Disturbance ecology meets epidemiology:
an exploration with wildlife and bovine tuberculosis

An Roinn Talmhaíochta, Bia agus Mara
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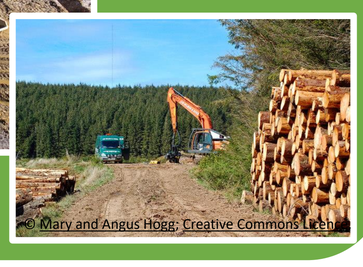
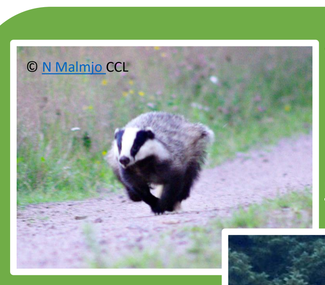
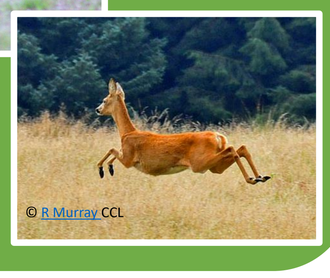
Spillover infection from **wildlife** is a cause of global concern in terms of Emerging Infectious Diseases (EIDs) and endemic pathogens that are maintained through dynamic interactions between wildlife, domesticated animals and humans[1, 2, 3].
Anthropogenic disturbance of wildlife habitat could pose a risk for spreading infectious pathogens.

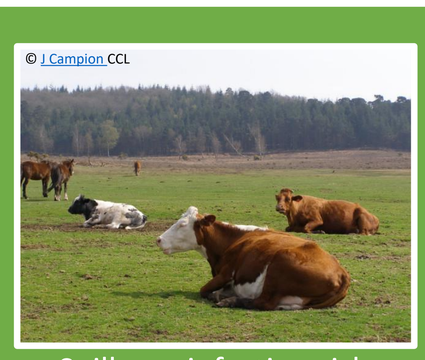
Disturbance (e.g. forest clearfelling, road building)





Wildlife response (e.g. movement, dispersal)



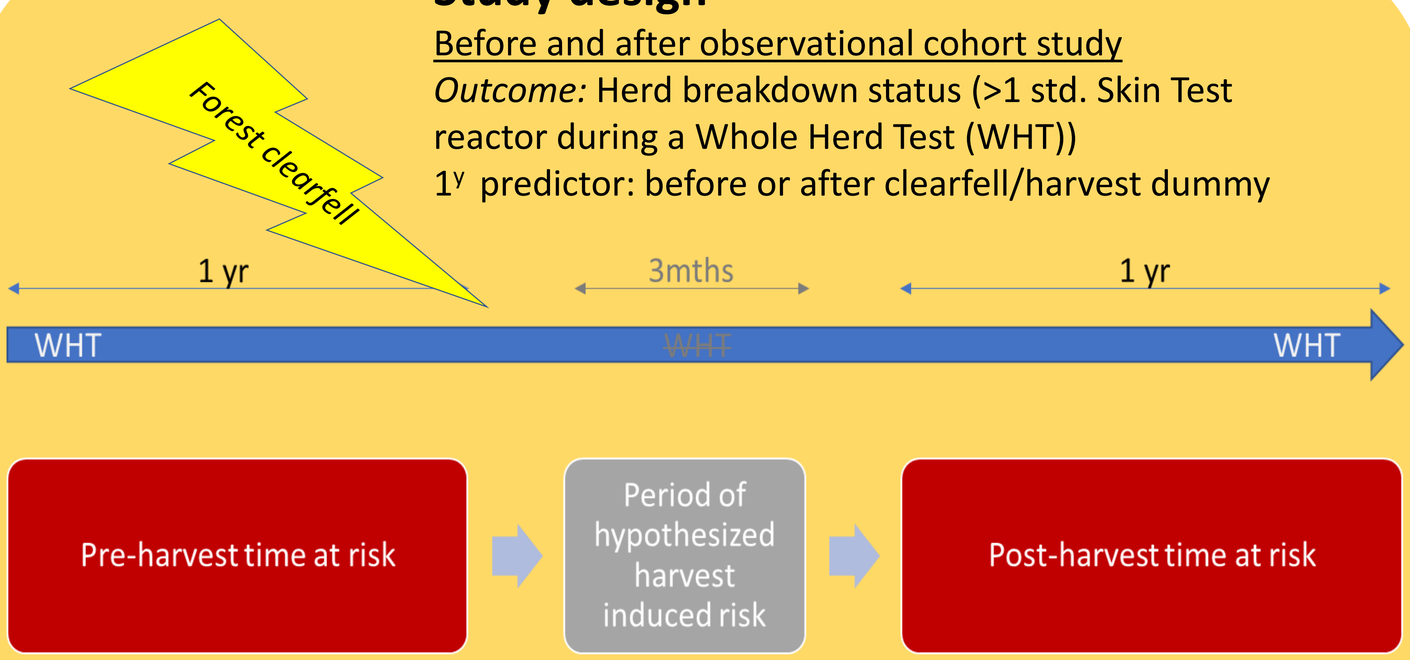


Spillover infection risk (e.g. into neighbouring farmland

Question: Is there relationship between clearfelling of forest stands and bovine Tuberculosis (bTB) herd breakdown risk in 'local' (<3km) herds?

Study design

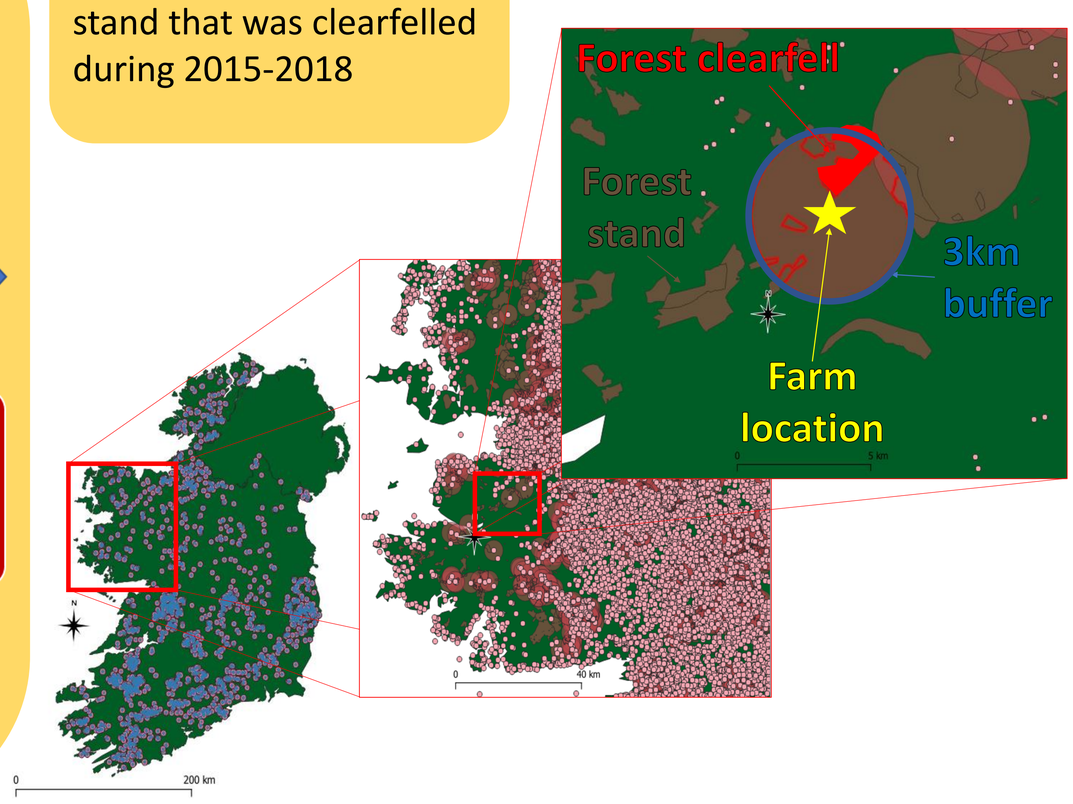
Before and after observational cohort study
Outcome: Herd breakdown status (>1 std. Skin Test reactor during a Whole Herd Test (WHT))
1ʸ predictor: before or after clearfell/harvest dummy

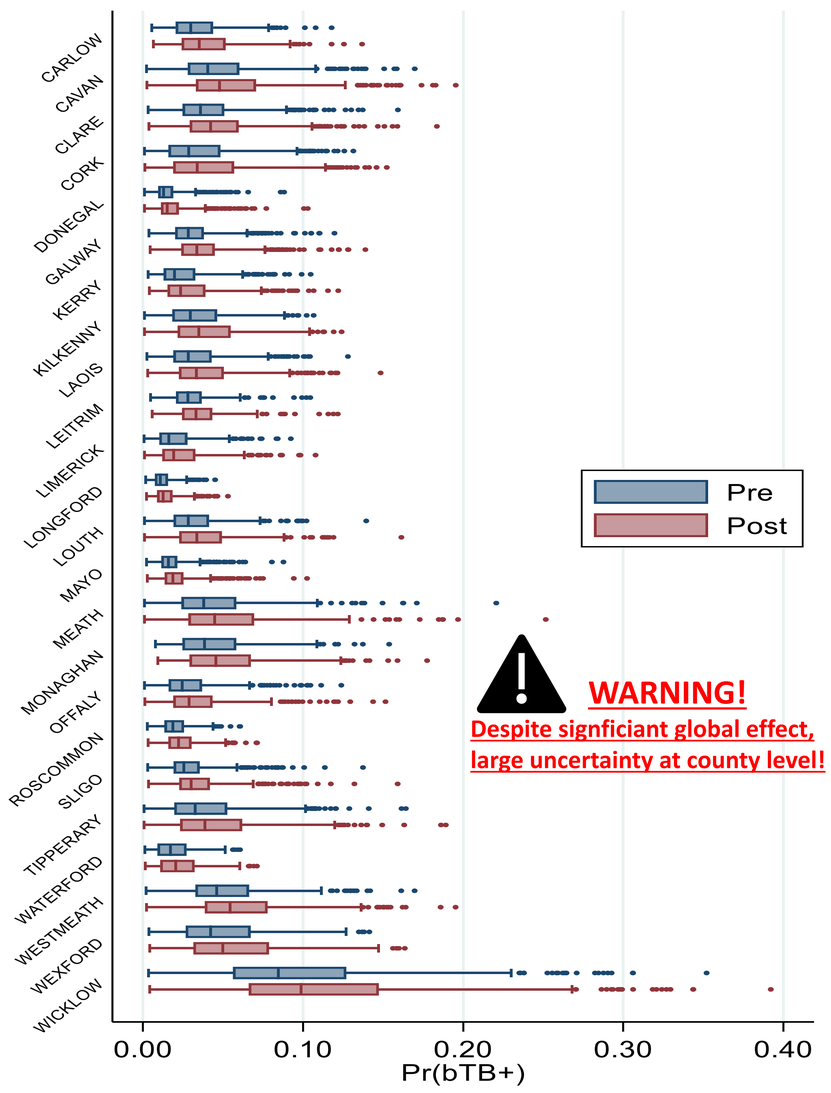


Model: Multi-level random effects logit regression
logit(0/1) ~ beta_1(before_after_dummy) + betas*(other covariates) + re(herd_number) + re(county)*
Confounders/covariates: herd size, herd type (dairy, beef), % of surrounding area forested

Cohort selection

Herds <3km from a forest stand that was clearfelled during 2015-2018





WARNING!
Despite signficiant global effect, large uncertainty at county level!

Results

16,380 herds met our selection criteria

% positive rose from **3.47% prior to clearfelling to 4.08% after clearfelling**

Binary status (1+ reactor)	Pre-clearfell	Post-clearfell	Total
0 *(no breakdown)*	15,811	15,711	31,522
Col %	96.53	95.92	96.22
1 *(breakdown)*	569	669	1,238
Col %	***3.47***	***4.08***	3.78
Total	**16,380**	**16,380**	**32,760**
Col %	**100**	**100**	**100**

Controlling for confounders, overall the 95%CI for the odds of this effect was >1 (OR:1.20; p=0.003; **95%ci: 1.07- 1.36**)
Herd size, location and herd type are all very important bTB risk factors

Future work

- Additional work required to verify these data
- Studies into affects of roads on cattle herd risk in train
- Mechanistic studies, including integrating wildlife behaviour and phylodynamics, are needed

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SCAN ME

[1] Daszak, Peter, Andrew A. Cunningham, and Alex D. Hyatt. "Emerging infectious diseases of wildlife--threats to biodiversity and human health." *Science* 287.5452 (2000): 443-449.
[2] Allen, Toph, et al. "Global hotspots and correlates of emerging zoonotic diseases." *Nature communications* 8.1 (2017): 1-10.
[3] Bengis, R. G., et al. "The role of wildlife in emerging and re-emerging zoonoses." *Revue scientifique et technique-office international des epizooties* 23.2 (2004): 497-512.