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Insights in livestock-related microbial concentrations in air at residential distances

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Project:

VGO – Livestock and health neighboring residents

 Universiteit Utrecht	 National Institute for Public Health and the Environment Ministry of Health, Welfare and Sport	 WAGENINGEN UR For quality of life	 niver
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Exposure measurements

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Health assessment

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Study background



- Several studies reported associations between farming and health in neighboring residents*
- Health effects possibly linked to microbial emissions from livestock farms
- Measurements performed at farms showed high levels of bacteria and their constituents in air
- Little known about levels at further distances, residential distances → important wrt potential public health relevance
- Hence we performed an **airborne exposure assessment study**



* Borlée et al., 2016, 2017, 2018; Smit et al., 2012, 2014; Radon et al., 2007; Pavilonis et al., 2013; Elliott et al., 2004; Wing et al., 2000; Mirabelli et al., 2006; Schinasi et al., 2011; Friesema et al., 2012; Poulsen et al., 2018

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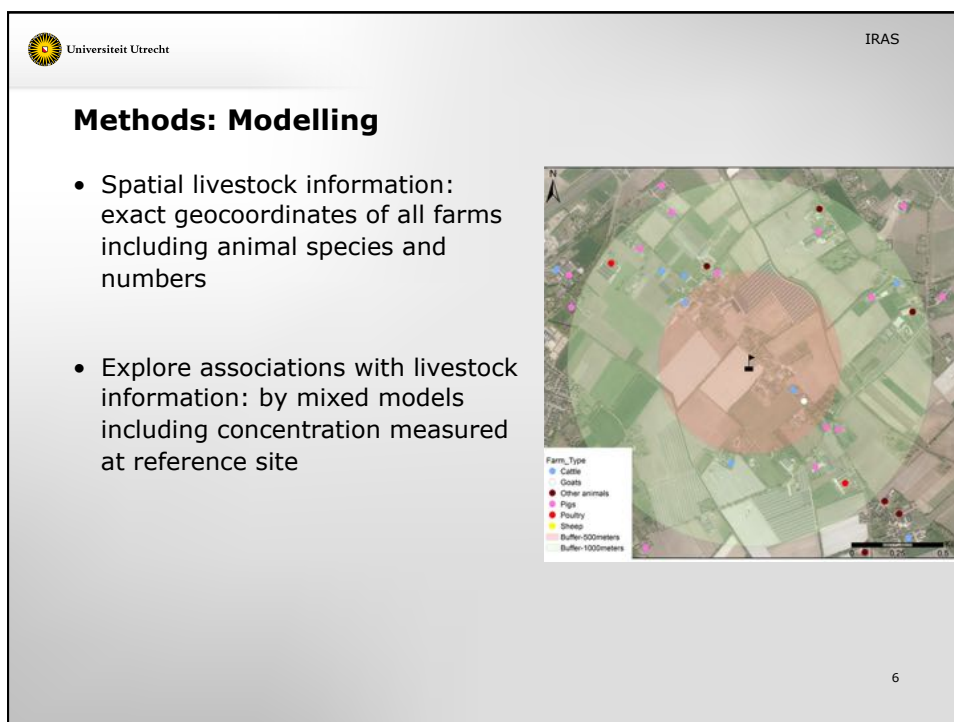
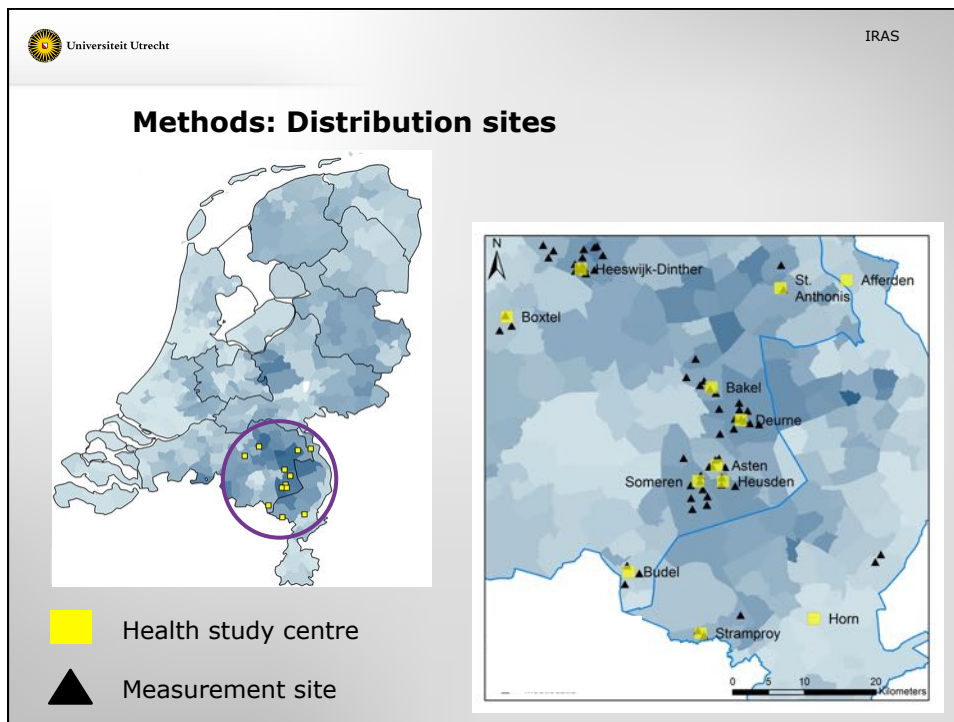
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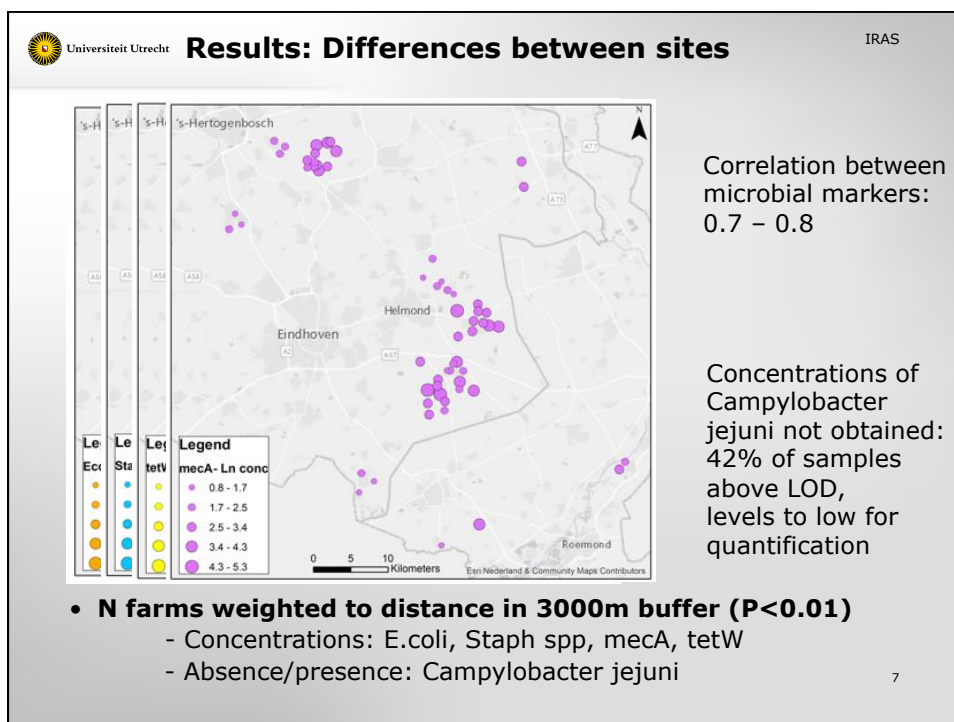
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Methods: Sampling and lab analyses

- Sampling:
 - 61 measurement sites
 - Each site measured 4 times – 2 weeks
 - Reference site measured continuously
 - In period from May 2014 until December 2015
 - Collection of ambient fine dust (PM10)
- Quantitative PCR analyses to determine DNA concentrations of:
 - Commensals (*Escherichia coli*, *Staphylococcus* spp)
 - Antimicrobial resistance genes (*tetW*, *mecA*)
 - Zoonotic pathogen (*Campylobacter jejuni*)







Universiteit Utrecht **Results: Multivariable mixed models** IRAS

	Commensal bacteria (ln copies/m ³)		AMR genes (ln copies/m ³)		Pathogenic bacteria (0/1)
	E.coli	Staph spp	tetW	mecA	C. jejuni
Variables (scaled 10 th -90 th percentile)	Exponent of estimate	Exponent of estimate	Exponent of estimate	Exponent of estimate	OR
N poultry weighted to distance in 3000m buffer	1.77*	2.53*	2.41*	3.90*	4.71*
N pigs weighted to distance in 3000m buffer	3.06*	1.90	2.36*	1.86	2.13
N cows weighted to distance in 3000m buffer	0.77	1.21	0.80	1.14	1.22
N horses weighted to distance in 3000m buffer	1.40	2.32	1.55	1.38	0.82
N goats weighted to distance in 3000m buffer	1.14	1.17	1.08	1.16	0.90
N sheep weighted to distance in 3000m buffer	0.87	0.95	0.75	0.76	0.75
N fur animals weighted to distance in 3000m buffer	1.13	1.32	1.20	1.21	0.88

* P-value < 0.05

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Discussion

- Livestock-related microbial exposures in air at residential distances
 - Relevance of number of farms and distance: 3000m
 - Independently associated animal species: *C. jejuni* (poultry) versus commensals & AMR genes (more generic)
- Implications of measured concentrations on health (if/what) unknown
- Outlook: development of Land Use Regression* models → predict concentrations for residential addresses of health study participants



* De Rooij et al., EHP 2018: LUR models for endotoxin based on livestock characteristics of surroundings



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