

SALIENCE OF CONCERNS ABOUT DISEASE TRANSMISSION AFFECTS ATTITUDES
TOWARD ETHNIC FOREIGNERS

by

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Abstract

The human mind evolved to avoid recurrent threats, one of them being the threat of interpersonal disease transmission. This could contribute to ethnic outgroup derogation in contemporary environments, since ethnic “foreign-ness” is a potential trigger of an evolved disease avoidance mechanism that motivates avoidance of contagiously diseased individuals. One hypothesis that emerges is that when susceptibility to contagious diseases is salient, individuals will express exclusionary attitudes toward subjectively foreign (but not familiar) ethnic groups. This hypothesis was tested in two experiments. In each experiment, some participants were made to feel susceptible to contagious diseases by viewing a series of pictures that conveyed the ease with which germs are transmitted in everyday life. In Study 1, compared to a control condition, these participants endorsed immigration of a subjectively foreign group (Nigerians) to a lesser extent than immigration of a subjectively familiar group (Scottish people). In Study 2, participants in this condition also indicated that less money should be spent on recruiting immigrants from subjectively foreign locations (Nigeria, Mongolia, Brazil, and Peru) than on immigrants from subjectively familiar locations (Scotland, Taiwan, Poland, and Iceland). The results of these studies are consistent with the hypothesis that an evolved disease-avoidance mechanism contributes to exclusionary attitudes toward subjectively foreign ethnic groups.

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Introduction

People sometimes feel threatened by foreign ethnic groups. These perceived threats underlie anti-foreigner attitudes intended to reduce particular threats (Stephan, Ybarra, & Bachman, 1999). In some contexts, foreigners are perceived as symbolically threatening by challenging important beliefs and moral values. These symbolic threats arouse attitudes that derogate foreign ethnic groups, like the belief that foreigners are lazy and lack ambition (Stangor & Crandall, 2000). In other contexts, foreigners are thought to pose “realistic” threats to individual well being such as physical harm, or threats to group well-being such as increasing the scarcity of resources (Neuberg, Smith, & Asher, 2000). These perceptions might arouse threat-relevant beliefs that foreigners are dangerous or should be excluded from economic relationships. The present investigation focuses on another realistic threat that people might sometimes perceive in foreigners—the threat of interpersonal disease transmission—that might account for attitudes reflecting a desire to exclude foreigners from social interactions.

Perceived threats that underlie anti-foreigner attitudes are often times irrational, since they might reflect exaggerated or non-existent concerns about foreigners. This is the situation for threats of interpersonal disease transmission; the perceived contagious disease threat posed by ethnic foreigners is much greater than the actual threat (Markel & Stern, 2002). Nevertheless, contexts that make people feel especially susceptible to disease are likely to arouse exclusionary attitudes toward people who are perceived as potentially diseased. If ethnically foreign groups are associated with disease concerns, then it is likely that they will be targets of exclusionary attitudes in these contexts. Two studies examined this possibility. Prior to describing these studies, a conceptual framework is useful for understanding why irrational concerns about

contagious disease transmission might underlie anti-foreigner attitudes. This framework is provided by an evolutionary psychological analysis of contemporary anti-social phenomena.

Evolved Psychological Models of Anti-Sociality

Numerous cognitive mechanisms likely arose as adaptations to the recurrent problems that humans faced in their ancestral environments (Barkow, Cosmides, and Tooby, 1992; Buss & Kenrick 1998; Crawford, 1998). Humans evolved in groups, and so many of these mechanisms probably came about as adaptations for successfully navigating the various domains of social life (Bugental, 2000; Kenrick, Sadalla, & Keefe, 1998). Group living conferred many adaptive benefits, such as the potential for cooperation, but it also posed numerous dangers to individual well being, such as the threat of physical harm. Therefore, it's likely that many evolved cognitive mechanisms discouraged sociality under specific circumstances, in order to avoid potentially dangerous others who might pose threats to individual well being or effective group functioning (Kurzban & Leary, 2001; Schaller & Park, in press).

Contemporary environments differ from ancestral human environments in innumerable ways, and so anti-social mechanisms that were functional in ancestral environments might be dysfunctional in the here-and-now. Previously adaptive threat-avoidance mechanisms have been theoretically linked to various dysfunctional anti-foreigner thoughts and behaviors in contemporary environments. Kurzban and Leary (2001) propose that anti-social mechanisms adapted to three domains of ancestral social life are implicated in contemporary anti-social processes. First, mechanisms designed for cooperating with other individuals would have discouraged interactions with poor social exchange partners. Second, mechanisms designed for coalitional exploitation would have encouraged exclusion and exploitation of outgroup members. Third, mechanisms designed for disease avoidance would have encouraged social exclusion of

individuals likely to be carrying contagious diseases. It is these anti-social mechanisms designed for disease avoidance that might be implicated in contemporary anti-foreigner attitudes reflecting irrational concerns about disease transmission.

Evolved disease avoidance. In ancestral environments, avoiding contagious diseases was of central concern (Park, Faulkner, & Schaller, in press). Contagious diseases and parasites require specific host environments, and so diseases and parasites carried by other humans posed a great risk to individual health. As a result, some cognitive mechanisms probably arose as adaptations for detecting contagiously diseased others and motivating disease-avoidant responses. When and how these mechanisms detected and responded to disease threats in ancestral environments influence when and how disease based anti-foreigner attitudes might emerge in contemporary environments.

Ancestral humans lacked the medical expertise to accurately diagnose the presence of contagious diseases, and would have instead depended on superficial features that heuristically connoted the presence of contagious diseases in others. Any superficial feature could have become heuristically associated with disease as long as it sometimes accurately reflected the presence of contagious diseases. Associating a feature with contagious diseases in the absence of any disease threat would have exacted an adaptive cost, initiating anti-social responses in the absence of threat. However, this adaptive cost would have been lower than the cost of failing to appropriately respond to people whose features accurately signified the presence of contagious diseases. Consequently, many superficial features that only sometimes predicted the presence of contagious diseases probably came to be heuristically associated with disease (Kurzban & Leary, 2001).

The detection of potential contagious disease carriers did not require conscious knowledge of the many superficial features that accurately predicted the presence of contagious disease. Instead, relatively automatic or unconscious detection of these features would have sufficed, and was probably quite adaptive (Schaller, 2002). An automatic, or reflexive response to heuristic indicators of disease would have more quickly and effectively aroused adaptive disease avoidance responses than a more conscious, deliberative response. This analysis suggests that in contemporary environments, disease avoidant responses might be automatically triggered by categories of people who share any feature that heuristically connoted the presence of contagious diseases in ancestral environments.

In the social environments humans evolved in, heuristic indicators of subjective “foreignness” were a class of features that potentially co-occurred with the presence of contagious diseases. Ancestral humans lived in small tribes, and often came in contact with somewhat foreign tribes, for example when on a seasonal basis numerous small tribes formed larger groups consisting of hundreds of people (Caporeal, 1997). From tribe to tribe, individuals may have developed immunities to different parasites or viruses. Cultural practices between tribes also would have differed, some of which would have arose as ways of reducing disease transmission, such as food preparatory or hygienic practices. Under these circumstances, members of subjectively foreign groups were more likely to be carriers of harmful contagious diseases than were members of one’s own group. An adaptive disease avoidance mechanism could then use any superficial feature indicating subjective foreignness to detect contagiously diseased others. In ancestral environments, these cues may have included known tribal outgroup status, visual outgroup features such as unusual dress, foreign cultural practices, and foreign language or dialect. In contemporary environments, a disease avoidance mechanism might be triggered by

features such as ethnic outgroup status, unusual dress or unusual skin color, and foreign cultural practices, languages, and accents (Schaller et al., 2003).

In addition to detecting potential contagious disease carriers, a successful disease avoidance system also required mechanisms for eliciting adaptive disease avoidance responses. This sort of a mechanism likely elicited disease-relevant emotions and cognitions to motivate social exclusion of potentially diseased individuals. Disgust is a basic emotion that motivates this sort of an adaptive response. Disgust has evolutionary roots in avoiding offensive objects that are harmful to ingest, and has interpersonal and behavioral components as well; it is elicited by “offensive” people and motivates physical distancing from an offensive object or person (Rozin, Haidt, & McCauley, 2000). Adaptive cognitions that also would motivate social exclusion include beliefs attributing disease-relevant characteristics such as “dirty” or “unhygienic” to potential disease carriers, as well as a belief that they should be physically avoided.

The implication for contemporary psychological phenomena is that an evolved disease avoidance mechanism is likely to automatically elicit adaptive emotions, such as disgust, and beliefs that attribute disease characteristics to contemporary categories of people who trigger the mechanism. Contemporary groups of people who are subjectively perceived as foreign are likely to trigger this mechanism, and so anti-foreigner attitudes may be automatically elicited, including beliefs that foreigners are diseased and should be socially excluded. Attitudes reflecting this concern about foreigners as potential disease carriers who should be avoided are abundant throughout history, and are also evident in more recent psychological literature.

Disease-Relevant Attitudes Toward Foreigners

Ideas similar to modern conceptions of contagion are evident in ancient eastern and western writings, many of which implicate foreigners as a source of illness. In ancient Greek

writings, the words “epaphe” and “synachrosis” reflected concerns about the interpersonal origins of illness (Nutton, 2000). Epaphe is derived from the Greek verb “to touch,” and is used to explain how people can “touch” others with disease. One can be touched by disease simply by being in the presence of foreigners, such as the Palaeothebans (backwoodsmen from what is now Turkey), who were believed to cause illness simply by looking at or breathing upon others. The word “synachrosis” also points to interpersonal contact as a source of physical as well as moral illness. Writings on synachrosis warned of the dangers of allowing children to associate with foreigners (Nutton, 2000).

Concepts in ancient Chinese medicine also reflect concerns about foreigners as potential disease carriers. “Kewu” is a word used in ancient Chinese pediatric medicine, and literally means “guest” or “to lodge” (ke) and “disorder,” “reversal,” or “encroachment” (wu; Cullen, 2000). Kewu is seen as a disorder that strikes children if they suddenly encounter a person or object they are not used to seeing. Children are also more likely to be struck by kewu when they are away from home or outside of the gates of their village. “Zhong ren” is another word for this kind of a disorder that originates from strange or foreign people, and literally means “being struck by a person” (Cullen, 2000).

Ancient eastern and western concepts of contagion might reflect somewhat rational concerns about foreigners as potentially diseased, since, foreigners probably were more likely to be carriers of contagious diseases. More modern beliefs about some foreign ethnic groups better illustrate an irrational association of foreigners with disease. One example is the exaggerated beliefs throughout history associating Jews with severe contagious diseases. In Medieval Europe, Jews were blamed for the plague, and as early as 1333 in Nazi Germany, Jews were banned from public swimming pools and public bathing facilities (Goldhagen, 1996). Nazi stereotypes of Jews

also reflected disease concerns; Jews were described as vermin, bacilli, and parasites. Recent psychological evidence also reveals an association between various ethnic groups in North America and disease concerns. At various times, African, European, Latin, and Asian groups have stereotypically described one another as “dirty” or “messy” (Fiske, 1998).

Disease concerns are also reflected in American immigration policies. In the early 1900’s Americans attributed disease concerns to new immigrants that were exaggerated relative to the actual incidence of contagious diseases among immigrants. They also viewed illnesses in immigrants already settled in America as a problem arising outside of the United States (Markel & Stern, 2002). Both the public and policy makers at the time distinguished between “old” immigrants, from subjectively familiar areas in northern Europe, and “new” immigrants, from subjectively foreign areas in eastern, central, and southern Europe. Medical exams were harsher for the new immigrants, arriving from areas like Russia, Poland, and Greece, than they were for the old immigrants, arriving from areas like Great Britain, France, and Germany. However, even the new immigrants from Europe were refused entry into the United States based on medical concerns far less often than were the more foreign immigrants from China, Japan, and Korea.

Negative beliefs about subjectively foreign groups based on disease concerns are also variable across time. In the case of American immigration policies, medical exams for both “old” and “new” immigrants became more thorough following the public’s increased awareness of bacteriology (Markel & Stern, 2000). Also, throughout history epidemics have intensified exclusionary reactions to foreign groups of people (Oldstone, 1998). A recent example is discrimination against ethnic minorities following the SARS outbreak. One news story reported that Canadian immigration officials wore masks at Chinese refugee hearings, in spite of the fact that the refugees lived in Canada for at least two years prior to their hearing, long before the

SARS outbreak began (“Chinese refugees face SARS discrimination,” 2003). Historically, when people have been made to feel more susceptible to contagious diseases, either because of disease outbreaks or the proliferation of ideas about interpersonal disease transmission, discrimination has followed, often in the form of intensified anti-foreigner attitudes. This may be due in part to the nature of an evolved disease avoidance mechanism that would have intensified disease-avoidant reactions in some circumstances.

Moderators of Disease-Avoidant Responses to Foreigners

Anti-social responses designed over evolutionary time to avoid recurrent threats would have been more functional in some situations than others. These responses would have been least functional in situations indicating that foreigners are unlikely to threaten individual or group well being. Here the benefits of anti-sociality would be low and the costs of excluding individuals suitable for social exchange would be high. The benefits of anti-sociality would have been higher (and the costs lower) in situations indicating that foreigners are very likely to threaten individual or group well being. Therefore, it’s likely that evolved anti-social responses would have been amplified or inhibited by any information connoting the likelihood of an interpersonal threat.

Information about the likelihood of interpersonal disease transmission comes from two sources. One is any contextual signal that implies a high or low likelihood of interpersonal disease transmission, such as the knowledge of current disease outbreaks. Another source is chronic feelings of susceptibility to contagious diseases. Just like some people might feel more chronically anxious or fearful, some people might also feel more chronically susceptible to contagious diseases. An evolved disease avoidance mechanism likely elicits the strongest disease-avoidance responses in those individuals who either chronically or contextually feel

especially susceptible to disease. This means that disease-avoidant reactions to contemporary foreign ethnic groups might be most negative in people who feel most susceptible to disease.

Chronic worries about disease and attitudes toward foreigners. The hypothesis that chronic feelings of susceptibility to disease underlie disease avoidant reactions to ethnic foreigners was initially tested in a series of correlation al studies. For these studies, a scale was developed to measure participants' feelings of susceptibility to contagious diseases (Perceived Vulnerability to Disease scale; Faulkner et al., 2003), and afterwards assessed these participants' attitudes toward immigrants from various geographic regions. Canadian participants' (who were primarily of East Asian and European Heritage) chronic feelings of vulnerability to disease predicted exclusionary attitudes toward immigrants from various subjectively foreign regions (Africa, the Middle East, South America, and Southern Asia), but did not predict exclusionary attitudes toward immigrants from subjectively familiar areas like East Asia and Europe. That is, participants who felt most chronically susceptible to contagious diseases expressed the strongest desire to exclude ethnically foreign groups from Canada, but did not express a particularly strong desire to exclude ethnically familiar groups.

Contextual indicators of disease susceptibility and attitudes toward foreigners. As with chronic worries about disease, any contextual information that implies an increased risk of susceptibility to disease might also amplify exclusionary reactions to ethnic foreigners. This is because in ancestral environments, a disease avoidance mechanism would have been most adaptive in contexts that connoted a high risk of interpersonal disease transmission, as in times of contagious disease outbreaks. In contemporary environments, there are numerous stimuli that might temporarily arouse worries about interpersonal disease transmission. These include news stories about the latest disease epidemic, advertisements for hygienic products that warn of the

multiple sources of germs and bacteria, and disgust-eliciting objects like sewers and odorous garbage cans. Few of these contemporary sources of disease concerns implicate ethnic foreigners as a source of disease; however they might automatically elicit an evolved disease avoidance response that includes an exclusionary reaction to ethnic foreigners. This leads to the hypothesis, tested in two studies, that temporarily heightened worries about disease will lead to attitudes that reflect a desire to socially exclude foreign, but not familiar ethnic groups.

Overview of Studies

Two experiments were designed to temporarily manipulate feelings of susceptibility to disease and examine the impact of these worries on attitudes toward various ethnic groups. In both studies, half of the participants were made to feel especially susceptible to contagious diseases by viewing a series of pictures that conveyed the ease with which bacteria and germs are transmitted in everyday life. Other participants in a control condition were made to feel especially susceptible to physical danger (a disease-irrelevant threat to safety) by viewing a series of pictures that conveyed the ease with which everyday accidents occur. Afterwards, participants in all conditions were given a questionnaire that assessed their attitudes toward the potential immigration of either a foreign or a familiar ethnic group. Study 1 described the potential immigration of either Nigerian or Scottish people, whereas Study 2 described the potential immigration of either Mongolian or Taiwanese people.

Participants in all studies also completed measures that assessed their stereotypical beliefs about potential immigrants as well as general beliefs about immigration. Conceptually, the effects of temporarily aroused worries about disease are more likely to occur on measures that are functionally relevant to the disease-avoidance process; for example, a desire to exclude some immigrant groups from entering one's home country might implicitly reflect a desire for

interpersonal avoidance based on disease-avoidance concerns. It seems less likely that effects of temporary disease worries might emerge on participants' stereotypical beliefs about ethnic outgroups; in the absence of information supporting specific beliefs, participants may be reluctant to offer stereotypical judgments. Indeed, in previous research, chronic worries about disease predicted functionally relevant attitudes toward ethnic outgroups, and only weakly predicted less functionally relevant stereotypical beliefs (Faulkner et al., 2003).

The effects of temporarily aroused worries about disease are also expected to be limited to measures assessing attitudes toward subjectively foreign ethnic groups, since cues heuristically connoting foreign-ness are likely triggers of an evolved disease-avoidance process. These effects are less likely to occur in the absence of such cues, for example, on items assessing attitudes toward subjectively familiar immigrant groups or on items assessing general beliefs about immigration. Consistent with this analysis, in previous studies chronic worries about disease did not predict negative attitudes toward familiar ethnic outgroups, nor did they predict attitudes toward immigration in general (Faulkner et al., 2003). Thus, drawing from conceptual expectations and previous findings, I predicted that temporarily aroused worries about disease will negatively influence participants' willingness to allow foreign, but not familiar ethnic groups into Canada, but might not influence general beliefs about immigration or stereotypical beliefs about ethnic outgroups.

In the present studies I also explored the relationship between chronic worries about disease (as measured by a self-report questionnaire) and temporarily aroused worries about disease. It seems possible that chronic and temporarily aroused feelings of vulnerability to disease may interact with one another in at least one of two ways: Perhaps the effects of chronic feelings of vulnerability to disease are strongest under conditions that arouse little or no worries

about the likelihood of disease transmission, and disappear under conditions that arouse more substantial worries. However, it's also possible that the predictive effects of individual differences in perceptions of vulnerability to disease emerge only under conditions that connote a substantial risk of disease transmission. In this case, conditions that make the threat of interpersonal disease transmission salient might act as a "trigger" that releases the effects of chronic feelings of vulnerability to disease. Conceptually, both patterns of interactions seem plausible (see Schaller et al., 2003; Snyder & Ickes, 1985). Thus, in all studies, I explored the potentially interactive effect between chronic and temporarily aroused perceptions of vulnerability to disease.

Pre-Testing: Perceived Foreign-ness of Ethnic Groups

In Studies 1 and 2, participants' attitudes toward foreign or familiar ethnic groups would be assessed, and so a preliminary study was conducted to determine which of eight ethnic groups participants would perceive as very subjectively foreign or familiar.

Participants

Participants were 26 undergraduate students at the University of British Columbia. Twenty-three participants were women and three were men; 18 were of East Asian heritage (primarily Chinese), six were of European heritage, and two were of other ethnic backgrounds. Four of the participants described their ethnic background as similar to the ethnicities of the groups they were rating: one was born and lived in Scotland, one was born and lived in Taiwan, one had parents born in Scotland, and one had parents born in Taiwan. Participants in Studies 1 and 2 were expected to have similar backgrounds, and so these participants' data were not excluded from results of the foreign-ness ratings. (The rank-order of overall ethnic group foreign-ness remained the same with these participants excluded from analyses.)

Procedure

The study was completed in small groups of one to five participants. Participants were asked to fill out a package of questionnaires, beginning with a demographic questionnaire that included questions about the participants' age, sex and ethnic background.

The next questionnaire asked participants about eight ethnic groups. These were immigrants from Taiwan, Peru, Poland, Nigeria, Scotland, Mongolia, Brazil, and Iceland. The eight ethnic groups were chosen to represent areas of the world with very different climatic and geographic characteristics. For instance, Nigeria contains tropical regions and is located in western Africa, Mongolia contains colder mountainous regions and is located in Northern Asia,

and Peru's climate and terrain varies substantially, and is located in western South America. Participants responded to five questions assessing subjective foreign-ness of the eight groups. The first question asked participants how visually different the eight ethnic groups were from people in the Vancouver area. The second question asked participants, in general, how culturally different the eight groups were from people in the Vancouver area. The next three questions asked how different the eight groups were from the participants themselves in three disease-relevant domains: personal hygiene and cleanliness, food preparation, and diet. Participants responded using nine-point rating scales that ranged from "not different at all" to "very different," with larger scores indicating greater perceived foreign-ness.

Following the foreign-ness questionnaire, participants completed a series of individual difference measures, one being the Perceived Vulnerability to Disease scale (PVD; Schaller et al., 2003). The PVD scale is an 18-item questionnaire that assesses chronic individual differences in feelings of susceptibility to contagious diseases (Schaller et al., 2003). Two subscales comprise the PVD scale. Eight items assess general beliefs about susceptibility to contagious diseases (e.g., "I have a history of susceptibility to infectious disease"). Ten other items assess aversion to germ-connoting situations (e.g., "I prefer to wash my hands pretty soon after shaking someone's hand). Participants indicate their agreement with all items using a 7-point rating scale ranging from "Strongly Disagree" to "Strongly Agree." Larger numbers indicate higher PVD.

Results and Discussion

Table 1 displays participants' average foreign-ness ratings of the eight ethnic groups for each of the five foreign-ness questions. Following these individual means are overall foreign-ness means averaged over the five foreign-ness questions. Immigrants from Nigeria were rated as most foreign overall, followed by immigrants from Mongolia, Brazil and Peru (rated equally

foreign), Iceland, Poland, Taiwan, and Scotland. The rank-ordered foreign-ness of groups was very similar across all foreign-ness questions. (One exception was the rank-order of immigrants from Taiwan, who were ranked fifth most foreign on the first three questions, but were ranked least foreign on the “food preparation” and “diet” questions.) Participants’ overall foreign-ness ratings of the ethnic groups were unrelated to their scores on both PVD subscales (all r ’s between $-.21$ and $.19$, all p ’s $> .30$).

Rated foreign-ness of the eight ethnic groups was then considered in choosing ethnic groups described as potential immigrants in the following two studies. In Study 1, the ethnic groups rated as most and least foreign, Nigerian and Scottish people, were described as potential immigrants. In Study 2, the ethnic groups rated as second most and second least foreign, Mongolian and Taiwanese people, were described as potential immigrants.

Study 1: Attitudes Toward Scottish and Nigerian Immigrants

In Study 1, half of the participants were assigned to a condition in which the threat of contagious diseases was made especially salient. The rest of the participants were assigned to a control condition in which a threat irrelevant to contagious disease concerns (physical danger) was made salient. Participants' attitudes toward the immigration of one of two ethnic groups were then assessed. Half of the participants were asked about the potential immigration of Nigerians (pre-rated as subjectively foreign) to Canada. Other participants were asked about the potential immigration of Scottish people (pre-rated as subjectively familiar) to Canada. These manipulations comprised a 2 (disease salience vs. control) X 2 (potential Nigerian vs. Scottish immigration) factorial design, in which a two-way interaction between disease salience and the described immigrant group was expected to emerge. Participants in the disease salience condition, but not participants in the control condition, were expected to hold more negative attitudes toward Nigerian immigrants than they were toward Scottish immigrants.

Participants

Participants were 57 undergraduate students at the University of British Columbia. Forty-three participants were women and 14 were men; 30 were of East Asian heritage (primarily Chinese), 17 were of European heritage, and 10 were of other ethnic backgrounds. None of the participants were of African heritage, but two participants were partly of Scottish heritage; one participant was born in Scotland and lived there for 13 years, but described her ethnic background as Punjabi, and one participant described her ethnic background as Scottish, British and Irish, but was born in Canada. In neither case were these participants in a condition that described immigration of an ethnic group similar to their own ethnic background.

Procedure

The study was completed in small groups of one to five participants. Participants first completed a questionnaire about general demographic information followed by a number of individual difference measures, including the Perceived Vulnerability to Disease scale.

Disease salience manipulation. Participants were then randomly assigned to one of two experimental conditions. In half of the sessions, participants were assigned to a disease salience condition. Participants in these sessions viewed a slide show designed to remind them of the various ways that diseases are transmitted in daily life, thus making the threat of contagious diseases especially salient. This "Disease" slide show included 11 pictures that would ostensibly be used in a health education program. As an example, one slide pictures a woman unsuccessfully attempting to kill cartoon germs in her kitchen with a spray bottle of cleaner, and is titled "The Horrors of the Kitchen Sponge and Family Pets." Another slide pictures a strand of hair surrounded by bacteria, and includes a title and caption that reads "Hair Bacteria. A microscopic view of a strand of hair and some of the typical bacteria that surround it." For the rest of the sessions, participants were assigned to a control condition, in which they viewed a slide show designed to make the threat of physical dangers especially salient. These slides were intended to make participants in the control condition feel susceptible to a threat to their well being that was irrelevant to contagious disease concerns. This "Accidents" slide show included 11 pictures that would ostensibly be used in a safety education program. Two examples of the "Accidents" slides are "School Bus Hazards," which pictures a girl bending over to pick up a book as a school bus is about to hit her, and "Electricity and Water Don't Mix," which pictures a woman in a bath tub surrounded by plugged-in electrical appliances.

Slide shows were projected onto a 1.25 by 1 m screen using a manual slide projector (Kodak ectagraphic slide projector, model B-2). Slides were viewed for approximately 15 seconds each time they were shown to participants. Participants viewed their assigned slide show twice; the first time they rated the “educational informativeness” of each slide on a 10-point rating scale, and after a second viewing they wrote a short paragraph describing their overall impressions of the slide show. Slide shows were shown twice to increase the probability that they would have the intended effect of increasing perceptions of susceptibility to contagious diseases or physical dangers.

Attitudes toward ethnic groups. Following the slide show, participants were told the initial study on “how people perceive educational information” was over and they were asked to help with an unrelated task. At this point, participants were asked to complete a questionnaire that assessed their attitudes toward one of two ethnic groups. In half of the sessions, participants were asked their opinions about potential Nigerian immigrants, and in the rest of the sessions participants were asked their opinions about potential Scottish immigrants. These groups were chosen to represent two ethnicities that participants would perceive as either very familiar or very foreign. (Of the eight ethnic groups, Nigerian immigrants were pre-rated as most foreign overall and Scottish immigrants were pre-rated as least foreign overall).

An experimenter told participants they were completing this questionnaire as a favor to another University of British Columbia researcher who was interested in immigration policy. Instructions that were ostensibly written by this researcher were then read aloud to participants. The instructions read:

I am interested in the recent public debate about immigration from [Nigeria/Scotland] into Canada. [Nigeria/Scotland] is a country in [Western Africa/Western Europe]. Some of the

people who live in [Nigeria/Scotland] have decided to immigrate to Canada. Most of these potential immigrants are applying to live in the Vancouver area. Please fill out this questionnaire so our local government can find out about your opinions on [Nigerian/Scottish] immigration to the Vancouver area.

The questionnaire consisted of six items. For the first item, participants indicated their agreement with the statement “The Canadian government should allow [Nigerian/Scottish] immigrants to live in Vancouver.” This item was designed to assess participants’ desires to socially exclude members of foreign or familiar ethnic groups. Subsequent analyses focused especially on this item, since social exclusion is conceptually linked to avoidance of contagious diseases (Kurzban & Leary, 2001, Park, Faulkner, & Schaller, in press). Also, in previous studies chronic worries about disease predicted participants’ responses to this item (Faulkner et al., 2003).

Five additional items assessed specific attitudes toward Nigerian or Scottish immigrants and general attitudes toward Canadian immigration policy. Two items specific to potential immigrants were “[Nigerian/Scottish] immigrants may bring costly health problems to Vancouver,” and “Criminal activity may be higher among [Nigerian/Scottish] immigrants than among typical Canadians.” Three items about Canadian immigration policy were “Immigration can bring problems from other countries into Canada,” “Canada’s immigration policies are too strict,” and “Canada should have the right to refuse entry to people applying to immigrate, who have been affiliated with certain questionable groups in their country of origin.” Participants rated the extent that they agreed with all six items using a 7-point rating scale that ranged from “Strongly Disagree” to “Strongly Agree.”

Participants also rated the extent that they believed 13 traits were characteristic of Scottish or Nigerian immigrants. Five traits were relevant to concerns about personal hygiene (sanitary, filthy, hygienic, clean, and dirty). Participants also rated the extent that potential immigrants were likeable, hostile, trustworthy, open-minded, ignorant, poor, lazy, and unintelligent. Ratings were made on a 9-point scale, with higher values indicating a belief that a trait is characteristic of the potential immigrant group.

Results and Discussion

Across all attitude and trait-rating items, there was a general tendency for participants to rate Nigerian immigrants less favorably than Scottish immigrants. For example, participants believed Nigerians were more likely to bring costly health problems to Vancouver, and rated Nigerians less favorably on numerous traits; participants believed Nigerians are less sanitary, clean, and open-minded, and are poorer and dirtier than Scottish immigrants (all p 's < .05).

Individual differences in Perceived Vulnerability to Disease. Participants' scores on the Germ Aversion PVD subscale predicted responses on the first attitude item, but not the additional five items. Participants who scored higher on this subscale were significantly less likely to endorse Scottish immigration to Vancouver ($r = -.43$, $p = .03$), and were also somewhat less likely to endorse Nigerian immigration to Vancouver ($r = -.18$, $p = .35$). Therefore, participants' scores on the Germ Aversion PVD subscale are considered in subsequent analyses of the effect of disease salience on attitudes toward Scottish and Nigerian immigrants.

Attitudes toward ethnic groups. Responses to the six attitude items were not highly correlated; average $r = .11$. Consequently, analyses focused on each item separately. Table 2 displays mean responses to the six items for participants in each experimental condition. A series of 2 ("Disease" vs. "Accidents" slide show) X 2 (attitudes toward Scottish or Nigerian

immigrants) Analyses of Covariance (ANCOVA) were conducted on participant's responses to each attitude item. Participants' scores on the Germ Aversion PVD subscale were included as a covariate in the ANCOVA analyses. Results of these analyses are presented in Table 3.

The anticipated interaction between disease salience condition and rated ethnic group on participants' attitudes emerged on the first item, which assessed exclusionary reactions to the two ethnic groups. Participants in the disease salience condition endorsed potential Nigerian immigration to a lesser extent than Scottish immigration, whereas participants in the control condition endorsed Nigerian immigration slightly more than Scottish immigration (see Tables 2 and 3). Simple effects analyses revealed that differences in endorsement of Scottish and Nigerian immigration were marginally significant in the disease salience condition ($F(1, 53) = 3.69, p = .06$), but were not significant in the control condition ($F(1, 53) = 0.29, p = .59$). On all other attitude items, none of the interactions reached conventional levels of statistical significance.

Regression analyses were also conducted on the first attitude item to explore whether individual differences in perceived vulnerability to disease might interact with manipulated disease salience. One regression analysis included participants' scores on the germ aversion subscale as a predictor of endorsement of potential immigration, and another analysis included overall PVD scores as a predictor (both analyses are included in Table 4). These analyses confirmed that only the slide show manipulation and target ethnic group manipulation interacted with one another; in neither case did participants' overall PVD scores or scores on the germ aversion subscale interact with the slide show manipulation or target ethnic group manipulation.

Trait ratings of ethnic groups. Ratings of potential immigrant groups on the hygiene-relevant traits were highly correlated (average $r = .68$), whereas ratings of immigrant groups on the additional traits were not (average $r = .38$), and so ratings on the hygiene-relevant traits were

combined into an average score reflecting perceptions of uncleanness. Table 5 presents means for perceptions of uncleanness and the additional traits in each experimental condition. Although Nigerians were rated more negatively on some of the traits (including uncleanness), and for some traits all potential immigrants were rated more negatively after watching the disease slide show, none of the patterns of means reflected the anticipated two-way interaction between disease salience condition and rated ethnic group. Therefore, ANCOVA analyses of trait rating scores, which did not reveal any significant interactions, are not presented.

The results of Study 1 provided initial support for the hypothesis that temporarily heightened disease worries would lead to exclusionary reactions to foreign, but not familiar ethnic groups. In the disease salience condition, participants' responses on the first attitude item, which assessed their endorsement of immigration to Canada, were relatively less favorable toward Nigerian than Scottish immigrants. Participants in the disease salience condition sought to exclude Nigerian immigrants from Canada more so than they sought to exclude Scottish immigrants, whereas participants in the control condition were about equally favorable toward Nigerian and Scottish immigration to Canada.

In Study 1, only participants' attitudes toward Nigerian and Scottish people were examined, and so an additional study was required to explore whether disease salience influences people's attitudes toward other subjectively foreign and familiar groups. Also, concerns about self-presentation might have kept some participants in Study 1 from indicating negative responses to ethnic groups on the attitude and trait rating measures. Therefore, an additional measure of attitudes toward immigration was required that would potentially be more sensitive to participants' negative reactions to some ethnic groups.

Study 2: Attitudes Toward Taiwanese and Mongolian Immigrants

In Study 2, an attempt was made to generalize the findings of Study 1 to various other foreign and familiar ethnic groups. This was accomplished in two ways. First, the immigration attitudes questionnaire described potential immigration of people from Taiwan or Mongolia, instead of Scotland or Nigeria. Of the eight pre-rated ethnic groups, immigrants from Mongolia were rated as second most foreign, and immigrants from Taiwan were rated as second least foreign. Therefore, when made to feel more susceptible to contagious diseases, it was expected that participants' attitudes would be more favorable toward immigrants from Taiwan than they would be toward immigrants from Mongolia.

An additional questionnaire was also developed to simultaneously examine participants' desires for inclusion or exclusion from Canada of a number of subjectively foreign or familiar ethnic groups. This questionnaire described how Canada sought to "advertise" itself as a destination for potential immigrants, and participants were instructed to divide Canada's budget for this sort of advertising between eight areas of the world. These areas were the origins of the eight pre-rated foreign and familiar ethnic groups. Participants in the disease salience condition, but not participants in the control condition, were expected to allocate more of Canada's immigration advertising budget to the relatively familiar areas, and less to the relatively foreign areas. On responses to this questionnaire, participants were also expected to more willingly express their negative reactions to ethnic groups, since exclusionary reactions toward some ethnic groups could be attributed to desires for inclusion of other ethnic groups.

Participants

Participants were 45 undergraduate students at the University of British Columbia. Thirty-four participants were women and 11 were men; 23 were of East Asian

heritage (primarily Chinese), 15 were of European heritage, and 7 were of other ethnic backgrounds. One of the participants was born in Taiwan and lived there for 12 years. This participant had been randomly assigned to a condition that described immigration of an ethnic group different from her own ethnic background.

Procedure

The study was completed in small groups of one to five participants. Each session began with participants completing the same demographic questionnaire as in Study 1, followed by a number of individual difference measures, one of them being the Perceived Vulnerability to Disease scale.

Next, participants were randomly assigned to a disease salience condition or a control condition. Participants in the disease salience condition again viewed the “Disease” slide show and participants in the control condition again viewed the “Accidents” slide show. The procedures for viewing and rating slides were identical to those used in Study 1.

Following the slide show, participants were told that the initial study was over and they were again asked to complete a questionnaire (ostensibly for another researcher) that assessed their attitudes toward immigration. To minimize potential experimenter bias, the experimenter did not read instructions aloud to participants. Instead, the same instructions that were read aloud to participants in Study 1 were written on a cover page to the immigration attitudes questionnaire in Study 2. In each session, half of the participants completed a questionnaire with instructions that described potential immigration of people from Taiwan, and half of the participants completed a questionnaire that described potential immigration of people from Mongolia.

The immigration attitudes questionnaire contained the same six attitude items and 13 trait rating items as in Study 1 (except that these items assessed attitudes toward immigrants from

Taiwan or Mongolia), along with an additional questionnaire on a separate page at the end of the questionnaire booklet. At the beginning of this “immigration advertising questionnaire,” a short paragraph explained that the Canadian government was considering “advertising” Canada as a suitable destination for potential immigrants around the world. The paragraph also explained that Canada had a finite amount of resources for this kind of “advertising,” and so it needed people’s input on where Canada should advertise itself as an immigration destination. Participants were then instructed to divide the budget as they saw fit between eight areas around the world. These eight areas were the origins of all pre-rated foreign and familiar immigrant groups: Taiwan, Peru, Poland, Nigeria, Scotland, Mongolia, Brazil, and Iceland. Beside each listed area, participants wrote a percent value between 0 and 100 that indicated what proportion of the budget they thought should be spent in each area.

Results and Discussion

Unlike participants’ perceptions of Nigerian and Scottish immigrants in Study 1, participants in Study 2 did not rate Mongolian immigrants less favorably than Taiwanese immigrants. Across all attitude items and traits, only one difference emerged; participants rated Mongolian immigrants as poorer than immigrants from Taiwan ($t(43) = 2.69, p = .01$).

Individual differences in Perceived Vulnerability to Disease. Participants’ scores on the PVD scale did not predict responses to any of the attitude or trait rating items. (For example, r ’s between Germ Aversion PVD scores and responses to the first attitude item (assessing endorsement of immigrants to Vancouver) were .09 and -.11 (both p ’s $> .60$) for participants rating immigrants from Taiwan and Mongolia, respectively). Therefore, scores on the PVD scale were not considered in subsequent analyses of the effect of disease salience on attitudes toward immigrants from Taiwan and Mongolia.

Attitudes toward ethnic groups and trait ratings. Responses to the six attitude items again were not highly correlated (average $r = .11$), and so analyses focused separately on the six items. Table 6 displays mean responses on these items for participants in each experimental condition. The pattern of means for all items did not reflect the predicted interaction between the disease salience manipulation and the ethnic groups that participants rated.

Ratings of immigrant groups on the hygiene-relevant traits were highly correlated (average $r = .71$), whereas ratings of immigrant groups on all other traits were not (average $r = .32$), and so ratings on the hygiene-relevant traits were again combined into an average score reflecting perceptions of uncleanness. Table 7 presents means for perceptions of uncleanness and the additional traits in each experimental condition. As in Study 1, scores on these traits did not reflect an interaction between slide condition and rated ethnic group.

A series of 2 (“Disease” vs. “Accidents” slide show) X 2 (attitudes toward Taiwanese or Mongolian immigrants) Analyses of Variance (ANOVA) were conducted on responses to the attitude and trait rating items. None of the predicted two-way interactions were significant, and so results of these analyses are not presented.

Immigration advertising measure. Participants in the disease salience condition were expected to allocate a smaller proportion of the immigration advertising budget to foreign areas than they were to familiar areas. Therefore, for analyses, the percent of the budget that each participant gave to the four most foreign areas (Nigeria, Mongolia, Brazil, and Peru) was combined into a single percent amount, as was the percent of the budget each participant gave to the four least foreign areas (Scotland, Taiwan, Poland, and Iceland). This allowed for a within-subjects comparison of budget amounts given to relatively foreign and relatively familiar areas.

A 2 (“Disease” vs. “Accidents” slide show) X 2 (potential Taiwanese vs. Mongolian immigration condition) X 2 (budget allocation to foreign vs. familiar areas, within subjects) Analysis of Variance (ANOVA) was conducted to examine allocation amounts between experimental conditions. The analysis revealed one significant effect; a two-way interaction emerged between slide condition and budget allocation to foreign vs. familiar areas ($F(1, 41) = 4.58, p = .038$). Participants watching the Disease slide show allocated more of Canada’s immigration advertising budget to familiar than foreign areas (62.43 vs. 37.57, respectively), whereas participants watching the Accidents slide show allocated about the same amount of the budget to the familiar and foreign areas (52.52 vs. 47.48, respectively). Allocation amounts to all areas in each slide condition are presented in Table 8.

To explore whether individual differences in PVD interacted with the disease salience manipulation, regression analyses were also conducted on responses to the first item of the attitude questionnaire and on participants’ budget allocation amounts to the four relatively foreign areas. The results of these analyses are presented in Table 9. As in Study 1, an interaction between individual differences in PVD and the disease salience manipulation did not emerge for participants’ endorsement of potential immigration to Canada, nor did it emerge for the amount of funds participants intended to spend in foreign areas to attract new immigrants to Canada.

The results of Study 2 provide some evidence that feelings of susceptibility to disease lead to exclusionary reactions to various foreign ethnic groups, in addition to people from Nigeria (as demonstrated in Study 1). This evidence came from participants’ responses on the “immigration advertising questionnaire,” but not the attitude or trait rating items that assessed participants’ reactions to potential Taiwanese or Mongolian immigration. Participants in the disease salience condition indicated that relatively less of Canada’s immigration advertising

budget should be spent in various subjectively foreign areas, including Nigeria, Mongolia, and Peru, reflecting their desires to exclude foreign ethnic groups from immigrating to Canada in the future.

Concerns about self-presentation might lie beneath the failure to demonstrate an effect of disease salience on endorsement of potential Mongolian or Taiwanese immigration. On the immigration attitudes measure, participants might have attributed smaller budget allocation amounts to some areas as a necessary outcome of giving larger amounts to other areas. Consequently, participants probably were less concerned that responses on this measure might indicate ethnic discrimination. This concern may have been greater for responses to attitude items assessing endorsement of Mongolian or Taiwanese immigration, since each participant assessed only one ethnic group, and was probably more aware that lack of endorsement could be interpreted as ethnic discrimination.

General Discussion

Across two studies, some evidence indicated that temporarily aroused worries about disease underlie negative reactions to ethnic foreigners. In Study 1, participants in a disease salience condition endorsed Nigerian immigration to a lesser extent than Scottish immigration. In Study 2, participants in a disease salience condition did not endorse potential immigration of a group from Mongolia (another relatively foreign group) less than a group from Taiwan (another relatively familiar group). However, in Study 2, participants in this condition did express a desire to spend relatively fewer government funds recruiting immigrants from various foreign areas around the world. Across both studies, the effects of temporary disease salience did not interact with participants' chronic worries about disease, as measured by the PVD scale. These results are consistent with an evolved disease-avoidance process that motivates avoidance of ethnic foreigners based on concerns about contagious diseases, especially under conditions connoting an increased risk of disease transmission. However, the findings were limited to certain dependent measures used in the two studies, and are also consistent with some alternative explanations of ethnic outgroup derogation. Therefore, prior to a discussion of directions for future research, the limited effect of the disease salience manipulation on attitudes toward ethnic foreigners, as well as alternative explanations for this effect, is discussed.

Inconsistencies across Measures

Participants in disease salience conditions in both studies expressed a desire to exclude a very subjectively foreign ethnic group (Nigerians) from Canada both in their responses on the attitude questionnaire (Study 1) and on the advertising budget measure (Study 2). However, a desire to exclude groups that were perceived as slightly less foreign (e.g., Mongolians) emerged only for participants' responses on the advertising budget measure included in Study 2. Two

possible explanations for this discrepancy are that participants may have been relatively less concerned about the disease risk posed by only moderately foreign groups, and they may have also felt more concerned about appearing ethnically prejudiced (see Plant & Devine, 1998) when responding to the attitude and trait items, compared to the immigration advertising questionnaire.

Of the three dependent measures used in both studies, participants were probably least concerned about appearing ethnically prejudiced or opposed to immigration to Canada in responding to the immigration advertising measure. Participants who gave greater amounts of the budget to familiar areas may have thought they appeared in favor of immigration, since they were especially positive toward the immigration of certain familiar groups. Allocation of lesser budget amounts to other foreign groups could then be considered an irrelevant byproduct of these apparently pro-immigration responses. This reasoning about exclusionary reactions to ethnic foreigners was unavailable to participants when responding to the attitude and trait rating items, since they were assessing only one ethnic group at a time. Here participants may have been more concerned about appearing prejudiced or against immigration, and may have only indicated a desire to exclude groups perceived as most foreign (e.g., Nigerians), and only on items most relevant to disease avoidance (e.g., endorsement of potential immigration to Canada). For groups perceived as somewhat less foreign (e.g., Mongolians), or on items less relevant to disease avoidance (e.g., trait items), a desire to appear unprejudiced and in favor of immigration may have overridden a desire to express negative reactions to foreign ethnic groups.

If concerns about appearing ethnically unprejudiced are indeed responsible for these inconsistent effects, then in future studies it will be important to use new dependent measures in which participants cannot control their responses, or use dependent measures which participants are unaware of. For example, the effect of disease salience on attitudes could be examined using

the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998; see also Devine et al., 2002). This response-time measure of implicit attitudes might uncover negative disease-relevant beliefs about ethnic foreigners that are less controllable than explicitly expressed attitudes. Future studies might also employ measures of physical distancing from ethnic foreigners, since people are potentially unaware of this disease-relevant response, and consequently might be unconcerned with controlling it.

Alternative Explanations of the Disease Salience Effect

Two alternative explanations might account for the effect of the disease salience manipulation on attitudes toward foreign, but not familiar ethnic groups. One focuses on the disease salience manipulation as a manipulation of mortality salience rather than feelings of susceptibility to contagious diseases, and another focuses on participants' perceptions of the ethnic groups as relatively more or less poor, as opposed to more or less foreign than one another.

Perceived poverty of ethnic groups. One alternative explanation for the effect of the disease salience manipulation is that participants in the disease salience condition were concerned about the relative poverty of members of ethnic groups that were pre-rated as relatively foreign. Participants who were temporarily made to feel worried about disease may have attempted to exclude members of poorer groups based on the rationale that people living in poverty are unable to afford proper health care, and as a result are more likely to carry harmful untreated diseases. This would suggest that exclusion of foreigners is based on a rational assessment of disease rates among people living in poverty, instead of an irrational, automatic disease avoidance response.

Evidence that the disease salience effect might follow from perceptions of poverty instead of foreign-ness comes from participants' trait ratings of potential immigrants in both studies; the relatively foreign ethnic groups, Nigerians and Mongolians, were perceived as significantly poorer than the relatively familiar groups from Scotland and Taiwan. Also, the actual proportion of citizens below the poverty line in any of the four relatively foreign areas is greater than that in any of the four relatively familiar areas (World Factbook On-line, 2002).

In future research, the potential confounding of foreign-ness and perceived and actual poverty could be avoided by utilizing ethnic groups that differ in relative foreign-ness, but not in relative poverty. Another solution is to assess participants' attitudes toward citizens of Canada who are described as having similar incomes, but either subjectively foreign or familiar ethnic backgrounds.

Mortality salience. An additional explanation of the disease salience effect is that, rather than intensifying participants' worries about contagious diseases, the disease salience manipulation instead intensified participants' worries about their own death. If worries about death (rather than worries about contagious diseases) were aroused in the disease salience condition, then the results would provide support for a Terror Management explanation of ethnic outgroup derogation. From this perspective, ethnic outgroup derogation bolsters one's own cultural values, which protect against death anxiety (see Pyszczynski, Greenberg, & Solomon, 1997, for a review). In studies examining this hypothesis, participants who thought about their own mortality were more likely to derogate ethnic outgroups (Greenberg et al., 1990). This might also account for the findings in the first two studies; participants who viewed the "Disease" slide show and expressed a desire to avoid ethnic foreigners might have experienced more death anxiety than participants who viewed the "Accidents" slide show.

To eliminate this alternative explanation in future studies, it is important to determine beforehand that disease salience and control conditions arouse equivalent amounts of death anxiety.

Directions for Future Research

Two directions for future research seem especially interesting to explore. One direction is to identify what other categories of people in addition to subjectively foreign ethnic groups might arouse an evolved disease avoidance mechanism that motivates exclusionary reactions. One category of people who are potential targets of evolved disease avoidance is known carriers of disease. Disease-based stigmatization is predicted by the severity and contagiousness of an illness, and also by the perception that an illness is under one's personal control (Crandall & Moriarty, 1995). Stigmatization based on severity and contagiousness is functionally relevant to threats of interpersonal disease transmission, whereas stigmatization based on personal responsibility for an illness might instead be relevant to threats to the belief in a just world (Lerner, 1980). Therefore, disease salience manipulations like those used in the present studies are likely to contribute to stigmatization of people suffering from severe and contagious illnesses, regardless of the extent of their personal responsibility for the illness.

Less obviously, people with physical disabilities are also potential targets of evolved disease avoidance. In ancestral environments, morphological and behavioral abnormalities such as facial disfigurements, missing limbs, or behavioral tics may have reliably indicated that a person is, or once was suffering from a contagious disease. In contemporary environments, people who appear morphologically unusual from disease-unrelated events such as accidents, and are confined to a wheelchair or are missing a limb might also arouse disease-avoidant thoughts and behaviors (Park et al., in press). Consistent with this hypothesis, people who are

more chronically worried about contagious disease transmission (as measured by the PVD scale) are less likely to have a friend with a physical disability (Park et al., in press). As with disease-avoidant reactions to foreign ethnic groups, disease-avoidant reactions to physically disabled people are probably also flexible. Therefore, conditions that make people temporarily more worried about contagious diseases may amplify social exclusionary thoughts and behaviors toward physically disabled people.

Another direction for future research is to investigate what other disease-avoidant reactions to foreign ethnic groups follow from temporary worries about contagious diseases. The present studies examined disease-avoidant attitudes toward foreign ethnic groups, but it's also likely that an evolved disease avoidance mechanism triggers relevant emotions (e.g., disgust), and behaviors (e.g., actual physical avoidance) as well. People often display disgust reactions when talking about foreign ethnic groups (Schiefenhövel, 1997); these emotional reactions may be strongest when people either feel chronically or temporarily worried about contagious diseases. Worries about contagious diseases might also influence physical behavior in the presence of people who appear visually foreign. When interacting with visually foreign people, we might unknowingly maintain a greater interpersonal distance. Even situations that don't involve actual interactions, like walking by someone on the sidewalk, might automatically elicit physical distancing from ethnic foreigners.

This analysis implies that recent disease scares that have received media attention might intensify people's negative reactions to various categories of people. For example, the SARS epidemic in Asia and some parts of North America might intensify exclusionary reactions to known carriers of disease, ethnic foreigners, and physically disabled people. Even the mad cow

disease scares in the United Kingdom and Canada (which implicate food, instead of other people as the source of disease transmission) might intensify exclusionary reactions.

Evolutionary vs. Cultural Origins of Disease-Based Ethnic Prejudice

One additional issue worth mentioning concerns whether an evolutionary or a historical or cultural process underlies the association of foreign immigrant populations with contagious disease concerns. For various reasons, including the unavailability of adequate health care in some parts of the world, in recent history, the incidence of contagious diseases among some foreign populations may be especially high. An abundance of historical evidence also documents the especially unsanitary conditions that immigrants endure in travel (Markel & Stern, 2002). In addition, a process of cultural evolution over the past several millennia may have contributed to beliefs about foreigners that are functionally related to disease-avoidance concerns. As a result of contact with foreign populations and a co-occurrence of disease outbreaks, within local cultures beliefs may have arisen that associate foreigners with disease and promote behavioral avoidance or social exclusion. These beliefs may be passed on inter-generationally, thus becoming a permanent part of cultural knowledge.

These alternative theoretical perspectives suggest that a desire to avoid or exclude foreign peoples based on a rational assessment of disease risks may account for findings in the present studies. However, these perspectives also imply that exclusionary attitudes might be based more clearly on attributions of disease-relevant traits to foreign peoples. Across both studies, participants in disease salience conditions and participants in control conditions were about equally likely to attribute disease-relevant traits to foreign ethnic groups. Thus, a rational process of associating foreigners with disease concerns may occasionally be engaged when there are

salient reasons for it (e.g., the recent outbreak of SARS). However, the present findings suggest that there are additional non-rational processes that contribute to similar anti-foreigner attitudes.

It is worth noting, of course, that processes of cultural evolution are entirely compatible, and often inter-related with processes of biological evolution (Boyd & Richerson, 1985). For instance, the ancient Greek belief that foreigners possess an “evil eye”, which by itself was thought to cause illness (Nutton, 2000), may have emerged and persisted because it motivates avoidance or exclusionary behaviors in the presence of foreigners. In general, beliefs that are especially likely to emerge and persist within cultures are those that help individuals solve fundamental adaptive problems (Krebs & Janicki, 2003).

Concluding Remarks

The hypotheses tested, and to some extent supported in both studies of this investigation were derived from an evolutionary model of contemporary cognition and behavior. Empirical support for these sorts of hypotheses cannot by itself verify underlying evolutionary models, but it does demonstrate the value of evolutionary psychological reasoning about contemporary psychological phenomena (Conway & Schaller, 2002). Evolutionary psychological reasoning leads to the discovery of novel hypotheses about the role of previously unexplored factors, like temporary contagious disease concerns, in seemingly unrelated phenomena, like anti-foreigner attitudes. This kind of reasoning also has implications for eliminating contemporary problems like ethnic conflict. At least two suggestions emerge from the findings of the present studies: First, if people are made aware of the automatic process whereby anti-foreigner attitudes are aroused as a result of irrational disease concerns, then they can make a conscious effort to inhibit expressing these attitudes when they are in disease arousing contexts. Second, if a disease avoidance response intensifies anti-foreigner attitudes when people are made aware of their

susceptibility to contagious diseases, it should also inhibit anti-foreigner attitudes when people are made aware of their ability to fend off contagious diseases. This means that reassurances about our safety from contagious diseases could lead to a decline in the derogation of foreign ethnic groups.

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Table 1

Foreign-ness Ratings of Eight Ethnic Groups

Foreign-ness item	Ethnic group							
	Nigeria	Mongolia	Brazil	Peru	Iceland	Poland	Taiwan	Scotland
1. "Visually different"	5.73	5.27	5.15	5.15	4.31	4.19	4.77	3.15
2. "Culturally different"	6.65	6.50	6.23	6.38	5.96	5.62	6.15	5.19
3. Hygiene and cleanliness	4.42	4.27	3.77	3.69	2.88	2.73	3.15	2.65
4. Food preparation	6.38	5.69	5.81	6.00	4.85	4.88	3.62	4.19
5. Diet	6.27	5.69	5.96	5.69	5.08	5.08	3.96	4.81
Overall foreign-ness	5.89	5.48	5.38	5.38	4.62	4.50	4.33	4.00

Table 2

Mean Attitude Scores for Slide Conditions and Rated Ethnic Groups (Study 1)

Attitude item	Slide condition			
	Accidents		Disease	
	Scotland	Nigeria	Scotland	Nigeria
1. The Canadian government should allow [Nigerian/Scottish] immigrants to live in Vancouver	5.85	6.07	6.36	5.53
2. [Nigerian/Scottish] immigrants may bring costly health problems to Vancouver	2.92	3.87	2.93	4.00
3. Criminal activity may be higher among [Nigerian/Scottish] immigrants than among typical Canadians	2.69	3.07	2.29	3.60
4. Immigration can bring problems from other countries into Canada	4.46	4.07	3.79	3.87
5. Canada's immigration policies are too strict	3.77	3.67	2.86	3.13
6. Canada should have the right to refuse entry to people applying to immigrate, who have been affiliated with certain questionable groups in their country of origin	5.77	4.67	5.57	5.67

Table 3

Analysis of Covariance Results for Attitude Items (Study 1)

Attitude item	Source	df	F	p
1. The Canadian government should allow [Nigerian/Scottish] immigrants to live in Vancouver	PVD-GA	1	8.99	< .01
	Ethnic group	1	1.93	.17
	Slide show	1	1.23	.27
	Group x slides	1	6.00	.02
	Error	52	(1.01)	
2. [Nigerian/Scottish] immigrants may bring costly health problems to Vancouver	PVD-GA	1	0.56	.46
	Ethnic group	1	7.34	< .01
	Slide show	1	0.19	.66
	Group x slides	1	0.09	.77
	Error	52	(2.05)	
3. Criminal activity may be higher among [Nigerian/Scottish] immigrants Than among typical Canadians	PVD-GA	1	1.71	.20
	Ethnic group	1	5.24	.03
	Slide show	1	0.39	.54
	Group x slides	1	2.03	.16
	Error	52	(2.13)	
4. Immigration can bring costly health problems from other countries into Canada	PVD-GA	1	0.27	.61
	Ethnic group	1	0.11	.75
	Slide show	1	0.62	.44
	Group x slides	1	0.42	.52
	Error	52	(2.53)	
5. Canada's immigration policies are too strict	PVD-GA	1	0.35	.56
	Ethnic group	1	0.08	.77
	Slide show	1	2.69	.11
	Group x slides	1	0.38	.54
	Error	52	(1.89)	
6. Canada should have the right to refuse entry to people applying to immigrate, who have been affiliated with certain questionable groups in their country of origin	PVD-GA	1	0.01	.98
	Ethnic group	1	1.85	.18
	Slide show	1	1.05	.31
	Group x Slides	1	2.57	.12
	Error	52	(1.93)	

note. Values in parentheses represent mean square errors.

Table 4

Regression Analysis Results for Endorsement of Potential Immigration (Study 1)

Predictor	B	β	<i>t</i>	<i>p</i>
Germ-Aversion PVD subscale as individual difference predictor				
PVD-GA main effect	-.44	-.40	-2.33	.02
Ethnic group main effect	-.19	-.18	-1.19	.24
Slide show main effect	-.18	-.17	-1.09	.28
PVD-GA x Ethnic group interaction	-.15	-.14	-.80	.43
PVD-GA x Slide show interaction	-.16	-.13	-.82	.42
Ethnic group x Slide show interaction	-.40	-.37	-2.44	.02
PVD-GA x Ethnic group x Slide show interaction	.04	.04	.24	.81
Overall PVD as individual difference predictor				
PVD main effect	-.36	-.33	-2.32	.03
Ethnic group main effect	-.15	-.14	-1.00	.32
Slide show main effect	-.14	-.13	-.91	.37
PVD x Ethnic group interaction	-.11	-.10	-.70	.49
PVD x Slide show interaction	-.24	-.21	-1.56	.13
Ethnic group x Slide show interaction	-.39	-.36	-2.58	.01
PVD x Ethnic group x Slide show interaction	.21	.18	1.4	.18

Table 5

Trait Rating Scores for Slide Conditions and Rated Ethnic Groups (Study 1)

Trait	Slide condition			
	Accidents		Disease	
	Scotland	Nigeria	Scotland	Nigeria
Perceptions of uncleanness (composite score)	3.55	4.26	3.49	4.49
Likeable	7.23	6.64	7.21	6.21
Hostile	4.15	3.86	4.43	4.14
Trustworthy	6.15	5.79	6.57	5.64
Open-minded	6.54	5.14	6.43	5.00
Ignorant	3.69	3.71	3.57	4.36
Poor	3.23	5.36	3.79	5.86
Lazy	2.92	3.43	3.07	3.50
Unintelligent	2.15	3.14	3.21	3.57

Table 6

Mean Attitude Scores for Slide Conditions and Rated Ethnic Groups (Study 2)

Attitude item	Slide condition			
	Accidents		Disease	
	Taiwan	Mongolia	Taiwan	Mongolia
1. The Canadian government should allow [Mongolian/Taiwanese] immigrants to live in Vancouver	5.45	5.58	5.18	5.82
2. [Mongolian/Taiwanese] immigrants may bring costly health problems to Vancouver	3.82	3.67	4.27	3.64
3. Criminal activity may be higher among [Mongolian/Taiwanese] immigrants than among typical Canadians	3.36	3.17	3.45	3.00
4. Immigration can bring problems from other countries into Canada	4.91	4.25	4.81	4.64
5. Canada's immigration policies are too strict	3.36	3.08	3.45	3.18
6. Canada should have the right to refuse entry to people applying to immigrate, who have been affiliated with certain questionable groups in their country of origin	4.82	5.50	5.36	5.73

Table 7

Trait Rating Scores for Slide Conditions and Rated Ethnic Groups (Study 2)

Trait	Slide condition			
	Accidents		Disease	
	Taiwan	Mongolia	Taiwan	Mongolia
Perceptions of uncleanness (composite score)	3.64	4.22	4.00	4.18
Likeable	6.55	5.75	6.55	6.45
Hostile	3.73	3.50	3.55	3.73
Trustworthy	5.45	5.75	6.18	6.45
Open-minded	5.18	5.08	5.36	5.54
Ignorant	3.54	3.83	3.82	4.91
Poor	3.73	5.42	4.27	5.36
Lazy	3.27	3.17	3.36	3.09
Unintelligent	3.00	2.83	3.09	3.18

Table 8

Advertising Budget Allocations to Foreign and Familiar Areas in each Slide Condition (Study 2)

	Slide condition	
	Accidents	Disease
Foreign Areas		
Nigeria	11.08	7.61
Mongolia	10.33	7.74
Brazil	13.67	13.36
Peru	12.35	8.85
Total (Foreign)	47.48	37.57
Familiar Areas		
Scotland	15.81	15.31
Taiwan	13.82	19.08
Poland	12.77	17.71
Iceland	10.00	10.32
Total (Familiar)	52.52	62.43

Table 9

Regression Analysis Results for Main Dependent Measures included in Study 2

Predictor	B	β	<i>t</i>	<i>p</i>
Endorsement of potential immigration				
PVD main effect	-.22	-.16	-.86	.40
Ethnic group main effect	.17	.13	.80	.43
Slide show main effect	-.005	-.004	-.02	.98
PVD x Ethnic group interaction	-.11	-.08	-.42	.68
PVD x Slide show interaction	.04	.03	.17	.87
Ethnic group x Slide show interaction	.16	.12	.74	.47
PVD x Ethnic group x Slide show interaction	-.16	-.12	-.64	.52
Budget amounts to pre-rated foreign areas				
PVD main effect	-2.54	-.16	-.92	.36
Ethnic group main effect	3.39	.22	1.43	.16
Slide show main effect	-5.15	-.33	-2.17	.04
PVD x Ethnic group interaction	.52	.03	.19	.85
PVD x Slide show interaction	-2.19	-.14	-.80	.43
Ethnic group x Slide show interaction	-2.23	-.14	-.94	.35
PVD x Ethnic group x Slide show interaction	-3.56	-.22	-1.30	.20