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Immunizing Against Prejudice: Effects of Disease Protection on Attitudes Toward Out-Groups

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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 effectively promotes disease avoidance but also results in an overgeneralized prejudice toward people who are not legitimate carriers of disease. In three studies, we tested whether experiences with two modern forms of disease protection (vaccination and hand washing) attenuate the relationship between concerns about disease and prejudice against out-groups. Study 1 demonstrated that when threatened with disease, vaccinated participants exhibited less prejudice toward immigrants than unvaccinated participants did. In Study 2, we found that framing vaccination messages in terms of immunity eliminated the relationship between chronic germ aversion and prejudice. In Study 3, we directly manipulated participants' protection from disease by having some participants wash their hands and found that this intervention significantly influenced participants' perceptions of out-group members. Our research suggests that public-health interventions can benefit society in areas beyond immediate health-related domains by informing novel, modern remedies for prejudice.

Keywords

evolutionary psychology, health, prejudice, social cognition, stigma, disease

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An evolutionary perspective suggests that prejudice has likely characterized interpersonal judgments since the beginning of human history. We propose a modern 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 social malady of prejudice.

Concerns About Disease 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). Under these conditions, people evolved mechanisms, or a behavioral immune system, that helped to minimize their exposure to disease-related threats (Schaller & Duncan, 2007). Because diseases can be transmitted unintentionally through contact with or even proximity to 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, affect personality profiles, and elicit automatic avoidance behaviors in perceivers (Ackerman et al., 2009; Houston & Bull, 1994; Mortensen, Becker, Ackerman, Neuberg, & Kenrick, 2010; Schaller & Murray, 2008). These changes in perception and behavior can provide an indirect measure of immunity because they lessen the probability of contact, and hence of disease transmission.

Human disease-avoidance mechanisms, however, also provide a foundation for broader prejudices. According to error-management theory, the costs associated with failing to detect a contagious individual (e.g., potential illness, disfigurement, or death) outweigh the costs of misidentifying a healthy person as a disease carrier (Haselton & Nettle, 2006). Consequently,

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disease-avoidance mechanisms occasionally "misfire" against targets who are not legitimate sources of disease (Kurzban & Leary, 2001). For example, chronic self-perceptions of vulnerability to disease predict attitudes toward targets with noncontagious health conditions (e.g., physical disability and obesity; Park, Faulkner, & Schaller, 2003; Park, Schaller, & Crandall, 2007) and toward social groups associated with subjectively unfamiliar cultural practices (e.g., immigrants and gay males; Cottrell & Neuberg, 2005; Schaller & Duncan, 2007). Even temporary exposure to a pathogen threat can elicit this overgeneralized prejudice. For instance, women show elevated ethnocentric and xenophobic attitudes during the early stages of pregnancy, when the fetus is most vulnerable to disease (Navarrete, Fessler, & Eng, 2007). Thus, prejudices that seem especially pernicious today can be linked to the workings of a system that evolved to protect the body from disease.

In our modern environment, however, methods for avoiding disease are no longer confined to the first-order methods of early threat identification and social avoidance. Relatively recent advances in medical technology offer more direct forms of protection. For instance, within the past century, public immunization interventions using vaccines have virtually eradicated major health threats such as smallpox and poliomyelitis (Centers for Disease Control and Prevention, 1999). Today, vaccinations continue to provide effective interventions against influenza and other contagious diseases (e.g., Nichol et al., 1995). Moreover, studies suggest that public-health campaigns promoting hand washing also help to prevent such diseases (e.g., Curtis & Cairncross, 2003; Rabie & Curtis, 2006).

Given the effectiveness of these technologies, public-health interventions have the potential not only to prevent the spread of disease, but also to quell the prejudices associated with the behavioral immune system. In other words, if the physical threat of contagion can be eliminated, it is possible that mental responses associated with disease-related threats will follow suit. In three studies, we tested whether experiences with two forms of disease protection (vaccination and hand washing) are capable of attenuating the relationship between concerns about disease and prejudice against out-groups.

Study 1: Immunizing Against Anti-Immigrant Attitudes

Previous research has suggested that concerns about disease predict prejudicial attitudes toward out-group members, particularly when the potential for contact is high. For instance, people exposed to disease-related threats express relatively more negative attitudes about foreign out-groups than do people who are not exposed to such a threat (Faulkner, Schaller, Park, & Duncan, 2004). On the basis of such research, we predicted that when a disease threat is salient, people who are protected from that disease (by vaccination) should express less prejudice toward immigrants than should people who are not protected from that disease. We also hypothesized that protection would have no effect on attitudes toward immigrants among participants who have not previously been exposed to a disease-related threat.

In addition, we tested a mediational model of psychological immunity. To the extent that perceptions of disease threat activate the psychological mechanisms implicated in prejudicial attitudes, perceived protection from disease should mediate the relationship between vaccination status and attitudes toward immigrants among participants exposed to a disease-related threat. That is, the perceived immunity to disease that results from vaccination should diminish the psychological mechanisms associated with anti-immigrant attitudes. In line with dissonance research suggesting that options are perceived more positively by people who have chosen them than by people who have not (Festinger & Carlsmith, 1959), our model predicted that participants who had been vaccinated prior to the study would perceive the vaccine as more effective than would unvaccinated participants[1] and that, in turn, these elevated perceptions of vaccine effectiveness would predict reduced anti-immigration attitudes. Perceptions of vaccine effectiveness, however, should influence anti-immigrant attitudes only among people who are concerned with protecting themselves against disease—namely, people who have been exposed to a disease-related threat. We therefore expected to find no significant relationship between perceived vaccine effectiveness and attitudes toward immigrants among participants who were not exposed to a disease-related threat.

Method

We recruited 135 participants (56 male, 75 female, 4 whose gender was not reported) from an online survey Web site. The study used a 2 (threat condition: disease threat vs. no threat) × 2 (vaccination status: vaccinated vs. unvaccinated) between-subjects design.

Study 1 was conducted during the fall of 2009, at the height of the H1N1 swine-flu epidemic. To prime disease threat, we had half of the participants read a passage about the swine-flu epidemic (disease-threat condition). To make the passage seem as realistic as possible, we composed it using excerpts from newspaper articles emphasizing that the swine flu might lead to the hospitalization of millions of people, even people who were healthy, and that although the swine-flu vaccine was in limited supply, medical experts recommended that everyone receive it (to read the passage, see the Supplemental Material available online). After reading the passage, participants indicated how effective they perceived the swine-flu vaccine to be, using a 9-point scale (1 = *not at all*, 9 = *extremely*). The other half of the participants (no-threat condition) rated the effectiveness of the swine-flu vaccine but did not read the passage.

For the dependent measure, participants completed a version of the Modern Racism Scale that was adapted to assess attitudes toward immigrants (e.g., "Over the past few years,

immigrants have gotten more economically than they deserve"; McConahay, 1986; α = .85). They also indicated in a background questionnaire whether they had previously received an H1N1 vaccination; on the basis of their answers to this question, all participants were further divided into naturally occurring vaccinated (n = 46) and unvaccinated (n = 86) groups.

Results and discussion

An analysis of variance conducted on the measure of prejudicial attitudes revealed the predicted interaction of threat condition with vaccination status, $F(1, 128) = 5.47$, $p = .021$, $\eta^2 = .041$. Pairwise comparisons confirmed that among participants in the disease-threat condition, those who were vaccinated scored lower on the adapted Modern Racism Scale ($M = 2.47$, $SD = 0.99$) than did those who were unvaccinated ($M = 2.96$, $SD = 0.96$), $F(1, 128) = 4.34$, $p = .039$, $\eta^2 = .033$ (see Fig. 1). Among participants who were not primed with a disease threat, however, no significant group differences emerged, $F(1, 128) = 1.54$, $p = .22$ (see Fig. 1). This result suggests that the effect found for participants in the disease-threat condition was not due to preexisting differences between vaccinated and unvaccinated participants.

Moreover, simple-effects analyses revealed that unvaccinated participants primed with a disease threat reported greater levels of prejudice than did unvaccinated participants who had not been primed ($M = 2.56$, $SD = 0.84$), $F(1, 128) = 3.93$, $p = .05$, $\eta^2 = .030$; this finding is consistent with previous research on the link between disease-related threats and negative attitudes toward immigrants (Faulkner et al., 2004). This difference did not emerge between the two groups of vaccinated participants, $F(1, 128) = 2.10$, $p = .15$.

To examine whether the effect of disease-related threat and vaccination status on anti-immigrant attitudes was mediated by perceptions of vaccine effectiveness, we tested for moderated mediation using methods recommended by Preacher, Rucker, and Hayes (2007) and Rucker, Preacher, Tormala, and Petty (2011). We entered vaccination status as the independent variable, score on the adapted Modern Racism Scale as the dependent variable, perception of vaccine effectiveness as the mediator (centered), and disease threat as the moderator of the relationship between perceived vaccine effectiveness and the dependent variable. For participants in the disease-threat condition, vaccination status indeed predicted scores on the dependent measure, $b = -0.49$, $SE = 0.25$, $t(66) = -2.00$, $p = .05$. The moderated mediation analysis revealed that vaccination status also predicted the proposed mediator, perceptions of vaccine effectiveness, $b = 1.66$, $SE = 0.33$, $t(130) = 5.10$, $p = .000$. Moreover, as predicted for participants in the disease-threat condition, perceptions of vaccine effectiveness mediated the relationship between vaccination status and anti-immigrant attitudes, indirect effect = −0.24, $SE = 0.12$, Sobel $z = -2.04$, $p = .041$. This relationship did not emerge for participants who were not exposed to a disease-related threat, indirect effect = 0.05, $SE = 0.10$, Sobel $z = 0.45$, $p = .65$. These results support our model proposing that vaccination status predicts perceived vaccine effectiveness, which then predicts anti-immigrant attitudes for participants who are exposed to a disease-related threat.

It is possible, however, that people's perceptions of vaccine effectiveness predict whether they get vaccinated, which then predicts their anti-immigrant attitudes. To account for this possibility, we created an alternative model in which we entered perceptions of vaccine effectiveness as the independent variable and vaccination status as the mediator. We also reentered disease threat as the moderator and score on the adapted Modern Racism Scale as the dependent variable. The data did not support this alternative model: Vaccination status did not mediate the relationship between perceived vaccine effectiveness and anti-immigrant attitudes for either participants primed with a disease-related threat, indirect effect = −0.04, $SE = 0.03$, Sobel $z = -1.50$, $p = .13$, or unprimed participants, indirect effect = 0.04, $SE = 0.03$, Sobel $z = 1.38$, $p = .16$.

Thus, results from Study 1 suggest that exposure to a disease-related threat is associated with increased anti-immigrant prejudice. People who are vaccinated and thus feel protected from disease, however, report less prejudice than do people who are not vaccinated. In fact, for disease-threatened participants, the decrease in prejudice associated with vaccination can be partially attributed to the perceived protection offered by the vaccine.

It could still be argued that the differences in anti-immigrant attitudes between vaccinated and unvaccinated participants in Study 1 are attributable to inherent group differences. Another alternative explanation is that because the H1N1 flu had foreign origins, it increased participants' suspicions about foreigners. It could also be argued that because there was a shortage of H1N1 vaccines in the United States during the flu epidemic, the participants who read the passage conflated a disease-related threat with a resource-related threat. We addressed these issues in Study 2.

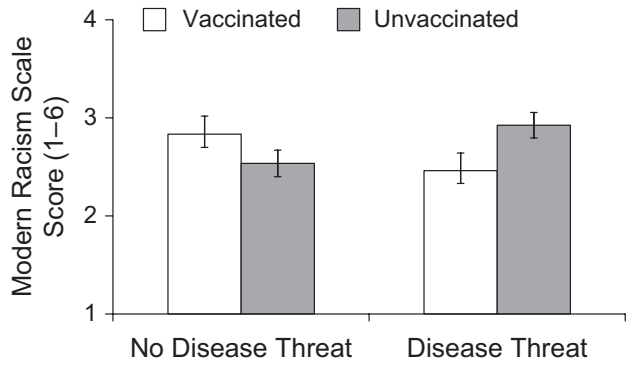

Fig. 1. Results from Study 1: mean score on the adapted Modern Racism Scale (McConahay, 1986) as a function of threat condition and vaccination status. Higher scores indicate greater prejudice toward immigrants. Error bars represent standard errors of the mean.

Study 2: Framing Effects on Prejudice

In Study 2, we addressed these alternative explanations in various ways. First, we adapted the threat passage to describe seasonal flu epidemics, which are not associated with foreign origins or with vaccine shortages, and we eliminated any mention of vaccine scarcity. Second, we added a dependent measure to assess attitudes toward nonforeign but commonly stigmatized groups (e.g., people who are obese). Finally, to account for alternative explanations related to inherent differences between vaccinated and unvaccinated people, we recruited only vaccinated participants and randomly assigned them to experimental and control conditions. If our predictions are correct, and perceived protection from disease attenuates expressed prejudice, then manipulating people's perceptions of protection from disease (by differentially framing how vaccines work) should produce similar effects on prejudice, even if all participants are objectively immunized from the disease.

In Study 2, we also probed a potential moderator of the basic effect observed in Study 1. Individuals vary in the extent to which they perceive themselves to be vulnerable to disease (Duncan, Schaller, & Park, 2009). Previous studies have shown that when a disease threat is salient, people who are chronically concerned about disease transmission are particularly prejudiced against out-groups (e.g., Faulkner et al., 2004). In the context of our study, we expected that perceived protection from disease would attenuate the relationship between prejudice and individual differences in perceived vulnerability to disease.

Method

Twenty-six individuals (10 male, 16 female) who had previously received the seasonal flu vaccine participated in this study. They were assigned to one of two conditions: protection framing or contamination framing. All participants read a passage about a disease threat that was similar to the passage used in Study 1 but described only the characteristics of the seasonal flu and did not mention the availability of vaccines. Participants assigned to the protection-frame condition read that "the seasonal flu vaccine protects people from the seasonal flu virus." Participants in the contamination-frame condition read that "the seasonal flu vaccine involves injecting people with the seasonal flu virus." Note that both of these statements are factually correct.

All participants used an out-group feeling-thermometer scale to indicate how warm or cold they felt toward seven specific groups (0° = *extremely cold or unfavorable*, 100° = *extremely warm or favorable*). We selected these seven social out-groups (obese people, crack addicts, heroin users, illegal immigrants, Muslims, the homeless, and disabled people) on the basis of pretesting and research linking prejudice toward these groups to perceived health- and culture-related threats (Cottrell & Neuberg, 2005). Responses on these items were averaged into a measure of general positivity toward out-group members ($\alpha = .79$). At the conclusion of the survey, we asked participants whether they belonged to any of the seven social groups. Three participants indicated that they identified with one or more of the groups; we excluded their ratings for those specific groups and used the participants' responses for the remaining items to calculate their scores on the dependent measure.

Participants also completed the Perceived Vulnerability to Disease Scale (Duncan et al., 2009). This scale measures individual differences in subjective sensitivity to disease and is typically separated into two subscales: Perceived Infectability, which measures general self-perceptions of susceptibility to disease, and Germ Aversion, which measures discomfort in contexts associated with disease transmission. Although scores on the complete Perceived Vulnerability to Disease Scale have been shown to predict perceptions and behaviors related to the avoidance of disease transmission (e.g., Mortensen et al., 2010), individual scores on the Germ Aversion subscale ($\alpha = .69$ in this study) appear to carry most of the weight in predicting prejudice against out-groups (e.g., Duncan et al., 2009; Faulkner et al., 2004).

Results and discussion

We conducted linear regression analyses predicting attitudes toward out-groups from framing condition, germ aversion (centered), and the interaction between these variables. We found no effect of perceived infectability (a result consistent with previous findings by Faulkner et al., 2004). Furthermore, the results showed no main effect of either condition or germ aversion, but they did reveal the predicted interaction between condition and germ aversion, $b = 18.15$, $SE = 6.83$, $t(22) = 2.66$, $p = .014$, $R^2 = .25$. Consistent with our hypothesis, simple-slopes analyses (see Fig. 2) revealed that for participants in the contamination-frame condition, germ aversion

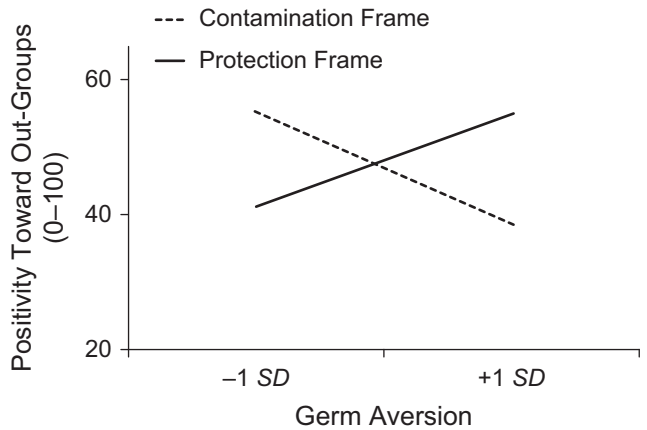

Fig. 2. Results from Study 2: mean rating of positivity toward out-groups as a function of framing condition and germ aversion. The graph shows estimated ratings for participants whose scores on the Germ Aversion subscale of the Perceived Vulnerability to Disease Scale (Duncan, Schaller, & Park, 2009) were 1 standard deviation above and below the mean.

negatively predicted attitudes toward out-group members, $b = -9.96$, $SE = 4.85$, $t(22) = -2.05$, $p = .05$. In contrast, for participants in the protection-frame condition, we found a trend in the opposite direction, $b = 8.19$, $p = .10$.

In sum, the results from Study 2 suggest that subjective perceptions of protection from disease can influence attitudes toward out-groups, even among people who are objectively immunized against disease. Specifically, when a disease threat is salient, framing vaccination against that disease in terms of contagion leads people who are chronically concerned about disease transmission to exhibit increased prejudice against out-groups. Framing vaccination in terms of its protective function, however, eliminates the relationship between germ aversion and prejudice. Taken together, our results from Studies 1 and 2 suggest that vaccination improves attitudes toward out-groups by making people feel protected from disease and thereby eliminating their aversion toward out-groups.

Thus far, we have considered the effects of an unmanipulated intervention against disease (i.e., vaccination). Whereas in Studies 1 and 2 we sought to rule out inherent differences between vaccinated and unvaccinated people as alternative explanations for our findings, we designed Study 3 to directly manipulate people's protection from disease.

Study 3: Washing Away Prejudice

In Study 3, we examined the effect of hand washing on the relationship between subjective perceptions of sensitivity to disease and negative attitudes toward out-groups. Research in public health has suggested that the simple act of washing one's hands with soap is an effective intervention against both gastroenteric and respiratory infections (e.g., Curtis & Cairncross, 2003; Rabie & Curtis, 2006), whereas research in social psychology has shown that hand washing affects people's moral actions and consumer decision making (e.g., Lee & Schwarz, 2010; Zhong & Liljenquist, 2006). We combined these two previously unconnected areas of research to investigate how hand washing affects perceptions of out-groups.

We also investigated whether the previously observed effects associated with disease-related threat extend to perceptions of all social targets or are specific to perceptions of stigmatized out-groups. To the extent that members of out-groups are more strongly associated with disease-related threats than are members of in-groups (Cottrell & Neuberg, 2005), we expected to find a relationship between germ aversion and prejudice when disease-threatened participants were rating out-group members, but not when they were rating members of their own groups.

Method

Thirty undergraduate participants were recruited from a subject pool and took part in Study 3 in exchange for course credit or $6. We excluded 4 participants who indicated that they identified with at least one of the out-group categories used in the dependent measure but did not specify the group to which they belonged. The remaining 26 participants (14 male, 12 female) were randomly assigned to one of two conditions (protection or control) and seated in front of a computer. Participants in the protection condition were instructed to rate a hand wipe after using it to clean their hands and the keyboard; participants in the control condition rated the hand wipe but did not use it. All participants then read a passage about the seasonal flu that was similar to the passage used in Study 2 except that it emphasized the use of antibacterial hand wipes as a protective measure against contamination (see the Supplemental Material).

For the dependent measure, participants rated their impressions of nine social groups using a feeling thermometer similar to that used in Study 2 but with a slightly modified scale (0 = *extremely cold or unfavorable*, 11 = *extremely warm or favorable*). Seven of these social groups were the out-groups rated by participants in Study 2 ($\alpha = .76$). Participants also provided ratings of positivity toward two in-groups: undergraduate students and their own families. We averaged these two ratings to create a measure of attitudes toward in-groups, $r = .50$. As in Study 2, participants also completed the Perceived Vulnerability to Disease Scale (Duncan et al., 2009).

Results and discussion

We conducted linear regression analyses predicting attitudes toward out-groups from condition, germ aversion (centered), and the interaction of these variables. As in Study 2, the results revealed no main effect of either variable, but they did reveal the predicted interaction between condition and germ aversion, $b = -1.10$, $SE = 0.54$, $t(22) = -2.04$, $p = .05$, $R^2 = .18$. Specifically, germ aversion was associated with negative attitudes toward out-groups among participants in the control condition, $b = -0.77$, $SE = 0.38$, $t(22) = -2.02$, $p = .05$. There was no relationship between these variables, however, among participants who had cleaned their hands, $b = 0.33$, $p = .39$ (see Fig. 3).

A separate analysis was conducted on attitudes toward in-groups. We did not find an interaction between condition and germ aversion for ratings of in-group members, $b = -1.17$, $p = .11$. This result supports our hypothesis that concerns about protection from disease affect prejudice toward out-groups in particular rather than attitudes toward people in general. (Note, however, that previous research by Navarrete & Fessler, 2006, suggests that concerns about disease predict positive in-group attitudes; the nonsignificant trend in our data is consistent with this pattern.)

In Study 3, we experimentally manipulated whether people were protected from disease and replicated the results previously observed with naturally occurring vaccination groups. In particular, we found a significant relationship between germ aversion and negative attitudes toward out-groups among participants who were not given an opportunity to clean their hands. Among participants who cleaned their hands, the relationship between germ aversion and negative attitudes toward

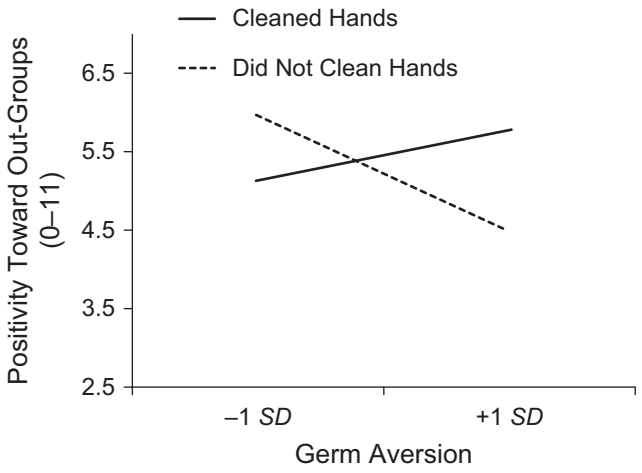

Fig. 3. Results from Study 3: mean rating of positivity toward out-groups as a function of condition and germ aversion. Participants in the protection condition cleaned their hands; participants in the control condition did not. The graph shows estimated ratings for participants whose scores on the Germ Aversion subscale of the Perceived Vulnerability to Disease Scale (Duncan, Schaller, & Park, 2009) were 1 standard deviation above and below the mean.

out-groups disappeared. Furthermore, we found evidence of a boundary condition for this effect: The results suggest a relationship between protection from disease and chronic germ aversion only for perceptions of out-groups, and not for attitudes toward in-groups.

General Discussion

Taken together, our results from three studies suggest that the benefits of vaccination and hand-washing interventions extend beyond immediate health-related contexts. We propose that knowledge about the evolved connections between disease and intergroup attitudes can be leveraged to counteract prejudice. Our results from Study 1 demonstrated that when threatened with disease, participants who were vaccinated against the disease exhibited less prejudice toward immigrants than did unvaccinated participants; furthermore, this relationship was mediated by participants' perceptions of the vaccine's effectiveness. In Study 2, we manipulated the observed mediator and found that perceived protection from disease, rather than actual immunization against disease, eliminated the relationship between chronic germ aversion and prejudice. In Study 3, we extended these findings by directly manipulating participants' protection from disease; results from this study demonstrated that interventions against disease can effectively change perceptions of out-group, but not in-group, members.

As vaccines are a relatively modern intervention, it is not surprising that perceptions of immunity mediate the link between protection from disease and prejudice. Psychological processes play a key role in the success of the behavioral immune system; moreover, as is demonstrated by widely known placebo effects, expectancies about one's immune system influence its functioning. Across three studies involving both activated and chronic disease threats, as well as both manipulated and nonmanipulated inoculation interventions, we found a consistent pattern: Treatments for physical diseases, such as the flu, can also be used to treat social maladies, such as prejudice.

These findings offer interesting theoretical and practical implications for society at large. The interventions in our research are directly relevant to current public-health campaigns and can be applied to multiple threats to society. Vaccination and hand-washing campaigns are already recognized as cost-effective ways to reduce mortality and morbidity (Curtis & Cairncross, 2003; Muennig & Khan, 2001), and the global market for vaccines is expected to double by the year 2016 (Landers, 2008). Turning public-health initiatives into novel, dual-purpose interventions may increase their practical contributions to society. The negative effects of prejudice and discrimination have been shown to disturb not only psychological but also physical well-being among targets of prejudice (e.g., Lewis, Kravitz, Janssen, & Powell, 2011), and thus to pervade many aspects of people's lives. Understanding how to improve prejudicial attitudes while promoting other social benefits is therefore of critical importance.

Future research should examine the efficacy of other disease-related interventions (e.g., the use of surgical gloves and face masks) in reducing prejudice. We expect that such health interventions might be most effective at addressing prejudice against groups heuristically associated with disease (Cottrell & Neuberg, 2005). Moreover, emerging research on cognitive links between the processing of disease and the processing of moral behavior (e.g., Borg, Lieberman, & Kiehl, 2008) indicates that interventions might ameliorate prejudice against a variety of targets, including members of out-groups associated with moral impurity and in-group members who have committed moral violations (e.g., cheaters).

Although our current findings do not address these extensions, they nevertheless point to a more general conclusion. Our research suggests that interventions targeting the source of disease-related concerns are also capable of addressing a derived, yet equally harmful threat: prejudice.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Supplemental Material

Additional supporting information may be found at http://pss.sagepub.com/content/by/supplemental-data

Note

1. We thank a reviewer for this insight.

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