive PCR tests, indicating presence of avian influenza virus, but the virus has not yet been typed, besides performance of H5 and H7 tests, which were negative. This suggests that a high pathogenicity subtype is not involved. Two farms were PCR negative, but positive for avian influenza antibodies.

A **broiler chicken** farm had repeated positive ***Salmonella* Enteritidis** test results from chick crates used to deliver chicks from the hatchery, while the farm was being re-stocked. The broiler breeder parent farm also tested positive and those birds were culled. A *Salmonella* reduction plan is being followed on the broiler farm.

A **pig** from **Saldanha** was diagnosed with **salt poisoning** on post-mortem examination. Before death, it showed ataxia and ventral skin discoloration.

Weaner **pigs** from **north of Cape Town** died after becoming anorexic and recumbent. **Oedema disease** (*E. coli*) was diagnosed on post-mortem examination.

Figure 4: *Galah or pink and grey cockatoo (Eolophus roseicapilla)* (R Taylor, shared under a Creative Commons Attribution 2.0 Generic license

Epidemiology Report edited by State Veterinarians Epidemiology:

Dr Lesley van Helden (Lesley.vanHelden@westerncape.gov.za)

Dr Laura Roberts (Laura.Roberts@westerncape.gov.za)

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