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Immunizing against Prejudice: Effects of Disease Protection on Attitudes toward out-Groups

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Immunizing against prejudice:
Effects of disease protection on outgroup attitudes

Julie Y. Huang

Alexandra Sedlovskaya

Yale University

Joshua M. Ackerman

Massachusetts Institute of Technology

John A. Bargh

Yale University

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Abstract

Contemporary interpersonal biases are partially derived from psychological mechanisms that evolved to protect people against the threat of contagious disease. This 'behavioral immune system' promotes effective disease avoidance but also results in over-generalized prejudice towards people who are not legitimate carriers of disease. Three studies test whether experiences with two modern forms of disease protection (receiving vaccines and cleaning one's hands) attenuate this relationship between disease concerns and prejudice. Study 1 demonstrates that when threatened with disease, vaccinated people exhibit less prejudice toward immigrants than unvaccinated people. Study 2 finds that framing vaccination messages in terms of immunity eliminates the relationship between chronic germ aversion and prejudice. Study 3 directly manipulates disease protection through hand-washing and shows this intervention is particularly effective for changing perceptions of outgroup members. This research suggests that public health interventions can benefit society beyond their immediate domain, specifically by informing novel, modern-day treatments for prejudice.

Immunizing against prejudice:

Effects of disease protection on outgroup attitudes

An evolutionary perspective suggests that prejudices have likely characterized interpersonal judgment since the beginning of human history. The present research proposes a modern-day treatment for this ancient social affliction. Specifically, we suggest that public health interventions, such as influenza vaccinations, reduce not only the spread of physical illness, but also the less tangible disease of prejudice.

Disease Concerns Beget Prejudice

Pathogens, parasites, and other disease-causing organisms consistently challenged survival throughout the course of human evolution (Ackerman, Huang, & Bargh, in press; Gangestad & Buss, 1993). In response, people evolved mechanisms, or a "behavioral immune system," to help minimize exposure to these threats (Schaller & Duncan, 2007). Since disease transmission can occur unintentionally through simple contact or proximity with a disease carrier, people are highly sensitive to behavioral and morphological cues that are associated (however imperfectly) with the presence of disease. Exposure to these cues (e.g., disfigurements) can focus attention, produce negative evaluations, alter personality profiles, and elicit automatic avoidance behaviors in perceivers (Ackerman et al., 2009; Houston & Bull, 1994; Mortensen et al., 2010; Schaller & Murray, 2008). These subsequent changes in perceptions and behaviors can provide an indirect measure of "immunity" because they lessen the probability of contact, and hence disease transmission.

Human disease-avoidance mechanisms, however, also provide the foundation for broader prejudices. The costs associated with failing to detect a contagious individual (including

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3 potential illness, disfigurement, or death) outweigh the costs of misidentifying a healthy person
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5 as a disease carrier (Hasleton & Nettle, 2006). Consequently, disease-avoidance mechanisms
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7 occasionally ‘misfire’ against targets who are not legitimate sources of disease (Kurzban &
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9 Leary, 2001). For example, people's chronic sensitivity to disease predicts their attitudes towards
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11 targets with non-contagious health conditions (e.g., the physically disabled or the obese; Park,
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13 Faulkner, & Schaller, 2003; Park et al., 2007) and social groups associated with subjectively
14
15 unfamiliar food, hygiene, and sex practices (e.g., immigrants; gay males; Cottrell & Neuberg,
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17 2005; Schaller & Duncan, 2007). Even temporary exposure to a pathogen threat is capable of
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19 eliciting this over-generalized prejudice; for instance, women show elevated ethnocentric and
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21 xenophobic attitudes during the early stages of pregnancy when the fetus is most vulnerable to
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23 disease (Navarrete, Fessler, & Eng, 2007). Thus, prejudices which seem especially pernicious
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25 today can be linked to the operation of a system which evolved to protect the body from disease.
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32 In the current-day environment, however, methods for avoiding disease are no longer
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34 confined to these first-order methods of early threat identification and social avoidance.
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36 Relatively recent advances in medical technology, offers more direct methods of protection. For
37
38 instance, within the past century, public health interventions using vaccinations have or have
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40 virtually eradicated major health threats such as smallpox and poliomyelitis (CDC, 1999).
41
42 Today, vaccines continue to provide effective interventions against influenza and other
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44 contagious diseases (e.g., Nichol et al., 1995). Moreover, studies suggest that public health
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46 campaigns promoting hand washing help prevent such illnesses (e.g., Curtis & Cairncross, 2003;
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48 Rabie & Curtis, 2006).
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53 Given the effectiveness of these technologies, public health interventions have the
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55 potential not only to dampen the spread of disease, but also to quell the prejudices associated
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3 with the behavioral immune system. That is, if the physical threat of contagion can be
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5 eliminated, it is possible that compensatory mental responses will follow suit. In three studies,
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7 we test whether experiences with two forms of disease protection (receiving vaccines and
8
9 cleaning one's hands) are capable of attenuating the relationship between disease concerns and
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11 prejudice.
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Study 1: Immunizing against anti-immigrant attitudes

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17 Previous research suggests that disease concerns predict prejudicial attitudes toward
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19 outgroup members, particularly when the potential for contact is high. For instance, people
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21 exposed to disease threats were more negative about and less willing to endorse immigration of
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23 foreign peoples (Faulkner, Schaller, Park, & Duncan, 2004). Based upon such research, we
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25 predicted that when a disease threat is salient, people who are protected from that disease (by
26
27 vaccination) will be less prejudiced towards immigrants compared to people who are not
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29 protected from that disease. We also hypothesized that protection would have no effect on
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31 immigrant attitudes when participants are not previously exposed to a disease-related threat.
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37 We further tested a mediational model of psychological immunity. To the extent that
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39 threat perceptions activate the psychological mechanisms implicated in prejudicial attitudes, we
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41 predicted that *perceived* protection from disease might mediate the relationship between
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43 vaccination status and immigrant attitudes for participants exposed to a disease-related threat.
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45 That is, believing oneself to be physically immune to disease, as a result of being vaccinated,
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47 should diminish the psychological mechanisms implicated in anti-immigrant attitudes. Consistent
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49 with dissonance research suggesting that people perceive chosen options as being more positive
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51 (Festinger & Carlsmith, 1959), our model predicted that vaccinated participants should perceive
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53 the vaccine as being more effective, compared to non-vaccinated participants¹. In turn, the
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elevated perceptions of vaccine effectiveness should predict reduced anti-immigration attitudes.

These perceptions of vaccine effectiveness, however, should only be relevant for people who are concerned with protecting themselves against disease--namely, participants who are exposed to a disease threat. There should be no significant relationship between perceived vaccine effectiveness and immigrant attitudes among participants who are not exposed to threat.

Methods

One hundred thirty-five participants (75 female, 56 male, 4 no report) were recruited from an online survey website. The study used a 2(disease threat: present, not present) X 2(protection status: vaccinated, unvaccinated) between participants design.

This study was conducted during the fall of 2009, during the height of the H1N1/swine flu epidemic. In order to prime disease threat, half the participants read a passage about the swine flu epidemic (disease threat condition). To appear as realistic as possible, the passage consisted of excerpts from newspaper articles which emphasized that swine flu might hospitalize millions of people, even those who were healthy, and that despite its limited supply, medical experts recommended that everyone receive the swine flu vaccination (see Figure S1). Participants then indicated how effective they perceived the swine flu vaccination to be (1 = Not at all; 9 = Extremely). The other half of participants did not read this passage before rating the vaccination's effectiveness (no disease threat condition).

For the dependent measure, participants completed an adapted modern racism scale for immigrants (e.g., "Over the past few years, immigrants have gotten more economically than they deserve;" McConahay, 1986), $\alpha = .85$. They also indicated in a background questionnaire whether they had previously received an H1N1 vaccination; based upon their answers to this

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question, all participants were further divided into vaccinated ($N = 46$) and unvaccinated ($N = 86$) naturally occurring groups.

Results and Discussion

An analysis of variance (ANOVA) on racism scores revealed the predicted interaction of condition with vaccination status, $F(1,128) = 5.67, p = .021, \eta^2 = .041$. Pairwise comparisons confirmed that for participants primed with the disease threat passage, those who were vaccinated scored lower on the adapted Modern Racism Scale ($M = 2.47, SD = .99$) compared to unvaccinated participants ($M = 2.96, SD = .96$), $F(1,128) = 4.34, p = .039, \eta^2 = .033$. When participants were not primed with threat, however, no significant group differences emerged, $F = 1.54, p = .22$. This suggests that the effect found for those in the threat condition was not due to pre-existing differences between vaccinated and unvaccinated people.

Moreover, simple effects analyses revealed that unvaccinated participants who were primed reported greater levels of prejudice ($M = 2.96, SD = .96$) compared to similarly unvaccinated but non-primed participants ($M = 2.56, SD = .84$), $F(1,128) = 3.93, p = .05, \eta^2 = .030$, thereby replicating previous research on the link between disease threats and negative attitudes towards immigrants (Faulkner et al., 2004). This difference did not emerge between groups of vaccinated participants, $F = 2.10, p = .15$.

To examine the specific prediction that the effect of threat and vaccination status on anti-immigrant attitudes is mediated by perceptions of vaccine effectiveness, we used methods to test for moderated mediation (Preacher, Rucker, & Hayes, 2007; Rucker, Preacher, Tormala, & Petty, 2011). We entered vaccination status as the independent variable, scores on the adapted Modern Racism Scale as the dependent variable, perceptions of vaccine effectiveness as the mediator (centered), and disease threat as the moderator of the relationship between perceived

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3 vaccine effectiveness and the dependent variable. When looking only at threatened participants,
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5 indeed, vaccination status predicted scores on the dependent measures, $b = -0.49$, $SE = 0.25$,
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7 $Wald = -2.00$, $p = .05$. Vaccination status also predicted the proposed mediator, perceptions of
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9 vaccine effectiveness, $b = 1.89$, $SE = 0.43$, $Wald = 4.37$, $p = .000$. Moreover, as predicted for
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11 participants in the disease threat condition, perceptions of vaccine effectiveness mediated the
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13 relationship between vaccination status and anti-immigrant attitudes, indirect effect = -0.24 , $SE =$
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15 0.12 , $Z = -2.04$, $p = .041$. This relationship did not emerge for participants who were not exposed
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17 to disease threat, indirect effect = 0.05 , $SE = .10$, $Z = 0.45$, $p = .65$. These results provided
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19 support for our model proposing that vaccination status predicts perceived vaccine effectiveness,
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21 which then predicts reduced anti-immigrant attitudes for participants who are exposed to a
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23 disease threat.
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30 It is also possible, however, that perceptions of vaccine effectiveness predict whether
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32 people get vaccinated, which then predicts their anti-immigrant attitudes. To address this
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34 alternate model, we entered perceptions of vaccine effectiveness as the independent variable and
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36 vaccination status as the mediator. We also re-entered disease threat as the moderator and
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38 Modern Racism Scale as the dependent variable. Ruling out this alternative model, the data
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40 revealed that vaccination status did not mediate the relationship between perceptions of vaccine
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42 effectiveness and anti-immigrant attitudes for either participants primed with disease threat or
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44 unprimed participants, indirect effect = -0.04 , $SE = 0.03$, $Z = -1.50$, $p = .13$ and indirect effect =
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46 0.04 , $SE = .03$, $Z = 1.38$, $p = .16$, respectively.
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51 Thus, Study 1 suggests that when disease threat is salient, people express more anti-
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53 immigrant prejudice; however, people who are vaccinated from that disease report less negative
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3 attitudes. In fact, for disease-threatened participants, the decreased prejudice associated with
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5 being vaccinated can be partially attributed to the perceived protection offered by this vaccine.
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8 Although the effects of the disease prime diminish such concerns, it could still be argued
9
10 that the effects observed in Study 1 between these vaccinated and unvaccinated participants are
11
12 attributable to inherent group differences. Another alternate explanation is that, because the
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14 H1N1 flu was a foreign disease, reminding people of a foreign-born virus would increase
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16 suspicion against foreigners. Moreover, it could also be argued that, as there was a shortage of
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18 H1N1 vaccines in the United States during the flu epidemic, the passage participants read
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20 conflated disease-related threat with resource-related threat. These issues are addressed in Study
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25 2.

Study 2: Framing effects on prejudice

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29 Study 2 addressed these alternate explanations in various ways. First, we adapted the
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31 threat passage to describe seasonal flu epidemics, which are not associated with foreign origin or
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33 with vaccine shortages, and eliminated any mention of scarcity to that effect. Second, we used a
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35 dependent measure which assessed attitudes towards non-foreign, but often stigmatized groups
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37 (e.g., people who are obese). Finally, to account for alternative explanations related to inherent
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39 differences between vaccinated and unvaccinated people, we recruited only vaccinated
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41 participants and randomly assigned them to experimental and control conditions. If the
42
43 predictions from Study 1 are correct, and *perceived* protection from disease attenuates expressed
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45 prejudice, then altering people's perceptions of disease safety (by framing how vaccines work in
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47 different ways) should produce similar effects on prejudice, even if all participants are
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53 objectively immunized from the disease.
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3 Study 2 also probes a potential moderator of the basic effect observed in Study 1.
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5 Individuals vary widely in their self-perceptions of disease vulnerability (Duncan, Schaller, &
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7 Park, 2009). Previous studies found that when a disease threat is salient, people who are
8
9 chronically sensitive to disease are particularly prejudiced against outgroups (e.g., Faulkner et
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11 al., 2004; Mortensen et al., 2010). In the current context, we expect that protection from disease
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13 may attenuate this relationship between prejudice and individual differences in disease
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15 sensitivity.
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Methods

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22 Twenty-six participants (16 female, 10 male) were recruited from an online survey
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24 website. Participants who indicated that they had already received the seasonal flu vaccination
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26 were assigned to one of two conditions: protection or contamination framing. All participants
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28 read a passage about a disease threat similar to that used in Study 1, but describing only the
29
30 characteristics of the seasonal flu with no mention of vaccine availability (see Figure S2).
31
32 Participants assigned to the protection frame condition read that, "The seasonal flu vaccine
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34 protects people from the seasonal flu virus." Participants in the contamination frame condition
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36 read that, "The seasonal flu vaccine involves injecting people with the seasonal flu virus." Note
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38 that both sentences are factually correct.
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44 All participants were given an outgroups feeling thermometer scale in which they
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46 indicated how warm or cold they felt towards specific groups (0° = Extremely cold or
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48 unfavorable; 100° = Extremely warm or favorable). Seven different social outgroups (the obese,
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50 crack addicts, heroin users, illegal immigrants, Muslims, the homeless, and disabled people)
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52 were chosen because previous literature links judgments of these groups to perceived health-
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3 related threats (Cottrell & Neuberg, 2005). Responses on these items were averaged into a
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5 measure of general positivity towards outgroup members, $\alpha = .79$.

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8 Participants also completed a Perceived Vulnerability to Disease scale (Duncan et al.,
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10 2009). This scale measures individual differences in disease sensitivity and is typically separated
11
12 into two subscales: perceived infectability (which measures general views of susceptibility to
13
14 disease), and germ aversion (which measures discomfort with contamination from contact).
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16 While people's scores on the entire scale have been shown to predict disease-avoiding
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18 perceptions and behaviors (e.g., Mortensen et al., 2010), individual scores on the germ aversion
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20 subscale appear to carry most of the weight in predicting prejudice against outgroups (e.g.,
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22 Duncan et al., 2009; Faulkner et al., 2004), $\alpha = .69$.

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27 At the conclusion of the survey, we asked participants whether they belonged to any of
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29 the seven social groups they rated. Three participants indicated that they identified with one or
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31 more of the groups; we excluded their ratings for those specific group(s) and calculated their
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33 prejudice score based on their responses to the remaining items.

34 35 36 37 **Results and Discussion**

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39 We conducted linear regression analyses predicting outgroup attitudes from disease threat
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41 condition, germ aversion (centered), and the interactions of these variables. There was no effect
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43 of the perceived infectability subscale (consistent with previous findings by Duncan and
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45 colleagues, 2009 as well as Faulkner and colleagues, 2004). Furthermore, the results showed no
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47 main effect of condition nor of germ aversion, but did reveal the predicted interaction of
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49 condition and germ aversion, $b = 18.15$, $SE = 6.83$, $Wald = 2.66$, $p < .014$, $R^2 = 0.25$ (see Figure
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51 2). Consistent with the hypothesis, simple slopes analyses determined that for participants in the
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53 contamination frame condition, germ aversion negatively predicted attitudes towards outgroup
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3 members, $b = -9.96$, $SE = 4.85$, $Wald = -2.05$, $p = .05$. In contrast, this effect was not present for
4
5 participants in the protection frame condition (in fact the pattern was marginal in the reverse
6
7 direction, $b = 8.19$, $p = .10$).
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10 In sum, the results from Study 2 suggest that people's subjective perceptions of disease
11 protection can affect their outgroup attitudes, even among people objectively protected from that
12 particular health threat. Specifically, when a disease threat is salient, framing vaccination from
13 that disease in terms of contagion leads people who are chronically sensitive to disease to exhibit
14 increased prejudice against outgroups. Framing vaccination in terms of its protective function,
15 however, erases the relationship between germ aversion and prejudice toward outgroups.
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17 Together with Study 1, our results suggest that vaccination improves outgroup attitudes by
18 making people feel protected from disease, thereby eliminating the need for social avoidance.
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29 Thus far, we have considered the effects of an unmanipulated disease intervention (i.e.,
30 vaccination). Though Studies 1 and 2 sought to rule out inherent differences between vaccinated
31 and unvaccinated people as alternative explanations for our findings, the final study was
32 designed to directly manipulate people's experiences with disease protection.
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Study 3: Washing away prejudice

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41 In Study 3, we tested the protective effect of hand-washing on the typical relationship
42 between individual sensitivity to disease and negative outgroup attitudes. Research in public
43 health suggests that the simple act of washing one's hands with soap is an effective intervention
44 against both gastroenteric and respiratory infections (e.g., Curtis & Cairncross, 2003; Rabie &
45 Curtis, 2006). Social psychological research also links hand-washing to altered self-perceptions
46 of morality and contamination (e.g., Lee & Schwarz, 2010; Zhong & Liljenquist, 2006). We
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3 connect these two previously unrelated areas of research to demonstrate how this disease
4
5 intervention affects perception of others.
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8 Study 3 also examined whether the disease-related effects observed in Study 2 extend to
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10 ratings of all social targets or are specific to negatively perceived outgroups. To the extent that
11
12 outgroups are thought to pose disease-related threats compared to members of one's own group
13
14 (Cottrell & Neuberg, 2005), we expected to observe a relationship between germ aversion and
15
16 lack of disease protection when disease-threatened participants were rating outgroup members,
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18 but not when they were rating members of their own group.
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Methods

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24 Thirty undergraduate participants were recruited from a subject pool in exchange for
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26 course credit or six dollars. We excluded four participants because they self-identified with at
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28 least one of the outgroup categories used in the dependent measure, but did not specify to which
29
30 exact group they belonged. The remaining twenty-six participants (12 female, 14 male) were
31
32 randomly assigned to one of two conditions. Participants in the protection condition were
33
34 instructed to use a hand wipe to clean their hands and the keyboard before rating the product;
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36 participants in the control condition rated but did not use the hand wipe. Afterwards, all
37
38 participants read a passage about the seasonal flu that was very similar to the one used in Study
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40 2, except it additionally stressed the use of antibacterial hand wipes as a protective means against
41
42 contamination (see Figure S2).
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48 For the dependent measure, participants rated their impressions of nine social groups
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50 using a feelings thermometer scale similar to that used in Study 2 (with a slightly adapted scale;
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52 0 = Extremely cold or unfavorable; 11 = Extremely warm or favorable). Seven of these social
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54 groups were the same outgroups used in Study 2, $\alpha = .76$. Participants also provided ratings of
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3 two ingroups: undergraduate students and their own families. These ratings were averaged into a
4
5 measure of ingroup attitudes, $r = .50$. As in Study 2, participants also completed the Perceived
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7 Vulnerability to Disease Scale (Duncan et al., 2009).
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Results and discussion

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12 We conducted linear regression analyses predicting outgroup attitudes from hand-
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14 washing condition, germ aversion (centered), and the interactions of these variables. As with
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16 Study 2, the results revealed no main effect of condition nor of germ aversion, but did reveal the
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18 predicted interaction of condition and germ aversion, $b = -1.10$, $SE = 0.54$, $Wald = -2.04$, $p =$
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20 $.05$, $R^2 = 0.18$. Specifically, when participants did not clean their hands, germ aversion was
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22 associated with stronger negative attitudes towards outgroups, $b = -0.77$, $SE = 0.38$, $Wald = -$
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24 2.02 , $p = .056$. This relationship disappeared, however, when participants were given the
25
26 opportunity to clean their hands, $b = .33$, $p = .39$ (see Figure 3). A separate analysis was
27
28 conducted on ingroup attitudes. Supporting our hypothesis that disease concerns and protection
29
30 uniquely affect attitudes towards outgroups (as opposed to attitudes towards people in general),
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32 we did not find an interaction between condition and germ aversion for ratings of ingroup
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34 members, $b = 1.17$, $p = .11$. (Previous research by Schaller and Murray (2008) suggests that
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36 disease concerns predict more positive ingroup attitudes; interestingly, this nonsignificant trend
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38 echoes this pattern.)
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46 In Study 3, we experimentally manipulated people's experiences with disease protection
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48 and replicated the results previously observed with naturally-occurring vaccination groups. In
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50 particular, the present study found a significant relationship between germ version and negative
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52 outgroup attitudes when participants were not given an opportunity to clean their hands. Yet,
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54 when participants cleaned their hands, the relationship between germ aversion and outgroup
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3 attitudes disappeared. Furthermore, Study 3 found evidence of a boundary condition for the
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5 disease protection effect. The relationship between disease protection and chronic germ aversion
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7 was present only for perceptions of outgroups, and not for ingroup attitudes.
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General Discussion

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12 Taken together, the results from three studies suggest that vaccination and hand-washing
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14 interventions present social benefits that extend beyond immediate health contexts. Specifically,
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16 we suggest that knowledge about evolved connections between disease and intergroup attitudes
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18 can be leveraged to counteract prejudice. Study 1 suggested that when people were threatened
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20 with disease, participants who were vaccinated against that disease exhibited less prejudice
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22 towards immigrants than unvaccinated participants; further, this relationship was mediated by
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24 perceptions of vaccine effectiveness. Study 2 manipulated the observed mediator and found that
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26 feeling safe from disease, rather than actual disease protection per se, eliminated the relationship
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28 between chronic germ aversion and prejudice. Study 3 extended these findings by directly
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30 manipulating experiences with disease protection and also by demonstrating that disease
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32 prevention is specifically effective for changing perceptions of outgroup but not ingroup
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34 members.
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41 As vaccines are primarily a modern-day intervention, it is not surprising that perceptions
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43 of safety mediate the link between disease protection and prejudice. The behavioral immune
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45 system evolved to promote effective avoidance, but as is demonstrated by widely known placebo
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47 effects, psychological mechanisms may still play a role in immune system functioning. Across
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49 studies, both activated and chronic disease threats, as well as manipulated and non-manipulated
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51 inoculation interventions, showed a consistent pattern: physical diseases such as flu and social
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53 diseases such as prejudice can be “treated,” and in very similar ways.
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DISEASE PROTECTION ON PREJUDICE

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3 Theoretically and practically, these findings offer interesting implications for society at
4 large. The interventions presented here are directly relevant to current public health campaigns
5 and 'general' enough to ameliorate multiple threats to society. Economically, vaccination and
6 hand-washing campaigns are already cost-effective when it comes to reducing mortality and
7 morbidity (Curtis & Cairncross, 2003; Muenning & Khan, 2001). Fittingly, the global
8 vaccination market is expected to double by the year 2016 (Landers, 2008). Turning such
9 initiatives into novel dual-purpose interventions may increase their economic and practical
10 contributions to society. The negative effects of prejudice and discrimination pervade all aspects
11 of people's lives today, disturbing not only psychological but also physical well-being (e.g.,
12 Lewis, Kravitz, Janssen, & Powell, 2011). Understanding how prejudicial attitudes can be
13 improved while promoting other social benefits is of critical importance.
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29 Future research may examine the efficacy of other disease-related interventions (e.g.,
30 using surgical gloves and face masks) in ameliorating prejudice. We expect that such health
31 interventions might be most effective at addressing prejudice against groups heuristically
32 associated with disease (Cottrell & Neuberg, 2005). Moreover, emerging research on cognitive
33 links between disease processing and the processing of moral behavior (e.g., Borg, Lieberman, &
34 Kiehl, 2008) indicates that those groups stereotyped as morally impure might also benefit from
35 these interventions, and it may even be that perceptions of ingroup members who have
36 committed moral violations (e.g., cheaters) are altered as a result.
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48 Whereas our current findings do not address these extensions, they nevertheless point to a
49 more general conclusion. To the extent that dimensions of modern-day discrimination are borne
50 from evolved, disease-avoidance mechanisms, our research suggests that interventions which
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DISEASE PROTECTION ON PREJUDICE

target the source of those concerns are also capable of addressing a derived, yet equally harmful threat: prejudice.

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Figure Captions

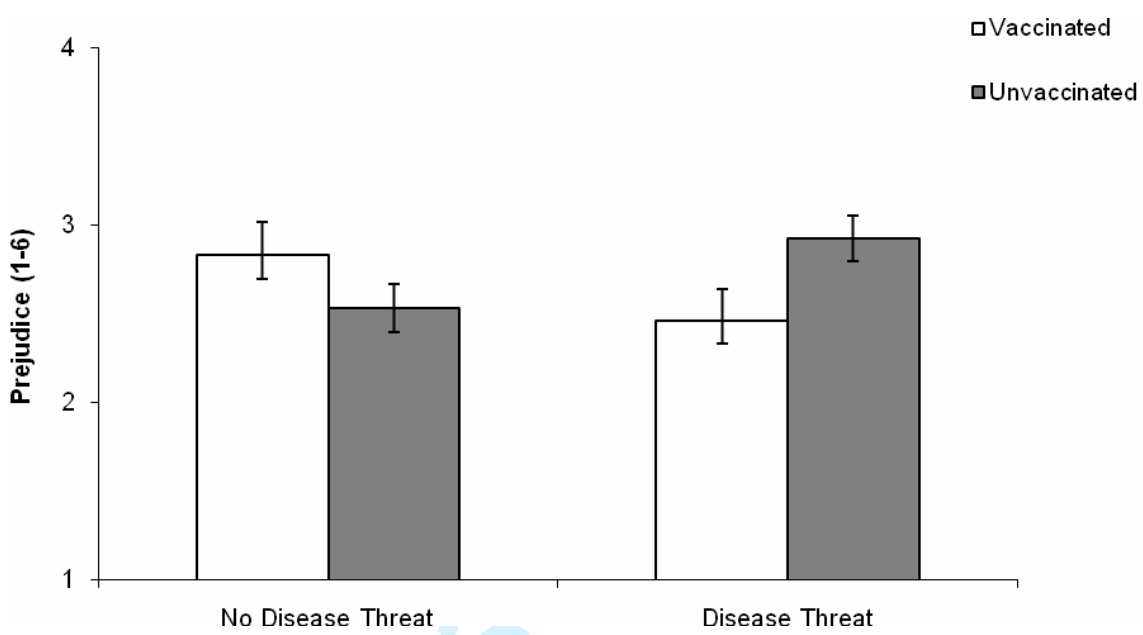
Figure 1. Mean scores on the adapted Modern Racism Scale by threat and vaccination status conditions (Study 1). Error bars represent standard errors of the mean.

Figure 2. Mean ratings on the outgroups feeling thermometer for contamination and protection framing conditions (Study 2). The graph shows estimated ratings for persons with germ aversion scores 1 standard deviation above and below the mean.

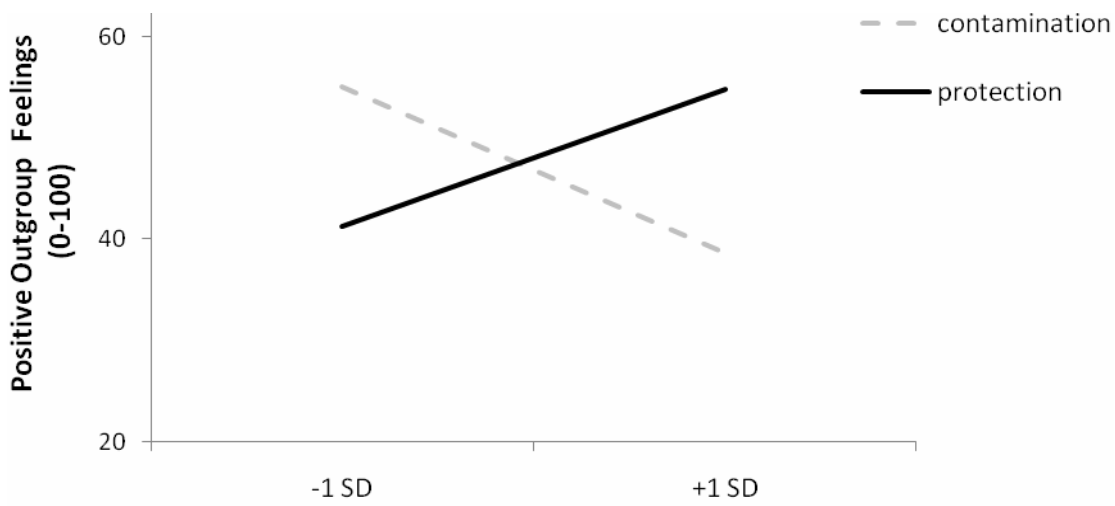
Figure 3. Mean ratings on the outgroups feeling thermometer for hand cleaning and no hand cleaning conditions (Study 3). The graph shows estimated ratings for persons with germ aversion scores 1 standard deviation above and below the mean.

ⁱ We thank a reviewer for this insight.

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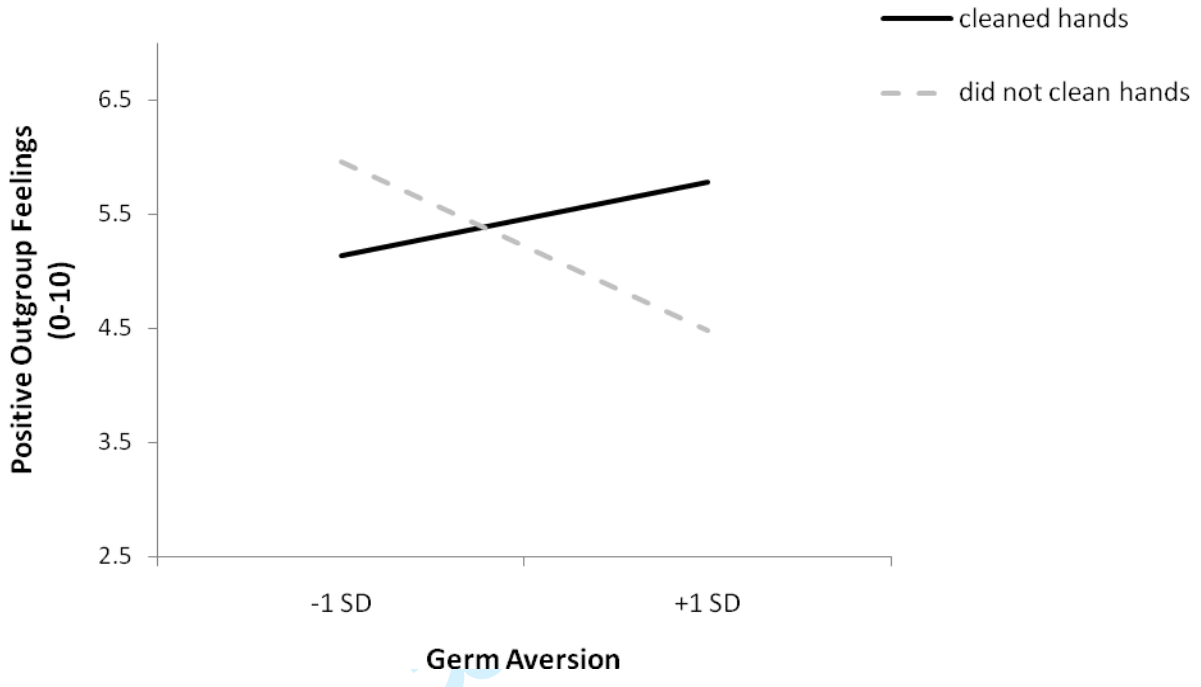


Germ Aversion

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Supplemental Figure 1

Below is an excerpt from recent local newspaper:

The first study of the early months of the swine flu (H1N1) global epidemic suggested that one quarter of Americans sick enough to be hospitalized with swine flu last spring also wound up needing intensive care; of these, 7 percent of them died. These rates are higher than with ordinary seasonal flu, and experts note that what is striking and unusual is that healthy people accounted for nearly half of the hospitalized cases.

In total, the CDC claims that over 2 million people could be hospitalized because of swine flu. Experts agree that the best way to protect oneself from the swine flu is to get the vaccine as it becomes available. As swine flu continues to spread across cities nationwide, there may not be enough vaccine supplies on hand to protect everybody.

Supplemental Figure 2

Below is an excerpt from recent local newspaper:

Flu season is approaching. Previous studies of the seasonal flu suggested that one quarter of Americans sick enough to be hospitalized with seasonal flu last spring also wound up needing intensive care; of these, 7 percent of them died. In total, the CDC claims that over 2 million people could be hospitalized because of seasonal flu.

Experts agree that the best way to protect oneself from the seasonal flu is to clean/sanitize one's hands regularly, especially in public places.