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Generalized or Origin-Specific Out-Group Prejudice?: The Role of Temporary and Chronic Pathogen-Avoidance Motivation in Intergroup Relations

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Abstract

Researchers have proposed that intergroup prejudice is partially caused by behavioral immune system mechanisms. Across four studies (total $N = 1{,}849$), we used both experimental (pathogen priming) and individual differences (pathogen disgust sensitivity [PDS]) approaches to test whether the behavioral immune system influences prejudice toward immigrants indiscriminately (the generalized out-group prejudice hypothesis) or specifically toward immigrants from a pathogen-rich ecology (the origin-specific out-group prejudice hypothesis). Internal meta-analyses lend some support to both hypotheses. At the experimental level, pathogen primes had no effect on attitudes toward origin-unspecified immigrants or immigrants from a pathogen-rich ecology. At the individual differences level, PDS has a unique negative effect on comfort with immigrants from pathogen-rich ecologies but not on comfort with immigrants from unspecified ecologies. However, pathogen disgust sensitivity was negatively related to the decision to allow entry to both origin-unspecified immigrants and immigrants from a pathogen-rich ecology.

Keywords

behavioral immune system, immigrants, out-group prejudice, pathogen disgust sensitivity, internal meta-analyses

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The 2013 Ebola outbreak, which began in Guinea and soon spread to Sierra Leone and Liberia, stoked fears of a global pandemic due to the virus's virulence and mortality rate. These fears reached their peak in the United States in mid-October 2014, when the first U.S. Ebola case was identified. Due to Ebola's lethal reputation, predictable and problematic panic soon spread (Yuhas, 2014), with one poll showing that 65% of Americans feared a widespread Ebola epidemic (Washington Post-ABC News Poll, 2014). Individuals who reported greater Ebola fears also reported greater prejudice toward West Africans and immigrants (Kim, Sherman, & Updegraff, 2016). With an increasingly interconnected world and a warming climate that favors the spread of tropical diseases, infectious disease outbreaks are likely to increase in frequency in the coming decades. Will the perceptions of pathogen threats that accompany these outbreaks shape intergroup attitudes, and, if so, how?

Evolutionary psychologists have suggested that out-group prejudices result from psychological mechanisms that evolved to neutralize the threats inherent to intergroup interactions in our ancestral environments (Neuberg, Kenrick, & Schaller, 2011). Pathogens, which are responsible for approximately 15 million worldwide deaths annually (about 25% of worldwide deaths; Morens, Folkers, & Fauci, 2004), have been proposed as one of these threats (Fincher & Thornhill, 2012). In order to minimize the costs posed by pathogens, complex organisms (including humans) have evolved functionally specialized anti-pathogen defenses including those that resist pathogens (the "classical" immune system) and those that

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motivate pathogen avoidance (the "behavioral" immune system). The behavioral immune system functions to detect pathogen cues and facilitate avoidance of contact with pathogens (Schaller & Park, 2011).

Some of the most striking findings in the behavioral immune system literature suggest that pathogens—and human pathogen-avoidance motives—might influence intergroup attitudes and behaviors. At the individual level, studies suggest that participants exposed to pathogen cues (e.g., slideshows of disgust-eliciting objects such as maggots or gory wounds) report elevated ethnocentrism (Navarrete & Fessler, 2006; Navarrete, Fessler, & Eng, 2007), conformity (Wu & Chang, 2012), and out-group prejudice (Faulkner, Schaller, Park, & Duncan, 2004). At the societal level, regions with relatively high levels of pathogen stress are more religious and collectivistic and less trusting of out-groups; these are putatively group cohesion mechanisms that inhibit the intergroup transmission of pathogens (Fincher & Thornhill, 2012; Fincher, Thornhill, Murray, & Schaller, 2008; Zhang, 2018).

Like all psychological mechanisms, those motivating pathogen avoidance involve trade-offs (Schaller & Park, 2011). While any prejudices against out-groups motivated by pathogen avoidance might confer benefits (e.g., in terms of avoiding out-groups' infectious diseases), they can also incur costs (e.g., missed opportunities for trading or mating). As a consequence, behavioral immune system responses should be adapted to be deployed strategically in situations in which benefits outweigh costs. Thus, the cost–benefit ratio of any pathogen-based out-group prejudice is likely to vary across individuals and contexts. At the individual differences level, those who are especially avoidant of pathogens might more heavily weigh the benefits of avoiding out-groups. Consistent with this possibility, previous studies suggest that individuals who report more disgust and anxiety toward pathogen cues (e.g., coughing people, bodily wastes) exhibit more negativity toward out-groups (Aarøe, Petersen, & Arceneaux, 2017; Navarrete & Fessler, 2006). At the contextual level, cues to pathogens, such as disgust-eliciting pictures, trigger behavioral immune system responses (Tybur & Lieberman, 2016) including, perhaps, out-group prejudice. Some studies find that temporary exposure to pathogen cues (e.g., viewing images of a dirty toilet or reading news of swine flu) increases prejudice toward an arbitrary out-group created by a minimal-groups procedure (Buckels & Trapnell, 2013) or toward real-world immigrants (Faulkner et al., 2004; Huang, Sedlovskaya, Ackerman, & Bargh, 2011). However, to our knowledge, no work has contrasted two hypotheses of when and why the behavioral immune system might relate to intergroup attitudes—what we term the generalized out-group prejudice hypothesis versus the origin-specific out-group prejudice hypothesis.

Generalized Versus Origin-Specific Out-Group Prejudice

The generalized out-group prejudice hypothesis is based on the assumption that, in our species' ancestral past, out-group membership was a reliable cue to infectiousness (Fincher & Thornhill, 2012) for two possible reasons. First, due to host–parasite coevolution, individuals might develop immunity against the parasites within their local ecology rather than against the parasites in the ecologies inhabited by out-groups (cf. De Barra & Curtis, 2012; Fessler, Clark, & Clint, 2015). Second, out-group members are more likely to violate the local norms that might partially evolve culturally to prevent infection from local parasites, for example, via food preparation (Fincher & Thornhill, 2012; Schaller & Neuberg 2008). According to these accounts, our minds evolved to treat out-group membership as a cue to infectiousness. Both perspectives imply that, at the individual differences level, those who are more avoidant of pathogens should be more prejudiced against out-groups in general. And, when the behavioral immune system is activated (e.g., via disgust-eliciting images), individuals should become more negative toward out-groups in general.

An alternative hypothesis in the literature suggests that out-group membership is not sufficient to trigger a pathogen-avoidance response (Faulkner et al., 2004). Instead, some other socially transmitted information about the out-group is required to engage the behavioral immune system. For example, Faulkner and colleagues (2004) found that, after exposure to pathogen cues, Canadian participants showed more negative attitudes (relative to participants primed with pathogen-irrelevant threats) toward immigrants from unfamiliar countries (e.g., Mongolia, Peru), but not toward immigrants from more familiar locations (e.g., Poland, Taiwan). Here, "foreignness" putatively reflects a representation of ecological and cultural differences. Similarly, White, Johnson, & Kwan (2014) found that perceptions of infectious disease dangerousness varied as a function of the distance from which the disease originated. These findings suggest that pathogen-based out-group prejudice might be origin-specific. That is, for the behavioral immune system to motivate prejudice based on group membership, the out-group must have some additional association with infectious disease.

To our knowledge, no research has compared the two hypotheses. The current research aims to do just this by testing whether pathogen-avoidance motivations generate prejudice toward out-groups without information about infectious disease (generalized out-group prejudice hypothesis) or only toward out-groups that are associated with disease threats (origin-specific out-group prejudice hypothesis).

Overview of the Present Investigation

In the present studies, we tested the generalized (Studies 1, 2, 3, and 4) and origin-specific out-group prejudice hypotheses (Studies 3 and 4), using both experimental and individual differences approaches. Across four studies, we manipulated exposure to pathogen cues, and we measured individual differences in pathogen disgust sensitivity (PDS). We tested whether behavioral immune system activation and individual differences in PDS increased prejudice (a) toward an origin-unspecified immigrant group (Study 1, 2, 3, and 4) and (b) toward origin-specific immigrants that come from a pathogen-rich ecology (Studies 3 and 4).

Evidence for (a) would support the generalized prejudice hypothesis, and evidence for (b) would support the origin-specific hypothesis.

Study 1

The aim of Study 1 was to examine how pathogen cues and individual differences in PDS would influence attitudes toward origin-unspecified immigrants (i.e., from an unspecified ecology).

Material and Methods

Ethics Statement

Ethical approval for all four studies was obtained from the Ethics Review Board (VCWE, Faculty of Behavioural and Movement Sciences, Vrije Universiteit Amsterdam). At the beginning of the online studies, participants read a consent form and provided consent to participate by clicking the button to start the survey.

Participants

Four hundred ninety-three U.S. participants were recruited from Amazon Mechanical Turk and received US$0.80 in return for their participation. Twenty-five participants were excluded from the data set after they failed to correctly answer an attention check question correctly (see page 10 in the Supplementary Materials for details). Thus, the final sample consisted of 468 participants (187 women, 281 men; mean age = 33.34 years, $SD = 10.74$ years).

Materials

Pathogen and neutral primes. In the literature, visual cues to pathogens and pathogen content essays have been used interchangeably as pathogen primes (see Tybur, Frankenhuis, & Pollet, 2014, for a review). In this study, we used a verbal prime condition, a verbal control condition, a visual prime condition, and a visual control condition. The verbal materials were identical to those used by White, Kenrick, and Neuberg (2013), with the pathogen prime describing disgust-eliciting volunteer work at a geriatric ward of a local hospital and the control story describing a typical Tuesday evening filled with homework. The visual materials were two picture sets. The pathogen picture set contained seven images with cues to pathogens (e.g., vomit, a dirty toilet) and three images of neutral household items (e.g., a spoon) in order to prevent participants guessing the aim of the study. The control picture set contained 10 images of household items. The priming materials used in the four studies are given in the Supplementary Materials (see page 2–9).

Immigrant scenarios. The immigrant scenarios described a group of 100 individuals (either men or women) aged 20–24 who were born and raised in an unspecified foreign country. The 100 individuals wanted to immigrate to the United States due to difficult conditions in their home country. If allowed to immigrate, they would live in the participants' community (see page 11–12 in the Supplementary Materials for the scenarios).

Measures of attitudes toward immigrants. To assess attitudes toward the immigrants, we measured how comfortable participants would feel if these 100 individuals were allowed to immigrate, from 0 (*very uncomfortable*) to 100 (*very comfortable*). In addition to the continuous measure, we included two other measures. One was a binary measure in which participants indicated whether, if the decision were up to them, they would allow the group to immigrate (yes or no). The other measure assessed perceived threats. Participants indicated the likelihood that the immigrant group would threaten their physical safety, health, and economic interests, as well as perceptions of positive effects that the immigrants would have on 1 (*not at all likely*) to 7 (*very likely*) point scales (see page 12–13 in the Supplementary Materials for details).

PDS. PDS was assessed using the Three Domain Disgust Scale (TDDS, Tybur, Lieberman, & Griskevicius, 2009), which measures sensitivity to pathogen, sexual, and moral disgust across 21 items on a 0 (*not at all disgusting*) to 6 (*extremely disgusting*) Likert-type scale. PDS had adequate reliability (Cronbach's $\alpha = .87$).

Covariates. We tested for effects with and without each of the following variables: sexual disgust sensitivity (SDS), social dominance orientation (SDO), social and economic political attitudes. SDS was assessed through the 7-item subscale of TDDS (Cronbach's $\alpha = .87$). Controlling for other domains of disgust is a standard practice in the pathogen disgust literature (e.g., DeBruine, Jones, Tybur, Lieberman, & Griskevicius, 2010; Pond et al., 2012; Terrizzi, Clay, & Shook, 2014); doing so allows for inferences regarding domain-specific relationships between pathogen disgust and other measures. Controlling for sexual disgust is especially relevant here because existing work suggests that any relationship between pathogen disgust and political attitudes disappears once controlling for sexual disgust (Billingsly, Lieberman, & Tybur, 2018; Tybur, Inbar, Güler, & Molho, 2015a; cf. Shook, Terrizzi, Clay, & Oosterhoff, 2015). Such results have challenged the contention that political ideologies are directly shaped by the behavioral immune system; they suggest that ideology is more strongly shaped by sexual strategies, which are themselves related to the behavioral immune system.

In addition to SDS, SDO and political ideology might partly account for the relationship between pathogen threat and intergroup attitudes (Tybur et al., 2016). SDO was measured with Pratto, Sidanius, Stallworth, and Malle's (1994) SDO Scale (Cronbach's $\alpha = .96$), and social and economic political attitudes were measured by two single-item measures, in which participants described their political attitudes to social or economic issues on a scale ranging from 1 (*very liberal*) to 7 (*very conservative*).

Table 1. Regression Analysis of Comfort With Immigrants in Study 1.

	Model 1				Model 2			
	B	*SE*	β	*t*	*B*	*SE*	β	*t*
Constant	66.45	1.25		53.31	95.4	3.83		24.88
PDS	−1.91	1.03	−0.002	−1.86	−0.25	1.05	−0.01	−0.24
Prime	−0.13	2.49	−0.09	−0.05	−0.72	2.21	−0.01	−0.33
PDS × Prime	5.62	2.05	0.13	2.74**	5.16	1.82	0.12	2.83**
SDS					−0.15	0.90	−0.01	−0.17
SDO					−0.44	0.06	−0.32	−7.07***
Social political attitude					−3.90	0.99	−0.24	−3.96***
Economic political attitude					−0.20	0.91	−0.01	−0.22
R^2_{adj}	0.016				0.229			
F_{change}	3.55*				32.99***			

Note. PDS = pathogen disgust sensitivity; SDS = sexual disgust sensitivity; SDO = social dominance orientation. Prime was effect coded in the model.
*$p < .05$. **$p < .01$. ***$p < .01$.

Procedure

Participants were asked to complete two ostensibly unrelated tasks: (1) a memory test and (2) a survey of attitudes toward social issues. For the memory test, which served as the pathogen prime, participants were randomly assigned to read one of two short stories or view one of two sets of pictures and then to complete a memory test about the story or picture set they viewed. Next, participants were told that they would complete a survey of attitudes toward social issues (i.e., immigrant scenarios and attitude measures) before proceeding to the memory test. After answering questions about the immigrants, participants answered questions about the essays or pictures they had seen (i.e., the memory test). Participants also reported how much disgust they felt while reading the story or viewing the pictures. As expected, participants reported feeling more disgust in the pathogen prime condition ($M = 5.43$, $SD = 1.66$) than in the control condition ($M = 1.31$, $SD = 0.82$), $F(1, 464) = 1{,}321.73$, $p < .001$, $\eta_p^2 = .74$. The pathogen picture set ($M = 6.07$, $SD = 1.17$) was reported as eliciting more disgust than the pathogen story ($M = 4.80$, $SD = 1.83$), $F(1, 464) = 61.70$, $p < .001$, $\eta_p^2 = .117$.

Finally, participants completed the SDO Scale, TDDS, and the questions about social and economic political attitudes. Participants also gave demographic information including age and sex.

Results and Discussion

Perceived Threats From Immigrants

We first examined whether the pathogen prime and individual differences in PDS related to perceptions of threats posed by immigrants by regressing threat perception on prime (pathogen vs. control), PDS, and the interaction between the two, separately for each threat category. Results revealed that immigrants were perceived as posing a greater health threat in the pathogen prime conditions ($M = 3.09$, $SD = 1.53$) relative to the control conditions ($M = 2.78$, $SD = 1.45$), $t(464) = -2.40$, $p = .017$. PDS was also associated with greater perceptions of health threat from the immigrants, $\beta = 0.19$, $t(464) = 4.29$, $p < .001$. Further, we detected a significant interaction between PDS and pathogen prime, $\beta = -0.13$, $t(464) = -2.87$, $p = .004$. Simple slopes analysis showed that, in the pathogen prime conditions, PDS was positively related to perceived health threat, $\beta = 0.40$, $t(464) = 5.10$, $p < .001$. However, in the control condition, PDS was unrelated to perceived health threat, $\beta = 0.08$, $t(464) = 1.06$, $p = .290$. These effects remained when controlling for SDO, SDS, and social and economic political attitudes (all p's $< .05$; for effects of pathogen prime and PDS on other perceived threats and positive effects, see Table 1 in the Supplementary Materials).

Attitudes Toward Immigrants

We next tested whether pathogen primes and PDS affect comfort with immigrants (the continuous measure of attitudes toward immigrants). Results are shown in Table 1. First, we regressed comfort with the immigrants on pathogen prime, PDS, and their interaction. Results showed a marginally negative main effect of PDS on comfort with immigrants, $\beta = -0.09$, $t(464) = -1.86$, $p = .063$, and a significant interaction between pathogen prime and PDS, $\beta = 0.13$, $t(464) = 2.74$, $p = .006$. To further analyze the interaction between PDS and pathogen prime, we probed the simple slopes (Aiken, West, & Reno, 1991; Dawson, 2014). In the control condition, there was no relationship between PDS and comfort with immigrants, $\beta = 0.85$, $t(464) = 0.60$, $p = .549$. However, in the pathogen prime condition, PDS was negatively related to comfort with immigrants, $\beta = -4.78$, $t(464) = -3.20$, $p = .001$. Additionally, participants higher in PDS (1 *SD* above the mean) reported marginally less comfort with immigrants in the control condition compared to the pathogen prime condition, $t(464) = 1.90$, $p = .058$, $r_p^2 = 0.007$. Conversely, participants lower in PDS (1 *SD* below the mean) reported more comfort with immigrants in the pathogen prime condition compared to the control condition, $t(464) = -1.98$, $p = .049$, $r_p^2 = 0.008$.

In the next model, we tested if the interaction was independent of the effect of SDO, SDS, and social and economic political attitudes: Results revealed that this was the case (see Table 1). As expected, SDO, $\beta = -0.32$, $t(460) = -7.07$, $p < .001$, and social political attitudes, $\beta = -0.24$, $t(460) = -3.96$, $p < .001$, also negatively predicted comfort with immigrants.

Similar to the continuous measure of comfort with immigrants, there was no difference in the decision to allow immigration between the pathogen prime condition (74.5%) and the control condition (79.7%), $OR = 0.77$, Wald $\chi^2(1) = 1.33$, $p = .249$, or between participants high and low in PDS, $OR = 0.97$, Wald $\chi^2(1) = 0.04$, $p = .842$. Additionally, the interaction between pathogen prime and PDS on the decision to allow immigration was marginally significant, $OR = 0.70$, $\chi^2(1) = 3.68$, $p = .055$. That is, in the pathogen prime condition, higher PDS individuals were more likely to reject the immigrants, $OR = 0.68$, $\chi^2(1) = 8.09$, $p = .004$, whereas in the control condition, PDS was unrelated to the decision to allow immigration, $OR = 0.97$, $\chi^2(1) = 0.04$, $p = .842$. We observed similar results when controlling for SDO, SDS, and social and economic political attitudes.

Finally, we also compared the effects of verbal versus visual materials and investigated the effect of immigrant sex on the measures described above. None of the conclusions described above changed based on these analyses, which are reported on page 14 in the Supplementary Materials.

Discussion

In Study 1, we first examined the generalized out-group prejudice hypothesis by testing whether a pathogen prime and PDS together influenced (a) the perceptions of threats posed by immigrants from an unspecified ecology, (b) comfort with immigrants, and (c) decisions to allow those immigrants to enter the United States. We found that PDS was associated with perceptions of greater health threat for participants in the pathogen prime condition. Further, participants high in PDS were less comfortable with immigrants in the pathogen prime condition than in the control condition. However, participants low in PDS were *more* comfortable with immigrants in the pathogen prime condition than in the control condition. These effects did not extend to our binary decision variable. Given these ambiguities, we conducted a replication study.

Study 2

Study 1 examined how a pathogen prime and PDS relate to attitudes toward an origin-unspecified immigrant out-group and suggested that PDS negatively predicts attitudes toward immigrants in a pathogen prime condition. In Study 2, we aimed to replicate the study while adding an additional individual difference variable related to pathogen avoidance: the germ aversion (GA) factor of the Perceived Vulnerability to Disease Scale (Duncan, Schaller, & Park, 2009). Additionally, we only used visual priming material in Study 2 since pathogen-relevant images were perceived as more disgusting in Study 1 than the pathogen-relevant story.

Material and Methods

Participants

Four hundred forty-seven U.S. participants were recruited through Amazon's Mechanical Turk and reimbursed with a payment of US$0.80. After excluding the participants who failed to answer an attention check question correctly, the final sample consisted of 439 participants (248 women, 191 men; mean age = 36.27 years, $SD = 11.95$ years).

Materials

Materials in Study 2 were similar to those of Study 1, except that we used only visual priming materials and added the GA factor of the Perceived Vulnerability to Disease Scale as an additional measure of pathogen avoidance. The GA factor is a frequently used self-report instrument that reflects trait-level behavioral immune system activation (Tybur et al., 2014). The GA factor is composed of eight statements (Cronbach's $\alpha = .79$), with which participants indicate their agreement on a 1 (*strongly disagree*) to 7 (*strongly agree*) scale.

Procedure

Procedures for Study 2 were similar to those of Study 1. Participants first viewed the images (pathogen prime vs. control), then read the same immigration scenario used in Study 1 and reported their attitudes toward immigrants from an unspecified foreign country, and then completed the ostensibly unrelated memory task before answering demographic questions.

Results and Discussion

Perceived Threats From Immigrants

Consistent with Study 1, participants in the pathogen prime condition ($M = 3.20$, $SD = 1.51$) perceived a greater health threat from the immigrants relative to participants in the control condition ($M = 2.78$, $SD = 1.51$), $t(435) = -2.65$, $p = .008$. Further, PDS was positively related to perceived health threat, $\beta = 0.28$, $t(435) = 6.03$, $p < .001$. Inconsistent with Study 1, the interaction between PDS and prime was not significant, $\beta = -0.02$, $t(435) = -0.38$, $p = .707$. GA similarly related to perceived health threat from immigrants, $B = 0.27$, $t(435) = 4.45$, $p < .001$. The effects of pathogen prime and PDS remained significant after controlling for SDO, SDS, social and economic political attitudes, as did the effect of GA (for the effects of pathogen prime, PDS, and GA on all perceived threats and perceived positive effects of immigration, see Table 2 in the Supplementary Materials).

Table 2. Regression Analysis of Comfort With Immigrants in Study 2.

	Model 1				Model 2			
	B	*SE*	β	*t*	*B*	*SE*	β	*t*
Constant	63.95	1.34		47.65	99.26	4.40		22.56
PDS	−3.57	1.13	−.15	−3.15**	−0.92	1.24	−.04	−0.74
Prime	−1.09	2.69	−.02	−0.41	−1.17	2.40	−.02	−0.49
PDS × Prime	5.62	2.27	−.01	−0.16	−0.42	2.02	−.01	−0.21
SDS					−2.26	1.02	−.12	−2.23*
SDO					−0.46	0.06	−.33	−7.22***
Social political attitude					−1.33	1.11	−.08	−1.20
Economic political attitude					−1.72	1.04	−.11	−1.65
R^2_{adj}	0.016				0.218			
F_{change}	3.33*				29.18***			

Note. Prime was effect coded in the model. PDS = pathogen disgust sensitivity; SDS = sexual disgust sensitivity; SDO = social dominance orientation.
*$p < .05$. **$p < .01$. ***$p < .01$.

Table 3. Regression Analysis of Comfort With Immigrants in Study 3.

	Model 1				Model 2			
	B	*SE*	β	*t*	*B*	*SE*	β	*t*
Constant	58.23	1.39		41.84	94.21	4.12		22.85
PDS	−5.22	1.21	−.20	−4.32***	−2.91	1.24	−.11	−2.35*
Prime	5.84	2.78	.10	2.10*	5.36	2.44	.09	2.20*
Origin	12.05	2.78	.20	4.33***	13.49	2.44	.22	5.54***
PDS × Prime	2.96	2.42	.06	1.23	2.29	2.13	.04	1.07
PDS × Origin	5.85	2.42	.11	2.42*	4.79	2.11	.09	2.27*
Prime × Origin	−3.10	5.57	−.03	−0.56	−2.51	4.88	−.02	−0.51
PDS × Origin × Prime	−2.19	4.83	−.02	−0.45	−5.29	4.26	−.05	−1.24
SDS					−2.25	1.05	−.10	−2.13*
SDO					−0.53	0.07	−.36	−7.68***
Social political attitude					−2.39	1.07	−.13	−2.24*
Economic political attitude					−0.13	0.96	−.01	−0.13
R^2_{adj}	0.095				0.309			
F_{change}	7.65***				34.87***			

Note. Prime and Origin were effect coded in the model. PDS = pathogen disgust sensitivity; SDS = sexual disgust sensitivity; SDO = social dominance orientation.
*$p < .05$. **$p < .01$. ***$p < .001$.

Attitudes Toward Immigrants

Next, we regressed comfort with immigrants on prime condition, PDS, and their interaction. Results are shown in Table 2. We observed no difference between the pathogen prime group ($M = 64.28$, $SD = 28.13$) and the control group ($M = 63.68$, $SD = 28.50$), $t(435) = -0.41$, $p = .685$. As in Study 1, PDS was negatively associated with comfort with immigrants, $\beta = -0.15$, $t(435) = -3.15$, $p = .002$. However, unlike in Study 1, pathogen prime did not interact with PDS, $\beta = -0.01$, $t(435) = -0.16$, $p = .875$. Next, we added the above-described covariates to the model. The interaction between pathogen prime and PDS remained nonsignificant. Further, the negative relationship between PDS and comfort with immigrants was nonsignificant after controlling for covariates, $\beta = -0.04$, $t(431) = -0.74$, $p = .458$.

We reran the analysis using GA in place of PDS. The results showed the same pattern as those using PDS; GA predicted less comfort with immigrants, $\beta = -0.16$, $t(435) = -3.41$, $p = .001$. This relationship also disappeared after controlling for the covariates, $\beta = -0.05$, $t(431) = -1.16$, $p = .246$. In addition, there was no interaction between GA and pathogen prime, $\beta = 0.002$, $t(435) = 0.05$, $p = .964$.

We found similar effects of PDS and GA on the decision to allow immigration (see Table 3 in the Supplementary Materials for more details).

Discussion

Study 2 was a replication of Study 1. We tested how a pathogen prime and PDS would affect perceptions of health threats posed by immigrants from an unspecified ecology, attitudes toward those immigrants, and decisions to allow those immigrants to immigrate. As in Study 1, a pathogen prime increased perceptions that the immigrants posed a health threat, but it affected

neither comfort with the immigrants nor a dichotomous decision to allow immigration. Further—and inconsistent with Study 1—the pathogen prime did not interact with PDS in predicting attitudes toward immigrants. Additionally, the weak bivariate relationship between PDS and comfort with immigrants (which was only marginally significant in Study 1) disappeared when we controlled for the covariates. Ultimately, results from Studies 1 and 2 did not provide compelling evidence in favor of the generalized out-group prejudice hypothesis.

Study 3

In Study 3, we added a between-subjects condition to the design to test the alternative origin-specific out-group prejudice hypothesis. Specifically, we compared how contextual pathogen cues and individual differences in PDS influence attitudes toward immigrants from Liberia, a nation associated with infectious disease in the period in which we collected data (shortly after the Ebola crisis; Parmet & Sinha, 2017) versus an origin-unspecified immigrants group.

Material and Methods

Participants

Four hundred fifty-three U.S. Mechanical Turk workers participated in exchange for US$0.80. Eight participants were excluded from the data set because they failed to answer a manipulation check question correctly. The final sample included 445 participants (178 women, 267 men; mean age = 34.47 years, $SD = 10.61$ years).

Materials

The materials of Study 3 were similar to those of Study 2, with one key change to the immigration scenario. In Study 3, immigrants were described as either coming from an unspecified foreign country, as we described in Studies 1 and 2, or from Liberia, which was described as wracked with infectious diseases, including Ebola and Zika virus.

Procedure

After completing the same visual priming procedure as in Study 2, participants were randomly assigned to read one of two immigrant scenarios. They then completed the same measures used in Study 2.

Results and Discussion

Perceived Threats From Immigrants

We first tested how immigrant origin (unspecified vs. a pathogen-rich ecology), pathogen prime, and PDS influenced perceptions of a health threat posed by the immigrants. Results indicated that Liberian immigrants were perceived as posing a greater health threat ($M = 4.10$, $SD = 1.81$) than were immigrants from an unspecified country ($M = 2.94$, $SD = 1.49$), $t(437) = -7.42$, $p < .001$. However, the pathogen prime had no effect on perceptions of health threat; this lack of effect applied to both Liberian immigrants, $t(437) = -0.09$, $p = .929$, and—in contrast to Studies 1 and 2—origin-unspecified immigrants, $t(437) = -1.00$, $p = .317$. Consistent with Study 2, PDS was positively related to perceived health threat, $\beta = 0.26$, $t(437) = 5.86$, $p < .001$. However, there were no two- or three-way interactions between pathogen prime, PDS, and immigrant origin (all ps > .10).

The effects of immigrant origin and PDS remained when controlling for SDO, SDS, and social and economic political attitudes. Results were similar when GA was treated as a pathogen-avoidance variable, with GA relating to perceived health threats, $\beta = 0.27$, $t(437) = 6.11$, $p < .001$. Effects on all perceived threats are reported in Table 4 in the Supplementary Materials.

Attitudes Toward Immigrants

We next tested the effects of immigrant origin, pathogen prime, and PDS on comfort with immigrants and the decision to allow immigration (see Table 3 for a summary of results). Participants were more comfortable with unspecified immigrants ($M = 64.19$, $SD = 27.37$) relative to Liberian immigrants ($M = 51.68$, $SD = 32.91$), $t(437) = 4.33$, $p < .001$. In contrast with Studies 1 and 2, participants in the pathogen prime condition ($M = 55.04$, $SD = 30.36$) expressed significantly less comfort with immigrants relative to those in the control condition ($M = 61.10$, $SD = 31.05$), $t(437) = 2.10$, $p = .037$. The effect of the prime on comfort with immigrants was not moderated by immigrant origin, $t(437) = -0.57$, $p = .578$. PDS was negatively related to comfort with immigrants, $\beta = -0.20$, $t(437) = -4.32$, $p < .001$. This relationship was not moderated by prime condition, $\beta = 0.06$, $t(437) = 1.23$, $p = .221$, but it was moderated by immigrant origin, $B = 0.11$, $t(437) = 2.42$, $p = .016$. Simple slopes analysis showed that PDS was negatively related to comfort with origin-specific immigrants (i.e., immigrants from Liberia), $\beta = -8.28$, $t(441) = -4.97$, $p < .001$, but unrelated to comfort with origin-unspecified immigrants, $\beta = -2.31$, $t(441) = -1.33$, $p = .184$. Note that this latter finding is consistent with Studies 1 and 2, in which PDS was unrelated to comfort with origin-unspecified immigrants after controlling for other ideological variables. Additionally, participants higher in PDS (1 SD above the mean) reported less comfort with Liberian immigrants compared to origin-unspecified immigrants, $t(441) = 4.83$, $p < .001$, $r_p^2 = 0.05$. Conversely, there was no difference between comfort with Liberian and origin-unspecified immigrants for participants lower in PDS (1 SD below the mean), $t(441) = 1.30$, $p = .194$, $r_p^2 = 0.003$. Conclusions were unchanged when controlling for the SDO, SDS, and social and economic political attitudes.

As an alternative measure of pathogen avoidance, we examined the interaction between GA and pathogen prime, $\beta = 0.09$, $t(441) = 0.61$, $p = .542$, and origin of immigrants, $\beta = 0.09$, $t(441) = 1.95$, $p = .052$. The pattern of the interactions was

Table 4. Regression Analysis of Comfort With Immigrants in Study 4.

	Model 1				Model 2			
	B	*SE*	β	*t*	*B*	*SE*	β	*t*
Constant	58.61	1.31		44.69	91.49	3.96		23.08
PDS	−3.31	1.09	−.13	−3.04**	−2.57	1.11	−.10	−2.31*
Prime	1.20	2.62	.02	0.46	1.80	2.28	.03	0.79
Origin	11.02	2.62	.19	4.20***	8.42	2.29	.14	3.67***
PDS × Prime	0.22	2.18	.004	0.10	−0.10	1.89	−.002	−0.05
PDS × Origin	1.97	2.18	.04	0.91	1.44	1.9	.03	0.76
Prime × Origin	−2.25	5.25	−.02	−0.43	−2.99	4.57	−.03	−0.65
PDS × Origin × Prime	0.31	4.35	.003	0.08	1.87	3.82	.02	0.49
SDS					0.18	0.93	.01	0.20
SDO					−0.42	0.06	−.29	−6.50***
Social political attitude					−1.81	1.07	−.11	−1.70
Economic political attitude					−3.21	1.00	−.20	−3.22**
R^2_{adj}	0.054				0.296			
F_{change}	4.01***				41.70***			

Note. Prime and Origin were effect coded in the models. PDS = pathogen disgust sensitivity; SDS = sexual disgust sensitivity; SDO = social dominance orientation.
*$p < .05$. **$p < .01$. ***$p < .001$.

similar to that observed with PDS. Individuals with high GA reported less comfortable with Liberian immigrants compared to origin-unspecified immigrants, $t(441) = 4.07$, $p < .001$, $r^2_p = 0.034$, but comfort with immigrants from an unspecific country did not differ from comfort with Liberian immigrants for low GA participants, $t(441) = 1.32$, $p = .187$, $r^2_p = 0.004$.

We next regressed the decision to allow immigration on pathogen prime, immigrant origin, PDS (in the first model), and GA (in the second model). In contrast with the continuous measure of comfort with immigrants, results showed no effects of pathogen prime (approval rates: prime condition = 66.4%, control condition = 65.3%), $OR = 0.77$, $\chi^2(1) = 0.21$, $p = .645$, or origin (approval rates: origin-unspecified immigrants = 71.8%, Liberian immigrants = 59.6%), $OR = 0.64$, $\chi^2(1) = 2.29$, $p = .130$. The interaction between immigrant origin and PDS was also not significant, $OR = 0.85$, $\chi^2(1) = 0.39$, $p = .532$. We observed similar results when using GA in the model (see Table 5 in the Supplementary Materials for details).

Discussion

In Study 3, we directly compared the generalized out-group prejudice hypothesis and the origin-specific out-group prejudice hypothesis by measuring attitudes toward origin-unspecified immigrants and Liberian immigrants. Inconsistent with Studies 1 and 2, participants in pathogen prime condition were less comfortable with immigrants than were participants in the control condition, and the effects were not moderated by the origin of immigrants. At the individual differences level, the relation between PDS and attitudes toward immigrants was moderated by the origin of immigrants; participants more motivated to avoid pathogens were less comfortable with Liberian immigrants, but they were no less comfortable with the origin-unspecified immigrants. This moderation effect supported the origin-specific out-group prejudice hypothesis over the generalized out-group prejudice hypothesis, at least at an individual differences level.

Study 4

In Study 3, we tested the generalized out-group prejudice hypothesis and the origin-specific out-group prejudice hypothesis by comparing attitudes toward an origin-unspecified immigrant group with attitudes toward Liberians, an immigrant group coming from a pathogen-rich ecology. We found that immigrant origin moderated the relationship between PDS and attitudes toward immigrants, which support the origin-specific out-group prejudice hypothesis over the generalized out-group prejudice hypothesis. However, inconsistent with Studies 1 and 2, we also found a main effect of pathogen prime, which was not moderated by immigrant origin—this result is more consistent with the generalized out-group prejudice hypothesis. Given inconsistencies across studies, we sought to replicate Study 3 in a fourth study.

Material and Methods

Participants

Five hundred seven U.S. Mechanical Turk workers participated the study. Ten participants who failed to answer the attention check question correctly were excluded. The final sample consisted of 497 participants (231 women, 266 men; mean age = 34.33 years, $SD = 10.58$ years).

Materials

Materials were similar to those of Study 3, with the exception of the two changes. First, we removed the name of the origin-specific county (Liberia) and only described the specific foreign country as prevalent of infectious disease. Second, we did

not measure GA since PDS and GA had similar relationships to attitudes toward immigrants in the previous two studies.

Procedure

After the priming procedure, participants were randomly assigned to read one of two immigrant scenarios. They then completed the same measures included in Study 3.

Results and Discussion

Perceived Threats From Immigrants

We first tested the effects of immigrant origin, pathogen prime, and PDS on perceived health threat. Results showed that origin-specific immigrants were perceived as posing a greater health threat ($M = 4.05$, $SD = 1.83$) than origin-unspecific immigrants ($M = 2.97$, $SD = 1.57$), $t(489) = -7.26$, $p < .001$. Perceptions of health threat did not vary across the pathogen prime condition ($M = 3.55$, $SD = 1.81$) and the control condition ($M = 3.47$, $SD = 1.77$), $t(489) = -0.19$, $p = .848$. This lack of effect applied to both origin-specific immigrants, $t(489) = -0.25$, $p = .801$, and to origin-unspecified immigrants, $t(489) = -0.02$, $p = .985$. Consistent with Study 3, the relationship between PDS and perceptions of health threats posed by the immigrants varied as a function of immigrant origin, $\beta = -0.11$, $t(489) = -2.56$, $p = .011$. Simple slopes analysis showed that individuals higher in PDS perceived a greater health threat from immigrants from a pathogen-rich ecology, $\beta = 0.24$, $t(493) = 3.80$, $p < .001$, but not from origin-unspecified immigrants, $\beta = -0.08$, $t(493) = -.55$, $p = .582$. The effects of origin, PDS, and their interaction remained when controlling for SDO, SDS, and social and economic political attitudes. Effects on all perceived threats are reported in Table 6 in the Supplementary Materials.

Attitudes Toward Immigrants

We next tested how immigrant origin, the pathogen prime, and PDS influenced comfort with immigrants (see Table 4). Consistent with Study 3, participants felt more comfortable with the origin-unspecified immigrants ($M = 64.05$, $SD = 27.68$) relative to the origin-specific immigrants ($M = 53.17$, $SD = 30.89$), $t(489) = 4.20$, $p < .001$. Consistent with Studies 2 and 3, PDS negatively predicted comfort with immigrants across groups, $\beta = -0.13$, $t(489) = -3.04$, $p = .002$. Consistent with Studies 1 and 2, there was no difference between comfort with immigrants in the pathogen prime condition ($M = 57.76$, $SD = 30.64$) and the control condition ($M = 59.44$, $SD = 28.98$), $t(489) = 0.46$, $p = .648$. However, unlike in Study 3, the interaction between origin and PDS was not significant, $\beta = 0.04$, $t(489) = 0.91$, $p = .366$. When controlling for the SDO, SDS, social and economic political attitudes, the effects of origin and PDS remained.

Next, we regressed the decision to allow immigration on prime, immigrant origin, PDS, and their interactions. Consistent with Study 3, the results showed no effects of PDS, $OR = 1.04$, $\chi^2(1) = 0.06$, $p = .811$, or origin (approval rates: origin-unspecified immigrants = 69.8%, origin-specific immigrants = 58.6%), $OR = 0.62$, $\chi^2(1) = 3.04$, $p = .081$. The interaction between origin and PDS was also not significant, $OR = 0.72$, $\chi^2(1) = 1.97$, $p = .161$ (see Table 7 in the Supplementary Materials for details).

Discussion

Results from Study 4 showed that attitudes toward immigrants from a pathogen-rich ecology were less positive than attitudes toward origin-unspecified immigrants. Consistent with Studies 1 and 2, there was no main effect of the pathogen prime on attitudes toward immigrants. Further, individuals higher in PDS were less comfortable with both immigrants from a pathogen-rich ecology and immigrants from an origin-unspecified ecology.

Meta-Analysis

Based exclusively on null hypothesis significance testing, some results were inconsistent across the four studies. Following recommendations based on "The New Statistics" (Cumming, 2014; Goh, Hall, & Rosenthal, 2016), we conducted internal, random effects meta-analyses to better estimate the overall effect sizes of pathogen prime and PDS on perceptions of health threats posed by immigrants, as well as comfort with and decisions regarding immigrants, using the Metafor package for R (Viechtbauer, 2010). We separately meta-analyzed effects when the immigrant group was unspecified (all data from Studies 1 and 2 and participants in the origin-unspecified immigrant conditions in Studies 3 and 4) versus when the immigrant group came from a pathogen-rich ecology (participants in the origin-specific immigrant group conditions in Studies 3 and 4). We repeated these analyses on effects controlling for the covariates to test the specific relationship between PDS and the dependent measures. See Figures 1–3 for the meta-analyzed effects.

Perceived Threats From Immigrants

First, we estimated the overall effects of pathogen prime on perceptions of health threats posed by immigrants from pathogen-rich versus unspecified ecologies. For immigrants from a nonspecified ecology, pathogen primes produced a small effect that did not overlap with zero, $d = .19$, 95% CI [0.08, 0.29]. For immigrants from pathogen-rich ecologies, pathogen primes produced a near-zero that did overlap with zero, $d = .01$, 95% CI [−0.17, 0.19]. Hence, after seeing cues to pathogens, participants perceived more of a health threat from immigrants but only if those immigrants were not already associated with pathogen-rich ecologies.

Next, we examined the bivariate correlations between PDS and perceptions of health threats posed by immigrants from pathogen-rich versus unspecified ecologies. Across studies, PDS was related to perceptions of a health threat posed by immigrants from unspecified ecologies, $r = .19$, 95% CI

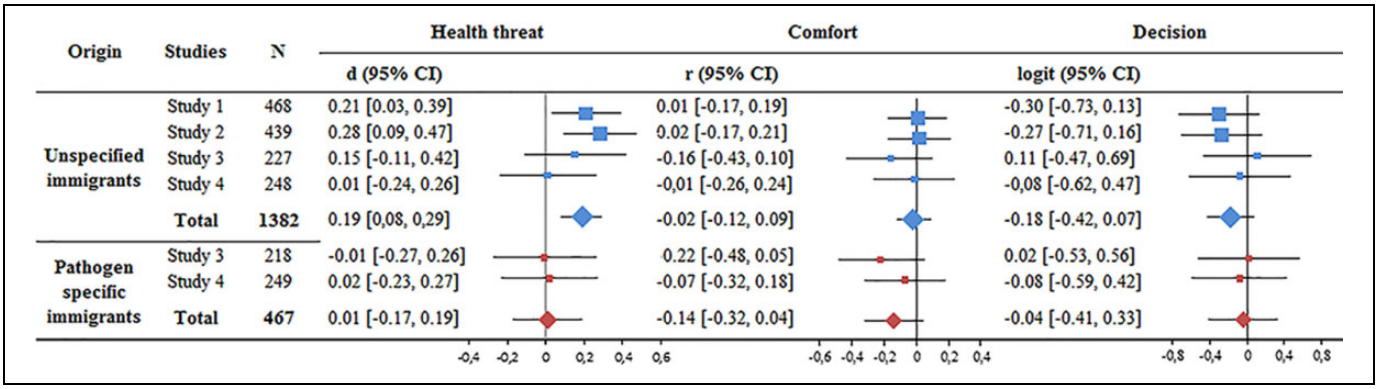

Figure 1. Meta-analyzed effects of pathogen prime across four studies. Separate effects of pathogen primes on perceived health threat, comfort with, and decision regarding immigrants from pathogen-rich and unspecified ecologies.

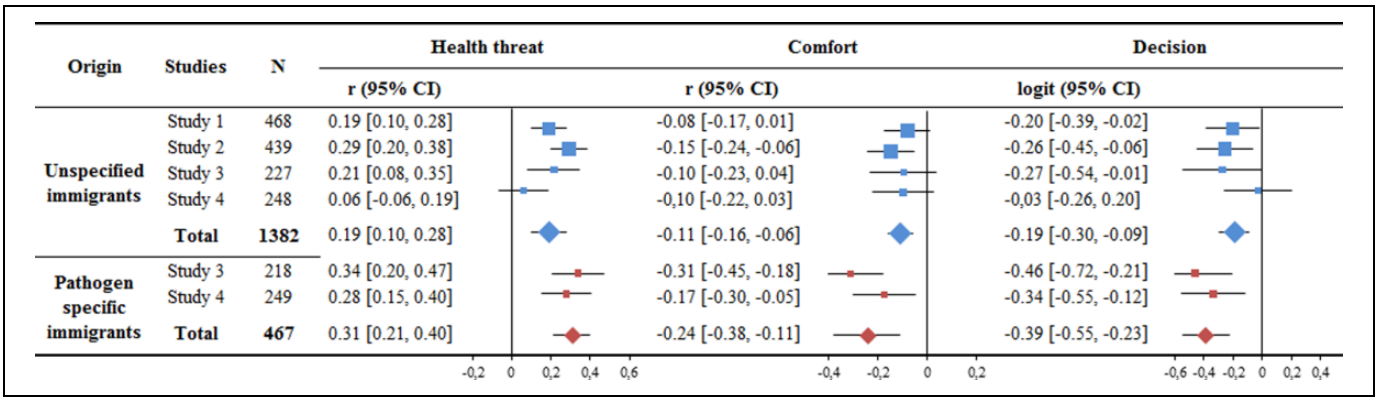

Figure 2. Meta-analyzed effects of pathogen disgust sensitivity across four studies. Separate effects of pathogen disgust sensitivity on perceived health threat, comfort with, and decision regarding immigrants from pathogen-rich and unspecified ecologies.

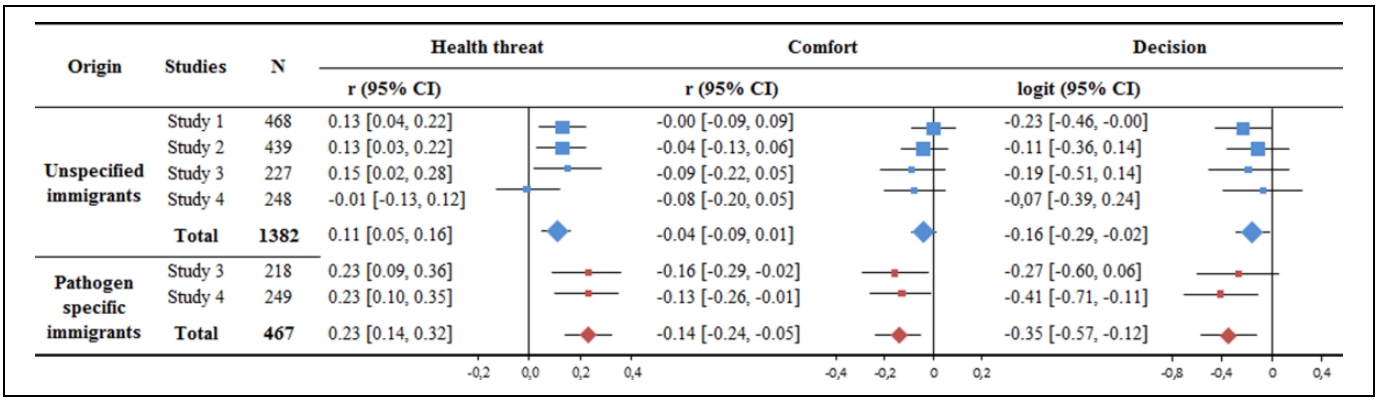

Figure 3. Meta-analyzed effects of pathogen disgust sensitivity (PDS) when controlling for the covariates across four studies. Separate effects of pathogen disgust sensitivity when controlling for social dominance orientation, sexual disgust sensitivity, and social and economic political attitudes on perceived health threat, comfort with, and decision regarding immigrants from pathogen-rich and unspecified ecologies.

[0.10, 0.28], and by immigrants from pathogen-rich ecologies, $r = .31$, 95% CI [0.21, 0.40]. The effects of PDS remained when controlling for the covariates, both for immigrants from unspecified ecologies, $r = .11$, 95% CI [0.05, 0.16], and for immigrants from pathogen-rich ecologies, $r = .23$, 95% CI [0.14, 0.32].

Attitudes Toward Immigrants

Effects of pathogen primes on comfort with immigrants from unspecified ecologies were small and overlapped with zero, $d = -.02$, 95% CI [−0.12, 0.09], as did effects of pathogen primes on comfort with immigrants from pathogen-rich

ecologies, $d = -.14$, 95% CI [−0.32, 0.04]. At a bivariate level, the relationship between PDS and comfort with both immigrants from unspecified ecologies, $r = -.11$, 95% CI [−0.16, −0.06], and immigrants from pathogen-rich ecologies, $r = -.24$, 95% CI [−0.38, −0.11], was small but did not overlap with zero. However, meta-analyses of partial correlations revealed that the relationship between PDS and comfort with immigrants from unspecified ecologies was close to zero after controlling for the covariates, $r = -.04$, 95% CI [−0.09, 0.01]. In contrast, the relationship between PDS and comfort with immigrants from pathogen-rich ecologies remained independent of the covariates, $r = -.14$, 95% CI [−0.24, −0.05].

Next, we examined the effects of pathogen prime and PDS on the binary immigration decision. Consistent with the continuous measure of comfort with immigrants, effects of pathogen primes on decisions to allow entry to immigrants from unspecified ecologies were weak and overlapped with zero, with an observed logit of −.18, 95% CI [−0.42, 0.07]. The effect was similar for decisions regarding immigrants from pathogen-rich ecologies, with an observed logit of −.04, 95% CI [−0.41, 0.33]. However, the effect of PDS on decisions to reject immigrants from unspecified ecologies, while weak, did not overlap with zero, logit = −.19, 95% CI [−0.30, −0.09]. Results were similar for immigrants from pathogen-rich ecologies, logit = −.39, 95% CI [−0.55, −0.23]. These effects remained after controlling for the covariates, both for immigrants from unspecified ecologies, logit = −.16, 95% CI [−0.29, −0.02], and immigrants from pathogen-rich ecologies, logit = −.26, 95% CI [−0.57, −0.12].

General Discussion

Do pathogen-avoidance motives stoke prejudice against out-groups in general or only against out-groups with specific associations with infectious disease? Answers to this question diverge strongly in the behavioral immune system literature (contrast, e.g., Shook et al., 2015 with Tybur, Inbar, Güler, & Molho, 2015b). Across four studies, we tested the two competing hypotheses. Results of internal meta-analyses provided some support to both hypotheses but were more in favor of the origin-specific out-group prejudice hypothesis than the generalized out-group prejudice hypothesis. For attitudinal measures, PDS was uniquely associated only with a continuous measure of comfort toward immigrants from a pathogen-rich ecology but not with comfort toward immigrants from unspecified ecologies. That said, PDS did uniquely predict decisions to allow both types of immigrant groups into the country, though the relationship was directionally stronger for immigrants from a pathogen-rich ecology. At the experimental level, pathogen primes had no effect on comfort with immigrants from an unspecific ecology or from a pathogen-rich ecology, nor did they affect yes/no decisions to allow immigrants to enter the country. Notably, pathogen primes did lead participants to perceive origin-unspecified immigrants—but not immigrants from a pathogen-rich ecology—as posing a greater health threat. That said, perceptions of health threats were higher for origin-specific immigrants—regardless of experimental condition—and changes in perception of health threats caused by the primes did not result in changes in attitudes toward immigrants. Notably, all effect sizes—even those that did not overlap with zero—were weak.

Overall, we interpret findings as suggesting that out-group membership is weakly—if at all—interpreted as diagnostic of a pathogen threat. This interpretation is consistent with other recent proposals and empirical work (De Barra & Curtis, 2012; Fessler et al., 2015; Tybur et al., 2016; Van Leeuwen & Petersen, 2017). For example, Van Leeuwen and Petersen (2017) asked a sample of participants from the United States and a sample of participants from India to report their comfort with physical contact with a target, who was either Indian or Caucasian and who either had no visible pathogen cues or had a sore on the face. Pathogen cues decreased comfort with contact for both in-group and out-group faces, for both Indian and American participants. However, comfort with contact was not lower for out-group targets than for in-group targets, and pathogen cues did not increase discomfort with contact more for out-group faces more than for in-group faces.

The null priming effect on out-group prejudice is seemingly inconsistent with effects reported by Faulkner and colleagues (2004), who found that high pathogen salience lead to more negative attitudes toward immigrants from unfamiliar countries. That said, the present study was not a direct replication of Faulkner and colleagues (2004); priming materials and the nature of the immigrant target group varied across the studies. These differences across studies speak to important issues for behavioral immune system hypotheses of intergroup attitudes and for the behavioral immune system literature more broadly.

Regarding behavioral immune system hypotheses of intergroup attitudes, in testing for differences in reactions to immigrants heuristically associated with infectious disease, Faulkner and colleagues (2004) categorized immigrants into familiar categories (e.g., Taiwanese) versus unfamiliar categories (e.g., Mongolians). Perceptions of foreignness were posited to reflect both ecological distance (and, hence, likelihood of carrying especially virulent pathogens) and differences in pathogen-relevant norms (e.g., food preparation, hygiene). In our study, we contrasted reactions to unlabeled immigrant groups versus immigrant groups that explicitly described as hailing from ecologies with infectious disease—either Liberia, which is in a world region that Faulkner and colleagues identified as perceived as foreign among North American participants (in Study 3), or an unnamed country (in Study 4). Van Leeuwen and Petersen (2017) used yet another technique, where skin color was and facial blemishes were used to connote foreignness and current infection level, respectively. Each of these approaches assumes a different piece of information that the behavioral immune system could use as input for pathogen-avoidance responses, with the first testing whether the behavioral immune system responds to past socially transmitted information that might be associated with infection, the second testing whether the behavioral immune system responds to explicit information regarding infectious disease, and the third

testing whether the behavioral immune system responds to morphological features (e.g., skin color) different from that common to the local ecology. Future work could benefit from more explicitly modeling the type of group-relevant information that should (and should not) lead to pathogen-avoidance responses.

Regarding broader methods in the behavioral immune system literature, Faulkner and colleagues (2004) aimed to prime pathogen-avoidance motives using a slideshow that explicitly highlighted the risks of infectious disease in the environment. We instead used either a story (based on that developed by White et al., 2013) or visual cues to pathogens without accompanying information. Although we see no reason to suspect that differences in the priming materials would lead to differences in study outcomes, we cannot rule out the possibility that our null results of pathogen primes on attitudes are idiosyncratic to our priming materials. Like other literatures that use priming techniques, the behavioral immune system literature could benefit from examinations of the differences in effects of different types of pathogen primes including those administered here and those administered by Faulkner et al. (Tybur et al., 2014).

Although we did not find an effect of pathogen primes on attitudes toward immigrants, we did find an effect of primes on perceptions of health threats posed by immigrants from an unspecified ecology. This result suggests that the same factors that shape perceptions of threats posed by immigrants might not shape general negativity versus positivity toward immigration. Although negative attitudes and social exclusion are often derived from perceptions of threats, the relationship between the two is imperfect (cf. Neuberg & Cottrell, 2008). This imperfection might mirror the disjunction between perceptions of health risk and prophylactic behavior, where perceptions of vulnerability to HIV are weakly (if at all) related to increased condom use (Gerrard, Gibbons, & Bushman, 1996).

The present research is a supplement to and expansion of behavioral immune system prejudice research, and it offers new implications, both theoretically and practically. Regarding theory, our findings suggest that any out-group prejudice based on pathogen avoidance varies across out-group type. Notably, both groups examined here were immigrant groups, which, by definition, hail from a different ecology. Nevertheless, we found that pathogen-avoidance motives relate to comfort with some groups hailing from a foreign ecology but not others. Theory arguing that out-group membership—and, further, foreignness—acts as a cue to infectiousness may need to be revised based on these findings. Further, results indicated that temporary cues of pathogens do not affect attitudes toward outgroups. As a practical implication, this finding suggests that everyday cues to pathogens—whiffs of garbage, dog feces on the pavement, or spoiled food in a refrigerator—do not affect intergroup attitudes. This finding should be especially heartening for policy makers who fear that an unclean city might lead to greater intergroup conflict. Consider, for example, Diederik Stapel's infamous (and famously retracted) study reporting that litter on the ground promotes stereotyping and discrimination (Stapel & Lindenberg, 2011). The current study speaks against this idea, and it suggests that, even if clean environments have many benefits, decreasing intergroup prejudice is not one of them.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article

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Supplemental Material

Supplemental material for this article is available online.

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