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Parasite Stress and Pathogen Avoidance Relate to Distinct Dimensions of Political Ideology Across 30 Nations

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People who are more avoidant of pathogens are more politically conservative, as are nations with greater parasite stress. In the current research, we test two prominent hypotheses that have been proposed as explanations these relationships between pathogens and politics. The first, which is an intragroup account, holds that the relationships are based on motivations to adhere to local norms, which are sometimes shaped by cultural evolution to have pathogen-neutralizing properties. The second, which is an intergroup account, holds that these same relationships are based on motivations to avoid contact with outgroups (who might pose greater infectious disease threats than ingroup members). Results from a study surveying 11,501 participants across 30 nations are more consistent with the intragroup account than with the intergroup account. National parasite stress relates to traditionalism (an aspect of conservatism especially related to adherence to group norms) but not to social dominance orientation (an aspect of conservatism especially related to endorsements of intergroup barriers and negativity toward ethnic and racial outgroups). Further, individual differences in pathogen-avoidance motives (i.e., disgust sensitivity) relate more strongly to traditionalism than to social dominance orientation within the 30 nations.

political ideology | pathogens | disgust | culture | evolutionary psychology

The costs imposed by pathogens on their hosts have spurred the evolution of complex anti-pathogen defenses, many of which are behavioral (1, 2). In humans, such defenses range from the proximate avoidance of pathogen cues to the execution of complex rituals, often with far-reaching consequences (3). At the individual level, functionally specialized psychological mechanisms detect pathogen cues and motivate avoidance of physical

contact with pathogens (e.g., via the emotion of disgust; 4). These mechanisms—which have been collectively referred to as the *behavioral immune system*—influence, among other things, mate

Significance

Pathogens—and anti-pathogen behavioral strategies—affect myriad aspects of human behavior. Recent findings suggest that anti-pathogen strategies relate to political attitudes, with more ideologically conservative individuals reporting more disgust toward pathogen cues, and with higher parasite stress nations being, on average, more conservative. However, no research has yet adjudicated between two theoretical accounts proposed to explain these relationships between pathogens and politics. We find that national parasite stress and individual disgust sensitivity relate more strongly to adherence to traditional norms than they relate to support for barriers between social groups. These results suggest that the relationship between pathogens and politics reflects intragroup motivations more than intergroup motivations.

Reserved for Publication Footnotes

Table 1.

Country	Language(s)	N	% Male	Age	$r_{T,DS}$	$r'_{T,DS}$	$r_{SDO,DS}$	$r'_{SDO,DS}$
Argentina (AR)	Spanish	827	64	34	.13	.20	.08	.11
Australia (AU)	English	300	48	31	.05	.07	.05	.06
Belgium (BE)	Dutch	448	46	23	.07	.10	.04	.06
Bosnia & Herzegovina (BA)	Bosnian and Croatian	326	30	28	.12	.15	.05	.07
Brazil (BR)	Portuguese	288	46	23	.03	.04	-.01	-.01
Canada (CA)	English	307	42	35	.03	.04	-.16	-.22
Chile (CL)	Spanish	262	49	28	.03	.04	-.01	-.01
China (CN)	Simplified Chinese	377	10	21	.12	.22	.12	.20
Croatia (HR)	Croatian	554	23	30	.08	.11	-.03	-.04
Denmark (DK)	Danish	126	40	24	.05	.08	-.02	-.02
Finland (FI)	Finnish	190	42	41	.33	.45	.05	.08
France (FR)	French	266	29	23	.09	.12	.15	.21
Germany (DE)	German	374	47	32	.12	.17	.05	.08
Greece (GR)	Greek	317	27	32	.10	.15	.08	.11
India (IN)	Hindi and English	504	57	23	.02	.03	.08	.14
Ireland (IE)	English	150	52	32	.09	.12	.17	.23
Israel (IL)	Hebrew	339	38	34	.22	.27	.03	.04
Japan (JP)	Japanese	394	53	32	.11	.17	-.04	-.06
Netherlands (NL)	Dutch	574	42	35	.15	.22	.02	.02
New Zealand (NZ)	English	595	27	29	.11	.15	-.06	-.09
Poland (PL)	Polish	210	31	28	-.09	-.12	-.05	-.09
Serbia (RS)	Serbian	402	31	29	.11	.14	.06	.08
Singapore (SG)	English	239	48	25	.06	.08	.03	.04
Slovakia (SK)	Slovak	338	33	32	.12	.16	.02	.03
Republic of Korea (KR)	Korean	137	42	21	-.05	-.07	.08	.12
Spain (ES)	Spanish	699	33	33	-.01	-.02	.00	.00
Sweden (SE)	English	117	45	30	.37	.52	.30	.41
Turkey (TR)	Turkish	1082	50	34	.12	.15	.03	.06
United Kingdom (UK)	English	276	27	28	.18	.25	-.05	-.07
United State (US)	English	483	62	30	.11	.13	.07	.09
Total		11,501	42	30	.10 [.07-.12]	.14 [.10-.18]	.04 [.02-.06]	.06 [.03-.10]

Survey language(s), proportion male, mean age, and bivariate correlations for samples in each nation surveyed. r' statistics are disattenuated for unreliability. The bottom row includes meta-analyzed correlations and 95% confidence intervals.

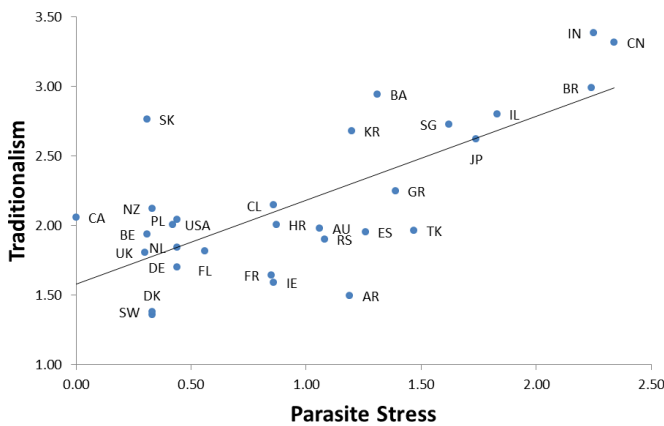


Fig. 1. The scatterplot displays the relationship between national parasite stress and traditionalism ($r = .70$). Each data point represents the mean traditionalism for a nation (with data points labeled with two letter country codes), controlling for sample demographic characteristics (age and sex).

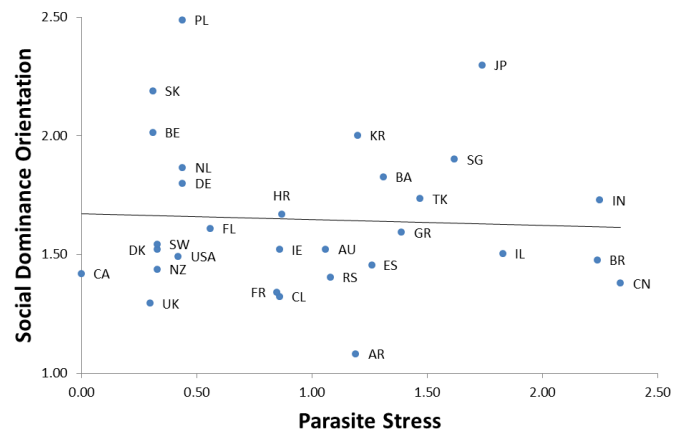


Fig. 2. The scatterplot displays the relationship between national parasite stress and social dominance orientation ($r = -.06$). Each data point represents the mean traditionalism for a nation (with data points labeled with two letter country codes), controlling for sample demographic characteristics (age and sex).

preferences (5, 6), dietary preferences (7), and person perception (8) (see 9, for a summary). At the cultural level, many rules and rituals putatively function to mitigate infection risk, including norms concerning food preparation and consumption (e.g., 10, 11), coughing and sneezing, and the use of a particular hand in ablutions (and little else).

Some of the most provocative findings in the behavioral immune system literature suggest that political attitudes are influenced both by individual motivations to avoid pathogens and

by the presence of pathogens within an ecology. At the individual level, the degree to which people are disgusted by pathogen cues and wary of infection-risky situations relates to a number of politically relevant variables, including political party preference, openness to experience, and collectivism (see 12 for a summary). At the cultural level, nations with greater infectious disease burdens (i.e., parasite stress) are governed by more authoritarian

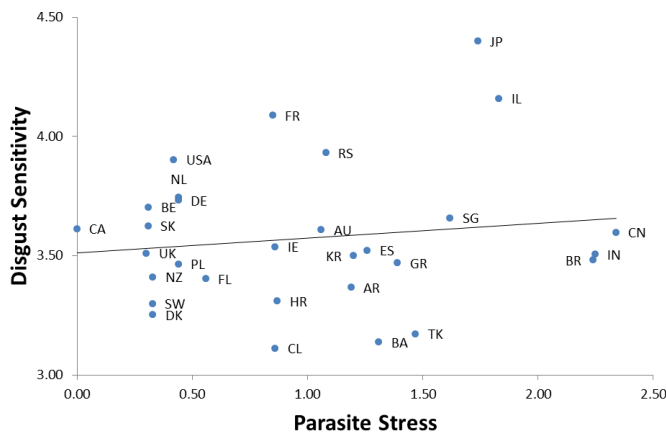


Fig. 3. The scatterplot displays the relationship between national parasite stress and disgust sensitivity ($r = .18$). Each data point represents the mean traditionalism for a nation (with data points labeled with two letter country codes), controlling for sample demographic characteristics (age and sex).

regimes and are more religious, more collectivistic, and less open to experience (13-17)—all hallmarks of conservative ideology. Two distinct hypotheses—one of which is fundamentally an intragroup account, and one of which is fundamentally an intergroup account—have been advanced to explain these empirical patterns (13, 18, 19). The first, which we refer to as a *traditional norms* account, is based on the assumption that some local rules and rituals (e.g., how foods are prepared and stored, which meats are acceptable, which hand one eats with) evolve culturally to neutralize local pathogen threats. This intragroup account suggests that departures from traditional norms puts individuals at a greater risk of infection, so more pathogen-avoidant individuals favor ideological positions that encourage adherence to traditional values (11, 20, 21).

The second hypothesis, which we refer to as an *outgroup avoidance* account, is based on the assumption that individuals develop greater resistance to locally-prevalent pathogens than to pathogens endemic to foreign ecologies—even, perhaps, those ecologies close enough to reach by foot (14, 16). This intergroup account holds that contact with outgroup members (who carry pathogens that individuals might have less immunity against) is more likely to result in infection than is contact with ingroup members. Consequently, more pathogen-avoidant individuals favor ideological positions that minimize intergroup pathogen transmission.

Which of these two hypotheses better explains the relationship between the behavioral immune system and ideology? Given that conservatism is characterized both by stronger preferences for ethnic, racial, and national ingroups (vs. outgroups) and by greater adherence to traditional cultural norms (22), existing data have been interpreted as supporting both hypotheses. Of course, both accounts could be correct—both intergroup and intragroup motivations could underlie the observed relationships between pathogens and politics. That said, no work has yet aimed to generate and test competing predictions derived from these two hypotheses. We aim to fill this gap here. To do so, we depart from standard practice in this area, which has interpreted several different constructs as reflecting a single dimension of ideology. For example, a recent meta-analysis of the relationship between the behavioral immune system and conservatism treated diverse constructs—including right-wing authoritarianism, collectivism, religiosity, and social dominance orientation—as interchangeable manifestations of social conservatism (12). In the current investigation, we consider how the above-described intragroup and intergroup accounts can be used to make distinct predictions regarding the relationship between the behavioral immune sys-

tem and two dimensions of ideology: traditionalism and social dominance orientation.

Dimension-specific relationships between pathogens and ideology

Political psychologists suggest that ideology can be broadly categorized along two dimensions (22, 23), one of which is conceptualized as relating more to intragroup attitudes and the other of which is conceptualized as relating more to intergroup attitudes (24). The first (intragroup) dimension is characterized by favoring adherence to versus departures from social traditions (frequently operationalized as right wing authoritarianism and, specifically, the traditionalism facet of right wing authoritarianism; 25). The second (intergroup) dimension is characterized by favoring versus rejecting (hierarchical) boundaries between groups (frequently operationalized as social dominance orientation; 26).

Although traditionalism and social dominance orientation (SDO) are generally positively correlated, they relate differently to social values (27-29). Whereas traditionalism relates strongly to religiosity (25)—a key variable in the behavioral immune system and ideology literature—SDO relates only weakly to conformity and adherence to religious orthodoxy (30, 31). Moreover, although both traditionalism and SDO relate to prejudices, they relate to prejudices toward different targets. Relative to SDO, traditionalism especially relates to prejudice toward the types of individuals who violate traditional social norms, including prostitutes, atheists, homosexuals, and drug users (32). In contrast, SDO especially relates to prejudice toward individuals possessing cues to different ecological origin (e.g., skin color), including White Americans' prejudice toward Blacks (33) and New Zealanders' prejudice toward Africans, Asians, and Maori (31, 32). Reactions to immigrants—outgroup members hailing from foreign ecologies—can further highlight differences between SDO and traditionalism. Traditionalism relates to anti-immigrant sentiments when immigrants are pictured as failing to adopt local cultures rules and rituals; in contrast, SDO relates to anti-immigrant sentiment when immigrants are pictured as assimilating and, hence, increasing contact between groups (34).

Given the above considerations, the intragroup (traditional norms) hypothesis implies that pathogen-avoidance motives should relate to traditionalism, but not necessarily SDO. The intergroup (outgroup-avoidance) hypothesis implies a different prediction. Because SDO relates more strongly to prejudice toward individuals from foreign ecologies (e.g., immigrants, individuals from a different ethnic background), whereas traditionalism relates more strongly to prejudice toward non-traditional subgroups within a common ecology (e.g., homosexuals, atheists) (31, 32, 34), the outgroup-avoidance hypothesis implies that pathogen-avoidance motives should relate to SDO, but not necessarily to traditionalism.

Testing competing behavioral immune system hypotheses within and across nations

Although results at individual and societal levels have been interpreted as providing converging evidence for behavioral immune system hypotheses of ideology, they differ in two important ways, each of which has implications for the hypotheses described above. First, almost all studies reporting individual-level relationships between the behavioral immune system and ideology have been conducted using North American samples. For example, 23 of the 24 studies considered in a recent meta-analysis of the relationship between individual differences in pathogen-avoidance motives and social conservatism used American or Canadian samples (12). In contrast, studies at the societal level have necessarily tested group-level relationships between parasite stress and ideology across nations or states. Second, whereas individual-level studies have used self-report instruments to assess pathogen-avoidance motives, cross-cultural studies have used national parasite stress estimates, with the assumption that greater ecological

409 parasite stress leads to stronger individual-level motivations to
410 avoid pathogens (35, 36). For example, in describing the potential
411 relationship between variables measured at the individual level
412 (e.g., disgust sensitivity) and societal level (i.e., parasite stress),
413 Fincher and Thornhill (14) argue, “Our approach suggests that
414 the relationship between infectious disease and religiosity will be
415 mediated...by disgust and contamination sensitivity” (page 78).

416 No research has yet tested (1) whether the individual-level
417 relationships between pathogen-avoidance motives and dimen-
418 sions of ideology (including traditionalism and SDO) found in
419 North America samples replicate across cultures; (2) whether
420 individuals in higher parasite stress nations indeed score higher
421 on instruments designed to measure pathogen-avoidance mot-
422 ives (e.g., disgust sensitivity); and (3) whether individual-level
423 pathogen-avoidance motives mediate any relationship between
424 country-level parasite stress and traditionalism, SDO, or both.
425 The current research aims to address these lacunas by measuring
426 traditionalism, SDO, and (pathogen) disgust sensitivity across a
427 number of nations, which vary in parasite stress. In doing this, we
428 test competing predictions made by the two behavioral immune
429 system hypotheses of ideology described above, and we do so
430 at both the national level and the individual level. We then use
431 the same data set to test the common assumption that higher
432 parasite stress at the country level is associated with stronger
433 pathogen avoidance-motives at the individual level. In total, we
434 report results using a sample of 11,501 individuals from 30 nations
435 (see Table 1 for details).

436 Results

437 Traditionalism

438 The intragroup, traditional norms hypothesis predicts a rela-
439 tionship between traditionalism and pathogen-avoidance mot-
440 ives. Results at both the individual and national levels were
441 consistent with this account. Individuals in nations with greater
442 parasite stress were more traditional, $t(26.54) = 4.16, p < .001$
443 (see Figure 1); to illustrate, nations' average traditionalism scores
444 correlated strongly with parasite stress, $r = .70, p < .001$. Notably,
445 these results are similar to those reported in previous analyses of
446 the relationship between parasite stress and archival estimates of
447 collectivism across 52 and 70 nations, which yielded correlations
448 of $r = .73$ and $r = .63$, respectively (13). Within nations, disgust
449 sensitivity also related to traditionalism, $t(25.97) = 8.46, p <$
450 $.001$, independent of national parasite stress. A random effects
451 meta-analysis showed the correlation between disgust sensitivity
452 and traditionalism to be $r = .10, 95\% \text{ CI } [.07, .12]$. Analyses on
453 correlations disattenuated for unreliability yielded similar results,
454 $r = .14, 95\% \text{ CI } [.10, .18]$.

455 Social Dominance Orientation

456 The intergroup, outgroup-avoidance account predicts a rela-
457 tionship between SDO and pathogen-avoidance motives. Results
458 were not consistent with this prediction at the nation level, with
459 individuals in higher parasite stress nations scoring no higher
460 on SDO, $t(25.19) = 0.12, p = .91$ (see Figure 2), and with the
461 correlation between national parasite stress and SDO close to
462 zero (and directionally opposite to predictions), $r = -.06, p =$
463 $.75$. Within nations, disgust sensitivity was indeed related to SDO,
464 $t(23.57) = 6.52, p < .001$. However, the random effects meta-
465 analysis indicated that the correlation between disgust sensitivity
466 and SDO was close to zero, $r = .04, 95\% \text{ CI } [.02, .06]$. Analyses on
467 disattenuated correlations yielded similar results, $r = .06, 95\% \text{ CI}$
468 $[.03, .10]$. Notably, these 95% confidence intervals did not overlap
469 with those for the relationship between disgust sensitivity and
470 traditionalism.

471 Cross-National Variability in Disgust Sensitivity

472 Although we observed variation in disgust sensitivity across
473 nations, $\tau_{00} = .09, \chi^2(1) = 47.41, p < .001$, this variability was
474 unrelated to parasite stress, $t(26.18) = 1.12, p = .28$ (see Figure 3).

475 That said, results suggested that the disgust sensitivity instrument
476 had similar validity across samples. In addition to observing a
477 relationship between disgust sensitivity and traditionalism across
478 nations, we also replicated previously reported sex differences
479 in disgust sensitivity (37, 38), with women consistently scoring
480 higher than men across nations, $t(20.73) = 16.46, p < .001$, meta-
481 analyzed $d = .41, 95\% \text{ CI } [.36, .45]$.

482 Discussion

483 Several lines of evidence point to a relationship between
484 pathogens and politics (9, 12). Here, we aimed to clarify the
485 nature of this relationship by generating competing predictions
486 using two behavioral immune system hypotheses of conservatism.
487 The traditional norms account predicts that pathogen-avoidance
488 motives should relate to traditionalism, which, relative to SDO,
489 more strongly relates to intragroup attitudes, such as endorse-
490 ments of traditional norms and antipathy toward within-group
491 deviants. In contrast, the outgroup-avoidance account predicts
492 that pathogen-avoidance motives should relate to SDO, which,
493 relative to traditionalism, more strongly relates to intergroup
494 attitudes, such negative attitudes toward ethnic outgroups and
495 support for barriers between groups. Results supported the tra-
496 ditional norms account over the outgroup-avoidance account,
497 with national parasite stress relating strongly to traditionalism
498 but not to SDO. Furthermore, a meta-analysis of individual-level
499 relationships within the 30 sampled nations revealed that disgust
500 sensitivity relates more strongly to traditionalism than to SDO.
501 Indeed, whereas the traditionalism-disgust sensitivity relationship
502 was of a magnitude similar to that observed in a large recent study
503 in the U.S. (39), the SDO-disgust sensitivity relationship, while
504 statistically significant, was near zero.

505 Results also helped to clarify the relationship between na-
506 tional parasite stress and individual pathogen-avoidance motives.
507 We found no support for the notion that individuals living in
508 more pathogen-dense countries are more disgust sensitive. This
509 null result may be understood by considering both the benef-
510 its and the costs of investing in pathogen avoidance. Although
511 greater disgust sensitivity steers individuals away from cues to
512 pathogens, it also constrains dietary, sexual, and social contact
513 opportunities (4, 40). If pathogens are ubiquitous enough that
514 investments in avoidance do not decrease infection—at least
515 not enough to offset the benefits of behaviors that pose some
516 infection risk—then individuals in pathogen-rich ecologies could
517 invest more effort in resisting pathogens (e.g., through greater
518 production of pathogen-combating cytokines; see 41) rather than
519 avoiding them. Of course, our parasite stress data—like most used
520 in this literature (36)—were measured at the country level, and we
521 cannot rule out the possibility that individual disgust sensitivity is
522 calibrated by individual rather than national pathogen exposure.
523 However, findings here corroborate previous results indicating
524 that childhood illness in a pathogen-rich location (Bangladesh)
525 is unrelated to disgust sensitivity in adulthood (42).

526 The observed null relationship between disgust sensitivity and
527 national parasite stress suggests that different processes might
528 account for the relationships between ideology and national
529 parasite stress versus ideology and disgust sensitivity. At the
530 national level, those norms categorized as “traditional” might be
531 more successfully transmitted and sustained within pathogen rich
532 ecologies if such norms lead to reduced contact with pathogens
533 (9-11, 20). Indeed, mathematical models indicate that pathogens
534 can result in the cultural evolution of such protective behaviors
535 (43). Alternatively, traditionalism might promote within-coalition
536 alliances that can provide health care in times of illness, which
537 might be especially critical to survival in high parasite stress
538 ecologies (14, 19, 44, 45). Or traditional norms might endure
539 more in pathogen-rich nations simply because the ecologies of
540 such nations are less hospitable to liberal Western institutions

545 and infrastructures, and were thus less influenced by European
546 colonialism (46).

547 At the individual level, those who are more motivated to avoid
548 pathogens might find traditional rules and rituals more appealing
549 for a number of reasons. Relative to less restricted sex (i.e., more
550 experimental, more partners), traditional, monogamous sex ex-
551 poses individuals to fewer pathogens (39) and reduces the ability
552 for sexually transmitted infections to thrive within communities
553 (47). Traditional food preparation techniques often include ingredi-
554 ents with antimicrobial properties (10), traditional food taboos
555 can evolve culturally to limit pathogen and toxin exposure (7, 48),
556 and traditional hygiene rules can coordinate behaviors to limit
557 pathogen transmission (e.g., when one hand is used to contact
558 bodily waste and is not used for physical contact with foods or
559 with social allies). Further, within each of these accounts, rela-
560 tionships between pathogen avoidance and traditionalism could
561 solely reflect motivations to avoid direct contact with pathogens,
562 or they could also reflect motivations to regulate others' behavior,
563 which might transmit pathogens to others (18, 47). Just as we have
564 attempted to clarify why the behavioral immune system might
565 relate to political ideology—either based on outgroup avoidance
566 or norm adherence—future work can clarify which of these as-
567 pects of traditionalism might be especially appealing to those
568 individuals especially motivated to avoid pathogens.

569 Method

570 The study was reviewed and approved by the VU Amsterdam
571 Vaste Commissie Wetenschap en Ethiek (VCWE) Institutional
572 Review Board. Further ethical approval was obtained where re-
573 quired by local ethics boards. Consent was gathered verbally after
574 participants read an information sheet describing the contents of
575 the survey.

576 Participants

577 We recruited participants in 30 countries (see Table 1). We
578 aimed to enroll at least 200 participants in each country and
579 to recruit participants from both universities and the general-
580 population. After excluding participants who (a) reported being
581 less than 18 years old, (b) did not report their sex, or (c) had
582 completely missing data for any of the instruments described
583 below, our final sample consisted of 11,501 participants, who were
584 42% male and had a mean age of 30.06 years ($SD = 12.62$).

586 Measures

587 Participants completed a short questionnaire described as
588 concerning “attitudes toward political issues and groups of
589 people.” In all but one country (Sweden, where English fluency
590 is high), questionnaires were translated into the official or native
591 language, with multiple languages offered in some multilingual
592 countries (see Table 1 for language details). The questionnaire
593 contained measures of traditionalism, SDO, and disgust sensi-
594 tivity. It also included items peripherally related to this paper,
595 including sex, age, religious attendance, endorsement of policy
596 issues (e.g., Should society increase its use of nuclear power?),
597 and attitudes toward different types of people. We focus only on
598 traditionalism, SDO, and disgust sensitivity here, but the English
599 version of the survey (including all items) is available in the online
600 Supplemental Materials.

601 Traditionalism.

602 We assessed traditionalism using the six-item short form of
603 the traditionalism facet of the Authoritarianism-Conservatism-
604 Traditionalism scale (25). This instrument relates strongly to re-
605 ligiosity and other manifestations of traditional values. Example
606 items include “The ‘old fashioned ways’ and ‘old fashioned values’
607 still show the best way to live” and “This country will flourish if
608 young people stop experimenting with drugs, alcohol, and sex, and
609 pay more attention to family values.” Responses were recorded on
610 a 0 (Strongly Disagree) to 6 (Strongly Agree) scale.

611 Social dominance orientation.

The four-item Short Social Dominance Orientation scale (49)
was used to assess social dominance orientation. The instrument
has been used in at least one previous cross-cultural study, where
it consistently (negatively) related to desires to protect ethnic and
religious minorities across cultures (49). Example items include
“In setting priorities, we must consider all groups” (reverse coded)
and “We should *not* push for group equality.” Responses were
recorded on a 0 (Extremely Oppose) to 6 (Extremely Favor) scale.

620 Disgust sensitivity.

621 Most research in the behavioral immune system literature has
622 operationalized pathogen-avoidance motives using self-report
623 measures of disgust sensitivity or contamination sensitivity (36).
624 We used the seven-item pathogen factor of the Three Domain
625 Disgust Scale (50) for the current investigation, for two reasons:
626 (1) its item content appears more interpretable to individuals
627 from diverse cultures relative to other instruments, and (2) it is
628 less confounded with sexual openness and neuroticism than other
629 disgust sensitivity instruments (39, 51). Participants reported how
630 disgusting they find each of six items on a 0 (not at all disgust-
631 ing) to 6 (extremely disgusting) scale. Example items include
632 “Stepping on dog poop” and “Sitting next to someone who has red
633 sores on their arm.”

635 Parasite stress

636 Researchers have used several different indices to estimate
637 parasite stress (36), with the most frequently used being the
638 historical prevalence of pathogens within regions (52) and the
639 contemporary frequency of nonzoonotic parasites within regions
640 (14). These two estimates were strongly correlated for the 30
641 nations sampled here, $r = .75$. We opted to use the historical
642 prevalence estimates because they were less strongly skewed, with
643 nation-level results less strongly influenced by the higher parasite
644 stress nations sampled here (e.g., India, Brazil). No conclusions
645 changed when using the nonzoonotic disease estimates, nor when
646 we used alternative parasite stress estimates (zoonotic parasites
647 and contemporary infectious disease deaths; see Supplementary
648 Materials for details and results). To facilitate visual interpreta-
649 tion of results (Figures 1-3), we added a constant to each nation's
650 parasite stress score so that the lowest scoring country (Canada)
651 had a value of zero.

652 Analytical strategy

653 Data were analyzed in SPSS version 23 using random slope,
654 random intercept linear mixed modeling with Restricted Maxi-
655 mum Likelihood Estimation (REML) criteria. Participants (level-
656 1 units) were nested within nations (level-2 units). Given that our
657 samples varied in their sex ratio and mean age, we controlled for
658 participant sex and age. We used disgust sensitivity as a level-1
659 predictor to test for effects of individual pathogen-avoidance mo-
660 tivations on SDO and traditionalism. We used historical parasite
661 prevalence as a level-2 variable to test for effects of parasite stress
662 on SDO, traditionalism, and pathogen-avoidance motivations.
663 We allowed the effects of each level-1 variable to vary across level-
664 2. Our analyses can thus be described as follows, where Y_{ij} refers
665 to traditionalism or SDO for individuals (i) within nations (j):

$$666 \text{Level 1: } Y_{ij} = \beta_{0j} + \beta_{1j}\text{DISGUST}_{ij} + \beta_{2j}\text{SEX}_{ij} + \beta_{3j}\text{AGE}_{ij} +$$

$$667 e_{ij}$$

$$668 \text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}\text{PARASITE}_j + u_{0j}; \beta_{1j} = \gamma_{10} + u_{1j}; \beta_{2j}$$

$$669 = \gamma_{20} + u_{2j}; \beta_{3j} = \gamma_{30} + u_{3j}$$

$$670 \text{We also tested whether disgust sensitivity (} Y_{ij} \text{ below) varied}$$

$$671 \text{across nations as a function of parasite stress, with the following}$$

$$672 \text{model.}$$

$$673 \text{Level 1: } Y_{ij} = \beta_{0j} + \beta_{1j}\text{SEX}_{ij} + \beta_{2j}\text{AGE}_{ij} + e_{ij}$$

$$674 \text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}\text{PARASITE}_j + u_{0j}; \beta_{1j} = \gamma_{10} + u_{1j}; \beta_{2j}$$

$$675 = \gamma_{20} + u_{2j}$$

676 After multi-level analyses, we meta-analyzed the level-1 ef-
677 fects using Comprehensive Meta-Analysis software. This strategy
678 allows for a point estimate of the effect size of the relationship
679 between disgust sensitivity and the two dimensions of ideology,
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as well as 95% confidence intervals for those relationships. Each country was treated as a different sample. For both traditionalism and SDO, we conducted two meta-analyses of the relationship with disgust sensitivity. The first involved meta-analyzing the

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observed effect size within each country; the second involved meta-analyzing the effect size after disattenuating for the country-specific unreliability in disgust sensitivity, traditionalism, and SDO.

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