

INFLUENCE OF GEOGRAPHICAL AND SWINE HERDS' FEATURES ON AUJESZKY'S DISEASE SEROPOSITIVITY IN NORTHERN ITALY



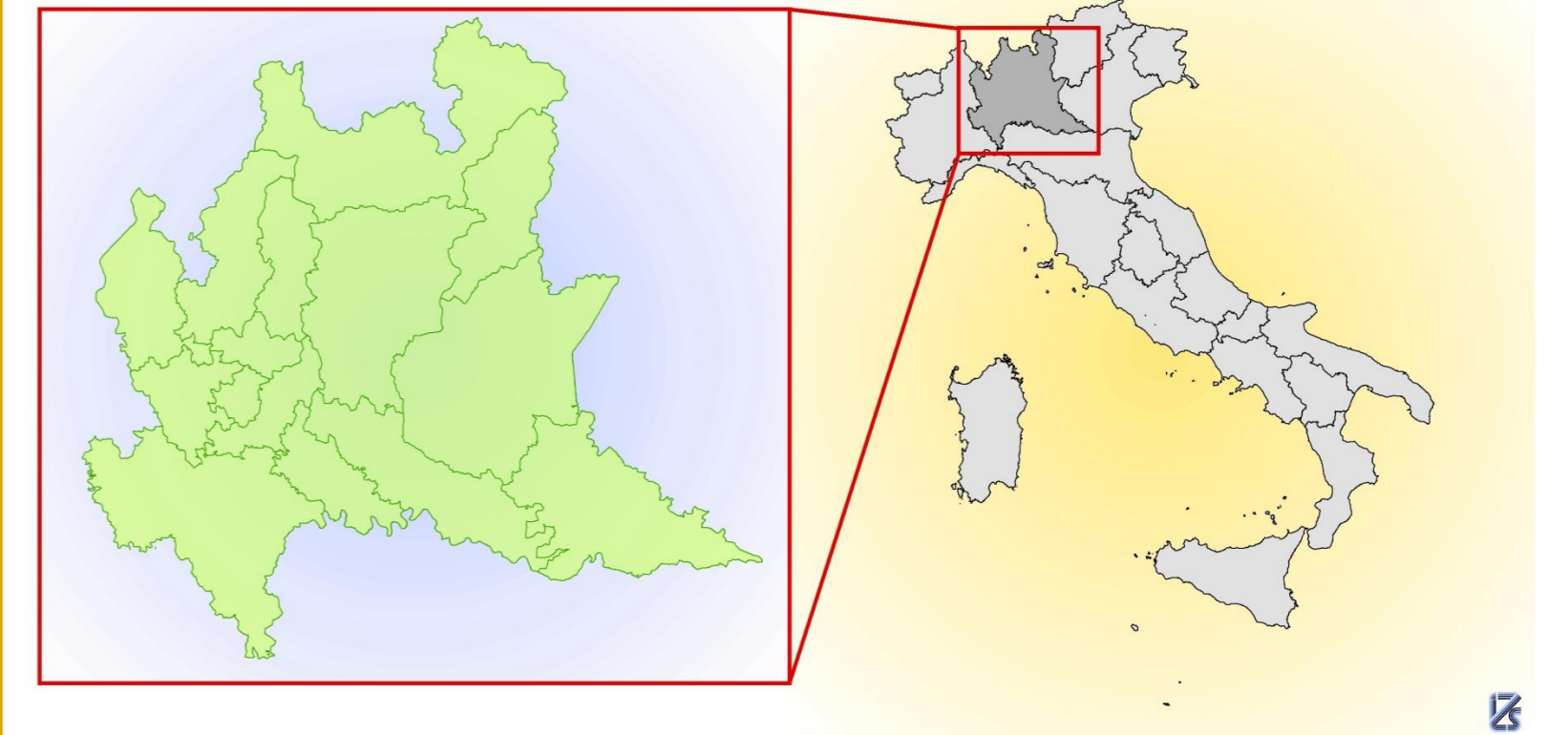
MARCO BERTOLETTI^{1*}, MARIO CHIARI¹, DOMINGA AVISANI¹, MONICA P. CERIOLI¹, LORIS G. ALBORALI^{1,2}, ANA MORENO MARTIN^{1,2}, ANTONIO LAVAZZA^{1,2}, MARCO FARIOLI³, LAURA GEMMA BREZZONI³, MARIAGRAZIA ZANONI¹

¹ ISTITUTO ZOOPROFILATTICO SPERIMENTALE DELLA LOMBARDIA E DELL'EMILIA ROMAGNA; ² NATIONAL REFERENCE LABORATORY FOR AUJESZKY'S DISEASE; ³ U.O. VETERINARIA, REGIONE LOMBARDIA, MILANO, ITALY



Sample and Variables

- 4373 SWINE HERDS IN LOMBARDY REGION WERE TESTED FOR AUJESZKY'S DISEASE (AD) DURING 4 YEARS, FROM 2011 TO 2014.
- 3 VARIABLES WERE COLLECTED FROM EACH SWINE HERD: CONSISTENCY OF THE HERD (CONS_HERD), CONSISTENCY OF THE FARM - HERDS' CLUSTER - (CONS_FARM), BOTH CONTINUOUS, AND A FACTOR VARIABLE NAMED TYPOLOGY OF SWINE HERD (TYPE)
- 5 GEOGRAPHICAL CONTINUOUS VARIABLES TAKEN INTO ACCOUNT FOR EACH SWINE HERD: DISTANCE FROM CLOSEST FARM (DIST_FARM), DISTANCE FROM CLOSEST PUBLIC ROAD (DIST_ROAD), DISTANCE FROM CLOSEST SLAUGHTERHOUSE (DIST_SLA), NUMBER OF SWINE HERDS WITHIN 3 KM (HERD_3) AND NUMBER OF HEADS WITHIN 3 KM (HEADS_3)
- NOT ALL THE SWINE HERDS WERE TESTED EVERY YEAR CONSIDERED IN THE STUDY.



MEDIAN VALUES FOR NEGATIVE AND POSITIVE AND MANN-WHITNEY U TEST RESULTS

VARIABLE	POSITIVE	NEGATIVE	P-VALUE
DIST_FARM	693	816	<0.001
DIST_ROAD	532	515	0.1601
DIST_SLA	2596	2315	0.003
HERD_3	12	9	<0.001
HEADS_3	19438	12472	<0.001
CONS_HERD	1953	835	<0.001
CONS_FARM	2342	1074	<0.001

CHI SQUARED TEST FOR TYPOLOGY OF SWINE HERDS

LEVEL OF TYPOLOGY	POSITIVE	NEGATIVE
FINISHING-FATTENING	216	957
FATTENING WEANERS	125	232
GROWING-FINISHING	24	54
FARROW-TO-FEEDER (F_FEED)	127	215
FARROW-TO-FINISH (F_FINISH)	299	403
FARROW-TO-WEANER (F_WEAN)	7	64
P-VALUE	<0.001	

Univariable Analysis

- THE UNIT OF THE STUDY IS THE SWINE HERD
- FOR THIS FORMER ANALYSIS, THE SWINE HERDS HAVE BEEN CONSIDERED POSITIVE WHEN THEY RESULTED POSITIVE AT LEAST IN ONE YEAR OVER THE FOUR STUDIED.
- THE AVERAGE VALUES OF THE CONTINUOUS VARIABLES ALONG THE YEARS WERE TAKEN INTO ACCOUNT IN ORDER TO HAVE ONE VALUE FOR EACH SWINE HERD
- MANN-WHITNEY TEST IS PERFORMED TO CHECK FOR THE DIFFERENCES IN THE VALUES OF CONTINUE VARIABLES BETWEEN THE GROUP OF POSITIVE AND NEGATIVE SWINE HERDS
- CHI-SQUARED TEST IS PERFORMED TO CHECK FOR THE DIFFERENCES IN THE TYPOLOGY BETWEEN POSITIVE AND NEGATIVE SWINE HERDS
- A PROBLEM OF MULTICOLLINEARITY MAY ARISE IN THE MULTIVARIABLE ANALYSIS, SINCE SOME OF THE VARIABLES MAY EXPLAIN THE SAME AMOUNT OF INFORMATION

Multivariable Modelling

- ONE MODEL PER EACH YEAR IS PERFORMED, IN ORDER TO ASSESS WHAT WERE THE VARIABLES WHICH AFFECTED THE RESPONSE (SEROPOSITIVITY TO AUJESZKY)

LOGISTIC REGRESSION OUTPUT:

- SIGNIFICANT VARIABLES: CONSISTENCY OF THE HERD, DISTANCE FROM THE CLOSEST FARM, NUMBER OF HEADS IN A 3KM RADIUS, TYPE OF SWINE HERD
- NOT SIGNIFICANT VARIABLES: DISTANCE FROM THE CLOSEST STREET, CONSISTENCY OF THE FARM, NUMBER OF SWINE HERDS WITHIN 3 KM, DISTANCE FROM THE CLOSEST SLAUGHTERHOUSE.
- CONSISTENT RESULTS IN SIGNIFICATIVITY DURING 4 YEAR-MODELS ARE REACHED
- ROC CURVE IS USED TO COMPARE PREDICTIVE PROBABILITY OF SEROPOSITIVITY FROM THE MODEL FOR EACH SWINE HERD AND POSITIVITY AS COMPUTED IN THE UNIVARIABLE ANALYSIS.

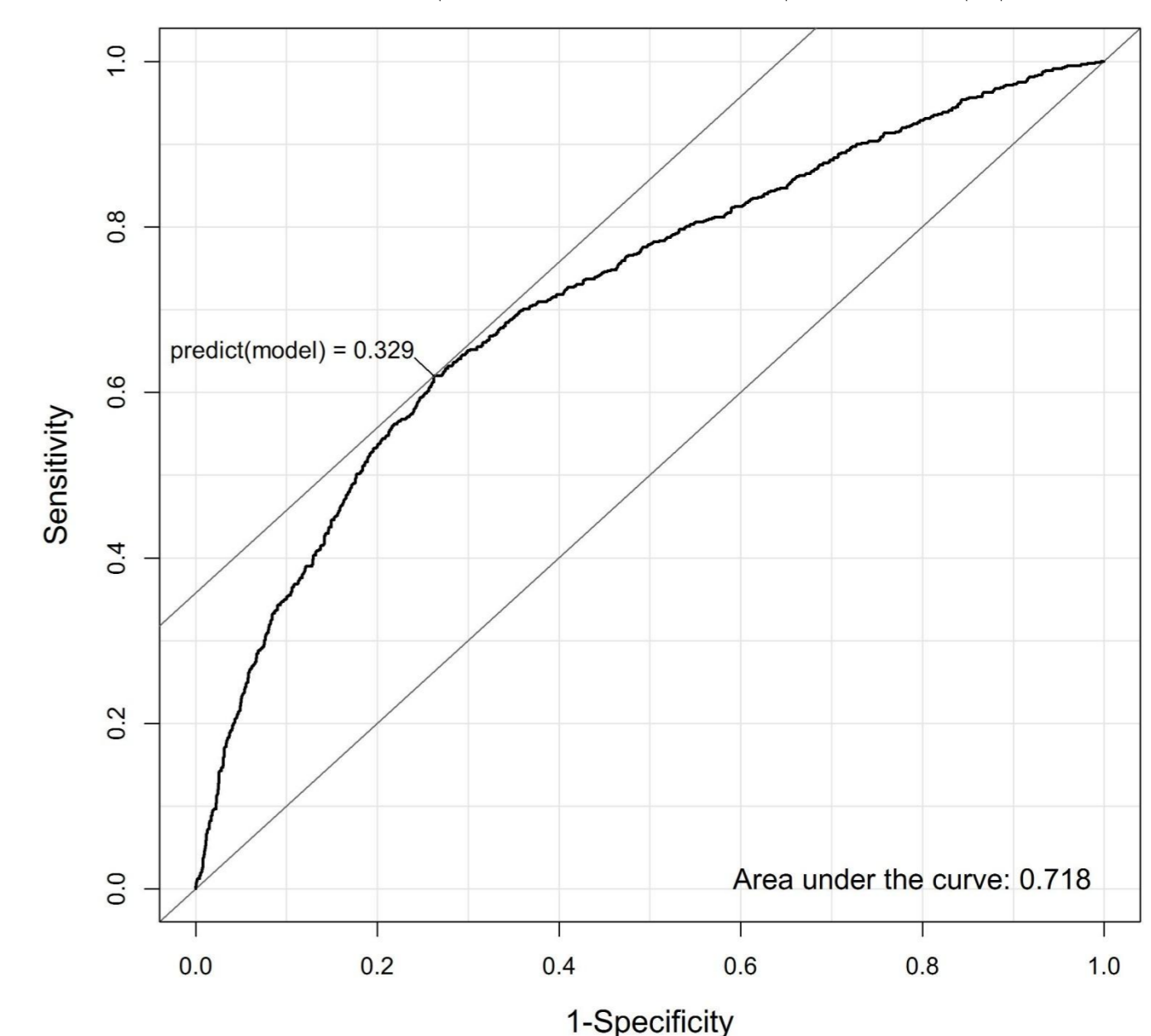
LOGISTIC REGRESSION MODELS' RESULTS

	COEFF.	P-VALUES			
		2011	2012	2013	2014
DIST_FARM	POSITIVE	<0.01	<0.01	0.22	0.05
HEADS_3	NEGATIVE	<0.01	<0.01	<0.01	<0.01
CONS_HERD	POSITIVE	<0.01	<0.01	<0.01	<0.01
TYPOLOGY (WITH RESPECT TO FINISHING-FATTENING):					
F_FEED	POSITIVE	0.73	0.01	0.10	<0.01
F_FINISH	POSITIVE	0.01	<0.01	0.11	<0.01
F_WEAN	NEGATIVE	<0.01	<0.01	0.03	0.61

Results

- SIGNIFICANT FACTORS ARE CONSTANT DURING YEARS
- DISTANCE FROM PIG FARMS, CONSISTENCY, FARROW-TO-FEEDER AND FARROW-TO-FINISH ARE RISK FACTORS
- NUMBER OF HEADS AND FARROW-TO-WEANER ARE PROTECTIVE FACTORS.
- SWINE HERDS WITH A PREDICTIVE PROBABILITY FROM THE MODEL GREATER THAN 0.329 ARE CONSIDERED POSITIVE.
- AUC IS EQUAL TO 0.718: THE MODEL HAS AN ACCEPTABLE ABILITY TO PREDICT

ROC CURVE TO TEST THE ABILITY TO PREDICT OF THE MODEL



Conclusions

- A LIST OF SIGNIFICANT VARIABLES, BOTH GEOGRAPHICAL AND FROM HERD'S FEATURES, HAVE BEEN FOUND IN ORDER TO EXPLAIN AUJESZKY'S DISEASE SEROPOSITIVITY IN SWINE HERDS.
- THE MODEL FOUND CAN BE USED TO PREDICT THE PROBABILITY OF A SWINE HERD TO BE SEROPOSITIVE

SPECIAL THANKS TO THE COLLEAGUES FROM S.E.L. FOR THE SUPPORT AND HELP