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Running Head: Sexual Pathogen Politics

**Is the Relationship Between Pathogen Avoidance and Ideological Conservatism
Explained by Sexual Strategies?
*In Press: Evolution and Human Behavior***

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Abstract

Multiple recent studies report that measures of pathogen avoidance (e.g., disgust sensitivity) correlate with political ideology. These relationships have been interpreted as suggesting that certain political views (specifically, those views that are categorized as socially conservative) function to mitigate the pathogen threats posed either by intergroup interactions or departures from traditional societal norms, which sometimes evolve culturally for anti-pathogen functions. We propose and test the alternative hypothesis that pathogen avoidance relates to conservatism indirectly via sexual strategies (e.g., relatively monogamous versus relatively promiscuous). Specifically, we argue that individuals who are more invested in avoiding pathogens follow a more monogamous mating strategy to mitigate against pathogens transmitted during sexual contact, and individuals following a more monogamous mating strategy adopt socially conservative political ideologies to support their reproductive interests. Results from three studies (N 's = 819, 238, and 248) using multiple measures of pathogen avoidance, sexual strategies, and ideology support this account, with sexual strategies fully mediating the relationship between measures of pathogen avoidance and conservatism in each study.

Keywords: Political attitudes, sexual strategies, pathogen avoidance, disgust, individual differences

1 **Is the Relationship Between Pathogen Avoidance and Ideological Conservatism Explained** 2 **by Sexual Strategies?**

3

4 **1.Introduction**

5 In recent years, political scientists and social, personality, and political psychologists
6 have contributed to a growing field of Evolutionary Political Science (Lopez & McDermott,
7 2012). Investigations in this area have used insights from evolutionary psychology to better
8 understand preferences for political leaders (Spisak et al., in press) as well as positions on
9 politically relevant issues such as recreational drug use (Kurzban et al., 2010), social welfare
10 (Aarøe & Petersen, 2013), and progressive taxation (Petersen et al., 2013).

11 Attitudes toward discrete political issues such as these often bundle into packages and
12 vary along dimensions referred to as ideological liberalism versus conservatism. Political
13 scientists and psychologists argue that two primary dimensions underlie variation in ideology: 1)
14 advocating for social change (left-wing) versus advocating for tradition (right-wing), and 2)
15 advocating for equality between individuals and groups (left-wing) versus tolerating inequality
16 (right-wing; for overviews, see Duckitt and Sibley, 2009; Jost et al., 2003, 2009). Much of the
17 research investigating how and why individuals vary along these dimensions has concluded that
18 ideological conservatism functions to generally neutralize or manage unpleasant sensations, such
19 as those accompanying fear and uncertainty (Jost et al., 2003). Evolutionary approaches to
20 ideology have similarly suggested that conservatism functions to neutralize threats, though they
21 have emphasized specific, fitness-relevant threats rather than internally generated,
22 phenomenological ones. We discuss two of these evolutionary perspectives here.

23

24 *1.1. Pathogen avoidance and ideological conservatism*

25 Researchers have suggested that certain elements of conservative ideology function at
26 least in part to reduce individuals' exposure to infectious microorganisms (Inbar & Pizarro,
27 2014; Terrizzi et al., 2013). For individuals who are more invested in avoiding pathogens, the
28 reasoning goes, the putatively pathogen-mitigating aspects of right-wing ideologies make these
29 ideologies more appealing. Most of the support for this account comes from studies reporting a
30 positive relationship between political attitudes and individual differences in pathogen
31 avoidance. These studies typically operationalize pathogen avoidance using self-report
32 instruments that either (a) ask participants to report the extent to which they agree with
33 statements such as "I do not like to write with a pencil someone else has obviously chewed on"
34 (referred to as "germ aversion" or "contamination sensitivity"); or (b) ask participants the degree
35 to which they would be disgusted by experiences such as "stepping in dog poop" (referred to as
36 "disgust sensitivity"). A recent meta-analysis of studies using these methods suggests that the
37 relationship between pathogen avoidance and conservatism is statistically robust and moderate in
38 size, $r=.26$ (Terrizzi et al., 2013).

39 Multiple potentially pathogen-neutralizing aspects of conservatism have been proposed to
40 explain this empirical relationship. One account suggests that interactions with outgroup
41 members might pose a greater pathogen threat than interactions with ingroup members if
42 outgroups carry—and are adapted to—pathogens from different ecologies (see Thornhill and
43 Fincher, 2014, for an overview). Given that ingroup favoritism is a hallmark of ideological
44 conservatism (Duckitt & Sibley, 2009), researchers have proposed that variation in conservatism
45 in part results from variation in effort to neutralize the putative pathogen threats posed by
46 intergroup interactions (Terrizzi et al., 2013). Another account points out that cultural evolution

47 might favor traditions and rituals (e.g., in terms of hygiene or food preparation) that are adapted
48 to neutralizing ecologically-specific pathogens (Billing & Sherman, 1998). Adherence to
49 tradition—and advocating for others in the community to also adhere to tradition—might thus
50 partially serve pathogen-neutralizing functions (Murray et al., 2011). Importantly, researchers
51 favoring both of these explanations have suggested that only the *social* conservatism dimension
52 (i.e., advocating for change versus favoring long-standing cultural traditions) reflects a pathogen
53 avoidance strategy (Terrizzi et al., 2013). For example, Terrizzi and colleagues (2010) suggest
54 that favoring versus disfavoring the legality of stem cell research, abortion, and medical
55 marijuana use reflects pathogen avoidance, whereas opinions regarding minimum wage,
56 environmental protection, and government-funded health care do not.

57 These accounts are consistent with empirical results showing bivariate relationships
58 between conservatism and pathogen avoidance. However, a growing body of theory and research
59 on the behavioral immune system suggests that myriad aspects of human psychology and
60 behavior might serve anti-pathogen functions (Schaller & Park, 2011; Thornhill & Fincher,
61 2014). This raises the possibility that there are alternative accounts that might explain the
62 empirical relationship between pathogen avoidance and conservatism. Here, we present and test
63 such an alternative explanation—that the relationship between measures of pathogen avoidance
64 and conservatism reflects sexual strategies.

65 *1.2. Pathogen avoidance and sexual strategies*

66 The costs imposed by pathogens have shaped the evolution of several aspects of human
67 sexuality and mate preferences (Tooby, 1982; Ridley, 1993; Tybur & Gangestad, 2011)
68 including, potentially, orientation toward monogamous versus promiscuous sexual strategies
69 (Schaller & Murray, 2008). Each new sexual partner presents a risk of exposure to novel

70 pathogens, either those commonly categorized as “sexually transmitted” (e.g., chlamydia) or
71 those that are transmitted via close physical contact, sexual or otherwise (e.g., influenza,
72 tuberculosis). Indeed, across primate groups, those species with greater promiscuity also invest
73 more energy in immune function, possibly to combat the pathogens transmitted during sexual
74 contact (Nunn et al., 2000). If the pathogen costs are greater than the benefits of multiple sexual
75 partners (including increased reproductive output for males and increased offspring genetic
76 diversity or quality for females; see Buss & Schmitt, 1993), mating systems might evolve to be
77 relatively monogamous (Loehle, 1995). Modeling simulations support this hypothesis, though
78 they also suggest that, rather than leading to homogenous monogamy throughout a population,
79 pathogen costs of sex can lead to increases in variability in monogamous versus promiscuous
80 mating strategies, with some individuals favoring a pathogen-risky sexual strategy (non-
81 monogamous) and others favoring a pathogen-risk-averse strategy (monogamous; Boots &
82 Knell, 2002; Kokko et al., 2002).

83 Empirical investigations of humans are consistent with the idea that more pathogen-
84 avoidant individuals adopt more monogamous mating strategies. For example, Murray and
85 colleagues (2013) found that the Germ Aversion subscale of the Perceived Vulnerability to
86 Disease scale (Duncan et al., 2009) relates negatively to short-term mating orientation ($\beta=-.19$),
87 meaning that individuals who are more avoidant of situations that are likely to transmit
88 pathogens are also less open to sex outside of a long-term, committed relationship. Similarly, the
89 sexual and pathogen factors of the Three Domain Disgust Scale (TDDS; Tybur et al., 2009) are
90 moderately correlated ($\beta=.40$), meaning that individuals who report being more disgusted by
91 pathogen cues also report being more disgusted by a variety of sexual acts and situations outside
92 of intercourse in a pair bond. Other research also indicates a relationship between pathogen

93 avoidance and sexual attitudes (e.g., Duncan et al., 2009; Olatunji, 2008). Hence, the same
94 operationalizations of pathogen avoidance used in investigations of the relationship between
95 pathogen avoidance and conservatism (i.e., disgust sensitivity and germ aversion; see Terrizzi et
96 al., 2013) also relate to sexual strategies. And, as it happens, recent research suggests that sexual
97 strategies may also relate to conservatism for reasons apart from pathogen avoidance.

98 *1.3. Sexual strategies and ideological conservatism*

99 Individuals following relatively monogamous versus relatively non-monogamous mating
100 strategies are helped or harmed by different social rules (Weeden et al., 2008; Weeden &
101 Kurzban, 2013). Rules that allow or even facilitate promiscuous sexual behavior in the social
102 ecology threaten the fitness interests of individuals following monogamous, high investment
103 reproductive strategies. Men who invest heavily in a single pair-bond have more to lose (e.g., via
104 cuckoldry) if the social ecology presents more opportunities for mate poaching via “non-
105 traditional” activities that present opportunities for casual, extra-pair sex (e.g., drug use, parties,
106 sexual exploration; Kurzban et al., 2010), and women who are highly dependent upon a pair-
107 bonded male’s investment encounter similar threats in environments where promiscuous sexual
108 behavior is condoned and partner resources might be reallocated from parenting effort to mating
109 effort (Price et al., in press). Therefore, individuals following relatively monogamous mating
110 strategies have a strategic interest in endorsing rules proscribing sexual promiscuity—rules that
111 characterize many ideological aspects of social conservatism (Weeden & Kurzban, 2014).

112 Results from several studies are consistent with the sexual strategies hypothesis of
113 conservatism. Using large U.S. samples, Weeden and colleagues (2008) and Kurzban and
114 colleagues (2010) find that the causal path flows from sexual strategies to ideological
115 conservatism rather than from ideological conservatism to sexual strategies. These empirical

116 patterns do not appear to be unique to the U.S.; indeed, they have been replicated in Japan, the
117 Netherlands, and Belgium (Quintelier et al., 2013). Further, data from the World Values Survey,
118 which includes nearly 300,000 individuals from 90 countries, indicate that religiosity
119 consistently relates to endorsement of rules that facilitate or interfere with sexual strategies (e.g.,
120 casual sex, prostitution, sexual infidelity), whereas it does not uniquely relate to endorsement of
121 rules unrelated to sexual strategies (Weeden & Kurzban, 2013). In the U.S., individuals living in
122 communities in which females are more economically dependent on males find sexual
123 promiscuity more wrong than individuals living in communities with greater sex egalitarianism
124 (Price et al., 2014). Finally, Li et al. (2010) find that, in an American university sample,
125 participants who view dating profiles depicting highly attractive members of their own sex (i.e.,
126 intrasexual competitors who could threaten investment in a monogamous mating strategy via
127 mate poaching) endorse greater religiosity.

128 *1.4. Do sexual strategies explain the relationship between pathogen avoidance and social*
129 *conservatism?*

130 There are, then, multiple possible explanations for the relationship between pathogen
131 avoidance and social conservatism. We have proposed that individuals invested in avoiding
132 infectious disease develop a high investment, relatively monogamous sexual strategy to mitigate
133 the pathogen costs associated with increasing numbers of sexual partners. Investment in this
134 sexual strategy then motivates a suite of socially conservative attitudes that are strategically
135 advantageous for those who have invested in monogamous pair bonds (we call this the *sexual*
136 *strategies* account of the relationship between pathogen avoidance and social conservatism).
137 Some existing evidence is consistent with this account. One recent study found that, out of
138 attitudes toward 14 groups, the Disgust Scale Revised (Olatunji et al., 2007) related most

139 strongly to attitudes toward groups that were seen as violating or promoting traditional sexual
140 rules (Crawford et al., 2014). Other studies that have been interpreted as supporting the pathogen
141 avoidance function of social conservatism are also consistent with this account. For example,
142 although resistance to stem cell research, abortion, and homosexual marriage has been
143 interpreted as a strategy for socially excluding outgroups who pose pathogen threats (Terrizzi et
144 al., 2010), other accounts suggest that such attitudes serve strategic reproductive functions
145 (Weeden & Kurzban, 2014). Hence, the existing empirical relationship between pathogen
146 avoidance variables and social conservatism variables could reflect a shared relationship between
147 pathogen avoidance and sexual strategies.

148 Naturally, the pathogen avoidance and sexual strategies explanations need not be
149 mutually exclusive—in fact, to the extent that people have coherent political ideologies, political
150 sentiments related and unrelated to sexual strategies might covary (Jost et al., 2003, 2009).
151 However, a strong version of the sexual strategies account, according to which the relationship
152 between pathogen avoidance and conservatism is entirely due to sexual strategies, makes a
153 testable prediction about the relationship between these variables. Namely, if this account is
154 correct, then sexual strategies should fully mediate the relationship between pathogen avoidance
155 and conservatism—that is, there should be no residual relationship between pathogen avoidance
156 and social conservatism after accounting for sexual strategies. In contrast, if conservatism
157 functions to neutralize pathogens in the ways detailed above, then pathogen avoidance should
158 relate to conservatism independently of sexual strategies. There are myriad ways of interacting
159 with and acquiring pathogens from outgroups that are seemingly unrelated to sex (e.g.,
160 exchanging goods), and there are myriad traditions (e.g., food preparation) that are similarly
161 unrelated to sex. Further, individuals following more versus less monogamous sexual strategies

162 would seemingly face the same threat of pathogens from outgroups or deviations from tradition.
163 Hence, this perspective can be used to predict that individual differences in pathogen avoidance
164 would covary with the residual variation in social conservatism not accounted for by sexual
165 strategies.

166 We aim to test these accounts across three studies by using a broad array of measures of
167 pathogen avoidance, sexual strategies, and ideological conservatism.

168 **2.Study 1**

169 Much of the literature on pathogen avoidance and conservatism operationalizes pathogen
170 avoidance using disgust sensitivity instruments. Indeed, even before the term “behavioral
171 immune system” entered the evolutionary psychological lexicon, political psychologists
172 suggested that conservatives are disgusted more easily than liberals (Jost et al., 2003). Hence, we
173 began our investigation by examining the relationship between conservatism and disgust
174 sensitivity. We chose to use the TDDS as a measure of disgust sensitivity, since it includes
175 separate pathogen and sexual disgust factors.

176 This investigation is similar to that described by Tybur and colleagues (2010), with two
177 important modifications. First, whereas Tybur and colleagues surveyed only undergraduate
178 university students, this study surveyed a larger sample of individuals with a broader range of
179 ages, educational background, and geographic locations. Second, in contrast with Tybur and
180 colleagues, who used broad measures of ideological conservatism that did not differentiate
181 between social conservatism and economic conservatism (e.g., level of agreement with the
182 statement “I consider myself to be politically liberal”), we separately asked participants how
183 liberal versus conservative they are on economic and social issues. Although endorsements of
184 “social” and “economic” conservatism are correlated, they differentially relate to personality

185 variables (Gerber et al., 2010), and they might differentially relate to reproductive or pathogen
 186 avoidance strategies (Weeden & Kurzban, 2014). Indeed, this shortcoming (i.e., not
 187 differentiating between social and economic conservatism) has cast doubt on the validity of
 188 results reported by Tybur and colleagues for testing the pathogen avoidance hypothesis of
 189 conservatism (see Terrizzi et al., 2013).

190 *2.1. Methods*

191 Participants were 819 adults (423 male; $M_{\text{age}} = 33.37$, $SD = 12.33$) recruited via Mechanical
 192 Turk, the SPN network website, and the Psychology Research on the Net website. Only
 193 Mechanical Turk users registered in the United States were allowed to participate. Further
 194 information about our samples can be found in the supplementary materials (see also Berinsky et
 195 al., 2012, and Paolacci et al., 2010, for more details on Mechanical Turk users). After completing
 196 other measures irrelevant to the current investigation, participants completed the following:

197 *Three Domain Disgust Scale* (Tybur et al., 2009): This is a 21-item measure that includes
 198 a seven-item *pathogen* factor, a seven-item *sexual* factor, and a seven-item *moral* factor. The
 199 pathogen factor of the TDDS has frequently been used to operationalize pathogen avoidance
 200 (e.g., DeBruine et al., 2010; Park et al., 2012), and the sexual factor has been used to test sexual
 201 strategies hypotheses (e.g., Kurzban et al., 2010; Quintelier et al., 2013) and shows similar sex
 202 differences and correlations with personality traits as other measures of sexual strategies (see
 203 Tybur et al., 2011; Tybur & DeVries, 2013; compare with Bourdage et al., 2007). We only
 204 included scores on the pathogen ($\alpha = .84$) and sexual ($\alpha = .88$) factors.

205 *Individual ideology items*: Participants answered three questions concerning ideology:

206 1) How would you describe your political orientation when it comes to social issues?

207 2) How would you describe your political orientation when it comes to economic issues?

208 3) Do you tend to agree more with the Democratic Party or with the Republican Party?
209 Each of these items was measured on a seven point, likert-type scale. The first two items were
210 anchored by “Very Liberal” and “Very Conservative.” The third item was anchored by “Much
211 more with Democrats” and “Much more with Republicans.”

212 *2.2.Results*

213 Consistent with past findings that pathogen avoidance is related to social conservatism,
214 we found that social conservatism related to the pathogen domain of the TDDS ($r=.16, p<.05$).
215 Lee and Preacher’s (2013) test for differences between dependent correlations suggested that this
216 relationship was stronger than those between the pathogen domain of the TDDS and economic
217 conservatism ($r=.08, p<.05$) and agreement with the Democratic versus Republican parties
218 ($r=.09, p<.05$). The sexual domain of the TDDS also related to all conservatism variables, though
219 the magnitudes of the correlations were stronger (r ’s=.34, .16, and .19, p ’s<.05, for social
220 conservatism, economic conservatism, and party identification, respectively).

221 We used structural equation modeling (via EQS 6.1) to test the sexual strategies account
222 of the relationship between pathogen avoidance and conservatism. This approach allows for a
223 direct statistical comparison of models in which effects of pathogen avoidance on conservatism
224 operate only via sexual strategies (i.e., mediation hypotheses) versus models in which pathogen
225 avoidance relates to conservatism independent of sexual strategies. Our approach involved
226 specifying a model in which (1) the sexual domain of the TDDS was regressed on participant sex
227 and the pathogen domain of the TDDS and (2) the three conservatism variables were regressed
228 onto participant sex and the sexual domain of the TDDS. Participant sex and the pathogen
229 domain of the TDDS were allowed to covary, as were error variances between conservatism
230 items (that is, variance in ideology items that was not accounted for by participant sex or the

231 sexual domain of the TDDS). Hence, the only relationships that were not modeled were direct
232 effects of pathogen avoidance on conservatism (that is, the direct relationships between pathogen
233 avoidance and conservatism were constrained to zero). A poor-fitting model would suggest that
234 pathogen avoidance relates to conservatism independently of its relationship with sexual
235 strategy. A well-fitting model would provide support for the strong version of the sexual
236 strategies hypothesis—that pathogen avoidance relates to conservatism only because it relates to
237 sexual strategies. As is standard in structural equation modeling, a significant chi-square value
238 rejects the null hypothesis that the covariance matrix implied by the model is identical to the
239 covariance matrix observed in the data. Other model fit indices, including comparative fit index
240 (CFI), root mean square error of approximation (RMSEA), and standardized root mean residual
241 (SRMR) are also routinely reported, since significant chi square values can result from trivial
242 misfit. All statistics are based on robust maximum likelihood estimates, which correct for biases
243 that might occur under violations of multivariate normality (Bentler, 2006).

244 -- Figure 1 here --

245 The model fit the data well, regardless of which criterion was used to evaluate model fit,
246 S-B $\chi^2(3)=1.56, p=.67, CFI=1.00, RMSEA=.00, SRMR<.01$. That is, the model in which direct
247 relationships between the pathogen domain of the TDDS and the three conservatism items were
248 constrained to zero was statistically indistinguishable from the observed data (see Figure 1 for
249 standardized coefficients). Each of the three indirect effects of the pathogen domain of the TDDS
250 on conservatism via the sexual domain of the TDDS was statistically significant at the $p<.05$
251 level (see supplementary materials for effect sizes). To illustrate the independent effects of
252 pathogen avoidance on conservatism, we also examined a saturated model in which direct effects
253 from pathogen avoidance to conservatism were freely estimated. Consistent with the near perfect

254 fit of the constrained model, all of these coefficients were close to zero (β 's=-.01, .02, and -.02
255 for social conservatism, economic conservatism, and party affiliation, respectively), with 95%
256 confidence intervals that overlapped with zero (see Table 1).

257 -- Table 1 here --

258 *2.3.Discussion*

259 Results from Study 1 offered initial support to the sexual strategies account of the
260 relationship between pathogen avoidance and conservatism, and were not straightforwardly
261 consistent with alternative accounts. However, two aspects of Study 1 might have limited our
262 ability to detect a relationship between pathogen avoidance and conservatism independent of
263 sexual strategies. First, the variables we used to measure conservatism explicitly mentioned
264 political attitudes and political party affiliation. Substantial variance in these items might have
265 related to issues (e.g., firearm regulations) only peripherally related to the purported prophylactic
266 aspects of conservatism. Other constructs that more directly relate to intergroup bias or
267 traditionalism might relate to pathogen avoidance independently of sexual strategies. Second, we
268 used only one of several measures that have been used to operationalize pathogen avoidance in
269 this literature—the pathogen domain of the TDDS. We address these two limitations in Study 2.

270 **3.Study 2**

271 Given the limited breadth of conservatism measures included in Study 1—and the sole
272 reliance on the TDDS to operationalize pathogen avoidance—we broadened our coverage of
273 both constructs in Study 2. Specifically, we included (1) the Disgust Scale-Revised (DS-R),
274 another instrument that is commonly used to operationalize pathogen avoidance in this literature,
275 and (2) instruments to measure religiosity, traditionalism, and tolerance of inequality, the latter
276 two of which are considered to be core dimensions of ideological conservatism (Jost et al.,

277 2003), and both of which relate to negativity toward outgroups (Duckitt & Sibley, 2009).
278 Measures of religiosity, traditionalism, and social dominance orientation have been used in
279 several of the studies testing for relationships between pathogen avoidance and social
280 conservatism (Terrizzi et al., 2013).

281 *3.1.Methods*

282 Participants were 238 adults (100 female; $M_{\text{age}}=32.75$, $SD=11.00$) recruited via
283 Mechanical Turk. After completing other measures irrelevant to the current investigation,
284 participants completed the TDDS (pathogen $\alpha=.89$; sexual $\alpha=.89$) and the following instruments:

285 *Disgust Scale-Revised* (DS-R; Olatunji et al., 2007): Olatunji and colleagues modified the
286 Disgust Scale (Haidt et al., 1994) by removing seven items, including the four items that were
287 originally intended to form a “sexual” factor. Thirteen items ask participants to indicate the
288 degree to which they agree with statements such as “It would bother me tremendously to touch a
289 dead body” on a 1 (strongly disagree) to 5 (strongly agree) likert scale, and 12 items ask
290 participants how disgusting they find statements such as “A friend offers you a piece of
291 chocolate shaped like dog doo” on a 1 (not disgusting at all) to 5 (extremely disgusting) scale
292 ($\alpha=.89$).

293 *Social Dominance Orientation* (Pratto et al., 2013): This is a four-item measure in which
294 participants indicate the degree to which they oppose versus favor statements (e.g., “Group
295 equality should be our ideal”) on a 1 (*extremely oppose*) to 7 (*extremely favor*) likert scale
296 ($\alpha=.82$).

297 *Traditionalism* (Duckitt et al., 2010): This is a six-item measure of traditionalism in
298 which participants are asked to indicate their agreement with statements such as “The ‘old-

309 fashioned ways' and 'old-fashioned values' still show the best way to live" on a 1 (strongly
310 disagree) to 7 (strongly agree) scale ($\alpha=.90$).

311 *Religiosity:* We also included three religiosity items recently used in an international Pew
312 Research Survey. Participants indicated "no" (which was coded as 0) or "yes" (which was coded
313 as 1) to the following items: "I believe faith in God is necessary for morality," "Religion is very
314 important to my life," and "I pray at least once per day." Item responses were averaged ($\alpha=.91$).

315 *Individual ideology items:* As in Study 1, participants answered individual items that
316 straightforwardly asked them to self-report their ideology. In contrast to Study 1, the "social" and
317 "economic" conservatism items did not explicitly mention "politics." The four items were:

318 1) In general, how liberal (left-wing) or conservative (right-wing) are you on economic
319 issues?

320 2) In general, how liberal (left-wing) or conservative (right-wing) are you on social
321 issues?

322 3) When it comes to politics, do you usually think of yourself as liberal, moderate,
323 conservative, or something else?

324 4) In political matters, people talk of "the left" and "the right." How would you place
325 your views on this scale?

326 The first and second items were measured on a 1 (very liberal) to 7 (very conservative)
327 scale with additional options for "don't know" and "can't pick one label." The third item was
328 measured on a 1 (very liberal) to 7 (very conservative) scale with additional options for "don't
329 know/not political," "libertarian," and "other." The fourth item was measured on a 1 (left) to 10
330 (right) scale, with an additional option for "Don't know/not applicable." We treated responses
331 from participants who selected one of these additional options (between five and ten percent of

322 responses, depending on the item) as missing data. These missing values were imputed using the
323 EQS EM algorithm for estimating missing data by considering participants' social dominance
324 orientation, traditionalism, age, sex, and the four political ideology items. Results were
325 unchanged when missing values were not imputed.

326 *3.2. Results*

327 We report analyses using both the pathogen domain of the TDDS and the DS-R
328 separately, with the TDDS correlation before the slash and the DS-R correlations after. Both
329 instruments were related to social conservatism ($r=.23/.22, p's<.05$), economic conservatism
330 ($r=.15/.14, p's<.05$), left versus right placement ($r=.19/.23, p's<.05$), general political
331 identification ($r=.22/.22, p's<.05$), traditionalism ($r=.25/.36, p's<.05$), social dominance
332 orientation ($r=.08/.13, p's=.23/.05$), and religiosity ($r=.26/.34, p's<.05$). As in Study 1, though,
333 the sexual domain of the TDDS was more strongly correlated with each measure of conservatism
334 than were either the DS-R or the pathogen domain of the TDDS (see Table 2).

335 -- Table 2 here --

336 We proceeded to test path models similar to that described in Study 1. We tested two
337 models separately—one in which the DS-R was used to operationalize pathogen avoidance, and
338 one in which the TDDS pathogen domain was used to operationalize pathogen avoidance. In
339 both models, we (1) regressed the sexual domain of the TDDS on participant sex and the
340 pathogen avoidance variable, and (2) regressed all seven ideology variables on the sexual domain
341 of the TDDS and on participant sex. Participant sex and pathogen avoidance were allowed to
342 covary, as were all error variances of conservatism items. Hence, as in Study 1, the model did
343 not allow any direct effects of pathogen avoidance on conservatism; it only allowed pathogen
344 avoidance to relate to conservatism indirectly via the sexual domain of the TDDS.

345 Replicating results from Study 1, the model in which pathogen avoidance was
346 operationalized using the TDDS pathogen domain—and in which direct relationships between
347 pathogen avoidance and conservatism were constrained to zero—fit the data well, S-B
348 $\chi^2(7)=10.84, p=.15, CFI=1.00, RMSEA=.05, SRMR=.02$. Results were virtually identical when
349 the DS-R was used, S-B $\chi^2(7)=9.80, p=.20, CFI=1.00, RMSEA=.04, SRMR=.02$. All indirect
350 effects of pathogen avoidance variables via the sexual domain of the TDDS were statistically
351 significant (see supplementary materials for effect sizes). As in Study 1, we also examined
352 saturated models in which all direct relationships between pathogen avoidance and conservatism
353 variables were freely estimated. Only one of the 95% confidence intervals for these direct effects
354 failed to overlap with 0 (that between the pathogen domain of the TDDS and traditionalism), and
355 this effect was in the opposite direction of that predicted by the pathogen avoidance model. In
356 sum, any positive relationships between pathogen avoidance variables and conservatism were, as
357 in Study 1, fully mediated by the sexual domain of the TDDS.

358 *3.3. Discussion*

359 Results from Study 2 provided further support for the strong version of the sexual
360 strategies hypothesis. This was the case across a broad array of instruments that have been used
361 to test the hypothesis that conservatism is a pathogen avoidance strategy, including
362 traditionalism, social dominance orientation, religiosity, political party identification, and
363 explicit endorsements of social and economic conservatism. Nevertheless, inferences based on
364 Studies 1 and 2 might be limited by two aspects of our designs. First, we used only the sexual
365 domain of the TDDS as a measure of sexual strategy. Although this measure includes items that
366 straightforwardly relate to monogamous orientations (e.g., “Bringing someone you just met back
367 to your room to have sex”), it also includes items that are less straightforwardly related to

368 monogamy (e.g., “Hearing two strangers having sex”). Second, we used only disgust sensitivity
369 instruments to operationalize pathogen avoidance. We sought to address both of these potential
370 limitations in Study 3.

371 **4.Study 3**

372 In addition to measuring the same variables used in Study 1 (i.e., identical conservatism
373 variables and the TDDS), we included the Germ Aversion factor of the Perceived Vulnerability
374 to Disease scale (Duncan et al., 2009) as an additional measure of pathogen avoidance, and the
375 attitudes factor of the revised Sociosexual Orientation Inventory (SOI; Penke & Asendorpf,
376 2008) as an additional measure of sexual strategies.

377 *4.1.Methods*

378 Participants were 254 adults recruited via Mechanical Turk. Six participants who either
379 did not report their sex or reported being neither male nor female were excluded from all
380 analyses. In the remaining sample (N=248; 150 male; $M_{age}=31.92$, $SD=11.31$), seven participants
381 had missing values on no more than three variables. As in Study 2, we imputed these missing
382 values using an EM algorithm. Measures for the study included the pathogen ($\alpha=.83$) and sexual
383 ($\alpha=.85$) domains of the TDDS, the three ideology items described in Study 1 (i.e., social
384 conservatism, economic conservatism, and party identification), and the following:

385 *Germ Aversion* (Duncan et al., 2009): This is an eight-item measure in which participants
386 were asked to indicate their agreement with statements such as “I prefer to wash my hands pretty
387 soon after shaking someone’s hand” on a 1 (strongly disagree) to 7 (strongly agree) scale
388 ($\alpha=.76$).

389 *SOI* (Penke & Asendorpf, 2008): This is a three-item measure of attitudes toward sex
390 outside of a monogamous relationship that is based on Simpson and Gangestad’s (1991) SOI.

391 Participants were asked to indicate their agreement with statements such as “I can imagine
 392 myself being comfortable and enjoying ‘casual’ sex with different partners” on a 1 (strongly
 393 disagree) to 7 (strongly agree) scale ($\alpha=.87$).

394 4.2. Results

395 The two pathogen avoidance instruments (Germ Aversion and TDDS pathogen)
 396 correlated $r=.55$, and the two sexual instruments (SOI attitudes and TDDS sexual) were similarly
 397 correlated, $r=-.54$. Germ aversion and TDDS pathogen had similar relationships with social
 398 conservatism (r 's=.09 and .11, p 's=.15 and .08), economic conservatism (r 's=.03 and .11,
 399 p 's=.03 and .11), and political party identification (r 's=.10 and .11, p 's=.14 and .09).

400 Sociosexual attitudes and TDDS sexual also had similar relationships with social conservatism
 401 (r 's=-.23 and .26, p 's<.05), economic conservatism ($r = -.09$ and .13, p 's=.18 and .05) and
 402 political party identification (r 's=-.18 and .20, p 's<.05).

403 -- Table 3 here --

404 -- Table 4 here --

405 We conducted four path analyses similar to the one described in Study 1. In each model,
 406 we (1) regressed one of the two sexual strategy variables on participant sex and one of the two
 407 pathogen avoidance variables, and (2) regressed the three ideology variables on participant sex
 408 and sexual strategy. As in Study 1, we also allowed the pathogen avoidance variable and
 409 participant sex to covary, and we allowed error variances for the three ideology variables to
 410 covary. Hence, in all four models, the direct effects of the pathogen avoidance variable on all
 411 three ideology variables were constrained to zero; that is, pathogen avoidance was only allowed
 412 to relate to conservatism indirectly via sexual strategy. Each model fit the data well, with all S-B
 413 χ^2 s between 0.89 and 3.22 (p 's between .36 and .82), all CFI's equal to 1.00, all RMSEAs

414 between .00 and .017, and all SRMR's less than or equal to .013. In each model, the indirect
415 effects from the pathogen avoidance to social conservatism via sexual strategies were significant
416 at the .05 level, as were five of eight the indirect effects on economic conservatism and party
417 affiliation (see supplementary materials for effect sizes). Further, in saturated models, all 95%
418 confidence intervals of the direct relationship between pathogen avoidance and conservatism
419 variables overlapped with zero.

420 *4.3. Discussion*

421 In all four combinations of pathogen avoidance and sexual strategies measures, we
422 observed no direct effect of pathogen avoidance on ideological conservatism. That is, any
423 relationship between pathogen avoidance and conservatism was fully mediated by sexual
424 strategies, regardless of which of two instruments of pathogen avoidance were used, and which
425 of two instruments of sexual strategy was used. Hence, results from Study 3 further supported
426 the sexual strategies explanation for the relationship between pathogen avoidance and
427 conservatism.

428 **5. General Discussion**

429 Results were clear and consistent across three studies—although instruments designed to
430 assess pathogen avoidance related to measures of ideological conservatism at a bivariate level,
431 these relationships were fully mediated by instruments measuring sexual strategies. We now
432 briefly describe how these results inform pathogen avoidance and sexual strategies perspectives
433 on ideology, and we discuss directions for future research.

434 *5.1. Pathogen avoidance and ideology*

435 Recent work has highlighted the myriad ways in which human psychology might
436 function to neutralize the infectious disease threats posed by pathogens (Schaller & Park, 2011;

437 Thornhill & Fincher, 2014). Adopting a conservative ideology—specifically, a socially
438 conservative ideology—has been proposed as an example of a pathogen-neutralizing strategy,
439 either because conservatism inhibits contact with outgroups (Terrizzi et al., 2013), or because
440 departures from traditional norms increase pathogen exposure (Murray et al., 2011; Schaller &
441 Murray, 2012). Results from the current studies seem difficult to reconcile these perspectives.
442 Sensitivity to sexual disgust accounted for 12%, 21%, and 7% of the variance in social
443 conservatism in Studies 1-3, respectively, and sociosexual attitudes accounted for 5% of the
444 variance in social conservatism in Study 3. Hence, there was substantial variance in social
445 conservatism *not* accounted for by sexual strategies in all three studies. If individuals adopt a
446 generally (socially) conservative ideology to reduce exposure to pathogens, it is not clear why
447 this variance in social conservatism *not* accounted for by sexual strategies was unrelated to
448 pathogen avoidance.

449 We point out that, despite our large samples (N 's=819, 238, and 248), it is possible that
450 we failed to detect very small direct effects of pathogen avoidance on conservatism independent
451 of sexual strategies. Future research could replicate these tests to further inform whether sexual
452 strategies partially versus fully mediate the relationship between pathogen avoidance and
453 conservatism. Further, these results cannot rule out the possibility that, even if general
454 dimensions of conservatism do not directly relate to pathogen avoidance, some specific
455 politically-relevant sentiments might have direct anti-pathogen functions. For example, our data
456 do not necessarily rule out the possibility that attitudes toward, say, immigration, relate to
457 pathogen avoidance independent of sexual strategies, perhaps especially in parts of the world
458 where immigration is a more salient issue than in the United States (see, e.g. Brenner and Inbar,
459 2014) or under conditions of especially high investment in avoiding pathogens (e.g., Faulkner et

460 al., 2004; Navarrete et al., 2007). Nevertheless, we again point out that we failed to detect any
461 relationship between pathogen avoidance and the sizeable variance in social conservatism that
462 was unaccounted for by sexual strategies in these samples from the United States, where most
463 studies on pathogen avoidance and ideology have been conducted.

464 *5.2. Pathogen avoidance and sexual strategies*

465 Sexual strategies, just like anti-pathogen strategies, affect myriad behaviors. The fact that
466 the two relate to each other presents theoretical and methodological challenges and opportunities.
467 Regarding theory, existing research has suggested that a number of factors shape sexual
468 strategies, including an individual's sex (Buss & Schmitt, 1993), the ratio of men to women in
469 the ecology (Schmitt, 2005), ecological harshness and, hence, survival prospects for offspring
470 lacking strong paternal investment (Gangestad & Simpson, 2000), and ability to convert mating
471 effort into reproductive output (Lukaszewski et al., 2014). Like others before us (Murray et al.,
472 2013; Schaller & Murray, 2008), we suggest that investment in avoiding infectious disease also
473 partially shapes sexual strategies. The empirical patterns observed in this paper and elsewhere
474 are consistent with this proposal. That said, more work (especially modeling work) is needed in
475 this area to understand the relationship between pathogen avoidance and sexual strategies. As
476 one example, relatively restricted sexual strategies might function to avoid specifically sexually
477 transmitted infections, or they might function to avoid pathogens that are transmitted via close,
478 though not necessarily sexual, physical contact. Future empirical tests might inform which of
479 these costs a restricted sexual strategy guards against.

480 Regarding methods, the current results suggest care in interpreting measures that include
481 both sexual and pathogen content. For example, the original Disgust Scale (Haidt et al., 1994)
482 includes items concerning condemnation of third-party sexual behaviors (e.g., "I think

483 homosexual activities are immoral”). Although some have suggested that these items increase
484 the validity of the Disgust Scale as a measure of pathogen avoidance (e.g., Terrizzi et al., 2013),
485 such items might inflate estimates of the relationship between pathogen avoidance and a criterion
486 variable (e.g., conservatism) if that criterion variable also relates to sexual strategies. The
487 revision of the Disgust Scale (Olatunji et al., 2007) eliminated the four items from this
488 instrument that were intended to capture sexual disgust during instrument development, but it
489 nevertheless include one item that references sex (“As part of a sex education class, you are
490 required to inflate a new unlubricated condom, using your mouth”). The correlation between
491 conservatism and this individual item with sexual content is markedly higher than that between
492 conservatism and the other items on the revised Disgust Scale (Inbar et al., 2012). Indeed, using
493 measures of pathogen avoidance that were not confounded with sexual strategies, we observed
494 weaker relationships between pathogen avoidance and social conservatism than those reported in
495 a recent meta-analysis (Terrizzi et al., 2013)¹.

496 Although removing most of the sex-related items from the Disgust Scale was a
497 methodological improvement, it removes the possibility of allowing for separate tests of
498 pathogen avoidance versus sexual strategies hypotheses with a single instrument. In contrast, the
499 TDDS offers an efficient method for doing this, since it has both sexual and pathogen factors
500 (see, e.g., DeBruine et al., 2010, for an example). Other readily available instruments (e.g., the
501 SOI; the PVD Germ Aversion factor) do not confound pathogen and sexual content. Just as our
502 interpretation of the relationship between pathogen avoidance and conservatism changes if we
503 take into account sexual strategies, other findings in the pathogen avoidance literature might
504 similarly be revisited by also examining sexual strategies.

¹ A meta-analysis of the effect sizes of pathogen avoidance and sexual strategies on conservatism within these three studies can be found in the supplementary materials.

505 *5.3. Sexual strategies and ideology*

506 Results lend further support to proposals that sexual strategies relate to ideological
507 conservatism (Kurzban et al., 2010; Weeden & Kurzban, 2014) and that they relate differently to
508 different categories of political sentiments. The difference in the magnitude of the correlations
509 between the sexual domain of the TDDS and different conservatism variables in Study 2, where
510 we measured the most conservatism variables, was striking. Whereas sensitivity to sexual disgust
511 related strongly to religiosity, traditionalism, and social conservatism (r 's=.48, .59, and .46,
512 respectively), it related only weakly to social dominance orientation and economic conservatism
513 (r 's=.15 and .25, respectively). This is consistent with the hypothesis that moral sentiments (at
514 least partially) function to shape rules that favor individual fitness interests (DeScioli & Kurzban,
515 2013). Whereas rules relevant to how social conservatism is defined in the population from
516 which we sampled (e.g., abortion, recreational drug use) can facilitate or disincentivize sex
517 outside of a pair-bond, rules relevant to how economic conservatism is defined (e.g., progressive
518 taxation, economic aid to the poor) presumably have less influence on individuals' ability to
519 pursue their sexual strategies.

520 *5.4. Concluding remarks*

521 The fact that pathogen avoidance relates to political ideology has been established in the
522 literature. The time now seems ripe to move on to second-generation topics—such as generating
523 and testing competing accounts of why this relationship exists. We hope that these studies
524 contribute to a clearer understanding of the relationship between sexual strategies, pathogen
525 avoidance, and political ideology.

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700

Figure Caption

701 Figure 1. Model constraining the direct relationship between pathogen avoidance and political

702 variables to zero, S-B $\chi^2(3) = 1.56, p = .67, CFI = 1.00, RMSEA = .00, SRMR < .01$. Error

703 variances for the three political variables are allowed to covary.

Table 1. Study 1 (N=819) bivariate correlations (r) and standardized regression coefficients, (β) unstandardized regression coefficients (b), and 95% confidence intervals between conservatism variables, pathogen disgust, and sexual disgust in the saturated model.

	<u>Pathogen TDDS</u>				<u>Sexual TDDS</u>			
	r	β	b	95% CI	r	β	b	95% CI
Social conservatism	.16	-0.01	-0.01	-0.22 -- 0.10	.34	0.42	0.46	0.37 -- 0.55
Economic conservatism	.09	0.02	0.03	-0.09 -- 0.14	.16	0.23	0.24	0.14 -- 0.33
Party affiliation	.08	-0.02	-0.03	-0.13 -- 0.08	.19	0.28	0.29	0.19 -- 0.38

Table 2. Study 2 (N=238) bivariate correlations (r) and standardized regression coefficients, (β) unstandardized regression coefficients (b), and 95% confidence intervals between conservatism variables, pathogen disgust, DS-R, and sexual disgust in the saturated models. Sexual disgust values left of the slash refer to the model in which pathogen disgust is used to operationalize pathogen avoidance, and values right of the slash refer to the model in which the DS-R is used to operationalize pathogen avoidance.

	<u>Pathogen TDDS</u>				<u>DS-R</u>				<u>Sexual TDDS</u>			
	r	β	b	95% CI	r	β	b	95% CI	r	β	b	95% CI
Right/Left	.19	-0.04	-0.07	-0.35 -- 0.22	.23	0.08	0.30	-0.27 -- 0.88	.36	0.49/ 0.43	0.78/ 0.68	0.53 -- 1.03 / 0.44 -- 0.92
Political ideology	.22	-0.03	-0.04	-0.23 -- 0.14	.22	0.03	0.07	-0.29 -- 0.44	.41	0.53/ 0.49	0.55/ 0.51	0.44 -- 0.66 / 0.35 -- 0.66
Social conservatism	.23	-0.06	-0.08	-0.26 -- 0.09	.22	.00	.00	-0.37 -- 0.36	.46	0.67/ 0.57	0.31/ 0.62	0.14 -- 0.48 / 0.46 -- 0.78
Economic conservatism	.15	.00	.00	-0.24 -- 0.23	.14	0.01	0.02	-0.38 -- 0.43	.25	0.27/ 0.26	0.66/ 0.31	0.46 -- 0.86 / 0.13 -- 0.49
Traditionalism	.25	-0.17	-0.20	-0.35 -- -0.06	.36	0.09	0.21	-0.07 -- 0.49	.59	0.80/ 0.65	0.78/ 0.65	0.65 -- 0.91 / 0.51 -- 0.78
SDO	.08	-0.01	-0.01	-0.16 -- 0.14	.13	0.09	0.16	-0.12 -- 0.44	.15	0.26/ 0.21	0.20/ 0.16	0.07 -- 0.33 / 0.04 -- 0.28
Religiosity	.26	-0.04	-0.01	-0.05 -- 0.03	.34	0.13	0.08	.00 -- 0.17	.48	0.56/ 0.47	0.15/ 0.13	0.11 -- 0.18 / 0.09 -- 0.17

Table 3

Study 3 (N=248) bivariate correlations (r) and standardized regression coefficients, (β) unstandardized regression coefficients (b), and 95% confidence intervals between conservatism variables, pathogen disgust, PVD germ aversion, and sexual disgust in the saturated models. Sexual disgust values left of the slash refer to the model in which pathogen disgust is used to operationalize pathogen avoidance, and values right of the slash refer to the model in which PVD germ aversion is used to operationalize pathogen avoidance.

	<u>TDDS Pathogen</u>				<u>PVD Germ Aversion</u>				<u>TDDS Sexual</u>			
	r	β	b	95% CI	r	β	b	95% CI	r	β	b	95% CI
Social conservatism	.10	-0.07	-0.11	-0.27 -- 0.09	.10	0.02	0.03	-0.17 -- 0.22	.26	0.39 / 0.35	0.46 / 0.42	0.29 -- 0.65 / 0.27 -- 0.56
Economic conservatism	.10	0.02	0.03	-0.20 -- 0.25	.05	0.00	0.00	-0.22 -- 0.22	.12	0.21 / 0.23	0.26 / 0.28	0.09 -- 0.45 / 0.13 -- 0.43
Party affiliation	.10	-0.02	-0.04	-0.24 -- 0.18	.11	0.04	0.07	-0.15 -- 0.29	.20	0.29 / 0.27	0.36 / 0.33	0.16 -- 0.56 / 0.16 -- 0.50

Table 4

Study 3 (N=248) bivariate correlations (r) and standardized regression coefficients, (β) unstandardized regression coefficients (b), and 95% confidence intervals between conservatism variables, pathogen disgust, PVD germ aversion, and sociosexuality in the saturated models. SOI values left of the slash refer to the model in which pathogen disgust is used to operationalize pathogen avoidance, and values right of the slash refer to the model in which PVD germ aversion is used to operationalize pathogen avoidance.

	<u>TDDS Pathogen</u>				<u>PVD Germ Aversion</u>				<u>SOI</u>			
	r	β	b	95% CI	r	β	b	95% CI	r	β	b	95% CI
Social conservatism	.10	0.07	0.11	-0.08 – 0.29	.10	0.07	0.11	-0.08 – 0.29	-.23	-0.27 / -0.27	-0.18 / -0.18	-0.26 -- -0.10 / -0.26 -- -0.10
Economic conservatism	.10	0.10	0.10	-0.09 – 0.31	.05	0.04	0.07	-0.13 – 0.27	-.09	-0.14 / -0.15	-0.09 / -0.10	-0.18 -- -0.01 / -0.18 -- -0.01
Party affiliation	.10	0.08	0.13	-0.06 – 0.34	.11	0.08	0.13	-0.07 – 0.34	-.18	-0.22 / -0.21	-0.15 / -0.15	-0.23 -- -0.06 / -0.23 -- -0.06