WEB MATERIAL

Risk Factors for Bites and Diseases Associated With Black-Legged Ticks: A Meta-Analysis

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Web Appendix 1

Search Strategy for Identifying Articles on Spatial Risk Factors for People Acquiring Pathogenic *Ixodes scapularis* or *Ixodes pacificus*

Criteria:

- Location:
  - States with incidence of at least 1 Lyme disease cases per 100,000 people in 2016 (2), states of the Midwest and Northeast (3), and California, Oregon, and Washington
  - Canadian provinces with incidence of at least 1 case per 100,00 people in 2013, the most recently reported year, and British Columbia (4)
- Risk factors:
  - We included as search terms the direct risk factors of entomological risk and human behavior, the indirect risk factors of host community, land use and land cover, property management, and abiotic variables, and synonyms for these terms.
  - We further drew search terms from the set of variables used by studies included in a meta-analysis on spatial components of tick-borne disease risk (Fischhoff et al., *in revision*). The previous study excluded incidence-based studies. To increase yield of the present search of incidence studies, we added search terms from a sample of incidence studies. For a randomly selected 50% (N = 20) of the incidence studies excluded from the previous study, we extracted relevant variables analyzed by those studies and added these as search terms.
  - Additional search terms were taken from the text and images of the Lyme disease website of the CDC (5) and the Tick Management Handbook of the Connecticut Agricultural Experiment Station (6).
  - Exclude: Articles on irrelevant locations, hosts, vectors, and topics (e.g., physiology, symptoms, treatment)
- Vectors / pathogens: *Ixodes scapularis* or *I. pacificus*, or pathogens transmitted by these species
- Language: English
- Publication types: Article OR Book Chapter OR Correction OR Correction, Addition OR Data Paper OR Early Access OR Note OR Proceedings Paper OR Retraction)

Advanced search in Web of Science matching above criteria:

TS = ((United States OR California OR Connecticut OR Delaware OR District of Columbia OR

Kansas OR Illinois OR Iowa OR Indiana OR Maine OR Maryland OR Massachusetts OR

Michigan OR Minnesota OR Missouri OR Montana OR Nebraska OR New Hampshire OR New Jersey OR New York OR North Dakota OR Ohio OR Oregon OR Pennsylvania OR Rhode Island OR South Dakota OR Vermont OR Virginia OR Washington OR West Virginia OR Wisconsin OR

Canad* OR Manitoba OR Ontario OR Quebec OR Nova Scotia OR British Columbia OR risk* factor*)

AND

(*Ixodes scapularis* OR *Ixodes dammini* OR *Ixodes pacificus* OR deer tick OR blacklegged tick OR black-legged tick OR Lyme OR Borreli* OR Babesi* OR Powassa* OR deer tick virus OR Anaplasm* OR phagocytophil* OR miyamotoi OR human granulocytic ehrlichi* OR Ehrlichia chaffeensis) AND

(risk* factor* OR case-control OR case* OR Odds Ratio OR longitudinal OR seropositive OR seroprevalen* OR incidence OR survey OR relative risk OR peridomestic* OR peri-domestic OR non-peridomestic OR nonperidomestic* OR neighbor* OR

acaricide* OR insecticide OR

acaricide* OR spray* OR

acorn OR

activity OR expos* OR

age OR hous* OR

animal* OR deer OR raccoon* OR stray dog* OR fence*` OR

avoid* OR brush* OR

avoid* OR brush* OR high grass* OR leaf litter OR

avoid* OR prevent* OR self protect* OR

barrier* OR wood chip* OR gravel OR

bath* OR shower* OR wash* off OR find* & tick* OR crawl* OR

bathe* OR yard* OR

Bird* OR feed* OR

birdfeeder OR

blacklegged tick OR

camp* OR

children OR outdoor OR sports OR

Clear* brush* OR

clear* grass* OR clear* brush* OR

Clear* litter OR

cloth* OR permethrin OR

Court* OR garden OR woods OR

coyote* OR

Deer damage* OR

deer OR

deer OR fenc* OR

deer population density OR

deer tick OR

deer vehicle accidents OR

Densit* infect* nymph* OR

density development OR less developed OR

developed land* OR

developed OR

developed OR landscape* OR

development level* OR

Distance* forest* OR

Dog OR household OR

dry barrier OR barrier OR lawn OR woods OR

dry* cloth* tick OR heat tick* cloth OR

ecologic region OR

ecosystem OR biotic OR abiotic OR weather OR

edge OR

edge* OR

entomologic* OR

entomologic* risk* index OR

entomological risk OR

entomological risk* index OR

feed birds OR

feed mammals OR

Feed* birds property OR

fence OR

find* tick* OR during search OR

Fish* OR

forest OR

forest OR shrub OR grass OR

forest patch area OR

forest* density OR

forest* land* OR

forest* OR

forest* OR fragment* OR

forest* OR patch* OR

Found tick OR

four-poster OR 4-poster OR

furniture OR mattress* OR trash OR hide* OR

garden* OR

gear OR pet* OR attach person OR coat* OR

golf* OR

Ground cover OR

Groundhog* OR

herbaceous developed land* OR

herbaceous land* cover OR

herbaceous OR

herbaceous OR forest* OR

herbaceous* OR

hik* OR

host communit* OR wildlife OR

human behav* OR behav* person OR behav people OR

Hunt* OR

infect* Borrelia burgdorferi OR nymph* Borrelia burgdorferi OR tick* Borrelia burgdorferi OR

Ixodes scapularis OR Ixodes pacificus OR

Ixodes scapularis OR Ixodes pacificus OR nymphs OR

job* wood* OR

land use develop* OR land use OR

land use OR land cover OR landscape OR

Landscap* tick* control* OR

landscape* OR

latitude* OR

Leaf litter OR

light color* cloth* OR

log pile OR yard OR

long pant* OR

long-sleeved OR

mice OR deer OR rodent* OR white-footed mouse OR eastern chipmunk OR

Mice OR mouse OR

mouse abundan* OR

Mow* OR lawn OR grass OR

normalized difference vegetation index OR NDVI OR

nymphal tick* OR

Occupat* OR

oil of lemon eucalyptus, OR para-menthane-diol, OR 2-undecanone OR

outdoor OR job* OR

outdoor OR recreat* OR

outdoor work* OR

outdoor* OR tick habitat OR woods OR field* OR activit* OR

outdoor* OR work* OR

outdoor* tick habitat woods fields OR

outdoors OR yard OR

Outside OR work* OR

Own* cat OR

Own* dog OR

Own* horse OR

Own* pet OR

Palmer Hydrologic Drought Index OR

pant* socks OR

patch* OR edge* OR

perimeter* OR

Permethrin OR bifenthrin OR carbaryl OR cyfluthrin OR deltamethrin OR lambda-cyhalothrin OR Pyrethrin OR

permethrin OR cloth* OR gear OR boot* OR pant* OR sock* OR tent* OR

pesticide* OR

pets OR home OR

Picnic OR

playground OR decks OR patio OR

population density OR

precipitation* OR

preventive OR

propert* management OR residen* management OR tick control OR

Protect* cloth* OR

protective OR measure* OR use* OR

proximity wooded OR

red fox OR

repel* OR DEET OR picaridin OR IR3535 OR expos* skin OR

repellent* OR

ride Horse* OR

rock* wall* OR

rodent control OR

Rural OR

Shrub OR land OR

Single family home OR

slope OR

Soils OR

spen* vegetation OR

stack* wood* OR dry wood area OR discourage rodent* OR

stone* wall* OR

Suburb* OR

summer precipitation OR

summer* temperature* OR

surface* water* OR

temperature* OR
tick abundance OR
tick bite OR
tick bite recog* OR
tick check OR tick infested OR
tick remov* OR
tick repellent* OR
tick safe zone OR
tick* abundan* OR
tick* check* OR
tick* densit* OR
tick* pet OR
trim branch* OR
Tuck pant* sock* OR
Unpowered OR
Urban OR
vegetable* OR garden* OR
village* OR
Visit parks OR
Visit* risk region OR
Walk outdoor* OR jog OR
Walk wood* OR jog OR
walk* OR center OR trail* OR
winter* temperature* OR
wood pile OR wood chip OR barrier OR
wood* yard* OR
Woodpile* OR wood pile OR
Woods OR
woods OR recreat* OR woods OR play* OR
woods propert* OR wood* neighbor* OR wood* county OR
work* OR recreation* OR outdoor* OR home* OR repellent* OR
work* outdoor* OR
yard work OR
yard* land* OR yard* home* OR home*

)

NOT

(Europe* OR Austria OR Italy OR Belgium OR Latvia OR Bulgaria OR Lithuania OR Croatia OR Luxembourg OR Cyprus OR Malta OR Czech Republic OR Netherlands OR Denmark OR Poland OR Estonia OR Portugal OR Finland OR Romania OR France OR Slovakia OR Germany OR Slovenia OR Greece OR Spain OR Hungary OR Sweden OR Ireland OR United Kingdom OR Switzerland OR China OR Africa* OR Kenya OR Brazil OR Turkey OR Zimbabwe OR India OR Ghana OR Sri Lanka OR Asia*))

NOT

TI = (canine OR horse* OR cat* OR feline OR chicken* OR fox* OR raccoon* OR bird* OR Rhipicephalus OR *Boophilus OR* Amblyomma OR Argasidae OR Dermacentor OR *Haemaphysalis* OR affinus OR

host OR detection OR surg* OR blood* OR genom* OR enzym* OR RNA OR reservoir OR DNA OR microb* OR card* OR molec* OR protein*)

AND Language: English

AND publication type: Article OR Book Chapter OR Correction OR Correction, Addition OR Data Paper OR Early Access OR Note OR Proceedings Paper OR Retraction)

Web Appendix 2

Procedures for Converting Data Types to Log Odds Ratios and Log Odds Ratio Standard Errors

Odds ratio

If a study reported the odds ratio, risk ratio, or rate ratio and confidence intervals associated with a risk factor, these ratio values were used to calculate the log odds ratio and log standard error. If the reported odds ratio was zero, this would result in an undefined log odds ratio value; therefore, a small number (0.0001) was added to these odds ratio and confidence interval values. If the log standard error equaled zero, this would prevent the data being used in meta-analysis; therefore, a small number (0.01) was added to all log standard error values.

Odds ratio, multiple values per variable

If multiple odds ratio values were reported for a variable and study, the log standard error was estimated across the log odds ratio values and assumed to apply to each data point in the set. A pooled estimate of the log odds ratio value was computed across the set of reported log odds ratio values.

Case control, continuous predictor

For studies reporting means and standard deviations for continuous predictors (e.g. hours per week in an activity) for cases and controls, these data were used to calculate the standardized mean difference d, between cases and controls, and the standard error around d, $\mathrm{SE_d}$ using function "escalc" in package "metafor" (7). Then we converted from d to the log odds ratio: $\mathrm{Log(OddsRatio)} = d\frac{\pi}{\sqrt{3}}$, and from $\mathrm{SE_d}$ to the log standard error: $\mathrm{Log(SE)} = \mathrm{SE}(d)\frac{\pi}{\sqrt{3}}$ (8). If a

study did not report the standard deviation or other measure of variance around the continuous predictor, but did report a P value, then the latter was used to obtain the standard deviation (9). If the study provided neither standard error nor P value, then the missing standard deviation values were multiply imputed based on repeated random draws from the standard deviation values reported across all studies. Simulation studies indicate ecological meta-analysis results are robust to use of multiple imputation (10), which was accomplished using the R package "mi".

Case control counts, categorical predictor

If case control data were reported (cases and controls with and without a risk factor), then log odds ratios and log standard errors were calculated using the Mantel-Hanszel method (function "rma.mh" in R package "metafor"). Where case control data were provided for more than categories of a factor, then the category with the lowest risk was designated the control level. IN that case, odds ratios were calculated between the control level and each other category. A pooled estimate was computed across all the log odds values for a given variable and study.

Cases and population size, two or more categories within a variable

If cases, but not population size, were reported at the U.S. county or state level, then population data were obtained from the Census for the relevant age, sex, origin, or race (11). If cases and population were reported for multiple categories of people (e.g. age classes), then the incidence rate ratio was calculated for each category. Then log odds ratios and log standard errors were calculated for each category with incidence greater than that of the lowest-incidence category. In computing log odds ratios, the Mantel-Haenszel method was applied with cases and population size for the category with the lowest incidence considered the control data, while each category

with higher incidence was considered, in turn, the treatment data (12). Using meta-analysis, a pooled log odds estimate was then found across all the log odds ratios for a given variable within a study.

Incidence in relation to predictor values

If multiple incidence and risk factor data were reported for a variable and study, then a generalized linear model (GLM) was constructed predicting incidence based on risk factor values. errors. Incidence was rounded to the nearest integer value. The GLM was constructed using the "glm" function in base R, with poisson-distributed errros. The log odds ratio value and log standard error were estimated by the beta coefficient and standard error of the beta coefficient in the fitted GLM (13). If a study directly reported the beta coefficient and standard error for a regression, then these were used similarly to estimate the log odds ratio and log standard error (14). If data on percent reporting an outcome (e.g. tick bite) were provided, then a linear model was constructed and the log odds ratio was obtained from the beta coefficient. If incidence or percent values were provided in relation to ranges, rather than means, of predictor values, then the midpoints of the ranges were used.

Cases and population in relation to predictor values

If cases, population size, and predictor values were reported, then incidence and standard error around incidence values were computed. These data were then used in fixed effects meta-regression against the predictor variable.

Cases and population before and after change in a predictor

For studies reporting cases and population before and after an intervention, values for incidence and log standard error in incidence were first computed (using measure "IR" in "metafor" function "rma"). These values were then used to calculate the standardized mean change from before to after, using measure "SMCR" in function "rma". The log odds ratio and log standard error were calculated based on this standardized mean difference (8).

Rate ratio, before after control impact

For studies reporting rate ratios, and standard deviation around the rate ratios, before and after an intervention, we found the difference between the impact vs. control log odds ratio, after the intervention, minus the impact vs. control log odds ratio before the intervention. The pooled log standard error was obtained with the formula: $\sqrt{SE_{before}^2 + SE_{after}^2}$ (15).

Multiple regression

If a study reported results of multiple regression, then the log odds ratio and log standard error were estimated based on the partial correlation coefficient, and standard error for that coefficient. The partial correlation coefficient was estimated based on the t value for each variable, sample size, and number of predictors in the multiple regression. Partial correlation coefficients were obtained using the "rma" function (measure = "PCOR") in R package "metafor".

Correlation coefficient and sample size

If a study reported the sample size and either the correlation coefficient between incidence and predictor value, or the r-squared value and direction of the relationship (positive or negative),

then these values were used to obtain the standard error around the correlation coefficient: $SE_r = \frac{\sqrt{1-r^2}}{n-2}$ (16). For papers that reported the confidence interval around the correlation coefficient, this was used to compute the standard error. The correlation coefficient and standard error around the correlation coefficient were used to compute first the standardized mean difference d and variance around d, and then these values were used to obtain the log odds ratio and log standard error (8). If multiple levels were reported for a variable (e.g., multiple years), then a pooled estimate was obtained using function “rma” in package “metafor”.

Effect sizes

If a study reports effect sizes and confidence intervals, these data are used to estimate the log odds ratio and log standard errors using function “rma” in package “metafor”.

Web Table 1.

Reclassification of Similar Variables Into Unified Variable Names

	Variable	Variable.Recategorized	Count_Variable_Recategorized	Variable.Make.Opposite	Category
1	ethnicity non-hispanic vs ethnicity hispanic	hispanic	6	1	socio-demographic
2	race white vs race black	non-white	6	1	socio-demographic
3	origin non-hispanic vs origin hispanic	hispanic	6	1	socio-demographic
4	rural neighborhood (vs. urban or subdivision)	pop. density	12	1	land use land cover
5	residence in rural area	pop. density	12	1	land use land cover
6	residence in sparsely populated area	pop. density	12	1	land use land cover
7	race: white vs. people of color	non-white	6	1	socio-demographic
8	clear litter where lawn met woods	compost / litter / cover	6	1	property management
9	residential setting relative to village outside village vs. inside village	pop. density	12	1	land use land cover
10	race: white vs. non-white	non-white	6	1	socio-demographic
11	whites vs. non-whites	non-white	6	1	socio-demographic

12	distance to coastline	coast	3	1	land use land cover
13	rural residence	pop. density	12	1	land use land cover
14	residence rural vs suburban	pop. density	12	1	land use land cover
15	did not use insect repellent	repellent	39	1	self-protection
16	rural vs. nonrural residence	pop. density	12	1	land use land cover
17	suburban vs. urban	pop. density	12	1	land use land cover
18	race asian vs race black	other vs. black	2	NA	socio-demographic
19	origin hispanic vs origin non-hispanic	hispanic	6	NA	socio-demographic
20	race other vs race black	other vs. black	2	NA	socio-demographic
21	self protection	protect generic	6	NA	self-protection
22	woods	forest	55	NA	land use land cover
23	ld awareness	awareness	23	NA	self-protection
24	outdoor activity	activity generic	8	NA	activity
25	visited high risk region	travel risky area	3	NA	activity
26	occupational tick exposure	occupational exposure	13	NA	activity
27	courtyard, garden or wooded	cover generic	9	NA	land use land cover

28	hours of outdoor recreational activity	outdoor recreation	16	NA	activity
29	clearing brush on and off property	landscape control	5	NA	property management
30	property size >2 acres	yard size	6	NA	land use land cover
31	camping	camping	7	NA	activity
32	jogging	walk / jog	5	NA	activity
33	time spent outdoors, median: in yard	yard work	14	NA	activity
34	time spent outdoors, median: in tick habitat	time in vegetation	3	NA	activity
35	average density of host-seeking i. scapularis	density ticks	10	NA	entomological risk
36	average prevalence of b. burgdorferi infected nymphs	din	14	NA	entomological risk
37	patch isolation	isolation	1	NA	land use land cover
38	patch size	cover generic	9	NA	land use land cover
39	number days >25 c + no precip. nymphal peak - may-jul	hot / dry	9	NA	abiotic
40	number days >25 c + no precip. larval peak - year t-1 aug-sept	hot / dry	9	NA	abiotic
41	proportion of correct knowledge questions	awareness	23	NA	self-protection
42	wear long sleeves	clothing	57	NA	self-protection
43	wear long pants	clothing	57	NA	self-protection

44	wear pants tucked into socks	clothing	57	NA	self-protection
45	repellent deet	repellent	39	NA	self-protection
46	tick check briefly	tick check	29	NA	self-protection
47	tick check exposed skin	tick check	29	NA	self-protection
48	tick check entire body	tick check	29	NA	self-protection
49	tick check body and scalp	tick check	29	NA	self-protection
50	natural or organic repellent	repellent	39	NA	self-protection
51	permethrin	repellent	39	NA	self-protection
52	use repellent all the time	repellent	39	NA	self-protection
53	wear protective clothing all the time	clothing	57	NA	self-protection
54	bathing or showering within two hours	bathe	3	NA	self-protection
55	perform tick check	tick check	29	NA	self-protection
56	checked body for ticks after outings	tick check	29	NA	self-protection
57	used insect or tick repellent during outings	repellent	39	NA	self-protection
58	residence near woods	forest	55	NA	land use land cover
59	residence near any body of water	water	6	NA	land use land cover
60	residence near overgrown weeds	herbaceous	20	NA	land use land cover
61	fishing	fish / raft	7	NA	activity
62	residence near pond or lake	water	6	NA	land use land cover

63	hunting	hunting	6	NA	activity
64	temperature variability and altitude	generic abiotic	1	NA	abiotic
65	temperature	temperature	21	NA	abiotic
66	human population density	pop. density	12	NA	land use land cover
67	mammalian richness	richness	5	NA	host community
68	density of infected nymphs	din	14	NA	entomological risk
69	pesticides for non-ticks	acaricide	6	NA	property management
70	fence (deer-exclusion)	fence	7	NA	property management
71	repellent	repellent	39	NA	self-protection
72	mowed lawn	yard work	14	NA	activity
73	bird feeder	feed wildlife	10	NA	property management
74	dry barrier where lawn met woods	landscape control	5	NA	property management
75	bathed	bathe	3	NA	self-protection
76	tuck pants into socks	clothing	57	NA	self-protection
77	light-colored clothing	clothing	57	NA	self-protection
78	sprayed acaricide	acaricide	6	NA	property management
79	permethrin-treated clothing	repellent	39	NA	self-protection
80	rodent-targeted tick-control	rodent tick control	1	NA	property management

81	log pile	wood pile	6	NA	property management
82	long pants	clothing	57	NA	self-protection
83	tick checking	tick check	29	NA	self-protection
84	fence on property (any)	fence	7	NA	property management
85	rock wall	stone wall	7	NA	property management
86	garden	garden	10	NA	property management
87	trimmed branches where lawn met woods	landscape control	5	NA	property management
88	setting relative to coast coastal vs. inland	coast	3	NA	land use land cover
89	lyme disease educational intervention by planned length of stay among visitors	awareness	23	NA	self-protection
90	lyme disease educational intervention by nantucket residence	awareness	23	NA	self-protection
91	visitor vs. resident	residence time	5	NA	socio-demographic
92	lyme disease educational intervention	awareness	23	NA	self-protection
93	density of nymphs infected with b. burgdorferi	din	14	NA	entomological risk
94	infection rate nymphal ticks with borrelia burgdorferi	nip	3	NA	entomological risk

95	infection rate nymphal ticks with b. microti	nip	3	NA	entomological risk
96	percent of ticks infected with b. burgdorferi	infected prevalence	1	NA	entomological risk
97	abundance of adult female ticks	density adults	2	NA	entomological risk
98	abundance of nymphs	density ticks	10	NA	entomological risk
99	owning a horse	horse	5	NA	socio-demographic
100	owning a different pet	pets / animals	12	NA	socio-demographic
101	lawn largest patch index	herbaceous	20	NA	land use land cover
102	lawn edge density	herbaceous	20	NA	land use land cover
103	hours in vegetation	time in vegetation	3	NA	activity
104	landscape tick control measures	landscape control	5	NA	property management
105	shrub class area	herbaceous	20	NA	land use land cover
106	any protective measure	protect generic	6	NA	self-protection
107	avoiding brush	avoid ticks	6	NA	self-protection
108	shrub percentage of land	herbaceous	20	NA	land use land cover
109	shrub total edge	herbaceous	20	NA	land use land cover

110	owning a dog	dog	8	NA	socio-demographic
111	owning a cat	cat	8	NA	socio-demographic
112	protective clothing	clothing	57	NA	self-protection
113	shrub landscape shape index	herbaceous	20	NA	land use land cover
114	shrub largest patch index	herbaceous	20	NA	land use land cover
115	shrub edge density	herbaceous	20	NA	land use land cover
116	race: american indian to black	american indian	3	NA	socio-demographic
117	race: american indian to asian/pacific islander	american indian	3	NA	socio-demographic
118	race: american indian to white	american indian	3	NA	socio-demographic
119	travel status travel to wooded, brushy, or grassy area in high incidence state vs. no travel to wooded, brushy, or grassy area in high incidence state	travel risky area	3	NA	activity
120	median duration (years) of residence	residence time	5	NA	socio-demographic
121	wear long-sleeved shirt	clothing	57	NA	self-protection
122	deer hunt vs. control town	deer hunt	5	NA	host community
123	four-poster vs. control town	deer four-poster	1	NA	host community

124	land use: highly developed vs. reference	developed	43	NA	land use land cover
125	slope	slope	1	NA	abiotic
126	soil	soils	1	NA	abiotic
127	tick check	tick check	29	NA	self-protection
128	clothing repellent	repellent	39	NA	self-protection
129	skin repellent	repellent	39	NA	self-protection
130	long sleeves	clothing	57	NA	self-protection
131	tuck pants	clothing	57	NA	self-protection
132	employee role	employment	3	NA	socio-demographic
133	black, non-hispanic vs. white	non-white	6	NA	socio-demographic
134	employer	employment	3	NA	socio-demographic
135	length of service	employment	3	NA	socio-demographic
136	college education vs. high school or lower	higher ed.	1	NA	socio-demographic
137	ground combat vs. not ground combat	occupational exposure	13	NA	activity
138	hispanic vs. white	hispanic	6	NA	socio-demographic
139	highest vs. lowest poverty level	income	9	NA	socio-demographic

140	wear light colored clothing -- heard about	clothing	57	NA	self-protection
141	wear hat to keep ticks out of hair	clothing	57	NA	self-protection
142	tuck pants into socks or boots	clothing	57	NA	self-protection
143	spray self with repellent	repellent	39	NA	self-protection
144	avoid sandals or going barefoot	clothing	57	NA	self-protection
145	avoid sandals or going barefoot -- heard about	awareness	23	NA	self-protection
146	wear long-sleeved shirt -- heard about	clothing	57	NA	self-protection
147	wear long pants -- heard about	awareness	23	NA	self-protection
148	wear long pants today	clothing	57	NA	self-protection
149	stay on trails -- heard about	awareness	23	NA	self-protection
150	inspect skin during/after hiking	tick check	29	NA	self-protection
151	inspect skin during/after hiking -- heard about	awareness	23	NA	self-protection
152	wear light colored clothing	clothing	57	NA	self-protection
153	avoid areas with long grass, woods, or brush -- heard about	awareness	23	NA	self-protection
154	avoid areas with long grass, woods, or brush	avoid ticks	6	NA	self-protection
155	tuck pants into socks or boots -- heard about	clothing	57	NA	self-protection
156	spray self with repellent - heard about	awareness	23	NA	self-protection
157	stay on trails	avoid ticks	6	NA	self-protection

158	knowing about at least one precaution	awareness	23	NA	self-protection
159	doing anything today to protect self	protect generic	6	NA	self-protection
160	taking any precautions	protect generic	6	NA	self-protection
161	percent forest squared	forest	55	NA	land use land cover
162	income	income	9	NA	socio-demographic
163	income squared	income	9	NA	socio-demographic
164	percent of edge between forest and open rural land, out of all landcover edge in analysis unit	developed-forest	20	NA	land use land cover
165	percent forest	forest	55	NA	land use land cover
166	vacationing in endemic county	travel risky area	3	NA	activity
167	(percent herbaceous cover)^2	herbaceous	20	NA	land use land cover
168	household income	income	9	NA	socio-demographic
169	(household income)^2	income	9	NA	socio-demographic
170	percent herbaceous edge adjacent to forest	herbaceous-forest	5	NA	land use land cover
171	percent herbaceous cover	herbaceous	20	NA	land use land cover

172	edge contrast index: percent of edge that is forest-herbaceous	herbaceous-forest	5	NA	land use land cover
173	number of forest patches <2 ha	forest	55	NA	land use land cover
174	percentage forest	forest	55	NA	land use land cover
175	landscape area	cover generic	9	NA	land use land cover
176	flower garden	garden	10	NA	property management
177	sitting area	activity area	13	NA	property management
178	pet ownership	pets / animals	12	NA	socio-demographic
179	tick control for cat	repellent	39	NA	self-protection
180	found ticks on pets	tick presence	6	NA	entomological risk
181	compost pile	compost / litter / cover	6	NA	property management
182	dining area	activity area	13	NA	property management
183	fencing	fence	7	NA	property management
184	stone walls	stone wall	7	NA	property management
185	children's equipment	activity area	13	NA	property management

186	dog only	dog	8	NA	socio-demographic
187	lawn sport area	activity area	13	NA	property management
188	vegetable garden	garden	10	NA	property management
189	both cat and dog	pets / animals	12	NA	socio-demographic
190	tick control for any pet	repellent	39	NA	self-protection
191	cat only	cat	8	NA	socio-demographic
192	deer density	deer	12	NA	host community
193	nymphal tick abundance	din	14	NA	entomological risk
194	nymphal tick densities in woods	din	14	NA	entomological risk
195	nymphal tick densities in lawn	din	14	NA	entomological risk
196	eri (entomological risk index, average number of infected nymphs per area) lawn) woods	din	14	NA	entomological risk
197	after vs. before deer abundance -- winter aerial survey	deer hunt	5	NA	host community
198	percentage ticks infected with borrelia burgdorferi	density infected	4	NA	entomological risk

199	eri (entomological risk index, average number of infected nymphs per area) lawn	din	14	NA	entomological risk
200	after vs. before deer hunt	deer hunt	5	NA	host community
201	after vs. before percentage residents reporting group size >- 4 deer	deer hunt	5	NA	host community
202	after vs. before percentage residents observing deer daily	deer hunt	5	NA	host community
203	ixodes scapularis distribution	tick presence	6	NA	entomological risk
204	normalized difference vegetation index	ndvi	2	NA	land use land cover
205	blacklegged ticks on property	tick presence	6	NA	entomological risk
206	ground cover including moist humus	compost / litter / cover	6	NA	property management
207	leaf litter	compost / litter / cover	6	NA	property management
208	groundhogs	groundhogs	1	NA	host community
209	warm weather clothing index	clothing	57	NA	self-protection
210	hiking	hiking	10	NA	activity
211	gardening	yard work	14	NA	activity
212	woodcutting	yard work	14	NA	activity
213	sunbathing	outdoor recreation	16	NA	activity
214	bird watching	outdoor recreation	16	NA	activity

215	horseback riding	horse	5	NA	socio-demographic
216	work and leisure outdoors fall	activity generic	8	NA	activity
217	clothing index x no. hours outdoors winter	clothing	57	NA	self-protection
218	clothing index x no. hours outdoors spring	clothing	57	NA	self-protection
219	clothing index x no. hours outdoors summer	clothing	57	NA	self-protection
220	clothing index x no. hours outdoors fall	clothing	57	NA	self-protection
221	clothing index x no. hours outdoors total	clothing	57	NA	self-protection
222	work and leisure outdoors winter	activity generic	8	NA	activity
223	work and leisure outdoors spring	activity generic	8	NA	activity
224	work and leisure outdoors summer	activity generic	8	NA	activity
225	years of residence	residence time	5	NA	socio-demographic
226	work and leisure outdoors total	activity generic	8	NA	activity
227	foxes per 1000 hours	fox	2	NA	host community
228	coyotes per fox	coyote	2	NA	host community
229	antlered deer harvest per mile squared	deer	12	NA	host community
230	coyote	coyote	2	NA	host community
231	fox	fox	2	NA	host community
232	deer	deer	12	NA	host community

233	camping >=0 hours/month vs. 0	camping	7	NA	activity
234	field games >=1 hours/month vs. 0	outdoor recreation	16	NA	activity
235	fishing >=1 hours/month vs. 0	fish / raft	7	NA	activity
236	mountain biking >=1 hours/month vs. 0	outdoor recreation	16	NA	activity
237	road biking >=1 hours/month vs. 0	outdoor recreation	16	NA	activity
238	deer observed in yard/month >=1 vs. 0	deer	12	NA	host community
239	jogging >=1 hours/month vs. 0	walk / jog	5	NA	activity
240	hiking >=1 hours/month vs. 0	hiking	10	NA	activity
241	rafting >=1 hours/month vs. 0	fish / raft	7	NA	activity
242	lizards observed in yard/month >=1 vs. 0	lizards	1	NA	host community
243	work outdoors yes vs. no	occupational exposure	13	NA	activity
244	trails wilderness hours/wk	hiking	10	NA	activity
245	read info on lyme disease	awareness	23	NA	self-protection
246	trails >=2 ft wide hours/month	hiking	10	NA	activity
247	hours/month spent clearing brush >= 1 vs. 0	yard work	14	NA	activity
248	hours/month spent weeding	yard work	14	NA	activity
249	remove tick with tweezers by twisting yes vs. no	tick check	29	NA	self-protection
250	ticks found on pet	ticks on pets	2	NA	entomological risk
251	check cat for ticks in month yes vs. no	tick check	29	NA	self-protection

252	remove tick with tweezers by pulling straight yes vs no	tick check	29	NA	self-protection
253	wear long pants outside	clothing	57	NA	self-protection
254	burn tick with match	tick check	29	NA	self-protection
255	pull tick out with fingers	tick check	29	NA	self-protection
256	contact with domestic animals in month yes vs. no	pets / animals	12	NA	socio-demographic
257	contact with a dog in month yes vs. no	dog	8	NA	socio-demographic
258	check dog for ticks in month yes vs. no	tick check	29	NA	self-protection
259	know lyme disease is in ca	awareness	23	NA	self-protection
260	contact with a cat in month yes vs. no	cat	8	NA	socio-demographic
261	trails narrow hours/wk	hiking	10	NA	activity
262	check for ticks	tick check	29	NA	self-protection
263	hours/month spent outdoors (leisure time)	outdoor recreation	16	NA	activity
264	hours/month spent on unpaved trails	hiking	10	NA	activity
265	hours/week spent in yard	yard work	14	NA	activity
266	use of insect repellent in month yes vs. no	repellent	39	NA	self-protection
267	wear light colors	clothing	57	NA	self-protection
268	wears socks tucked in pants 20-100% of time vs. 0-5%	clothing	57	NA	self-protection

269	coniferous	forest	55	NA	land use land cover
270	herbaceous	herbaceous	20	NA	land use land cover
271	development	developed	43	NA	land use land cover
272	forest patch size and forest patch isolation (lyme patch)	forest	55	NA	land use land cover
273	forest patch size and forest patch isolation (tick patch)	forest	55	NA	land use land cover
274	ndvi	ndvi	2	NA	land use land cover
275	forest cover percent	forest	55	NA	land use land cover
276	entomological risk index (infected nymphs / minute)	din	14	NA	entomological risk
277	nymphal tick abundance (per minute)	din	14	NA	entomological risk
278	nymphal tick infection rate with borrelia burgdorferi	nip	3	NA	entomological risk
279	precipitation may june	precipitation	10	NA	abiotic
280	cumulative gdd above 10 c through week 21	temperature	21	NA	abiotic
281	mean saturation deficit before onset	precipitation	10	NA	abiotic
282	cumulative precipitation after week 8	temperature	21	NA	abiotic
283	cumulative gdd above 10 c through week 20	temperature	21	NA	abiotic

284	hispanic vs. non-hispanic summer months	hispanic	6	NA	socio-demographic
285	hispanic vs. non-hispanic fall months	hispanic	6	NA	socio-demographic
286	nymphal ticks collected per hour	don	3	NA	entomological risk
287	tick infection rate	infection prevalence	2	NA	entomological risk
288	entomologic risk index	din	14	NA	entomological risk
289	percent forested	forest	55	NA	land use land cover
290	clear brush	landscape control	5	NA	property management
291	woodpile	wood pile	6	NA	property management
292	deer damage landscape	deer	12	NA	host community
293	deer on property	deer	12	NA	host community
294	bird species richness	richness	5	NA	host community
295	lizard species richness	richness	5	NA	host community
296	small mammal species richness	richness	5	NA	host community
297	check body	tick check	29	NA	self-protection
298	avoid ticks	avoid ticks	6	NA	self-protection
299	any preventive behavior	protect generic	6	NA	self-protection
300	climate degree days >0	temperature	21	NA	abiotic

301	deciduous forest habitat	forest	55	NA	land use land cover
302	i. scapularis collected per hour (density)	density ticks	10	NA	entomological risk
303	inside cat	cat	8	NA	socio-demographic
304	dog	dog	8	NA	socio-demographic
305	outside cat	cat	8	NA	socio-demographic
306	horse	horse	5	NA	socio-demographic
307	work exposure: more than half outdoors	occupational exposure	13	NA	activity
308	golf	outdoor recreation	16	NA	activity
309	work exposure: any outdoors	occupational exposure	13	NA	activity
310	winter temp. t-1	temperature	21	NA	abiotic
311	phdi t-2	hot / dry	9	NA	abiotic
312	summer temp t-1	temperature	21	NA	abiotic
313	summer precip t-1	precipitation	10	NA	abiotic
314	acorns t-2	acorns	6	NA	host community
315	mice t-1	mice	8	NA	host community
316	outdoor work hours	occupational exposure	13	NA	activity
317	ticks noted on pet	tick presence	6	NA	entomological risk

318	years at residence (>=32 vs. <32)	residence time	5	NA	socio-demographic
319	deer sightings near residence	deer	12	NA	host community
320	fragment perimeters density	cover generic	9	NA	land use land cover
321	percentage of developed	developed	43	NA	land use land cover
322	percentage of forest	forest	55	NA	land use land cover
323	percentage of herbaceous	herbaceous	20	NA	land use land cover
324	fragmented forest area percentage	forest	55	NA	land use land cover
325	contrast-weighted developed-forest edge density	developed-forest	20	NA	land use land cover
326	total edge contrast index developed forest	developed-forest	20	NA	land use land cover
327	contrast-weighted edge index herbaceous developed	developed-herbaceous	6	NA	land use land cover
328	total edge contrast index herbaceous developed	developed-herbaceous	6	NA	land use land cover
329	contrast-weighted edge density herbaceous forest	herbaceous-forest	5	NA	land use land cover
330	total edge contrast index herbaceous forest	herbaceous-forest	5	NA	land use land cover
331	population density	pop. density	12	NA	land use land cover

332	educational intervention	awareness	23	NA	self-protection
333	use insect repellent on clothes at work	repellent	39	NA	self-protection
334	use insect repellent on clothes at leisure	repellent	39	NA	self-protection
335	tuck pants legs into socks at leisure	clothing	57	NA	self-protection
336	check oneself for ticks at leisure	tick check	29	NA	self-protection
337	wear long sleeved shirt at leisure	clothing	57	NA	self-protection
338	wear long pants at work	clothing	57	NA	self-protection
339	use insect repellent on skin at work	repellent	39	NA	self-protection
340	use insect repellent on skin at leisure	repellent	39	NA	self-protection
341	tuck pants legs into socks at work	clothing	57	NA	self-protection
342	check oneself for ticks at work	tick check	29	NA	self-protection
343	wear long-sleeved shirt at work	clothing	57	NA	self-protection
344	wear long pants at leisure	clothing	57	NA	self-protection
345	wear long sleeved shirt at work	clothing	57	NA	self-protection
346	check for ticks during outdoor activites	tick check	29	NA	self-protection
347	check for ticks after outdoor activities	tick check	29	NA	self-protection
348	tuck pants legs into socks	clothing	57	NA	self-protection
349	before activity: use acaricides	repellent	39	NA	self-protection
350	single family home	yard size	6	NA	land use land cover
351	deer damage to landscape	deer	12	NA	host community

352	mice observed	mice	8	NA	host community
353	age nearby housing	age housing	2	NA	land use land cover
354	yard/land attached to home	yard size	6	NA	land use land cover
355	does using woods in or near the yard for recreation or play increase the risk?	time in vegetation	3	NA	activity
356	leave feed for animals	feed wildlife	10	NA	property management
357	ride horses	horse	5	NA	socio-demographic
358	camp in a tent	camping	7	NA	activity
359	gardening activity tools	yard work	14	NA	activity
360	frequency of yard work	yard work	14	NA	activity
361	years in home	residence time	5	NA	socio-demographic
362	visit parks	outdoor recreation	16	NA	activity
363	being a parent	parent	1	NA	socio-demographic
364	have children who participate in outdoor sports	outdoor recreation	16	NA	activity
365	outdoor recreation	outdoor recreation	16	NA	activity
366	walk or jog outdoors	walk / jog	5	NA	activity
367	camp in an rv	camping	7	NA	activity
368	finding ticks during a search	tick check	29	NA	self-protection

369	walk or jog in woods	walk / jog	5	NA	activity
370	picnic in parks	outdoor recreation	16	NA	activity
371	picnic outside parks	outdoor recreation	16	NA	activity
372	age of home	age housing	2	NA	land use land cover
373	adult ticks collected per hour	density adults	2	NA	entomological risk
374	questing adult ticks (tick bodies) positive for babesia	density infected	4	NA	entomological risk
375	questing adult ticks (tick bodies) positive for babesia microti	density infected	4	NA	entomological risk
376	percent adult ticks infected with b. burgdorferi	infection prevalence	2	NA	entomological risk
377	eri: product of tick abundance (average number of nymphs per hectare) and the proportion of ticks infected by b. burgdorferi	din	14	NA	entomological risk
378	nymphs/ha	don	3	NA	entomological risk
379	proportion of white-footed mice seropositive for b. microti	mice	8	NA	host community
380	i. scapularis submitted to httkp	density ticks	10	NA	entomological risk
381	b.b. positive i. scapularis collected from deer	din	14	NA	entomological risk

382	ticks collected from small mammals	density ticks	10	NA	entomological risk
383	ticks collected from deer	density ticks	10	NA	entomological risk
384	june moisture levels (phdi) t-2	hot / dry	9	NA	abiotic
385	pland24: percentage of land cover of class developed high intensity	developed	43	NA	land use land cover
386	lpi24: largest patch index at the landscape level class developed, high intensity	developed	43	NA	land use land cover
387	tmaxa	temperature	21	NA	abiotic
388	ed23: class-level edge density for class developed medium intensity	developed	43	NA	land use land cover
389	edge21_41	developed-forest	20	NA	land use land cover
390	lpi21: largest patch index at the landscape level class developed, open space	developed	43	NA	land use land cover
391	te21: total edge at the landscape level class developed, open space	developed	43	NA	land use land cover
392	tmaxa: maximum annual temperature	temperature	21	NA	abiotic
393	pland21: percentage of land cover of class developed, open space	developed	43	NA	land use land cover
394	pland42	forest	55	NA	land use land cover
395	ca41	forest	55	NA	land use land cover

396	pland41	forest	55	NA	land use land cover
397	lpi71	herbaceous	20	NA	land use land cover
398	ed: edge density at the landscape level	cover generic	9	NA	land use land cover
399	lpi23: largest patch index at the landscape level class developed, medium intensity	developed	43	NA	land use land cover
400	edge22_41	developed-forest	20	NA	land use land cover
401	pland21	developed	43	NA	land use land cover
402	lpi21	developed	43	NA	land use land cover
403	lpi23	developed	43	NA	land use land cover
404	lpi42	forest	55	NA	land use land cover
405	ed21: edge density at the landscape level class developed, open space	developed	43	NA	land use land cover
406	pland23: percentage of land cover of class developed, medium intensity	developed	43	NA	land use land cover
407	ca43	forest	55	NA	land use land cover
408	lpi41	forest	55	NA	land use land cover

409	ed41	forest	55	NA	land use land cover
410	lpi41: class-level largest patch index for class deciduous forest	forest	55	NA	land use land cover
411	pland41: percentage of land cover of class deciduous forest	forest	55	NA	land use land cover
412	ed23	developed	43	NA	land use land cover
413	ed21	developed	43	NA	land use land cover
414	pland24	developed	43	NA	land use land cover
415	edge22_43	developed-forest	20	NA	land use land cover
416	te41: class-level total edge index for class deciduous forest	forest	55	NA	land use land cover
417	te24: class-level total edge index for class developed, high intensity	developed	43	NA	land use land cover
418	pland23	developed	43	NA	land use land cover
419	lpi43	forest	55	NA	land use land cover
420	te21	developed	43	NA	land use land cover
421	ed22: edge density at the landscape level class developed, low intensity	developed	43	NA	land use land cover

422	ca24: total area of land cover class developed high intensity	developed	43	NA	land use land cover
423	te43	forest	55	NA	land use land cover
424	ed43	forest	55	NA	land use land cover
425	edge21_43	developed-forest	20	NA	land use land cover
426	ed41: class-level edge density for class deciduous forest	forest	55	NA	land use land cover
427	te41	forest	55	NA	land use land cover
428	ratio edge developed medium intensity to grassland & herbaceous	developed-herbaceous	6	NA	land use land cover
429	ratio edge developed medium intensity to mixed forest	developed-forest	20	NA	land use land cover
430	total area land cover class developed open space	developed	43	NA	land use land cover
431	total area land cover class developed high intensity	developed	43	NA	land use land cover
432	total area land cover class deciduous forest	forest	55	NA	land use land cover
433	total area land cover class developed low intensity	developed	43	NA	land use land cover
434	total area land cover class developed medium intensity	developed	43	NA	land use land cover

435	ratio edge developed low intensity to deciduous forest	developed-forest	20	NA	land use land cover
436	ratio edge developed low intensity to evergreen forest	developed-forest	20	NA	land use land cover
437	ratio edge developed low intensity to mixed forest	developed-forest	20	NA	land use land cover
438	ratio edge developed low intensity to grassland & herbaceous	developed-herbaceous	6	NA	land use land cover
439	ratio edge developed medium intensity to deciduous forest	developed-forest	20	NA	land use land cover
440	ratio edge developed medium intensity to evergreen forest	developed-forest	20	NA	land use land cover
441	edge density deciduous forest	forest	55	NA	land use land cover
442	edge density evergreen forest	forest	55	NA	land use land cover
443	edge density mixed forest	forest	55	NA	land use land cover
444	edge density grassland & herbaceous	herbaceous	20	NA	land use land cover
445	ratio edge developed open space to deciduous forest	developed-forest	20	NA	land use land cover
446	total area land cover class evergreen forest	forest	55	NA	land use land cover
447	percentage developed evergreen forest	forest	55	NA	land use land cover

448	ratio edge developed open space to grassland & herbaceous	developed-herbaceous	6	NA	land use land cover
449	total edge grassland & herbaceous	herbaceous	20	NA	land use land cover
450	largest patch index developed low intensity	developed	43	NA	land use land cover
451	largest patch index developed medium intensity	developed	43	NA	land use land cover
452	largest patch index developed high intensity	developed	43	NA	land use land cover
453	largest patch index deciduous forest	forest	55	NA	land use land cover
454	largest patch index evergreen forest	forest	55	NA	land use land cover
455	largest patch index mixed forest	forest	55	NA	land use land cover
456	largest patch index grassland & herbaceous	herbaceous	20	NA	land use land cover
457	ratio edge developed high intensity to deciduous forest	developed-forest	20	NA	land use land cover
458	ratio edge developed high intensity to evergreen forest	developed-forest	20	NA	land use land cover
459	ratio edge developed open space to evergreen forest	developed-forest	20	NA	land use land cover
460	ratio edge developed open space to mixed forest	developed-forest	20	NA	land use land cover

461	largest patch index	cover generic	9	NA	land use land cover
462	largest patch index developed open space	herbaceous	20	NA	land use land cover
463	edge density	cover generic	9	NA	land use land cover
464	edge density developed open space	developed	43	NA	land use land cover
465	edge density developed low intensity	developed	43	NA	land use land cover
466	edge density developed medium intensity	developed	43	NA	land use land cover
467	edge density developed high intensity	developed	43	NA	land use land cover
468	total edge at landscape level	cover generic	9	NA	land use land cover
469	total edge developed open space	developed	43	NA	land use land cover
470	percentage developed open space	developed	43	NA	land use land cover
471	percentage developed low intensity	developed	43	NA	land use land cover
472	percentage developed medium intensity	developed	43	NA	land use land cover
473	percentage developed high intensity	developed	43	NA	land use land cover

474	total area land cover class mixed forest	forest	55	NA	land use land cover
475	total area land cover class grassland and herbaceous	herbaceous	20	NA	land use land cover
476	percentage developed deciduous forest	forest	55	NA	land use land cover
477	percentage developed mixed forest	forest	55	NA	land use land cover
478	percentage developed grassland & herbaceous	herbaceous	20	NA	land use land cover
479	precipitation	precipitation	10	NA	abiotic
480	maximum annual temperature	temperature	21	NA	abiotic
481	total area at landscape level	cover generic	9	NA	land use land cover
482	total edge deciduous forest	forest	55	NA	land use land cover
483	total edge developed low intensity	developed	43	NA	land use land cover
484	total edge developed medium intensity	developed	43	NA	land use land cover
485	total edge developed high intensity	developed	43	NA	land use land cover
486	total edge evergreen forest	forest	55	NA	land use land cover
487	total edge mixed forest	forest	55	NA	land use land cover

488	ratio edge developed high intensity to mixed forest	developed-forest	20	NA	land use land cover
489	ratio edge developed high intensity to grassland & herbaceous	developed-herbaceous	6	NA	land use land cover
490	host species richness	richness	5	NA	host community
491	forest area	forest	55	NA	land use land cover
492	have any pets at home	pets / animals	12	NA	socio-demographic
493	living close to grassy or heavily wooded area	herbaceous-forest	5	NA	land use land cover
494	routinely check for ticks on the body after being outdoors?	tick check	29	NA	self-protection
495	having an occupational exposure	occupational exposure	13	NA	activity
496	wear clothing to protect against ticks while outdoors, e.g., long pants, long-sleeved shirts, or light-colored clothing	clothing	57	NA	self-protection
497	routinely use tick repellents on the skin and/or clothing while outdoors	repellent	39	NA	self-protection
498	engage in outdoor activities that put you at higher risk for tick bites (such as hiking, camping, gardening, hunting)	outdoor recreation	16	NA	activity
499	entomologic risk index (total number of ticks × proportion of ticks infected)	density infected	4	NA	entomological risk

500	ever seen ticks on pet	ticks on pets	2	NA	entomological risk
501	hiking or camping	outdoor recreation	16	NA	activity
502	forest patch area	forest	55	NA	land use land cover
503	average forest patch perimeter	forest	55	NA	land use land cover
504	forest density	forest	55	NA	land use land cover
505	perimeter between forested land and developed land	developed-forest	20	NA	land use land cover
506	forested land	forest	55	NA	land use land cover
507	surface water area	water	6	NA	land use land cover
508	percent developed land	developed	43	NA	land use land cover
509	largest forest patch area	forest	55	NA	land use land cover
510	dependence of persistence on proximity to water	water	6	NA	land use land cover
511	dependence of colonization on proximity to water	water	6	NA	land use land cover
512	dependence of recolonization on proximity to water	water	6	NA	land use land cover
513	dependence of recolonization on tick density	density ticks	10	NA	entomological risk

514	dependence of persistence on tick density	density ticks	10	NA	entomological risk
515	deer vehicle accidents	deer	12	NA	host community
516	sex male vs sex female	female	4	1	socio-demographic
517	sex male vs. female	female	4	1	socio-demographic
518	rural vs. non-rural	pop. density	12	1	land use land cover
519	male vs. female	female	4	1	socio-demographic
520	distance from coast (km)	coast	3	1	land use land cover
521	age 0 to 9 vs age	age	8	NA	socio-demographic
522	age 40 to 49 vs age	age	8	NA	socio-demographic
523	age 60 to 100 vs age	age	8	NA	socio-demographic
524	age 1 to 4 vs age	age	8	NA	socio-demographic
525	age 40 to 44 vs age	age	8	NA	socio-demographic
526	median time (h/week) hiking off trails in wooded areas	hiking	10	NA	activity
527	median time (h/week) hiking on trails in wooded areas	hiking	10	NA	activity

528	median time (h/week) in outdoor recreation	outdoor recreation	16	NA	activity
529	wear light-colored clothing	clothing	57	NA	self-protection
530	check clothes for ticks	tick check	29	NA	self-protection
531	check body for ticks	tick check	29	NA	self-protection
532	apply repellent to skin	repellent	39	NA	self-protection
533	apply repellent to clothing	repellent	39	NA	self-protection
534	age less than 16 years	age	8	NA	socio-demographic
535	own dog(s)	dog	8	NA	socio-demographic
536	deer-exclusion fence	fence	7	NA	property management
537	property >= 6.07 hectares	yard size	6	NA	land use land cover
538	own horse(s)	horse	5	NA	socio-demographic
539	number of precautions known	awareness	23	NA	self-protection
540	wear long-sleeved shirt today -- heard about	clothing	57	NA	self-protection
541	wear long-sleeved shirt today	clothing	57	NA	self-protection
542	tick control for dog	repellent	39	NA	self-protection
543	educational intervention vs. comparator	awareness	23	NA	self-protection
544	hours in your yard	yard work	14	NA	activity
545	hours in other outdoor places	activity generic	8	NA	activity

546	indoor-outdoor pets	pets / animals	12	NA	socio-demographic
547	property size>1 but less than 2 acres	yard size	6	NA	land use land cover
548	stone wall	stone wall	7	NA	property management
549	bathed or showered	bathe	3	NA	self-protection
550	hours in someone else's yard	yard work	14	NA	activity
551	birdfeeder in yard	feed wildlife	10	NA	property management
552	outdoor dining area	activity area	13	NA	property management
553	property more than half woods	forest	55	NA	land use land cover
554	frequency of deer sighting	deer	12	NA	host community
555	frequency of outdoor activities	activity generic	8	NA	activity
556	age (mean)	age	8	NA	socio-demographic
557	house lot size	yard size	6	NA	land use land cover
558	pet owner	pets / animals	12	NA	socio-demographic
559	insect repellent on skin sometimes	repellent	39	NA	self-protection
560	insect repellent use on skin always	repellent	39	NA	self-protection
561	insect repellent use on skin usually	repellent	39	NA	self-protection

Web Table 2.

Citation Information for Articles Used in Quantitative Meta-Analysis

Authors	Year	Title	Journal	Page Nos.
Bowen	1984	A Focus of Lyme diseases in Monmouth County, New Jersey	AMERICAN JOURNAL OF EPIDEMIOLOGY	
PF SMITH	1988	OCCUPATIONAL RISK OF LYME-DISEASE IN ENDEMIC AREAS OF NEW-YORK STATE	ANNALS OF THE NEW YORK ACADEMY OF SCIENCES	289-301
BS SCHWARTZ	1990	LYME-DISEASE IN OUTDOOR WORKERS - RISK-FACTORS, PREVENTIVE MEASURES, AND TICK REMOVAL METHODS	AMERICAN JOURNAL OF EPIDEMIOLOGY	877-885
MD GOLDSTEIN	1990	LYME-DISEASE IN NEW-JERSEY OUTDOOR WORKERS - A STATEWIDE SURVEY OF SEROPREVALENCE AND TICK EXPOSURE	AMERICAN JOURNAL OF PUBLIC HEALTH	1225-1229
BS SCHWARTZ	1991	ANTITICK SALIVA ANTIBODY - A BIOLOGIC MARKER OF TICK EXPOSURE THAT IS A RISK FACTOR FOR LIME DISEASE SEROPOSITIVITY	AMERICAN JOURNAL OF EPIDEMIOLOGY	86-95
B ALPERT	1992	INCIDENCE AND PREVALENCE OF LYME-DISEASE IN A SUBURBAN WESTCHESTER COUNTY COMMUNITY	NEW YORK STATE JOURNAL OF MEDICINE	8-May
MM HUYCKE	1992	PREVALENCE OF ANTIBODY TO BORRELIA-BURGDORFERI BY INDIRECT FLUORESCENT-ANTIBODY ASSAY, ELISA, AND WESTERN IMMUNOBLOT IN HEALTHY-ADULTS IN WISCONSIN AND ARIZONA	JOURNAL OF INFECTIOUS DISEASES	1133-1137
RS LANE	1992	RISK-FACTORS FOR LYME-DISEASE IN A SMALL RURAL-COMMUNITY IN NORTHERN CALIFORNIA	AMERICAN JOURNAL OF EPIDEMIOLOGY	1358-1368
BS SCHWARTZ	1994	LONGITUDINAL-STUDY OF BORRELIA-BURGDORFERI INFECTION IN NEW-JERSEY OUTDOOR WORKERS, 1988-1991	AMERICAN JOURNAL OF EPIDEMIOLOGY	504-512

C LEY	1995	CASE-CONTROL STUDY OF RISK-FACTORS FOR INCIDENT LYME-DISEASE IN CALIFORNIA	AMERICAN JOURNAL OF EPIDEMIOLOGY	S39-S47
GE GLASS	1995	ENVIRONMENTAL RISK-FACTORS FOR LYME-DISEASE IDENTIFIED WITH GEOGRAPHIC INFORMATION-SYSTEMS	AMERICAN JOURNAL OF PUBLIC HEALTH	944-948
GL CAMPBELL	1995	EPIDEMIOLOGIC AND DIAGNOSTIC STUDIES OF PATIENTS WITH SUSPECTED EARLY LYME-DISEASE, MISSOURI, 1990-1993	JOURNAL OF INFECTIOUS DISEASES	470-480
W HALLMAN	1995	PRECAUTIONS TAKEN AGAINST LYME-DISEASE AT 3 RECREATIONAL PARKS IN ENDEMIC AREAS OF NEW-JERSEY	ENVIRONMENT AND BEHAVIOR	437-453
JD Klein	1996	Environmental and life-style risk factors for lyme disease in children	CLINICAL PEDIATRICS	359-363
MC Nicholson	1996	Methods for evaluating lyme disease risks using geographic information systems and geospatial analysis	JOURNAL OF MEDICAL ENTOMOLOGY	711-720
PW Rand	1996	Low seroprevalence of human Lyme disease near a focus of high entomologic risk	AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE	160-164
RC Falco	1996	Duration of tick bites in a Lyme disease-endemic area	AMERICAN JOURNAL OF EPIDEMIOLOGY	187-192
TN Mather	1996	Entomologic index for human risk of Lyme disease	AMERICAN JOURNAL OF EPIDEMIOLOGY	1066-1069
CL Fritz	1997	Seroepidemiology of emerging tickborne infectious diseases in a northern California community	JOURNAL OF INFECTIOUS DISEASES	1432-1439
U Kitron	1997	Spatial analysis of the distribution of Lyme disease in Wisconsin	AMERICAN JOURNAL OF EPIDEMIOLOGY	558-566
BJ Wallace	1998	Human granulocytic ehrlichiosis in New York	ARCHIVES OF INTERNAL MEDICINE	769-773
DJ White	1998	Human babesiosis in New York State - Review of 139 hospitalized cases and analysis of prognostic factors	ARCHIVES OF INTERNAL MEDICINE	2149-2154

EK Cromley	1998	Residential setting as a risk factor for Lyme disease in a hyperendemic region	AMERICAN JOURNAL OF EPIDEMIOLOGY	472-477
KA Orloski	1998	Emergence of Lyme disease in Hunterdon County, New Jersey, 1993: A case-control study of risk factors and evaluation of reporting patterns	AMERICAN JOURNAL OF EPIDEMIOLOGY	391-397
KC Stafford	1998	Temporal correlations between tick abundance and prevalence of ticks infected with Borrelia burgdorferi and increasing incidence of Lyme disease	JOURNAL OF CLINICAL MICROBIOLOGY	1240-1244
TJ Daniels	1998	Geographic risk for Lyme disease and human granulocytic ehrlichiosis in southern New York state	APPLIED AND ENVIRONMENTAL MICROBIOLOGY	4663-4669
EA Belongia	1999	Clinical and epidemiological features of early Lyme disease and human granulocytic ehrlichiosis in Wisconsin	CLINICAL INFECTIOUS DISEASES	1472-1477
ME Ryan	1999	Prevalence of antibody to Borrelia burgdorferi in an outpatient setting in central and northeastern Pennsylvania	INFECTIOUS DISEASES IN CLINICAL PRACTICE	341-345
ML Sanders	1999	Antibody levels to recombinant tick calreticulin increase in humans after exposure to Ixodes scapularis (say) and are correlated with tick engorgement indices	AMERICAN JOURNAL OF EPIDEMIOLOGY	777-784
RC Falco	1999	Temporal relation between Ixodes scapularis abundance and risk for Lyme disease associated with erythema migrans	AMERICAN JOURNAL OF EPIDEMIOLOGY	771-776
RS Lane	1999	Anti-arthropod saliva antibodies among residents of a community at high risk for Lyme disease in California	AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE	850-859
RS Ostfeld	2000	Biodiversity and disease risk: The case of lyme disease	CONSERVATION BIOLOGY	722-728
CB Phillips	2001	Lyme disease and preventive behaviors in residents of Nantucket Island, Massachusetts	AMERICAN JOURNAL OF PREVENTIVE MEDICINE	219-224
EA Belongia	2001	Tickborne infections as a cause of nonspecific febrile illness in Wisconsin	CLINICAL INFECTIOUS DISEASES	1434-1439
G Smith	2001	Risk factors for Lyme disease in Chester County, Pennsylvania	PUBLIC HEALTH REPORTS	146-156

CC Chow	2003	Lyme disease trends - Dutchess County, New York, 1992-2000	MOUNT SINAI JOURNAL OF MEDICINE	207-213
R Malouin	2003	Longitudinal evaluation of an educational intervention for preventing tick bites in an area with endemic Lyme disease in Baltimore County, Maryland	AMERICAN JOURNAL OF EPIDEMIOLOGY	1039-1051
S Subak	2003	Effects of climate on variability in Lyme disease incidence in the northeastern United States	AMERICAN JOURNAL OF EPIDEMIOLOGY	531-538
Townsend	2003	The effects of bird feeders on Lyme disease prevalence and density of Ixodes scapularis (Acari: Ixodidae) in a residential area of Dutchess County, New York	JOURNAL OF MEDICAL ENTOMOLOGY	
GJ McCabe	2004	Precipitation and the occurrence of Lyme disease in the northeastern United States	VECTOR-BORNE AND ZOONOTIC DISEASES	143-148
EM Schauber	2005	What is the best predictor of annual Lyme disease incidence: Weather, mice, or acorns?	ECOLOGICAL APPLICATIONS	575-586
JS Brownstein	2005	Forest fragmentation predicts local scale heterogeneity of Lyme disease risk	OECOLOGIA	469-475
LJ Demma	2005	Epidemiology of human ehrlichiosis and anaplasmosis in the United States, 2001-2002	AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE	400-409
L. E. Jackson	2006	A comparison of analysis units for associating Lyme disease with forest-edge habitat	COMMUNITY ECOLOGY	189-197
LE Jackson	2006	Towards landscape design guidelines for reducing Lyme disease risk	INTERNATIONAL JOURNAL OF EPIDEMIOLOGY	315-322
Neeta P. Connally	2006	Assessing peridomestic entomological factors as predictors for Lyme disease	JOURNAL OF VECTOR ECOLOGY	364-370
Lawren H. Daltroy	2007	A controlled trial of a novel primary prevention program for Lyme disease and other tick-borne illnesses	HEALTH EDUCATION \& BEHAVIOR	531-542
Peter W. Rand	2007	Passive surveillance in Maine, an area emergent for tick-borne diseases	JOURNAL OF MEDICAL ENTOMOLOGY	1118-1129

Robert A. Jordan	2007	Effects of reduced deer density on the abundance of Ixodes scapulatis (Acari : ixodidae) and Lyme disease incidence in a northern new jersey endemic area	JOURNAL OF MEDICAL ENTOMOLOGY	752-757
Sarah E. Rodgers	2007	Human Babesia microti incidence and Ixodes scapularis distribution, Rhode Island, 1998-2004	EMERGING INFECTIOUS DISEASES	633-635
J. Stone Doggett	2008	Lyme disease in Oregon	JOURNAL OF CLINICAL MICROBIOLOGY	2115-2118
Marietta Vazquez	2008	Effectiveness of personal protective measures to prevent Lyme disease	EMERGING INFECTIOUS DISEASES	210-216
Paul C. F. Graf	2008	Prevalence of seropositivity to spotted fever group rickettsiae and Anaplasma phagocytophilum in a large, demographically diverse US sample	CLINICAL INFECTIOUS DISEASES	70-77
Neeta P. Connally	2009	Peridomestic Lyme Disease Prevention Results of a Population-Based Case-Control Study	AMERICAN JOURNAL OF PREVENTIVE MEDICINE	201-206
Seth T. Walk	2009	Correlation between Tick Density and Pathogen Endemicity, New Hampshire	EMERGING INFECTIOUS DISEASES	585-587
F. Scott Dahlgren	2011	Increasing Incidence of Ehrlichia chaffeensis and Anaplasma phagocytophilum in the United States, 2000-2007	AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE	124-131
Jennifer M. Garnett	2011	Student Column EVALUATION OF DEER-TARGETED INTERVENTIONS ON LYME DISEASE INCIDENCE IN CONNECTICUT	PUBLIC HEALTH REPORTS	446-454
Meagan F. Vaughn	2011	Pilot Study Assessing the Effectiveness of Long-Lasting Permethrin-Impregnated Clothing for the Prevention of Tick Bites	VECTOR-BORNE AND ZOONOTIC DISEASES	869-875
Arianne M. Folkema	2012	Epidemiology of Ehrlichiosis and Anaplasmosis among American Indians in the United States, 2000-2007	AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE	529-537

Elizabeth D. Hilborn	2012	Repeated holdout cross-validation of model to estimate risk of Lyme disease by landscape characteristics	INTERNATIONAL JOURNAL OF ENVIRONMENTAL HEALTH RESEARCH	11-Jan
Mikhail Menis	2012	Babesiosis among Elderly Medicare Beneficiaries, United States, 2006-2008	EMERGING INFECTIOUS DISEASES	128-131
Starr-Hope Ertel	2012	Effect of Surveillance Method on Reported Characteristics of Lyme Disease, Connecticut, 1996-2007	EMERGING INFECTIOUS DISEASES	242-247
Taal Levi	2012	Deer, predators, and the emergence of Lyme disease	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA	10942-10947
Daniel H. Wiznia	2013	The Use of Deer Vehicle Accidents as a Proxy for Measuring the Degree of Interaction Between Human and Deer Populations and Its Correlation With the Incidence Rate of Lyme Disease	JOURNAL OF ENVIRONMENTAL HEALTH	32-39
Michael G. Walsh	2013	The Relevance of Forest Fragmentation on the Incidence of Human Babesiosis: Investigating the Landscape Epidemiology of an Emerging Tick-Borne Disease	VECTOR-BORNE AND ZOONOTIC DISEASES	250-255
Phoebe Minh Tran	2013	Effects of Landscape Fragmentation and Climate on Lyme Disease Incidence in the Northeastern United States	ECOHEALTH	394-404
Alyson Lorenz	2014	Inter-Model Comparison of the Landscape Determinants of Vector-Borne Disease: Implications for Epidemiological and Entomological Risk Modeling	PLOS ONE	NA
Casey Finch	2014	Integrated Assessment of Behavioral and Environmental Risk Factors for Lyme Disease Infection on Block Island, Rhode Island	PLOS ONE	NA
Ellen Stromdahl	2014	Comparison of phenology and pathogen prevalence, including infection with the Ehrlichia muris-like (EML) agent, of Ixodes scapularis removed from soldiers in the midwestern and the northeastern United States over a 15 year period (1997-2012)	PARASITES \& VECTORS	NA
Howard J. Kilpatrick	2014	The Relationship Between Deer Density, Tick Abundance, and Human Cases of Lyme Disease in a Residential Community	JOURNAL OF MEDICAL ENTOMOLOGY	777-784

Kirby C. Stafford III	2014	Expansion of Zoonotic Babesiosis and Reported Human Cases, Connecticut, 2001-2010	JOURNAL OF MEDICAL ENTOMOLOGY	245-252
Maria A. Diuk-Wasser	2014	Monitoring Human Babesiosis Emergence through Vector Surveillance, New England, USA	EMERGING INFECTIOUS DISEASES	225-231
R. Jory Brinkerhoff	2014	Lyme Disease, Virginia, USA, 2000-2011	EMERGING INFECTIOUS DISEASES	1661-1668
Robert P. Smith Jr.	2014	Human Babesiosis, Maine, USA, 1995-2011	EMERGING INFECTIOUS DISEASES	1727-1730
Sean M. Moore	2014	Meteorological Influences on the Seasonality of Lyme Disease in the United States	AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE	486-496
Turney	2014	The negative relationship between mammal host diversity and Lyme disease incidence strengthens through time	ECOLOGY	3244–3250
Joseph D. Forrester	2015	Epidemiology of Lyme disease in low-incidence states	TICKS AND TICK-BORNE DISEASES	721-723
Mikhail Menis	2015	Babesiosis Occurrence among the Elderly in the United States, as Recorded in Large Medicare Databases during 2006-2013	PLOS ONE	NA
Sara E. Seukep	2015	An Examination of the Demographic and Environmental Variables Correlated with Lyme Disease Emergence in Virginia	ECOHEALTH	634-644
Sharon K. Greene	2015	Disparities in Reportable Communicable Disease Incidence by Census Tract-Level Poverty, New York City, 2006-2013	AMERICAN JOURNAL OF PUBLIC HEALTH	E27-E34
Stacie J. Robinson	2015	Disease Risk in a Dynamic Environment: The Spread of Tick-Borne Pathogens in Minnesota, USA	ECOHEALTH	152-163
Alison F. Hinckley	2016	Effectiveness of Residential Acaricides to Prevent Lyme and Other Tick-borne Diseases in Humans	JOURNAL OF INFECTIOUS DISEASES	182-188
Amber D. Butler	2016	Tick-borne disease preventive practices and perceptions in an endemic area	TICKS AND TICK-BORNE DISEASES	331-337

Christina A. Nelson	2016	Lyme Disease in Hispanics, United States, 2000-2013	EMERGING INFECTIOUS DISEASES	522-525
Guang Xu	2016	Passive Surveillance of Ixodes scapularis (Say), Their Biting Activity, and Associated Pathogens in Massachusetts	VECTOR-BORNE AND ZOONOTIC DISEASES	520-527
James C. Burtis	2016	The impact of temperature and precipitation on blacklegged tick activity and Lyme disease incidence in endemic and emerging regions	PARASITES \& VECTORS	NA
Jeremy M. Cohen	2016	Spatial scale modulates the strength of ecological processes driving disease distributions	PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA	E3359-E3364
Katharine S. Walter	2016	Invasion of two tick-borne diseases across New England: harnessing human surveillance data to capture underlying ecological invasion processes	PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES	NA
Nancy A. Shadick	2016	A School-Based Intervention to Increase Lyme Disease Preventive Measures Among Elementary School-Aged Children	VECTOR-BORNE AND ZOONOTIC DISEASES	507-515
Phoebe Tran	2016	Validating negative binomial lyme disease regression model with bootstrap resampling	ENVIRONMENTAL MODELLING \& SOFTWARE	121-127
Salima Gasmi	2016	Analysis of the human population bitten by Ixodes scapularis ticks in Quebec, Canada: Increasing risk of Lyme disease	TICKS AND TICK-BORNE DISEASES	1075-1081
Aenishaenslin	2017	Exposure and preventive behaviours toward ticks and Lyme disease in Canada: Results from a first national survey	TICKS AND TICK-BORNE DISEASES	112-118
E. H. Jones	2018	Pet ownership increases human risk of encountering ticks	ZOONOSES AND PUBLIC HEALTH	74-79
Mead	2018	Risk factors for tick exposure in suburban settings in the Northeastern United States	TICKS AND TICK-BORNE DISEASES	319-324

Web Table 3.

Odds Ratios and Confidence Intervals for Variables Measured in Relation to Tick Bites and Disease

P values were computed, using a linear model, for variables with at least two observations.

variable.recategorized	Odds.ratio	CI.upper	CI.lower	*P*	DF	*t*	disease.or.bite	Category	N.observations	N.studies	P Value Significance	CI Excludes 1
not activity generic	1.009	1.103	0.915	0.7162	1	0.478	bite	activity	2	2		
hiking	1.077	1.734	0.669	NA	NA	NA	bite	activity	1	1		
outdoor recreation	1.32	1.664	1.046	NA	NA	NA	bite	activity	1	1		*
hunting	1.327	2.114	0.833	NA	NA	NA	bite	activity	1	1		
yard work	1.164	1.663	0.815	NA	NA	NA	bite	activity	1	1		
tick presence	2.599	4.317	1.564	NA	NA	NA	bite	entomological risk	1	1		*
not deer	1.082	1.329	0.88	NA	NA	NA	bite	host community	1	1		
land use	3.275	4.253	2.297	0.2107	2	1.818	bite	land measure type	3	3		*
cover	1.769	2.596	0.942	0.384	2	1.106	bite	land measure type	3	2		
yard size	2.59	3.635	1.545	0.298	2	1.394	bite	land use land cover	3	3		*
not pop. density	6.626	14.233	3.085	NA	NA	NA	bite	land use land cover	1	1		*
not forest	1.25	3.506	0.446	NA	NA	NA	bite	land use land cover	1	1		

coast	1.162	4.37	0.309	NA	NA	NA	bite	land use land cover	1	1		
feed wildlife	1.613	1.927	1.299	0.2027	1	3.033	bite	property management	2	2		*
activity area	1.456	1.678	1.234	0.2594	1	2.317	bite	property management	2	2		*
garden	1.217	1.501	0.933	0.368	1	1.533	bite	property management	2	2		
not fence	1.421	1.806	1.036	0.5478	1	0.86	bite	property management	2	2		*
stone wall	1.203	1.527	0.879	0.6922	1	0.525	bite	property management	2	2		
not acaricide	1.137	1.666	0.776	NA	NA	NA	bite	property management	1	1		
wood pile	1.486	2.36	0.936	NA	NA	NA	bite	property management	1	1		
compost / litter / cover	1.56	2.483	0.981	NA	NA	NA	bite	property management	1	1		
clothing	2.744	3.749	1.739	0.5613	1	0.824	bite	self-protection	2	2		*
not repellent	1.284	1.489	1.079	0.7107	4	0.398	bite	self-protection	5	5		*
tick check	1.467	2.344	0.59	0.7403	1	0.432	bite	self-protection	2	2		
not awareness	1.113	1.508	0.718	0.7915	1	0.34	bite	self-protection	2	2		
not avoid ticks	9.845	50.681	1.913	NA	NA	NA	bite	self-protection	1	1		*
protect generic	1.086	2.061	0.572	NA	NA	NA	bite	self-protection	1	1		
bathe	3.7	10.504	1.303	NA	NA	NA	bite	self-protection	1	1		*
pets / animals	1.61	1.835	1.385	0.0259	2	6.088	bite	socio-demographic	3	3	*	*

age	3.255	3.651	2.859	0.0685	4	2.476	bite	socio-demographic	5	5		*
dog	1.855	2.338	1.372	0.1582	1	3.94	bite	socio-demographic	2	2		*
male	1.31	1.359	1.261	0.2074	3	1.602	bite	socio-demographic	4	4		*
cat	1.733	3.139	0.957	NA	NA	NA	bite	socio-demographic	1	1		
horse	3.464	7.422	1.617	NA	NA	NA	bite	socio-demographic	1	1		*
hot / dry	5.622	7.017	4.227	0.248	2	1.613	disease	abiotic	3	3		*
temperature	1.084	1.097	1.071	0.3607	6	0.989	disease	abiotic	7	7		*
precipitation	1.06	1.071	1.049	0.8312	4	0.227	disease	abiotic	5	5		*
slope	1.357	2.093	0.879	NA	NA	NA	disease	abiotic	1	1		
soils	2.294	3.055	1.723	NA	NA	NA	disease	abiotic	1	1		*
generic abiotic	1.015	1.046	0.985	NA	NA	NA	disease	abiotic	1	1		
travel risky area	4.225	5.066	3.384	0.0568	2	4.014	disease	activity	3	3		*
yard work	1.346	1.443	1.249	0.083	7	2.021	disease	activity	8	8		*
activity generic	1.634	2.127	1.141	0.1201	1	5.239	disease	activity	2	2		*
time in vegetation	1.733	1.953	1.513	0.1781	2	2.04	disease	activity	3	3		*
walk / jog	1.993	2.415	1.571	0.343	3	1.123	disease	activity	4	4		*
hunting	1.705	2.036	1.374	0.4395	3	0.889	disease	activity	4	4		*

outdoor recreation	1.171	1.257	1.085	0.488	6	0.739	disease	activity	7	7		*
fish / raft	1.178	1.282	1.074	0.5273	5	0.679	disease	activity	6	6		*
occupational exposure	1.116	1.175	1.057	0.5287	10	0.653	disease	activity	11	11		*
hiking	1.197	1.378	1.016	0.6757	3	0.462	disease	activity	4	4		*
camping	1.072	1.168	0.976	0.8272	5	0.23	disease	activity	6	6		
DON	45.278	79.743	10.813	0.0462	1	13.751	disease	entomological risk	2	2	*	*
ticks on pets	2.576	3.649	1.503	0.1223	1	5.142	disease	entomological risk	2	2		*
tick presence	2.771	3.286	2.256	0.1732	3	1.78	disease	entomological risk	4	4		*
density ticks	1.13	1.154	1.106	0.4747	4	0.788	disease	entomological risk	5	5		*
DIN	1.199	1.215	1.183	0.7054	8	0.392	disease	entomological risk	9	9		*
not NIP	1.17	1.256	1.084	0.801	1	0.323	disease	entomological risk	2	2		*
density infected	1.087	1.128	1.046	0.9126	2	0.124	disease	entomological risk	3	3		*
infection prevalence	1.041	1.061	1.021	0.9216	1	0.124	disease	entomological risk	2	2		*
not density adults	1.013	1.033	0.993	0.9539	1	0.072	disease	entomological risk	2	2		
infected prevalence	1	1.235	0.81	NA	NA	NA	disease	entomological risk	1	1		
deer	2.874	3.177	2.571	0.0203	6	3.132	disease	host community	7	7	*	*
mice	1.127	1.151	1.103	0.632	2	0.56	disease	host community	3	3		*

not richness	1.059	1.103	1.015	0.8883	2	0.159	disease	host community	3	3		*
not groundhogs	2.39	6.156	0.928	NA	NA	NA	disease	host community	1	1		
not deer hunt	244.203	497.443	119.883	NA	NA	NA	disease	host community	1	1		*
not deer four-poster	1.481	2.979	0.737	NA	NA	NA	disease	host community	1	1		
not fox	20.532	59.053	7.139	NA	NA	NA	disease	host community	1	1		*
lizards	2.14	3.42	1.339	NA	NA	NA	disease	host community	1	1		*
coyote	36.089	111.604	11.67	NA	NA	NA	disease	host community	1	1		*
acorns	3.873	7.797	1.924	NA	NA	NA	disease	host community	1	1		*
land use	1.94	2.013	1.867	0.0038	11	3.659	disease	land measure type	12	9	***	*
cover	2.049	2.055	2.043	0.0456	33	2.078	disease	land measure type	34	22	*	*
edge	2.49	2.507	2.473	0.2693	11	1.163	disease	land measure type	12	7		*
fragmentation	1.018	1.027	1.009	0.8336	8	0.217	disease	land measure type	9	7		*
herbaceous-forest	1.349	1.385	1.313	0.0038	3	8.186	disease	land use land cover	4	4	***	*
not pop. density	1.868	1.955	1.781	0.0278	8	2.683	disease	land use land cover	9	9	*	*
yard size	2.442	3.196	1.688	0.1131	1	5.568	disease	land use land cover	2	2		*
not developed	10.627	10.746	10.508	0.1626	5	1.637	disease	land use land cover	6	6		*
forest	1.068	1.075	1.061	0.2649	16	1.155	disease	land use land cover	17	17		*

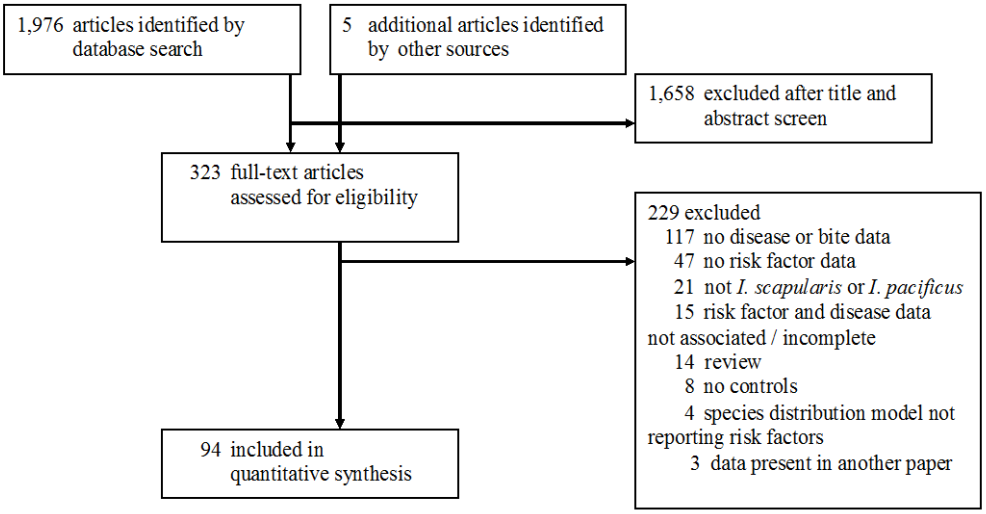
cover generic	1.047	1.059	1.035	0.323	5	1.096	disease	land use land cover	6	6		*
not developed-forest	5.255	5.329	5.181	0.4	4	0.941	disease	land use land cover	5	5		*
ndvi	1.698	2.014	1.382	0.5501	1	0.854	disease	land use land cover	2	2		*
herbaceous	1.159	1.203	1.115	0.5911	6	0.567	disease	land use land cover	7	7		*
not developed-herbaceous	2.877	3.887	1.867	0.6825	1	0.545	disease	land use land cover	2	2		*
water	1.03	1.049	1.011	0.8344	2	0.237	disease	land use land cover	3	3		*
coast	1.07	1.121	1.019	0.8815	1	0.188	disease	land use land cover	2	2		*
not isolation	1.03	1.053	1.006	NA	NA	NA	disease	land use land cover	1	1		*
age housing	2.044	3.532	1.183	NA	NA	NA	disease	land use land cover	1	1		*
garden	1.303	1.516	1.09	0.0463	2	4.485	disease	property management	3	3	*	*
not acaricide	1.414	1.649	1.179	0.1134	3	2.217	disease	property management	4	4		*
wood pile	1.671	1.83	1.512	0.1228	3	2.132	disease	property management	4	4		*
stone wall	1.461	1.598	1.324	0.2099	3	1.591	disease	property management	4	4		*
landscape control	2.397	3.134	1.66	0.2546	2	1.581	disease	property management	3	3		*
feed wildlife	1.218	1.329	1.107	0.3813	5	0.96	disease	property management	6	6		*
compost / litter / cover	1.184	1.407	0.961	0.7026	2	0.44	disease	property management	3	3		

not fence	1.019	1.223	0.815	0.9625	2	0.053	disease	property management	3	3		
rodent tick control	1.515	4.111	0.559	NA	NA	NA	disease	property management	1	1		
activity area	1.012	1.865	0.549	NA	NA	NA	disease	property management	1	1		
not bathe	1.801	2.243	1.359	0.1144	1	5.506	disease	self-protection	2	2		*
not clothing	1.128	1.167	1.089	0.2901	11	1.111	disease	self-protection	12	12		*
not avoid ticks	1.492	1.805	1.179	0.3062	2	1.363	disease	self-protection	3	3		*
not repellent	1.038	1.074	1.002	0.5706	13	0.582	disease	self-protection	14	14		*
not tick check	1.03	1.046	1.014	0.6323	11	0.492	disease	self-protection	12	12		*
awareness	1.067	1.181	0.953	0.6863	5	0.428	disease	self-protection	6	6		
protect generic	1.019	1.194	0.844	0.9495	3	0.069	disease	self-protection	4	4		
cat	1.283	1.448	1.118	0.005	4	5.61	disease	socio-demographic	5	5	***	*
white	4.143	4.301	3.985	0.0079	5	4.277	disease	socio-demographic	6	6	***	*
other vs. black	4.315	6.064	2.566	0.1092	1	5.773	disease	socio-demographic	2	2		*
pets / animals	1.267	1.392	1.142	0.1533	4	1.76	disease	socio-demographic	5	5		*
horse	1.483	1.791	1.175	0.1684	3	1.807	disease	socio-demographic	4	4		*
not Hispanic	1.914	1.981	1.847	0.1759	4	1.642	disease	socio-demographic	5	5		*
residence time	1.491	1.6	1.382	0.202	4	1.525	disease	socio-demographic	5	5		*

not dog	1.122	1.262	0.982	0.5985	4	0.571	disease	socio-demographic	5	5		
income	1.124	1.173	1.075	0.7109	4	0.398	disease	socio-demographic	5	5		*
parent	1.36	1.828	1.012	NA	NA	NA	disease	socio-demographic	1	1		*
American Indian	4.393	6.977	2.766	NA	NA	NA	disease	socio-demographic	1	1		*
employment	1.041	1.634	0.663	NA	NA	NA	disease	socio-demographic	1	1		
higher ed.	1.4	1.836	1.068	NA	NA	NA	disease	socio-demographic	1	1		*

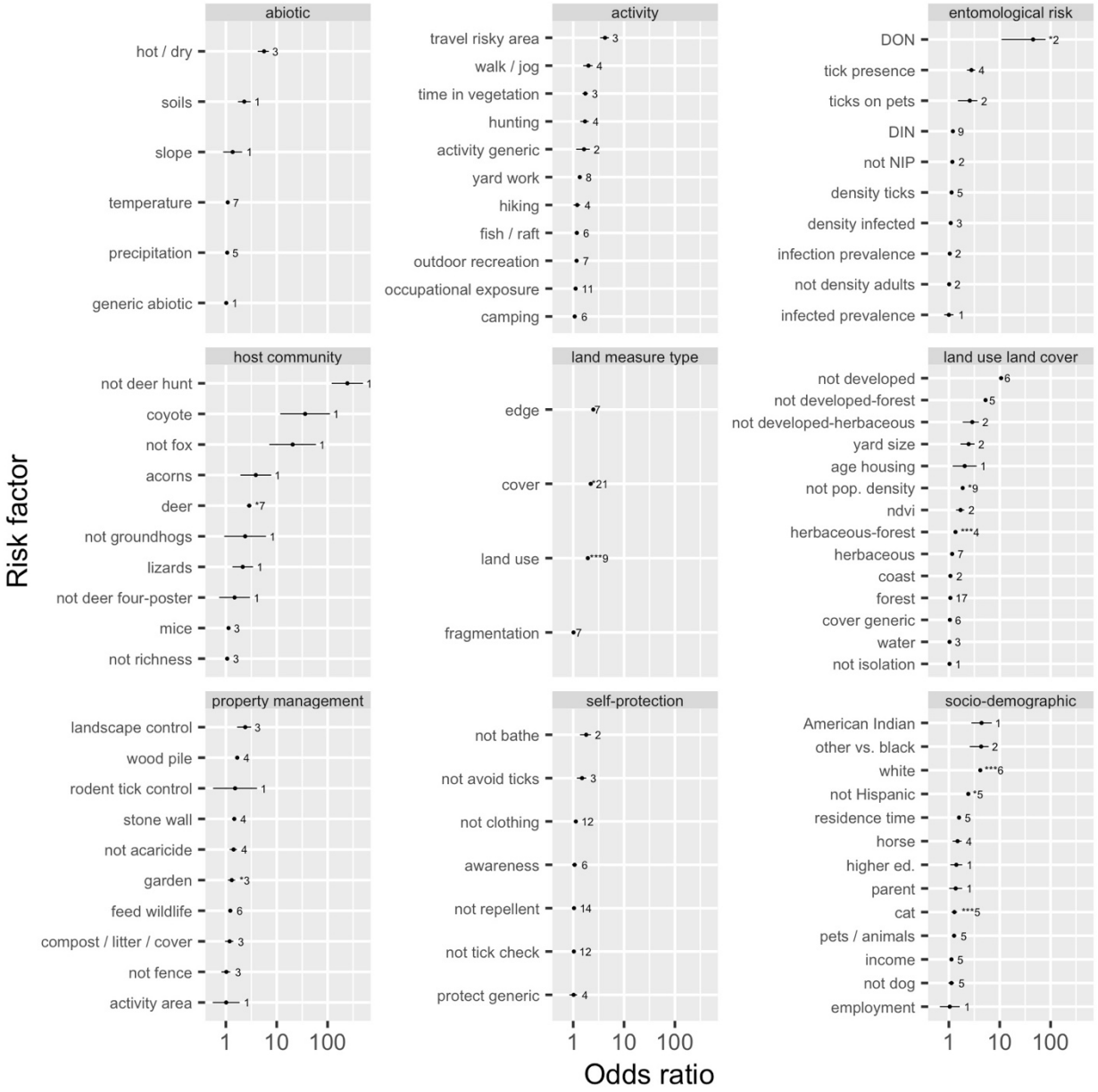
Web Figure 1.

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram.



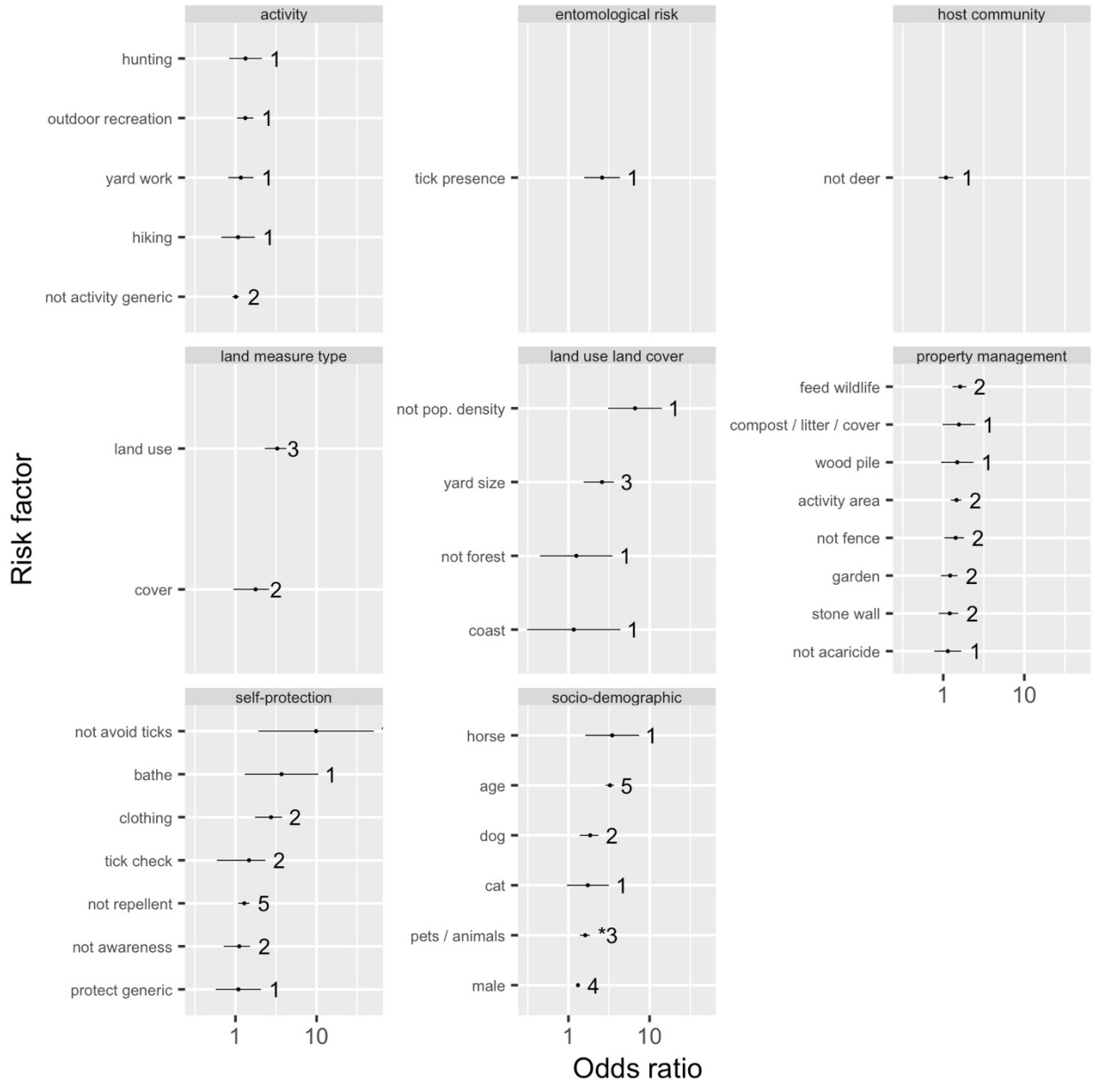
Web Figure 2.

Estimates of odds ratios for risk factors for tick-borne disease. Error bars depict 95% confidence intervals. Data have been plotted on a log scale.



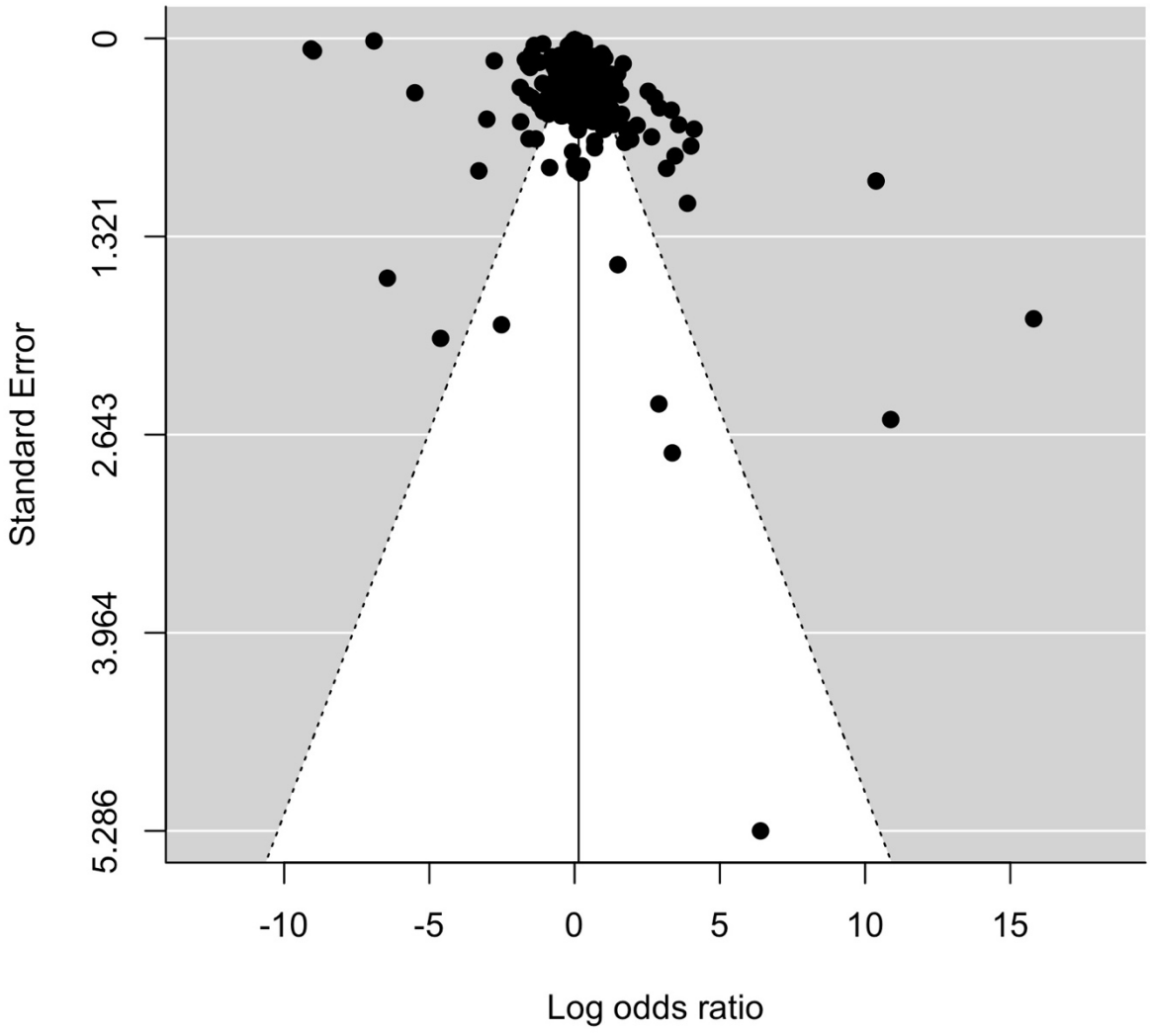
Web Figure 3.

Estimates of odds ratios for risk factors for tick bites, plotted on a log scale. Error bars depict 95% confidence intervals. Where “not” precedes a factor, this indicates the result is for the opposite of that factor. For example, “not awareness” means lack of awareness; “not activity generic” means not doing generic activity that exposes one to ticks.



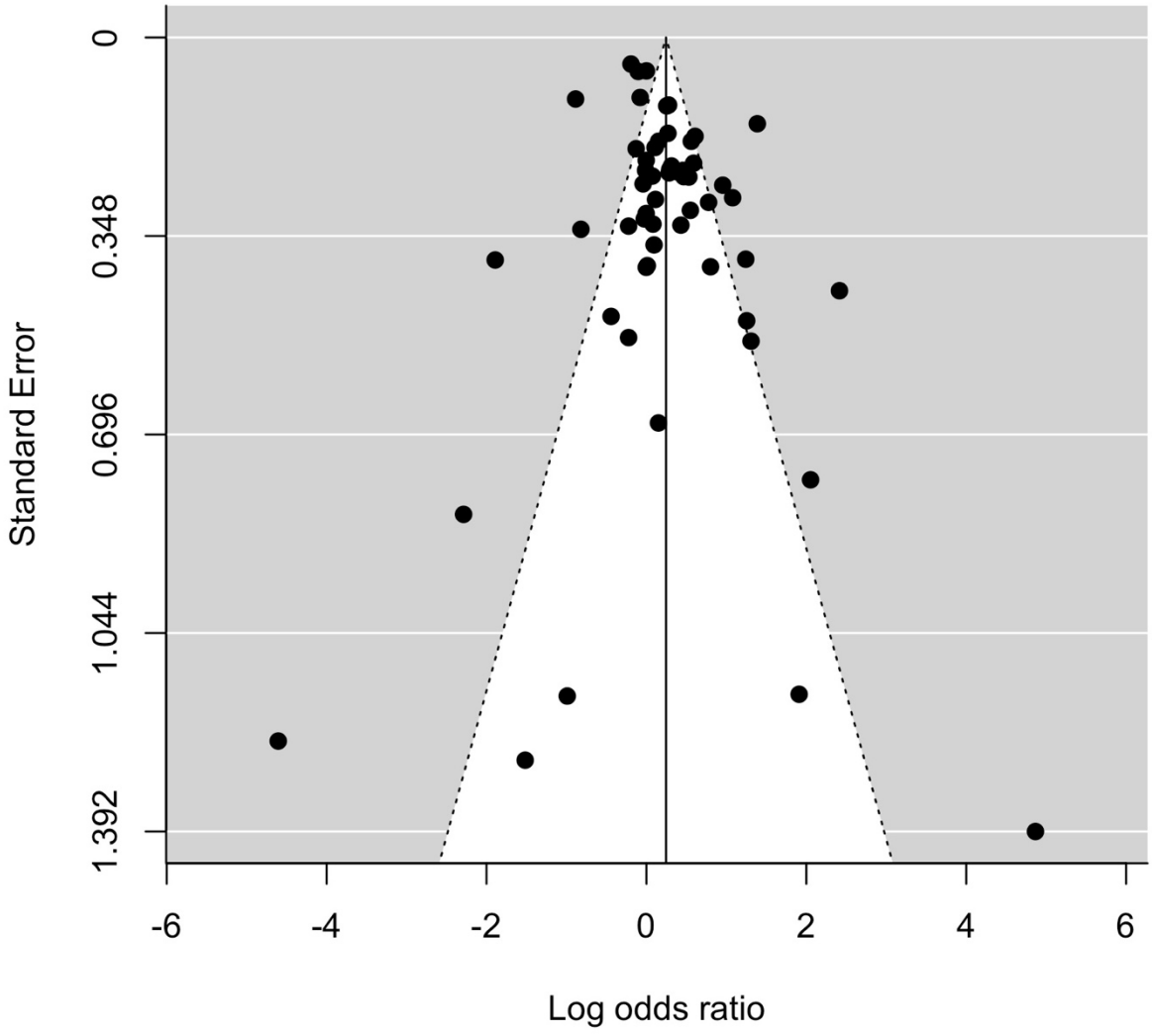
Web Figure 4.

Funnel plot depicting observed effect size (log odds ratio) versus standard error in the log odds ratio for disease data. Without publication bias or other sources of heterogeneity, most points would be expected to lie within the white pseudo-confidence region. The pseudo-confidence region has bounds $\theta \pm 1.96SE$, where θ is the estimated log odds ratio values based on an intercept-only mixed model fitted to the data, and SE is the standard error value relative to the y-axis (1).



Web Figure 5.

Funnel plot depicting observed effect size (log odds ratio) versus standard error in the log odds ratio for tick bite data. Without publication bias or other sources of heterogeneity, most points are expected to lie inside the white pseudo-confidence region.



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