Table 1

The effect of increases or decreases in testing parameters on performance parameters (median percentage savings (MPS), probabilities of savings exceeding 75% ($Pr > S_{75\%}$) and minimum negative predictive values (MinNPV)) using the Modified Simple Pooling and Modified Halving Protocols

Testing Parameter Change		Effect on Performance Parameter		
		MPS	$Pr > S_{75\%}$[b]	MinNPV
Prevalence	Increase (Decrease)	Decrease (Increase)	Decrease[c] (Increase)[c]	Decrease (Increase)
Pool size	Increase (Decrease)	Protocol dependent	Protocol dependent	Increase (Decrease)
Herd Size	Increase (Decrease)	No change[a]	Protocol dependent	Increase[d] (Decrease)[d]
Sensitivity	Increase (Decrease)	Increase (Decrease)	Increase[c] (Decrease)[c]	Increase (Decrease)

[a]Width of the distribution narrowed with increased herd size

[b]Probabilities of savings exceeding 50% ($Pr > S_{50\%}$) varied in an identical manner

[c]Remained invariant when probabilities were either 0 or 1

[d]Changes were minimal

Table 2

Probability that the number of tests required to classify all individuals in a herd of 1000 animals after randomly allocating samples into pools of 5, 10, 20 and 50, respectively, will exceed the number of tests required when a pool size of 10 is used for various prevalences (P) and test sensitivities, given perfect test specificity

		Sensitivity									
P	Pool	Modified Simple Pooling					Modified Halving				
	Size	0.5	0.6	0.7	0.8	0.9	0.5	0.6	0.7	0.8	0.9
0.01	5	1	1	1	1	1	1	1	1	1	1
	[a]10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	20	0.08	0.11	0.14	0.19	0.22	< 0.01	<0.01	<0.01	<0.01	<0.01
	50	0.65	0.81	0.91	0.96	0.98	0.01	0.02	0.07	0.17	0.36
0.05	5	0.99	0.98	0.96	0.93	0.87	1	1	1	1	1
	[a]10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	20	0.80	0.89	0.95	0.98	0.99	0.10	0.23	0.42	0.66	0.87
	50	0.94	0.98	1	1	1	0.38	0.67	0.89	0.98	1
0.10	5	0.82	0.63	0.43	0.24	0.10	1	1	1	0.99	1
	[a]10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	20	0.76	0.85	0.92	0.97	0.99	0.21	0.41	0.62	0.82	0.96
	50	0.75	0.85	0.93	0.98	1	0.35	0.61	0.83	0.97	1

[a]Comparisons with pool size of 10 represent a comparison with an identical distribution.

Table 3

Probability that savings attributable to Modified Simple Pooling and Modified Halving Protocols will exceed 75% of the cost of individual testing for various pool sizes, prevalences (P) and test sensitivities for a herd of 1000 animals given perfect test specificity

P	Pool Size	Sensitivity: Modified Simple Pooling 0.5	0.6	0.7	0.8	0.9	Modified Halving 0.5	0.6	0.7	0.8	0.9
0.01	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10	0.17	0.05	0.01	<0.01	<0.01	0.99	0.95	0.82	0.55	0.16
	20	0.87	0.72	0.50	0.29	0.13	1	1	1	1	0.87
	50	0.37	0.19	0.08	0.02	0.01	1	0.99	0.96	0.86	0.37
0.05	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	20	<0.01	<0.01	<0.01	<0.01	<0.01	0.46	0.06	<0.01	<0.01	<0.01
	50	<0.01	<0.01	<0.01	<0.01	<0.01	0.30	0.04	<0.01	<0.01	<0.01
0.10	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	20	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
	50	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01

Table 4

Median, 2.5 and 97.5 percentiles for the distribution of savings as a percentage of the cost of individual testing for Modified Simple Pooling and Modified Halving Protocols at various prevalences (P), pool sizes and test sensitivities for a herd of 1000 animals given perfect test specificity

P	Pool Size	Sensitivity: Modified Simple Pooling 0.5	0.6	0.7	0.8	0.9	Modified Halving 0.5	0.6	0.7	0.8	0.9
0.01	5	56 (55, 58)	56 (55, 57)	56 (55, 57)	56 (55, 57)	55 (55, 56)	57 (56, 58)	57 (56, 58)	57 (56, 58)	56 (55, 57)	56 (55, 56)
	10	74 (71, 77)	73 (71, 76)	72 (70, 75)	73 (71, 76)	71 (70, 73)	77 (75, 79)	77 (75, 78)	76 (74, 78)	75 (74, 77)	74 (73, 76)
	20	78 (73, 84)	76 (72, 82)	76 (71, 80)	76 (72, 82)	73 (71, 78)	86 (83, 89)	85 (81, 88)	84 (80, 87)	82 (79, 85)	81 (79, 83)
	50	71 (56, 86)	66 (52, 81)	62 (52, 76)	66 (52, 81)	57 (47, 71)	88 (80, 95)	85 (77, 93)	83 (75, 90)	80 (72, 88)	75 (70, 83)
0.05	5	47 (44, 50)	45 (43, 48)	44 (41, 46)	43 (40, 45)	42 (40, 44)	51 (49, 54)	49 (47, 52)	45 (45, 50)	45 (43, 48)	43 (42, 45)
	10	56 (50, 63)	53 (47, 59)	50 (45, 56)	47 (42, 52)	45 (41, 50)	69 (65, 73)	66 (62, 70)	63 (59, 67)	59 (56, 63)	56 (53, 59)
	20	51 (39, 63)	46 (34, 57)	40 (29, 51)	36 (27, 46)	32 (23, 40)	74 (68, 81)	70 (62, 76)	64 (56, 71)	58 (51, 65)	52 (46, 58)
	50	37 (17, 61)	32 (12, 52)	22 (7, 42)	17 (2, 32)	8 (-2, 22)	72 (57, 85)	62 (47, 77)	54 (36, 69)	44 (29, 59)	31 (19, 46)
0.10	5	37 (34, 42)	34 (30, 38)	32 (28, 35)	29 (26, 33)	28 (25, 31)	45 (42, 48)	41 (38, 45)	37 (34, 41)	34 (31, 37)	30 (27, 33)
	10	42 (34, 50)	36 (29, 44)	31 (24, 39)	27 (21, 34)	23 (18, 30)	61 (56, 66)	56 (50, 61)	50 (44, 56)	44 (38, 49)	38 (33, 42)
	20	37 (24, 50)	29 (17, 42)	22 (11, 34)	15 (6, 26)	10 (2, 19)	66 (57, 74)	58 (48, 67)	49 (39, 58)	39 (30, 49)	29 (21, 38)
	50	32 (12, 56)	27 (7, 47)	17 (2, 37)	8 (-2, 27)	3 (-2, 17)	66 (49, 80)	54 (36, 72)	41 (24, 59)	29 (13, 44)	14 (1, 29)

Table 5

Minimum negative predictive values obtained from the distribution of test results for the Modified Simple Pooling and Modified Halving Protocols as a function of prevalence (P), pool size and test sensitivity for a herd of 1000 given perfect test specificity.

P	Pool Size	Sensitivity: Modified Simple Pooling 0.5	0.6	0.7	0.8	0.9	Modified Halving 0.5	0.6	0.7	0.8	0.9
0.01	5	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
	10	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
	20	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
	50	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
0.05	5	0.95	0.96	0.97	0.97	0.98	0.95	0.95	0.96	0.96	0.98
	10	0.95	0.96	0.96	0.97	0.98	0.95	0.95	0.96	0.96	0.97
	20	0.95	0.96	0.96	0.97	0.98	0.95	0.95	0.96	0.96	0.97
	50	0.95	0.95	0.96	0.97	0.98	0.95	0.95	0.95	0.96	0.97
0.10	5	0.91	0.92	0.93	0.95	0.97	0.90	0.91	0.92	0.94	0.96
	10	0.91	0.92	0.93	0.94	0.97	0.90	0.91	0.92	0.93	0.96
	20	0.91	0.92	0.93	0.95	0.97	0.90	0.91	0.92	0.93	0.95
	50	0.91	0.91	0.92	0.94	0.96	0.90	0.90	0.91	0.93	0.94

Table 6

Overall optimality rankings of different pool sizes for Modified Simple Pooling(MSP) and Modified Halving (MH) Protocols at prevalences of 0.01, 0.05 and 0.1 assuming (i) invariant sensitivity and (ii) reduced sensitivity with increase in pool size

Ranking	Prevalence				
	0.01	0.05		0.1	
	(i)(ii)	(i)	(ii)	(i)	(ii)
1	MH_{20}	[a]MH_{20}	MH_{50}	MH_{10}	MH_{50}
2	MH_{50}	[a]MH_{10}	MH_{20}	MH_{20}	MH_{20}
3	MH_{10}	MH_{50}	MH_{10}	MH_{50}	MH_{10}
4	MSP_{20}	MSP_{10}	MSP_{10}	MH_{5}	MH_{5}
5	MSP_{10}	MH_{5}	MH_{5}	MSP_{10}	MSP_{50}
6	MSP_{50}	MSP_{20}	MSP_{20}	MSP_{5}	MSP_{10}
7	MH_{5}	MSP_{50}	MSP_{50}	MSP_{20}	MSP_{20}
8	MSP_{5}	MSP_{5}	MSP_{5}	MSP_{50}	MSP_{5}

[a]Particularly for Se from 0.5 to 0.7

Table 7

Probability that savings attributable to Modified Simple Pooling and Modified Halving Protocols would exceed 50% of the cost of individual testing for various pool sizes, prevalences (P) and test sensitivities for a herd of 1000 animals given perfect test specificity

P	Pool Size	Sensitivity: Modified Simple Pooling 0.5	0.6	0.7	0.8	0.9	Modified Halving 0.5	0.6	0.7	0.8	0.9
0.01	5	1	1	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1	1	1
	20	1	1	1	1	1	1	1	1	1	1
	50	1	1	0.99	0.98	0.96	1	1	1	1	1
0.05	5	0.02	<0.01	<0.01	<0.01	<0.01	0.88	0.33	0.02	<0.01	<0.01
	10	0.98	0.84	0.49	0.16	0.02	1	1	1	1	1
	20	0.55	0.18	0.03	<0.01	<0.01	1	1	1	0.99	0.73
	50	0.17	0.04	<0.01	<0.01	<0.01	1	0.94	0.64	0.17	0.01
0.10	5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	10	0.02	<0.01	<0.01	<0.01	<0.01	1	0.98	0.48	0.01	<0.01
	20	0.02	<0.01	<0.01	<0.01	<0.01	1	0.94	0.39	0.01	<0.01
	50	0.09	0.01	<0.01	<0.01	<0.01	0.97	0.66	0.16	0.01	<0.01

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