



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Risk factors for sporadic cryptosporidiosis in the Netherlands: analysis of a three year case-control study

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Analyses performed by Laura Nic Lochlainn, EPIET fellow



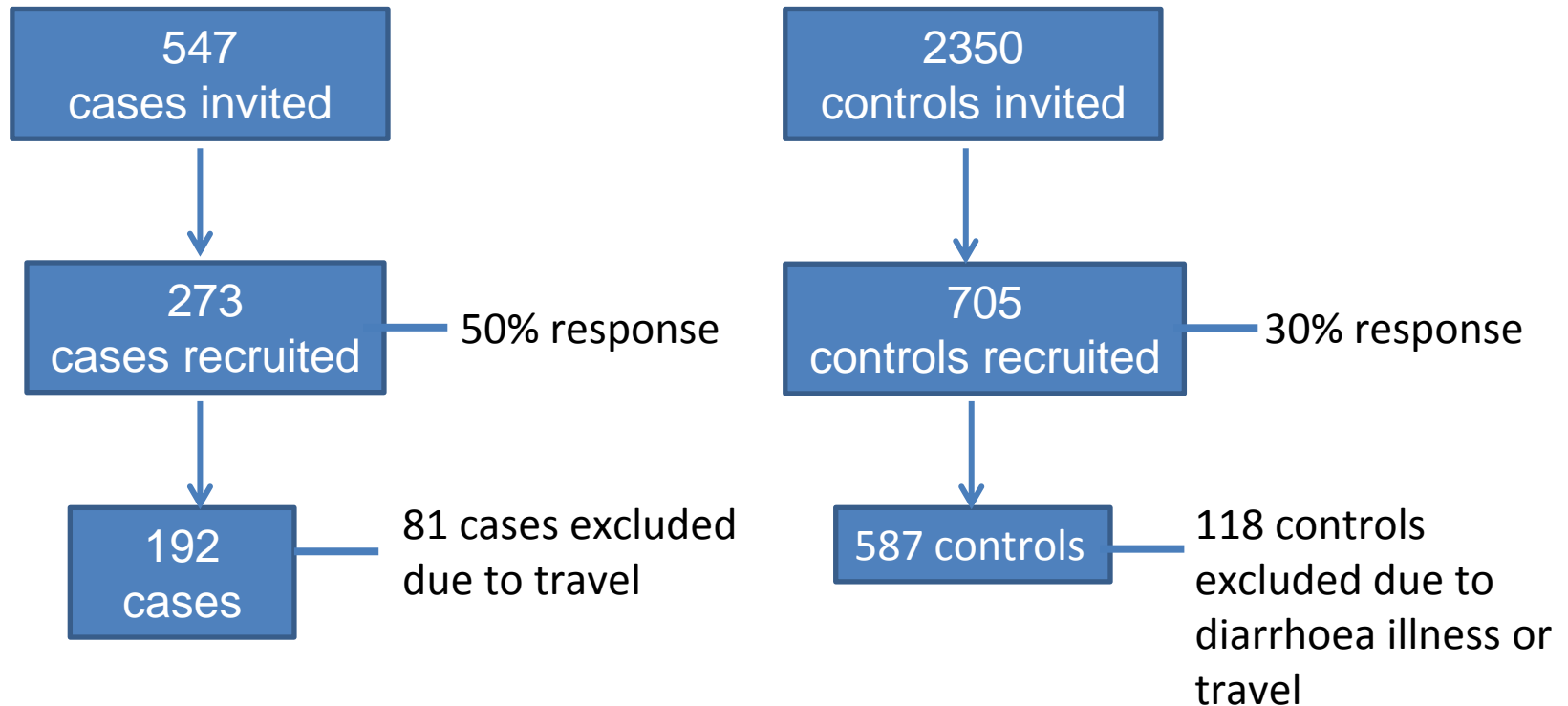
Risk factors

STUDY YEAR ONE

(preliminary analyses)

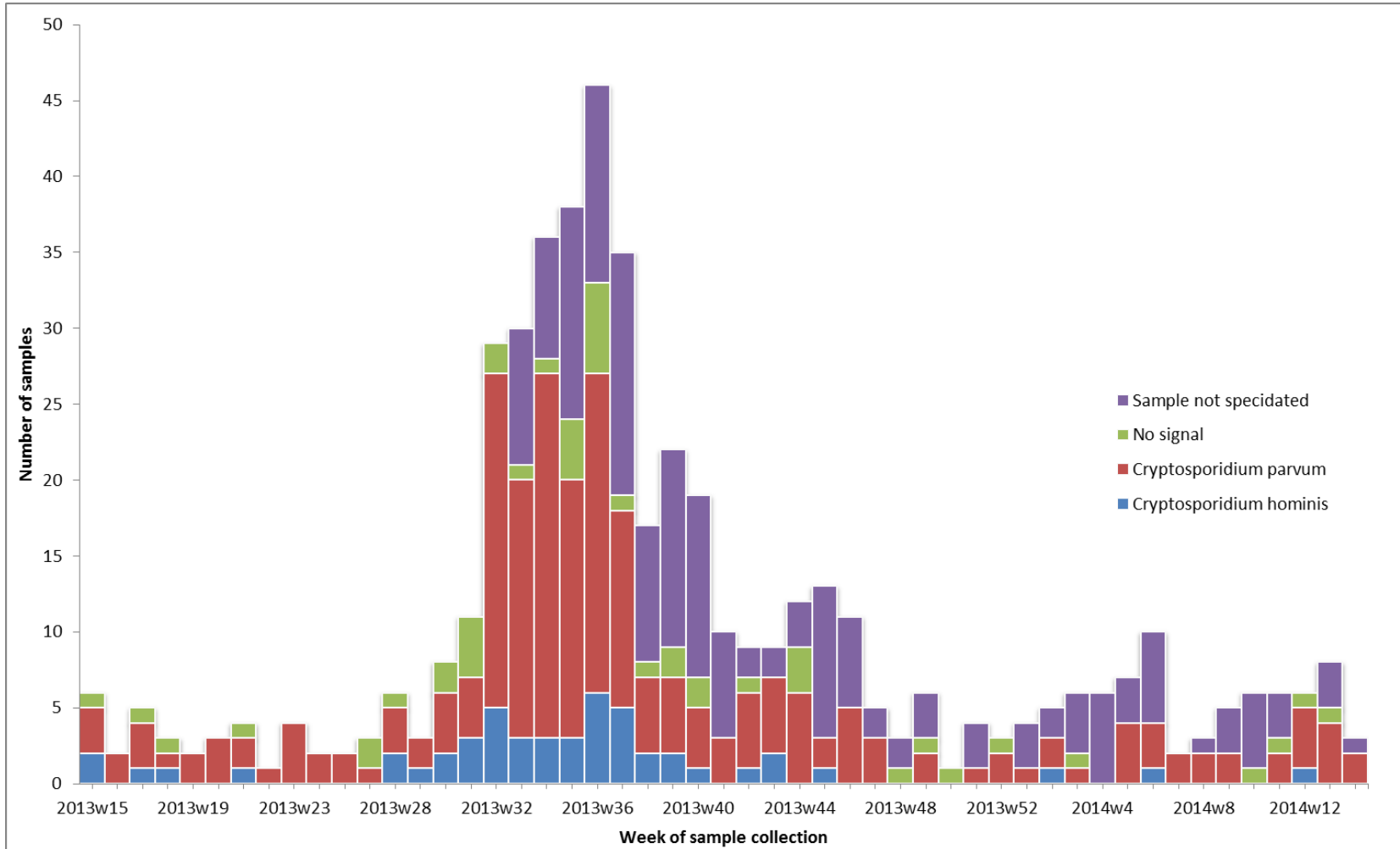


Recruitment of participants April 2013- April 2014





Cryptosporidium samples by species, the Netherlands, April 2013 - April 2014, (n=547*)

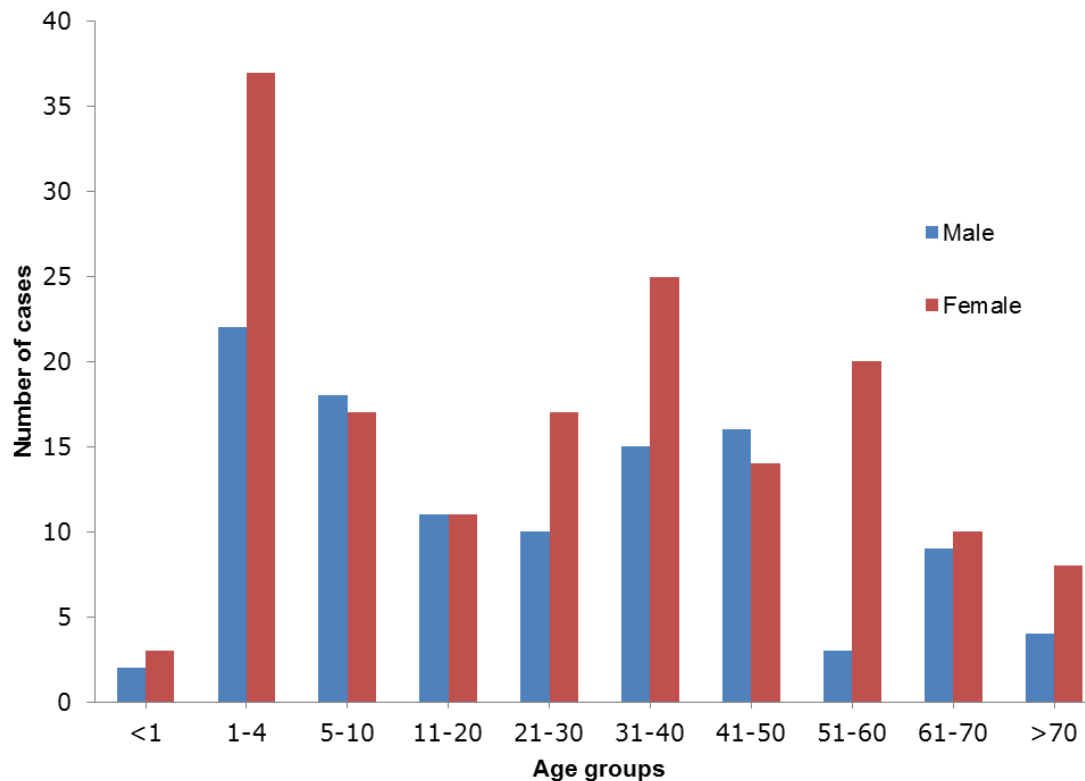


* 44 samples with missing date of sample collection



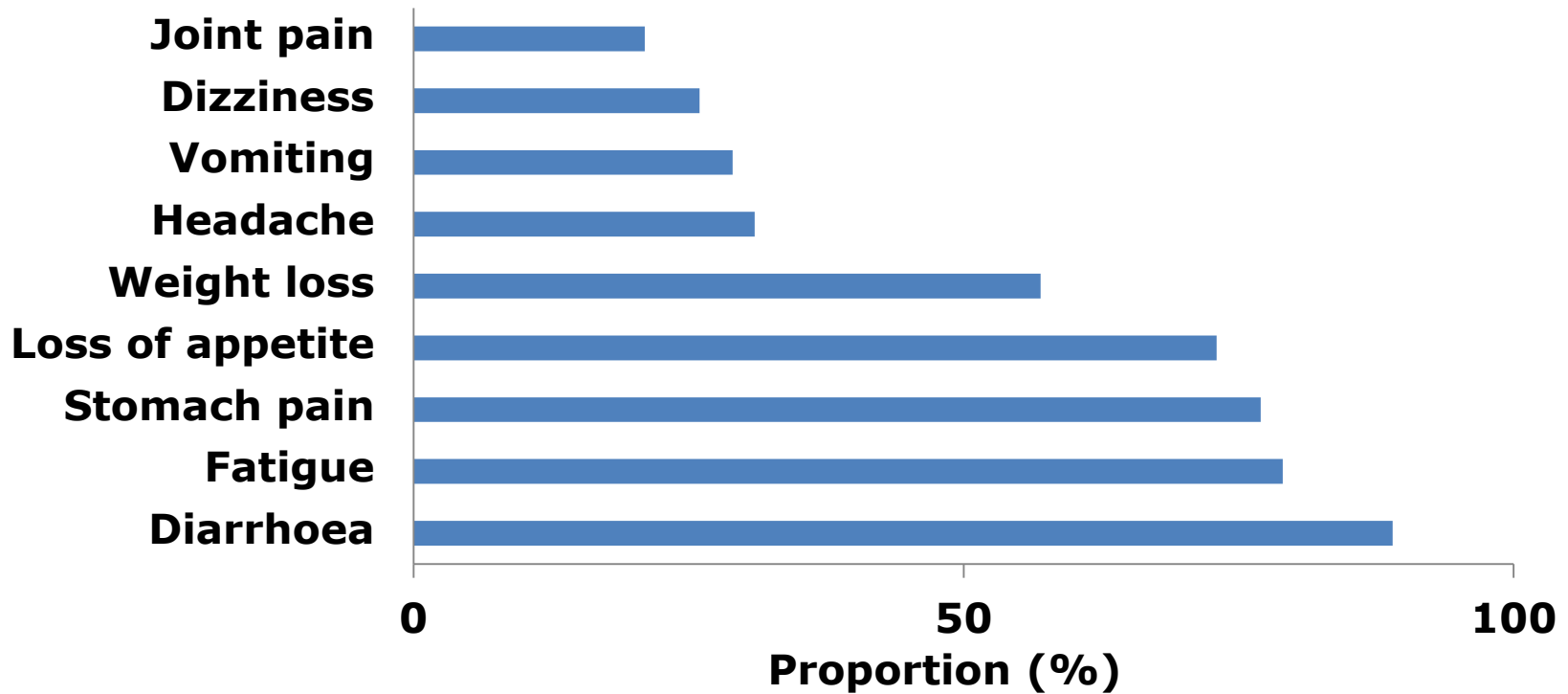
Characteristics of cases of cryptosporidiosis, the Netherlands, 2013-2014

- Median age of cases: 28 years (range 1-95)





Symptoms of cryptosporidiosis cases, the Netherlands, 2013-2014





Characteristics of cryptosporidiosis cases and controls, the Netherlands, 2013-2014

	Proportion of exposure (%)		Odds ratio*	P-value
	Cases	Controls		
Swam in river or lake	10	2	6.2	<0.001
Ate barbequed food	40	19	3.9	<0.001
Had contact with cattle	15	5	3.7	<0.001
Swam in the sea	6	2	3.7	0.004
Picnicked	31	18	2.6	<0.001
Household diarrhoeal case	19	11	2.5	<0.001
Ate unusual food	11	3	2.3	0.011
Scuba dived in a pool	4	2	2.1	0.110
Bite nails	24	16	1.7	0.013
Drank untapped water	20	13	1.6	0.061
Swam in an inflatable pool	18	15	1.5	0.083
Visited a farm	28	23	1.4	0.068
Played in a sandbox	28	40	0.6	0.016

*Single variable logistic regression adjusted for age, gender, season and excluding those who travelled⁷



Factors associated with cryptosporidiosis: multivariable analysis

Characteristics	Odds ratio*	95% CI
Swam in a river or lake	4.9	2.0-12.0
Had contact with cattle	3.8	2.0-7.0
Ate barbequed foods	3.8	2.4-6.1
Shared house with a diarrhoeal case	1.8	1.1-3.0
Played in a sandbox	0.4	0.2-0.7

*Multivariable logistic regression adjusted for age, gender, season and excluding those who travelled ⁸



Conclusions study year 1

- *C. parvum* predominant agent of cryptosporidiosis
- Four independent risk factors associated with cryptosporidiosis :
 - Swimming in rivers or lakes
 - Contact with cattle
 - Eating barbecued food
 - Shared a house with a diarrhoeal case



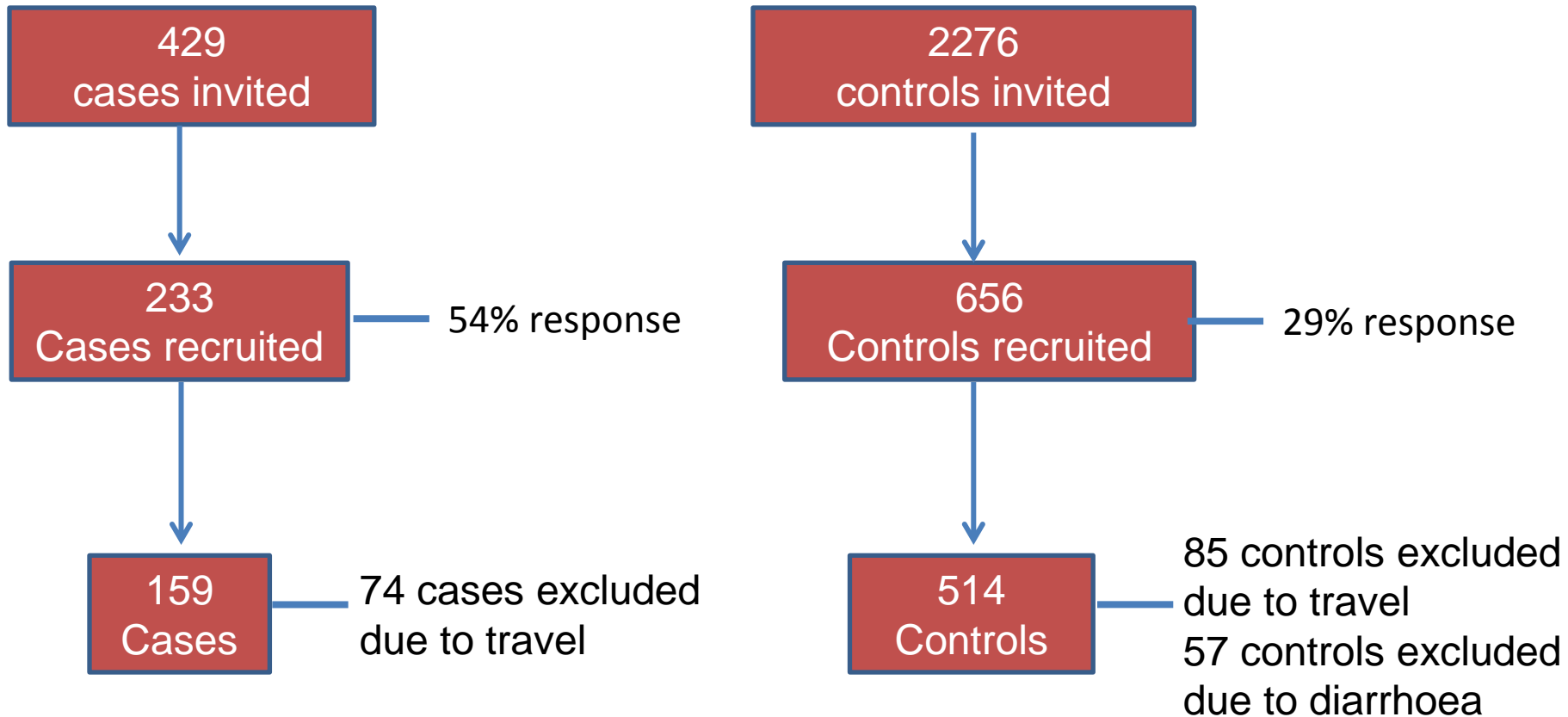
Risk factors

STUDY YEAR TWO

(preliminary analyses)

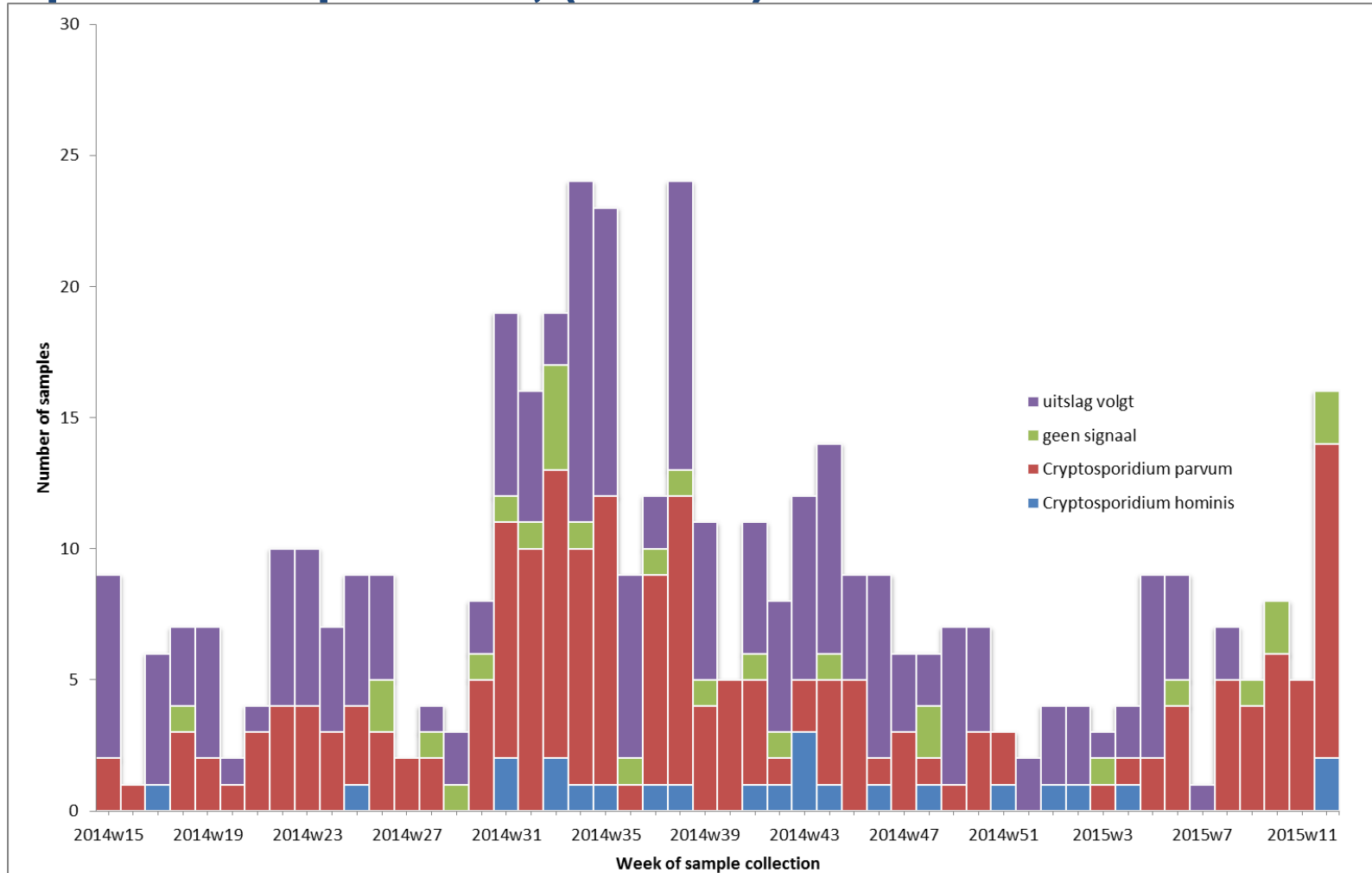


Recruitment of participants April 2014-April 2015





Cryptosporidium samples by species, the Netherlands, April 2014-April 2015, (n=429*)

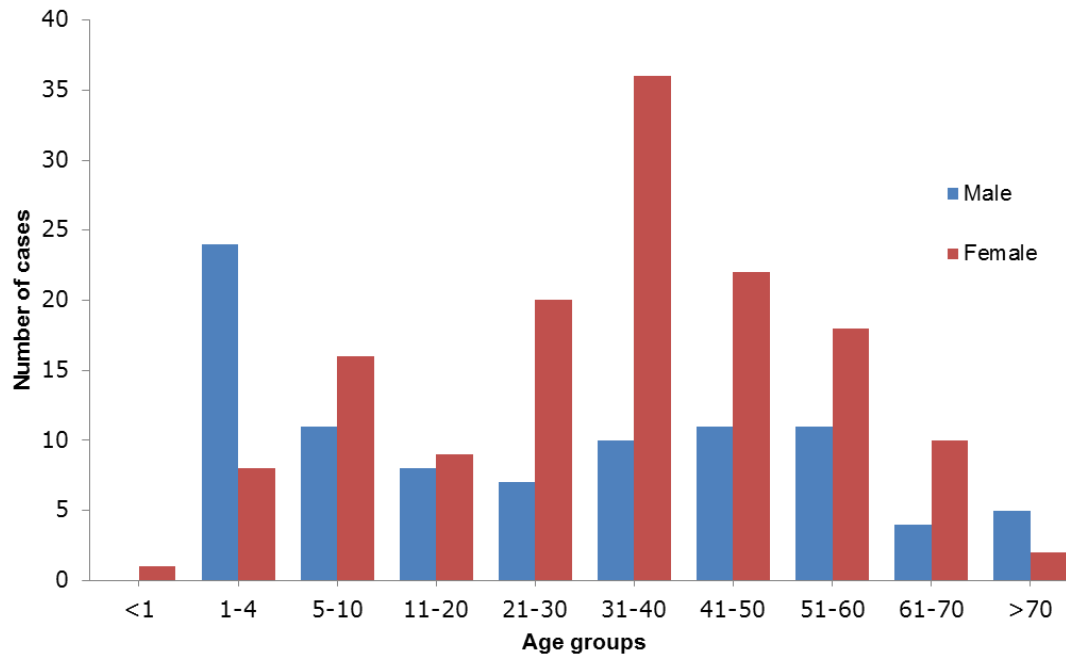


* 26 samples with missing date of sample collection



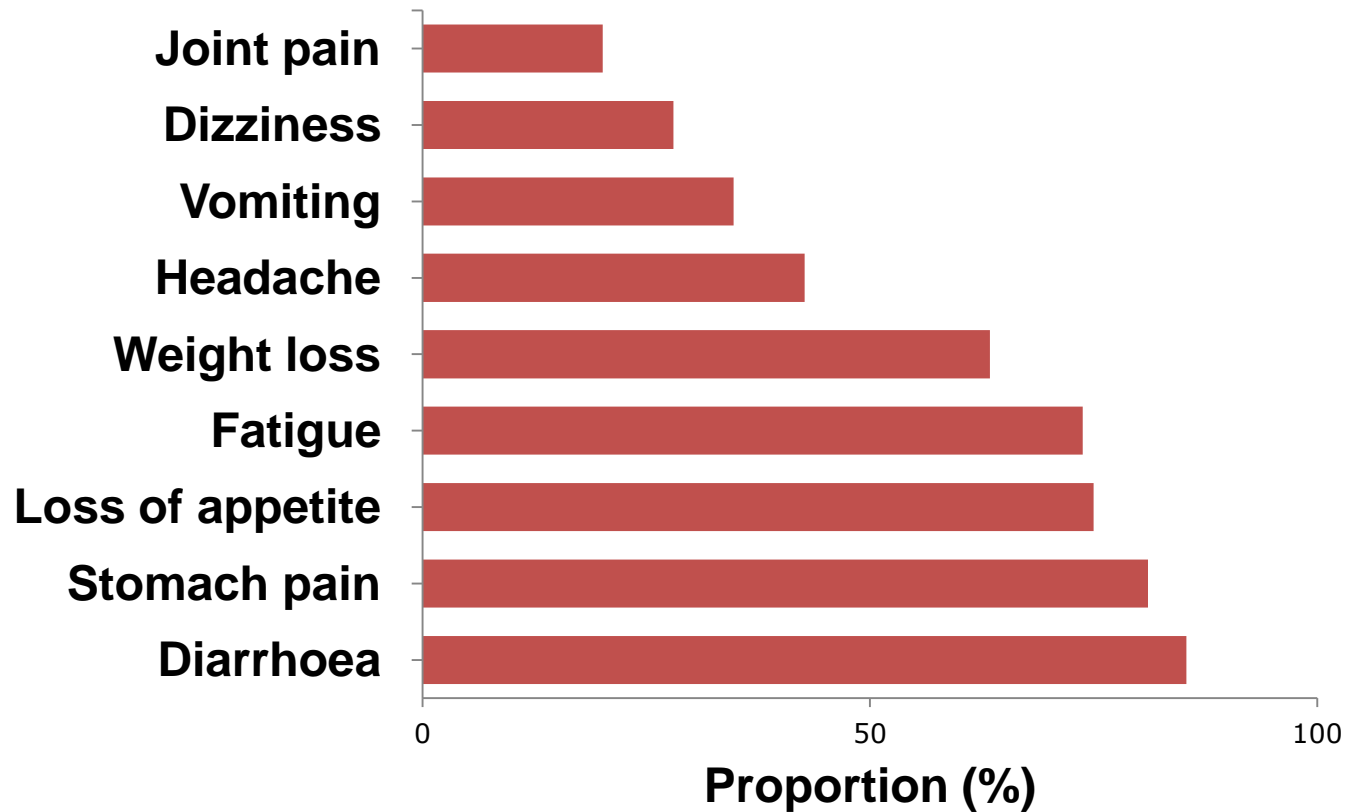
Characteristics of cases of cryptosporidiosis, the Netherlands, 2014-2015

- Median age of cases: 30 years (range 1-92)





Symptoms of cryptosporidiosis cases, the Netherlands, 2014-2015





Characteristics of cryptosporidiosis cases and controls, the Netherlands, 2014-2015 (I)

	Proportion of exposure (%)		Odds ratio*	P-value
	Cases	Controls		
Ate unusual food	19 (13)	20 (4)	3.71	<0.001
Non-household diarrhoeal case	11 (14)	18 (5)	3.53	0.003
Petted cattle or calves	22 (13)	27 (5)	3.24	<0.001
Used an inflatable pool	38 (23)	59 (12)	2.66	<0.001
Swallowed inflatable pool water	15 (9)	23 (5)	2.4	0.014
Household diarrhoeal case	29 (19)	52 (10)	2.16	0.003
Swallowed pool water	29 (21)	58 (13)	2.08	0.006
Immunosuppressed	18 (12)	28 (6)	1.98	0.038
Had farm animal contact	36 (22)	75 (15)	1.81	0.012
Had contact with young animals	29 (26)	64 (17)	1.75	0.031
Washed hands after petting animals	34 (40)	95 (28)	1.74	0.035
Swam in a pool	61 (37)	141 (28)	1.66	0.010
Visited a farm	42 (26)	107 (21)	1.43	0.099
Washed hands after petting farm animals	20 (14)	44 (9)	1.11	0.057
Contact with animal faeces	24 (19)	59 (13)	1.09	0.002

*Single variable logistic regression adjusted for age, gender, season and excluding those who travelled



Characteristics of cryptosporidiosis cases and controls, the Netherlands, 2014-2015 (II)

	Proportion of exposure (%)		Odds ratio*	P-value
	Cases	Controls		
Gardening	33 (20)	132 (26)	0.64	0.052
Ate pre-packed salad	82 (56)	295 (64)	0.64	0.031
Ate cream	61 (43)	250 (55)	0.63	0.020
Ate yoghurt	124 (80)	420 (87)	0.63	0.057
Picnicked	31 (20)	134 (26)	0.62	0.042
Travelled within the NL	36 (22)	161 (32)	0.60	0.020
Ate carrots	95 (68)	377 (79)	0.57	0.010

*Single variable logistic regression adjusted for age, gender, season and excluding those who travelled¹⁶



Factors associated with cryptosporidiosis: multivariable analysis 2014-2015

Characteristics	Odds ratio*	95% CI
Ate unusual food	6.1	2.4-15
Non-household diarrhoeal case	3.0	1.2-7.5
Household diarrhoeal case	2.8	1.3-5.8

*Multivariable logistic regression adjusted for age, gender, season and excluding those who travelled ¹⁷



Unusual food free text responses: Study year two

Afhaalchinees

Carpaccio bij servisch restaurant

Cubaans

Garnalen bij barbecue

Indiaas eten

Indisch en Thais op Pasar Malam

Inktvis, garnalen, oesters, sushi, steakhouse, steengrillen

Italiaanse broodjes van de Jumbo

Kip in wokgerecht met glasnoodles

Tapas

Turkse punten met feta/gehakt van de groenteboer en een

Turkse zoete lekkernij waarvan ik de naam vergeten ben

arbeien

barbecue

broodje shaslik van shoarmazaak

carpaccio, ossenhaas en sla in restaurant

chinees

chinees (afhaal)

dieet voor coloscopie

haring

japans

kiploempia

voor onze dochter is veel nog nieuw. O.a. mexicaans met

bonen, mais, paprika, stokbrood met kruidenboter, augurken.

knolselderij, gember

marshmallows

melk via borstvoeding

mogelijk veemelk boerderij

mosselen

noodles

ongepasteuriseerde melk

paella met zeevruchten van lidl

patat

patat en poffertjes ivm vakantie

pepernoten

pompoenpannenkoek

rauwe zalm, vers van visboer

rijstemelk

sushi

verse geitenkaas,

yoghurt, geitenkaas

zalm

zilveruitjes

kipsatesalad van Albert Heijn



Conclusions study year 2

- *C. parvum* predominant agent of cryptosporidiosis
- Three independent risk factors associated with cryptosporidiosis:
 - Ate unusual food
 - Contact with a non-household diarrhoeal case
 - Contact with household diarrhoeal case



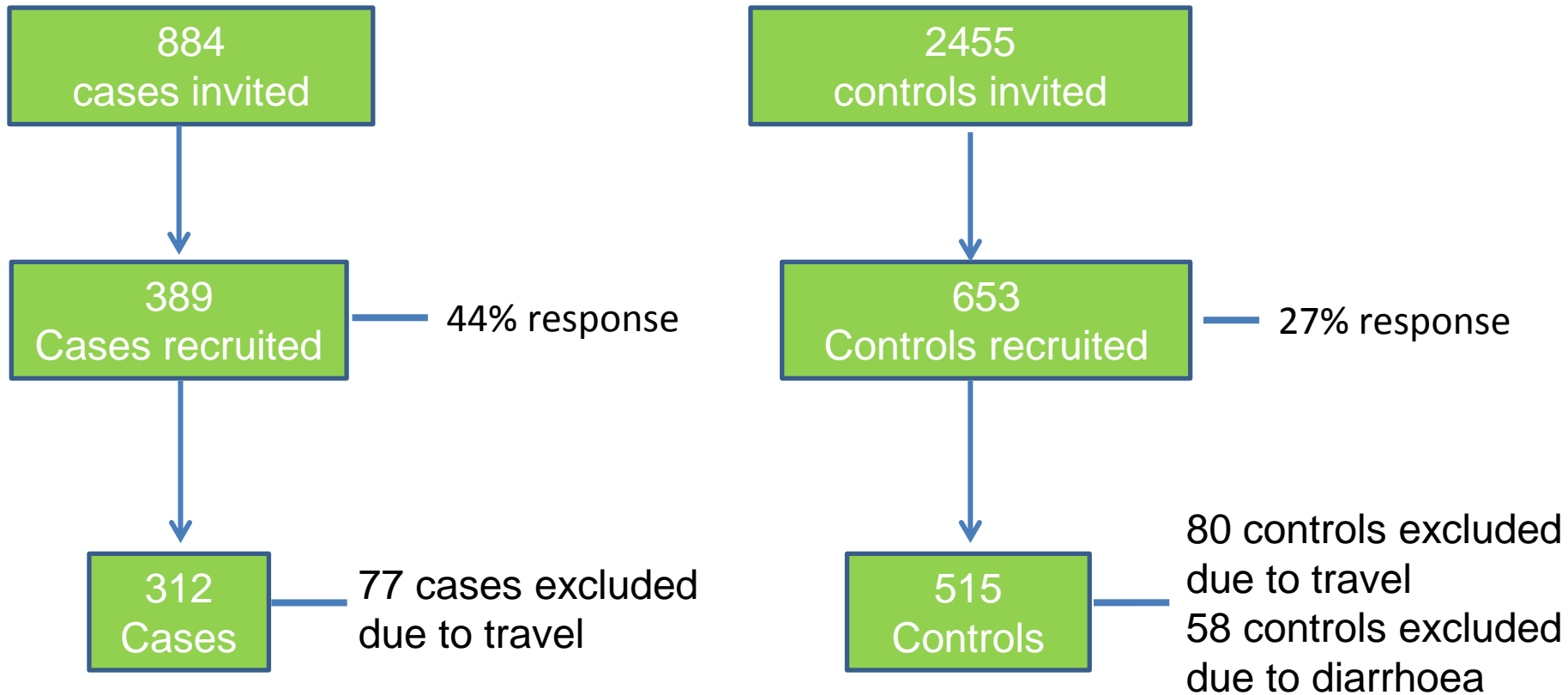
Risk factors

STUDY YEAR THREE

(preliminary analyses)

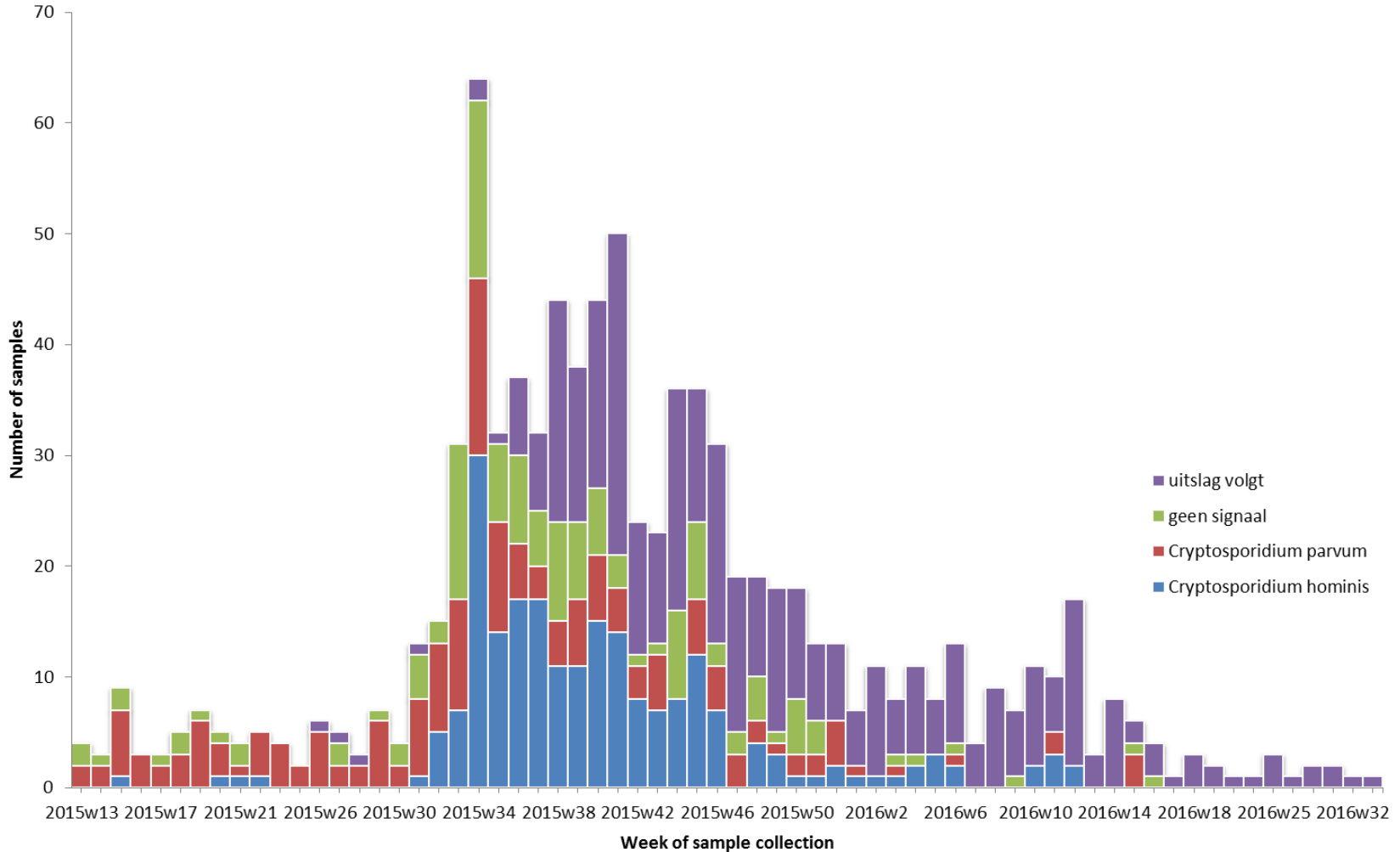


Recruitment of participants April 2015-April 2016





Cryptosporidium samples by species, the Netherlands, April 2015 - April 2016 (n=884*)

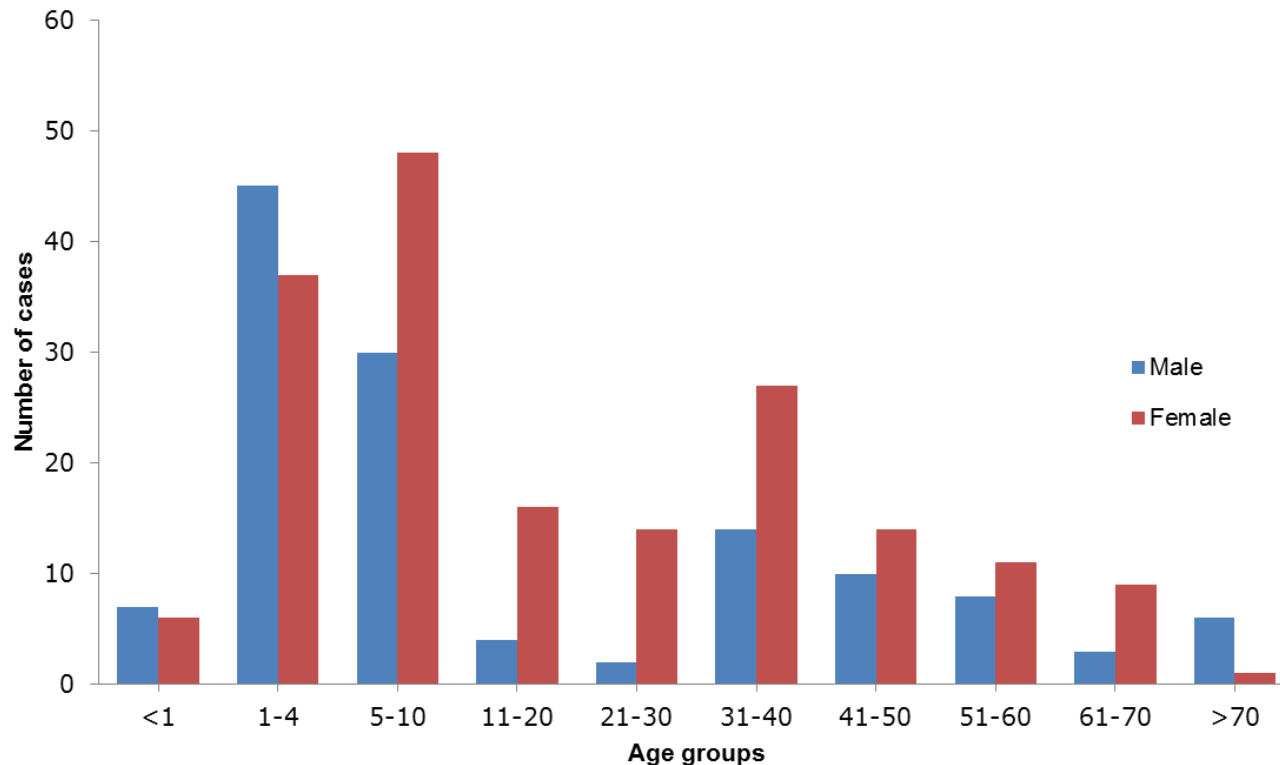


* 45 samples with missing date of sample collection



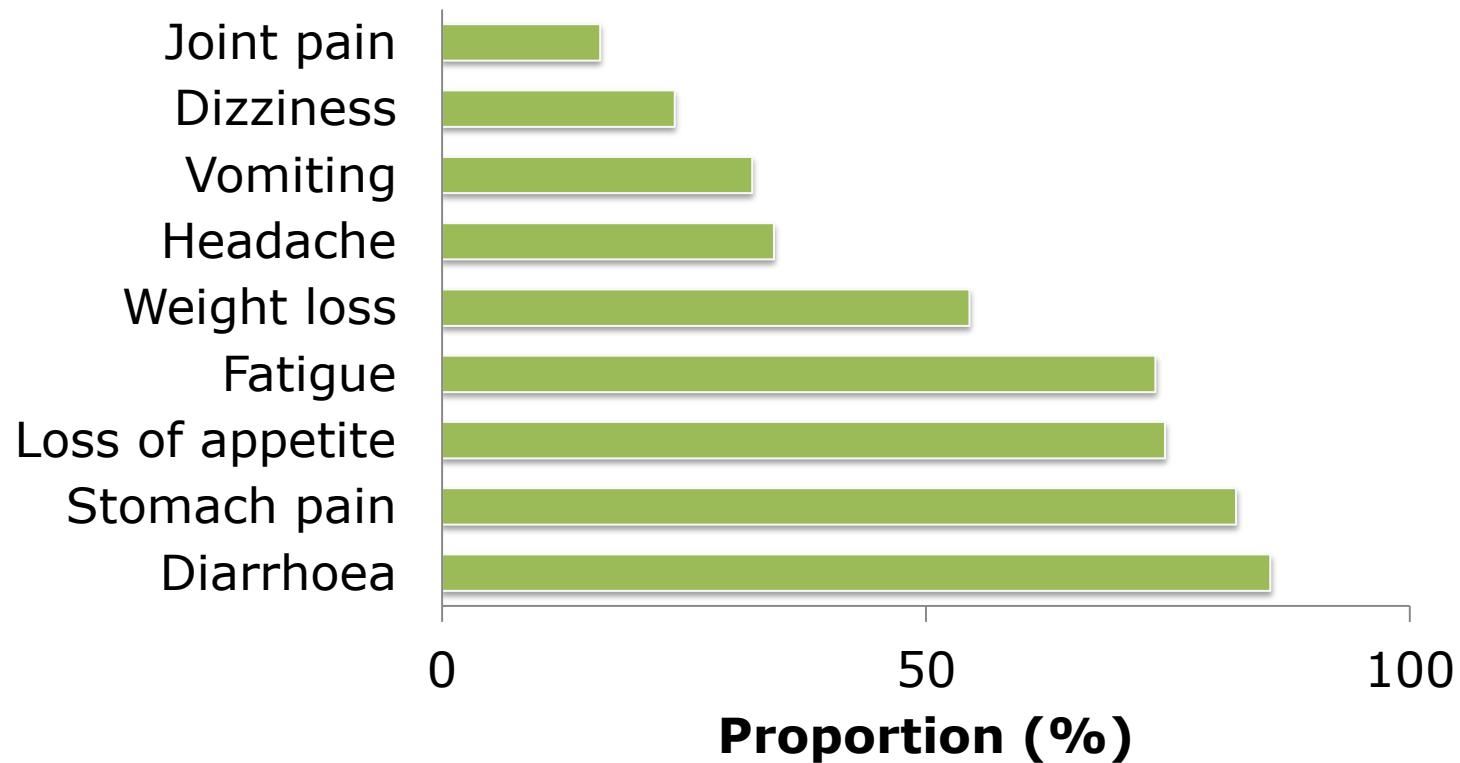
Characteristics of cases of cryptosporidiosis, the Netherlands, 2015-2016

- Median age of cases: 25 years (range 1-87)





Symptoms of cryptosporidiosis cases, the Netherlands, 2015-2016





Characteristics of cryptosporidiosis cases and controls, the Netherlands, 2015-2016 (I)

	Proportion of exposure (%)		Odds ratio*	P-value
	Cases	Controls		
Non-household diarrhoeal case	29 (9)	20 (4)	3.68	<0.001
Take immunosuppressive meds	24 (8)	18 (4)	3.12	0.001
Swallow water during sport	20 (6)	23 (4)	3.03	0.019
Household transmission	85 (27)	69 (13)	2.97	<0.001
Contact with cattle or calves	33 (11)	24 (5)	2.51	0.002
Swim in river or lake	18 (6)	21 (4)	2.39	0.014
Nappy changing of child <5 years	60 (19)	59 (11)	2.17	<0.001
Visited a farm	91 (29)	93 (18)	1.91	<0.001
Contact with sheep or lamb	26 (8)	23(4)	1.89	0.039
Swim in inflatable pool	83 (27)	90 (14)	1.82	0.002
Sand in mouth	33 (11)	46 (9)	1.80	0.031

*Single variable logistic regression adjusted for age, gender, season and excluding those who travelled²⁵



Characteristics of cryptosporidiosis cases and controls, the Netherlands, 2015-2016 (II)

	Proportion of exposure (%)		Odds ratio*	P-value
	Cases	Controls		
Swallow inflatable pool water	28 (9)	27 (5)	1.76	0.056
Contact with goats	36 (12)	33 (6)	1.75	0.034
Contact with animal feces	43 (14)	60 (12)	1.72	0.018
Swim in pool	145 (47)	180 (35)	1.64	0.002
Ate barbequed foods	70 (22)	113 (22)	1.59	0.019
Bottle fed child <5 years	40 (13)	49 (10)	1.50	0.081
Help child >5 years with toilet	36 (12)	48 (9)	1.50	0.095
Washed child >5 years	44 (14)	59 (11)	1.41	0.123
Ate filet American	72 (23)	109 (21)	1.41	0.068
Swallow pool water	70 (22)	98 (19)	1.40	0.094
Washed child <5 years	75 (24)	96 (19)	1.38	0.072

*Single variable logistic regression adjusted for age, gender, season and excluding those who travelled²⁶



Characteristics of cryptosporidiosis cases and controls, the Netherlands, 2015-2016 (III)

	Proportion of exposure (%)		Odds ratio*	P-value
	Cases	Controls		
Ate herbs	84 (27)	216 (52)	0.52	<0.001
Ate hard cheese	160 (51)	336 (65)	0.58	0.001
Ate raw vegetables	71 (23)	179 (35)	0.60	0.004
Ate tomatoes	176 (56)	367 (71)	0.65	0.013
Ate chicken	249 (80)	447 (87)	0.66	0.019
Drank pasteurised milk	186 (60)	345 (67)	0.66	0.018
Holiday in the Netherlands	73 (23)	167 (32)	0.67	0.022
Ate cream	122 (39)	247 (48)	0.73	0.049
Ate ice-cream	157 (50)	323 (63)	0.75	0.084

*Single variable logistic regression adjusted for age, gender, season and excluding those who travelled²⁷



Factors associated with cryptosporidiosis: multivariable analysis 2015-2016

Characteristics	Odds ratio*	95% CI
Immunosuppressed	4.8	1.7-7.8
Non-household diarrhoeal case	3.7	1.9-7.8
Household diarrhoeal case	3.5	2.0-6.1
Ate herbs	0.5	0.3-0.8



Conclusions study year 3

- *C. hominis* was the predominant agent of cryptosporidiosis
- Three independent risk factors associated with cryptosporidiosis
 - Being immunosuppressed
 - Contact with a non-household diarrhoeal case
 - Shared a house with a diarrhoeal case



In the near future...



- Finalise data management
 - Sometimes date of birth or date of sample collection is missing
 - Sometimes date of birth of parent (instead of child)
 - Check inconsistencies in questionnaire / database
- Finalise data analyses
 - Repeat year by year analyses
 - Conduct a combined analysis of three study years
 - Conduct a species specific analysis
 - Analyses of sequellae
- Write scientific report(s)
- Public health implications