

Assessing effects from the first four years of industry-led badger culling in England on the incidence of bovine tuberculosis in cattle, 2013 - 2017 (Downs *et al.* (2019) Scientific Reports)

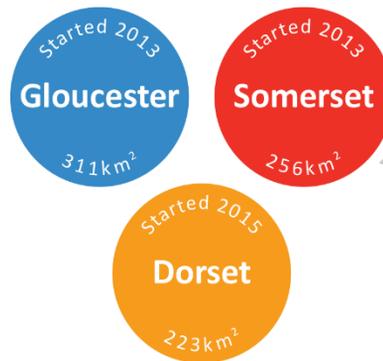
Industry-led badger culling began in England in 2013, and by the end of 2018 there were 32 licensed cull areas in operation. A recent study published in *Scientific Reports* by Downs *et al.* (2019)^[1] provides the best estimate to date of effects on TB in cattle where culling takes place.

What did the research involve?

The study investigated the effect of culling in the first three licensed badger cull areas in England using data from 2013 – 2017. Analyses were conducted to compare the rate of new TB breakdowns (the TB incidence rate*) in the cull areas, selected by the farming industry, to rates in matched comparison areas with no culling. The full analyses included multivariable analyses, controlling for the effect of risk factors which could also explain differences in TB incidence between culling and comparison areas (e.g. historical levels of TB, numbers of cattle in herds, badger density, % of dairy herds, historical culling). Cull areas were similar but not identical to comparison areas. The analyses tested for differences within cull areas and in 2 km wide surrounding (buffer) areas.

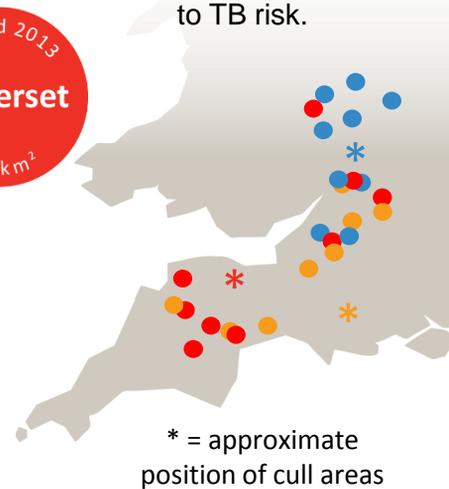
Cull areas

Three areas were evaluated in the study



Comparison areas

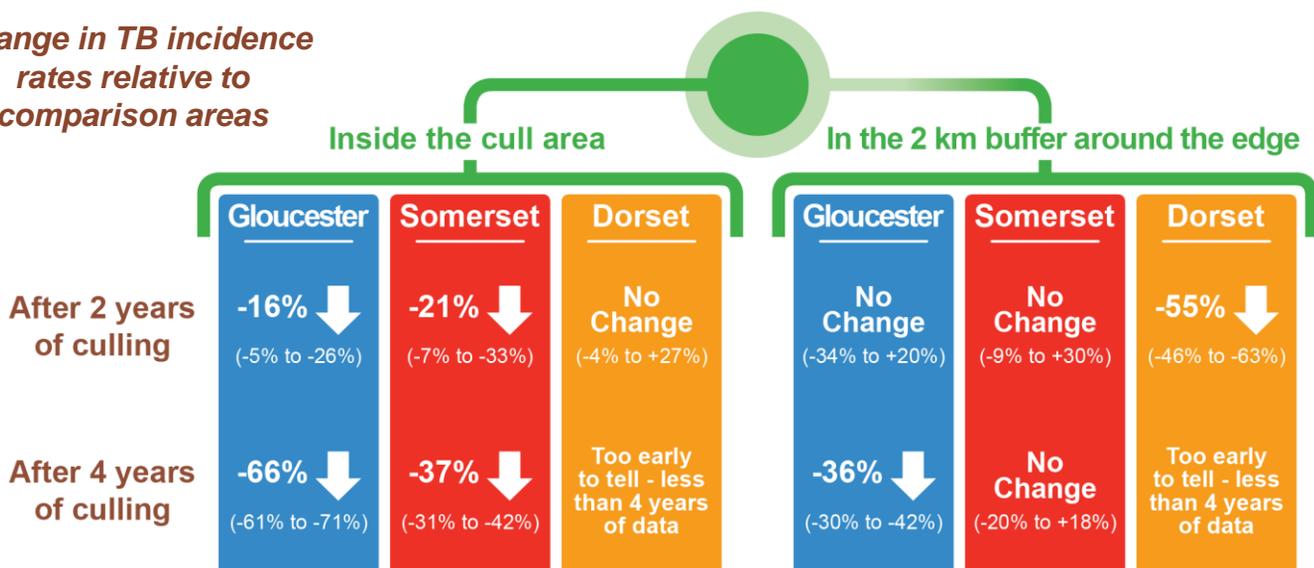
All within the High Risk Area (HRA) of England. Similar to the cull areas in relation to factors relevant to TB risk.



What were the results?

A direct comparison between TB incidence rates in cull areas and comparison areas found few differences, but did not account for TB risk factors (see above). The full multivariable analyses showed that after four years of culling there were reductions in TB incidence rates of 66% (95% CI 61 to 71%) in Gloucestershire and 37% (95% CI 31 to 42%) in Somerset relative to comparison areas. TB incidence rates in the buffer areas surrounding cull areas were lower after four years in Gloucestershire and after two years in Dorset relative to comparison area buffers (see below):

Change in TB incidence rates relative to comparison areas



*Refers to changes in the OTF-W (official TB free – withdrawn) incidence rate (with 95% Confidence Interval). OTF-W incidents are TB breakdowns where *Mycobacterium bovis* infection has been confirmed in at least one animal from the herd by post-mortem tests.

How do the Downs *et al.* results compare to previous studies?

Industry-led culling

- Annual monitoring reports from the APHA show incidence rates and prevalence of TB in the cull areas and their buffers change over time [2]. However, these analyses do not control for effects due to TB risk factors other than culling and it is not possible to conclude whether culling is having any effects from these reports.
- Brunton *et al.*, which investigated changes in the Gloucestershire and Somerset over two years, found statistically significant reductions in TB in both cull areas relative to comparison areas in multivariable analyses [3]. An increase in TB in the buffer area surrounding the Somerset cull area relative to comparison areas was also detected, which has not been detected in the most recent analyses [1].

A scientific trial of culling

- In the Randomised Badger Culling Trial (RBCT), conducted in England between 1998 and 2005, culling or no culling was randomly allocated between equally sized (100 km²) areas. Widespread culling in the RBCT was associated with a statistically significant -23% (95% CI -12 to -33%) reduction in TB incidence inside cull areas, and an almost statistically significant +25% (95% CI -1 to +56%) increase in buffer areas (relative to areas without culling) [4]. Larger reductions of up to 50% in cull areas were recorded in the years after culling, although these faded over time [5]. Because the culling was randomly allocated to areas, fewer factors were controlled for in the RBCT multivariable analysis than in Brunton *et al.* [3] and Downs *et al.* [1].

What can we conclude from this study?

- This study provides evidence that industry-led badger culling can result in significant reductions in the number of new TB breakdowns in cattle, but results were variable, with no significant changes observed inside the Dorset cull area (in the two years considered). There is no evidence of increases in TB incidence rates in buffer areas (perturbation effect) over 4 years.
- Although encouraging, these results relate to the first three cull areas. These areas may differ from other cull areas in cattle population, badger population, or other factors related to cull effectiveness and TB risks. Therefore it is possible that culling badgers in other areas could have different effects to those observed here. It is important that analyses of the effects from badger culling continues.
- Although badger culling was the primary difference between cull areas and comparison areas, other factors such as additional biosecurity advice in cull areas or other changes in farmer behaviour may have also contributed to the differences in TB observed.



Number of active badger cull areas in counties in England by the end of 2018

Where can I find more info?

For more information on a range of TB topics visit www.tbhub.co.uk. This sheet was produced as a part of a Knowledge exchange project funded by NERC. For more info and to download the full list of TB fact sheets visit www.tbknowledgeexchange.co.uk.

Studies referenced

1. Downs *et al.* (2019) Assessing effects from the first four years of industry-led badger culling in England on the incidence of bovine tuberculosis in cattle, 2013 - 2017 Scientific Reports 2019 (www.nature.com/articles/s41598-019-49957-6).
2. APHA 2019. Bovine TB in cattle: Annual monitoring report. For the period 2013 - 2018.
3. Brunton *et al.* (2017) Assessing the effects of the first 2 years of industry-led badger culling in England on the incidence of bovine tuberculosis in cattle in 2013–2015. Ecology and Evolution.
4. Donnelly *et al.* (2007) Impacts of widespread badger culling on cattle tuberculosis: concluding analyses from a large-scale field trial. Int. Journal of infectious diseases.
5. Jenkins *et al.* (2010). The duration of the effects of repeated widespread badger culling on cattle tuberculosis following the cessation of culling. PLoS One.