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(De)contaminating product preferences: A multi-method investigation into pathogen threat's influence on used product preferences

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ABSTRACT

How does being motivated to avoid infectious disease affect the kinds of products people value and buy? Using population-level and experimental data, six studies converge to indicate that infectious disease cues can negatively impact evaluation of secondhand, but not new, products. Studies 1–2 demonstrate that used merchandise retailer revenues are lower in states with elevated pathogen prevalence. Studies 3a–3b echo this relation on an individual level, showing that experimental manipulation of infectious disease threat weakens interest in used products. Such effects are eliminated when sellers are known to buyers and when buyers engage in a behavior (hand-washing) associated with infection prevention (Studies 4–5). Internal meta-analyses reveal that disease threat consistently decreased used goods preferences and elevated valuation of new products across our experimental studies. This research advances our understanding of how disease avoidance motivation changes reactions to everyday objects, thereby highlighting how infectious disease psychology influences important domains of individual and societal life.

In modern life, everyday contexts are rife with information about infectious disease threats. Advertisements for cleaning products promote the idea that germs are ubiquitous; health organizations issue cautions about flu season; public spaces are often crowded with sneezing people. The present research employs real-world retail data and laboratory-based experiments to chart how everyday cues to illness can affect evaluations of common objects—namely, secondhand versus newer merchandise. In so doing, we hope to extend our current understanding of goal-driven processes by examining the critical and motivationally-relevant aspects of infectious disease psychology when applied to everyday objects, and the particular representational features linked to such threats. We use theoretically-driven interventions to target and interrupt disease threat responses, strengthening the case for specific process-level components of this psychology. More broadly, we aim to elucidate how these motivational factors influence diverse outcomes—thereby demonstrating not only how evolutionarily-rooted motivations affect judgments in the current day, but also the implications of their operation for individuals as well as larger communities.

1. Ecological management of disease threats

Throughout the course of human evolution, pathogens, parasites, and other disease-causing organisms presented continual threats to survival (Ackerman, Huang, & Bargh, 2012; Gangestad & Buss, 1993; Griskevicius & Kenrick, 2013). The consequences of exposure to pathogenic and parasitic threats were grave, ranging from temporary incapacity, disfigurement, and social ostracism, to death. Even today, people in both developing and industrialized countries face threats from contagious disease, with infections accounting for up to 15% of all deaths (Cagliani & Sironi, 2013; Dye, 2014).

Given these high survival costs, humans may have evolved a "behavioral immune system" comprised of psychological and behavioral processes that lessen the risks of exposure to biological contagion threats (Schaller & Park, 2011). As a preemptive line of defense against the threat of infectious disease (even in current-day contexts), the behavioral immune system renders people highly sensitive to and avoidant of individuals who display certain interpersonal behaviors and morphological cues that are associated (however imperfectly) with pathogenic or other disease-related threats (Ackerman et al., 2009; Houston & Bull, 1994). For example, upon exposure to disease-related cues, people increasingly attend to and avoid individuals bearing features heuristically associated with infection (e.g., birthmarks; amputated limbs) even when those features objectively pose no risk of transmission (Park, Faulkner, & Schaller, 2003).

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1.1. Objects as disease-carriers

While many diseases spread directly from person to person, objects can also transmit disease-causing organisms. For instance, in a nationwide examination of grocery stores, potentially dangerous bacteria were found on 51–72% of shopping carts (Gerba & Maxwell, 2012). If objects can act as potential disease carriers, however, which types of durable goods present the greatest perceived risks? Certainly, aspects of objects that trigger sensations associated with contamination (e.g., consistency, moisture, scent) should affect impressions (Krishna & Schwarz, 2014; Oum, Lieberman, & Aylward, 2011). In the current investigation, we consider a similarly important feature associated with risk of illness—the perceived *usage history* of objects, rather than qualities inherent to the objects themselves. That is, individuals concerned about germs may be more likely to react negatively to, and devalue, objects that have been handled by other people (who are potential germ carriers themselves). For evaluators concerned with infectious disease threat, perceiving that an object has been in prior contact with someone else should, at some level of processing, highlight an increased risk of interacting with that object.

A useful context for exploring this possibility involves people's evaluations about used (secondhand) products. Secondhand products are marked by usage history and thus represent a potential source of contamination. This contamination may involve actual germ transfer, but because people cannot directly observe infectious diseases themselves, they must infer transfer from imperfect indicators such as prior contact. Indeed, people do seem especially sensitive to behaviors indicating the potential for germ transfer, even extending this to perceptions of transfer of other, less concrete entities. For example, research on magical contagion suggests that people behave as though both positive and negative psychological attributes of a previous handler can be transmitted to an object through physical contact (Rozin, Millman, & Nemeroff, 1986). The longer a pair of sunglasses was worn by a positive celebrity, the more it is valued (Newman, Diesendruck, & Bloom, 2011); similarly, merchandise handled by attractive people are evaluated relatively more positively (Argo, Dahl, & Morales, 2008), supporting the notion that people attend to the fact of prior contact when interacting with products.

While this research indicates that people infer changes in the abstract nature of objects touched by others, here we explicitly link object evaluations to the motivational processes which comprise the behavioral immune system. Our framework suggests that people may be particularly likely to devalue products when both of the following elements are present: (1) products have been in relatively higher contact (particularly through usage) with others, and (2) evaluators face some indicator of active infectious disease threat (e.g., situational cues, chronic concerns, ecological infectious disease prevalence). Products like secondhand goods have been handled and used by others, are thus particularly likely to be affected by disease-related cues. As described earlier, it is important to note that as with many evolved psychological mechanisms (Sperber & Hirshfeld, 2004), behavioral immune responses are often applied in an overgeneralized manner to stimuli and cues that share features associated with infection risk, even if the true risk is negligible. Thus, we expected relatively negative responses towards secondhand products to occur whether or not those products represent legitimate threats to survival.

In contrast, we predict that valuation of new products should not be affected in the same manner as their used counterparts. New products are not marked by the proximate cue (prior contact or usage) associated with potential germ transfer, and instead are "pure" in the sense that no previous owner has physically interacted with them. Therefore, people may not associate such products with danger. If anything, the untouched nature of new products may act as a signal of safety, promoting *increased* product appeal. That is, in an evaluative context featuring the risk of infectious disease threat, the purity of new, 'untouched' objects may be especially welcome. Thus, we have reason to expect that people will react differently to new products than to used versions—especially when disease-related concerns are particularly salient.

2. The present research

An important goal of social psychological research is to better understand how individuals are affected by society and vice versa (e.g., Markus & Kitayama, 2010). While much of social psychological research has traditionally focused on outcomes at the individual level (Huang & Bargh, 2014), a growing number of studies have demonstrated how disease salience impacts aspects of broader cultural systems, including nation-level variation in collectivism and ethnocentrism (e.g., Fincher, Thornhill, Murray, & Schaller, 2008; Fincher & Thornhill, 2012). Such findings rest on the idea that historical exposure to ecologically prevalent infectious diseases would have created a selection pressure for anti-pathogen and anti-parasite defenses, many of which could be psychological (Fincher et al., 2008). Consequently, we present six studies which employ a multi-method approach to examine whether infectious disease 1) is associated with decreased used merchandise sales at the community level, and 2) elicits relatively negative bias in judgments about secondhand products at the individual level.

Specifically, Studies 1–2 marshal U.S. state data to demonstrate that used merchandise retailers (but not retailers of new products) report lower revenues in communities with high disease prevalence rates. Studies 3a–b present individual-level data to argue that disease concerns have a causal, negative influence on secondhand product evaluation by accentuating relative differences between newer and used products. Meanwhile, Studies 4 and 5 use intervention paradigms to test theoretically-grounded moderators and thereby illuminate potential solutions to evaluator devaluation. Together, these studies converge on the notion that a fundamental motivation to avoid disease can infect a wide variety of current-day judgments with real-world consequences for both individuals and communities.

3. Population-level retail patterns in states with high versus low infectious disease prevalence

3.1. Study 1

Studies 1 and 2 examine U.S. state indices of consumer purchasing to demonstrate how the threat of illness affects decision making assessed at the community level. Such data provide an ecologically valid means of determining the presence and scope of the phenomenon in question—that is, is there a real and substantive effect to investigate?—prior to more precise experimental analysis. Previous research has linked regional variation in disease prevalence to certain interpersonal preferences; for example, people who live in high pathogen environments tend to be less extraverted (Schaller & Murray, 2008) and prefer more attractive leaders (White, Kenrick, & Neuberg, 2013) than people who face milder infection risks. We drew on such work to examine whether disease prevalence rates predicted regional variability in consumer purchasing patterns for used goods.

As previously mentioned, new retail merchandise is theoretically unmarked by a prior handling by other users, and thus should not be affected by disease rates in the same manner as used products. Consequently, we expected new product consumer purchasing patterns to provide a boundary condition for our predicted effect in Study 1.

3.1.1. Method

We adopted Fincher and Thornhill's (2012) state-level disease incidence metric as our measure of disease prevalence. This Parasite Stress USA index is based on the reported number of cases of all infectious diseases tracked by the CDC from 1993 to 2007, and thus arguably provides a direct measure regarding regional variability in the presence of infectious diseases.

For our dependent measure, we turned to the U.S. Government's Nonemployer Statistics Data Series, which contains annual data on small businesses since 2004 (http://www.census.gov/econ/census/). The nonemployer establishments tracked within this dataset are typically run by self-employed individuals with no paid employees (colloquially known as 'mom-and-pop' stores). We retrieved 2004–2007 revenue data (the years which overlapped with our predictor variable) for businesses primarily engaged in the retail of used merchandise (reported in $1 k units). We also collected revenue data for another retail industry (general merchandise retailers) which shares key similarities with used merchandise retailers, and thus could potentially serve as a quasi-control group in our analyses.[1]

A number of control variables were included. Given that a region's relative size may correlate with that region's disease prevalence, we obtained data on state population from the U.S. Census from 1993 to 2007 (http://www.census.gov/econ/census/). One might also argue that the shakiness of a state's economic climate may increase the likelihood that people will frequent budget-friendly retailers (including used goods stores). Consequently, multiple measures of economic health were incorporated into our dataset, including median income, wealth inequality (Gini Index) and unemployment rates from 1993 to 2007 (http://www.bls.gov/home.htm). As community education levels have been associated with both positive health outcomes and economic growth (e.g., Hout, 2012), we included the education index from the Measure of America to serve as a proxy for this variable within our dataset (http://www.measureofamerica.org/).

Finally, research also suggests that people who are politically conservative may be more predisposed to feel disgust compared to their liberal counterparts (Inbar, Pizarro, & Bloom, 2009). One might argue, then, that politically conservative states are more likely to be home to higher proportions of disgust-sensitive individuals, which may then account for any observed regional variation in decreased spending for used goods. Consequently, we included political affiliation (historic Electoral College votes; http://www.archives.gov) in our dataset as well.[2] We calculated the square root of select variables (used and general merchandise revenues, state population) to reduce skewness, and mean-centered all predictors (see S.I. for additional analyses).

3.1.2. Results and discussion

We first examined whether the parasite stress index predicted revenues from used merchandise nonemployer retailers, controlling for population, income, unemployment, inequality, education, and political affiliation (Table 1). Regression analyses revealed that, consistent with our predictions, disease prevalence was significantly and negatively associated with used merchandise store success ($\beta = -0.131$, $p = 0.030$). Unsurprisingly, the model also indicated that states with greater populations tended to also report higher revenues for used merchandise ($\beta = 0.947$, $p < 0.001$). Regressing parasite stress on used merchandise sales without control variables revealed the same pattern of association (see S.I. for details).

One might argue, however, that disease prevalence is associated with lower retail activity in general. To test this alternate hypothesis, we re-ran the same regression (including control variables) on revenue data for nonemployer retailers of general merchandise. As expected, analyses revealed no relationship between disease-threat and general merchandise store revenues ($\beta = -0.054$, $p = 0.372$). However, a positive effect of population size mimicked that found for used merchandise revenues ($\beta = 0.907$, $p < 0.001$). These findings support the notion that higher disease prevalence rates predict lower used merchandise retailer revenues (but not for new products in general)—even controlling for potential third variables, and across a significant time period.

Table 1
Results of multiple regression analysis simultaneously examining the effects of population, median income, unemployment, inequality, education, political affiliation (0 = democratic, 1 = republican), and parasite stress on revenues from nonemployer establishments classified within used merchandise and general merchandise industries from 1993 to 2007 (Study 1).

Predictor	Used merchandise revenues			General merchandise revenues		
	β	*t*	*p*	β	*t*	*p*
Population (transformed)	0.947	16.754	0.000	0.907	15.679	0.000
Income	−0.051	−0.636	0.528	0.105	1.270	0.211
Unemployment	−0.025	−0.461	0.647	0.042	0.747	0.459
Inequality	−0.086	−1.135	0.263	−0.089	−1.149	0.257
Education	−0.063	−0.734	0.467	0.128	1.461	0.151
Political affiliation	0.038	0.686	0.497	−0.011	−0.193	0.848
Parasite stress USA	−0.131	−2.253	0.030	−0.054	−0.901	0.372

3.2. Study 2

In Study 2, we sought to replicate our real-world approach by examining another retail dataset and another index of infectious disease prevalence. Following White et al. (2013) and DeBruine, Jones, Crawford, Welling, and Little (2010), we operationalized regional disease prevalence through measures of infant mortality rates and longevity. Public health research suggests that infant mortality offers a useful proxy measure with which to track population health due to its sensitivity to disease epidemics (Reidpath & Allotey, 2003); similarly, DeBruine and colleagues operationalized countries' general disease-related fitness according to their scores on national health indices, with low mortality rates and high longevity indicating improved relative fitness against pathogen threats. Consequently, we obtained state infant death rates from the CDC (https://data.cdc.gov) and life expectancy rates from the Measure of America (http://www.measureofamerica.org/). Since the most recent state-level life expectancy data available was for 2010, we matched infant death rates for that year. As with White et al.'s (2013) data, infant mortality rates and average life expectancy were highly correlated, $r(51) = -0.74$, so we averaged z-scores of these measures into a composite index of disease-threat. This proxy for disease threat was significantly correlated with the Parasite Stress-USA measure used in Study 1, $r = 0.65$, supporting its use in the current study.

3.2.1. Method

For our dependent measure, we retrieved the most recent state-level sales data (2012) from the U.S. Economic Census (http://www.census.gov/econ/census/) for businesses primarily engaged in the retail of used merchandise (reported in $1 k units). Unlike the establishments profiled in Study 1, the establishments in this dataset include large, medium, and small companies with payroll and paid employees.

As a comparison condition, we considered the possibility that disease threat is associated with decreased revenues for low-status products in particular. The U.S. Economic Census contains more detailed industry categories compared to the Nonemployer Statistics data series; consequently, we were able to access data for subcategories within the general merchandise industry category used in Study 1. Thus, 2012 revenue data for the discount department store industry, which offers similarly budget-friendly options as used merchandise retailers, served as our quasi-control group in Study 2.

As with Study 1, we gathered available data regarding state-level population, income, unemployment, inequality, education, and political affiliation for 2012. We calculated the square root of select variables (used and general merchandise revenues, state population) to reduce skewness, and mean-centered all predictors (see S.I. for details).

[1] See Supplementary Information for further details regarding the variables used in Study 1.

[2] We thank an anonymous reviewer for many of these suggestions.

3.2.2. Results and discussion

We observed patterns consistent with Study 1 when regressing disease prevalence, population, income, unemployment, inequality, education, and political affiliation on our indices of used product sales (Table 2a). Specifically, when examining these simultaneous predictors' influence upon used merchandise revenues, disease threat again significantly and negatively predicted success for used merchandise retailers ($\beta = -0.119$, $p = 0.045$). Similar to the previous study, state population also positively predicted reported used merchandise revenues ($\beta = 0.944$, $p < 0.001$).

Next, we simultaneously regressed our predictor variables on revenues reported within our (similarly low-status) quasi-control industry. Consistent with our predictions, discount department store sales were not affected by disease rates in the same way as used merchandise revenues. Specifically, no relationship emerged between disease threat and discount department store sales ($\beta = -0.049$, $p = 0.488$). The same analysis, however, revealed evidence of a positive effect of population ($\beta = 0.883$, $p < 0.001$), as well as a marginal influence of political affiliation ($\beta = 0.127$, $p = 0.056$).

To address any idiosyncrasies with the 2012 data, we collected and analyzed more comprehensive data. We re-ran the above analyses with all available data for our variables of interest from 2000 to 2012 (see S.I. for details). Similar patterns were observed in the data (Table 2b). Holding other predictors constant, state disease indices again predicted lower used merchandise revenues across multiple years ($\beta = -0.115$, $p = 0.052$). Further echoing patterns from the 2012 data, state population was positively correlated with secondhand retailer revenues ($\beta = 0.932$, $p < 0.001$). Unlike study 1 however, an additional analysis of aggregated disease prevalence and used merchandise sales without control variables did not reflect the same pattern of association (see S.I.).

Similar patterns to those reported earlier emerged for aggregate discount department store data. As before, disease threat did not predict discount retailer revenues ($\beta = -0.032$, $p = 0.575$). However, population ($\beta = 0.918$, $p < 0.001$), income ($\beta = 0.151$, $p = 0.040$), and political affiliation ($\beta = 0.153$, $p = 0.014$) emerged as significant predictors.

To summarize the data across studies thus far: Using two distinct databases and two measures of disease prevalence, we found consistent evidence that used merchandise retailers (but not retailers of equivalent new products) report lower revenues in communities with high disease prevalence rates. Within the context of our studies, these archival data provide an initial, population-level demonstration that people's motivations to avoid infectious disease can influence their decisions regarding used products. More generally, these data suggest that processes linked to individual disease threat management can influence economic outcomes at population levels, and thus have practical implications across a variety of real-world contexts, from measuring how public health initiatives affect local communities, to deciding where to open new retailer stores.

Table 2a
Results of multiple regression analysis simultaneously examining the effects of population, median income, unemployment, inequality, education, political affiliation (0 = democratic, 1 = republican), and disease prevalence on 2012 revenues for used retailers and discount department retailers (Study 2).

Predictor	Used merchandise revenues			Discount department merchandise revenues		
	β	*t*	*p*	β	*t*	*p*
Population (transformed)	0.944	20.954	0.000	0.883	15.877	0.000
Income	−0.013	−0.193	0.848	0.143	1.674	0.102
Unemployment	0.006	0.127	0.899	0.015	0.257	0.799
Inequality	−0.010	−0.224	0.824	−0.009	−0.168	0.868
Education	0.050	0.687	0.496	−0.012	−0.130	0.897
Political affiliation	0.040	0.699	0.488	0.127	1.973	0.056
Disease prevalence	−0.119	−2.075	0.045	−0.049	−0.700	0.488

Table 2b
Results of multiple regression analysis examining the effects of population, median income, unemployment, inequality, education, political affiliation (0 = Democratic, 1 = Republican), and disease prevalence on revenues for used retailers and discount department retailers from 2002 to 12 (Study 2).

Predictor	Used merchandise revenues			Discount department merchandise revenues		
	β	*t*	*p*	β	*t*	*p*
Population (transformed)	0.932	20.430	0.000	0.918	20.288	0.000
Income	0.005	0.063	0.950	0.151	2.127	0.040
Unemployment	0.022	0.420	0.677	−0.026	−0.489	0.627
Inequality	−0.057	−1.190	0.241	0.012	0.309	0.759
Education	0.052	0.655	0.516	0.063	0.802	0.427
Political affiliation	0.038	0.619	0.539	0.153	2.578	0.014
Disease prevalence	−0.115	−1.998	0.052	−0.032	−0.565	0.575

4. Individual-level responses to pathogen threat cues

Next, we turn to experimental methods to establish individual-level complements to the population-level inquiries of Studies 1–2, examining disease threat's causal effect on used product evaluation. In so doing, we hope to shed light on the psychological processes that likely contribute to the observed regional variation in used merchandise retailer performance.

4.1. Study 3a

If individuals' behavioral immune systems are activated by stimuli that prime concerns about infectious disease (Schaller & Park, 2011), exposing individuals to disease-related cues should trigger devaluation of used merchandise. Note, however, that this prediction is in accordance with non-exclusive mechanisms. While disease cues are likely to accentuate the *relative* difference between used and new products, it remains possible that increased disease salience may also drive heightened dislike for used products in general (vs. negative-control threat). Thus, we also tested whether disease-triggered aversions to secondhand products are driven by either of these two comparisons.

People's reactions towards new products, however, should not be affected in the same manner as their used counterparts. First, in Studies 1 and 2, we found no evidence that new products were devalued in states with high disease prevalence. Second, new products do not possess the usage history cue (prior contact) associated with potential germ transfer. It is even possible that new products, free from heuristic evidence of contamination, could be seen as sources of safety in pathogen-threatening contexts. For this reason, we suspected that individual participants would react differently to new products, compared to used versions.

4.1.1. Method

We triggered participants' motivational concerns about disease through exposure to online advertisement banners. In addition to being strongly relevant to real online shopping contexts, these banners allow for incidental information to be provided to participants. Banners were created and pretested to ensure that exposure would trigger either disease threat or the threat of physical accidents (with accident-related banners offering a negatively-valenced threat unrelated to disease; Faulkner, Schaller, Park, & Duncan, 2004). Each banner featured a company logo relevant to the particular threat domain (e.g., disease threat = CVS drug store; accident threat = State Farm insurance; see S.I.).

Ninety-nine American Mturk workers (47 female, 40 male, 12 no report) participated for monetary compensation. This study was originally conducted as a pilot study, and occurred prior to field-wide concerns about replication issues; consequently, the heuristic used to determine sample size was 25 participants per condition. All participants were randomly assigned into one of four conditions within a 2(threat: disease, accident) × 2(product: new, used) level between-participants design. Three participants took longer than 3 standard deviations of the average

participant time to complete the survey, and were excluded from subsequent analyses.

All participants viewed a mock-up of an Amazon.com screenshot featuring a microwave which was described as either brand-new or previously-owned. An ad banner unobtrusively adorned the top right corner of the visual space. Half of the participants saw one of three randomly-chosen disease-related banners; the rest saw one of three randomly-chosen accident-related banners (see S.I.). All participants reported their willingness-to-pay for the microwave as a percentage of the product's original retail price (0 = 0% *of the original retail price*; 10 = 120% *of the original retail price*; similar to Rios, Finkelstein, & Landa, 2015). We used an interval scale to reduce the amount of response variance typical of willingness-to-pay measures, and guard against outliers (Rucker & Galinsky, 2008).

4.1.2. Results and discussion

An analysis of variance (ANOVA) revealed no main effect of threat ($F(1,92) = 0.180$, $p = 0.673$) but a significant effect of product condition ($F(1,92) = 9.340$, $p = 0.003$) which was qualified by the predicted threat-by-product interaction, $F(1,92) = 4.139$, $p = 0.045$, $\eta_p^2 = 0.043$, Fig. 1). In harmony with our predictions, participants exposed to disease banners reported being willing to pay a lesser percentage of the microwave's original price when it was used ($M = 5.14$, $SD = 2.61$) compared to when it was new ($M = 7.64$, $SD = 2.20$); $F(1,92) = 13.245$, $p < 0.001$. In contrast, no differences emerged between willingness-to-pay for the previously-owned ($M = 6.35$, $SD = 2.01$) versus new ($M = 6.85$, $SD = 2.61$) microwave for accident-primed participants, $F(1,92) = 0.511$, $p = 0.477$.

Another key test of our prediction involves the simple effect of threat within the used product condition. Though this contrast was not significant ($F(1,92) = 2.636$, $p = 0.108$), we note that average willingness-to-pay was slightly lower in the disease threat condition than in the accident condition. Additionally, while evaluations of new products were numerically higher for disease threatened participants compared to control participants, the comparison failed to reach statistical significance, $F(1,92) = 1.519$, $p = 0.221$.

4.2. Study 3b

One might argue that used products differ from their brand-new counterparts in important ways, including ownership and age. If disease concerns trigger devaluation of used products, however, the product's age, or mere fact of prior ownership should matter less than whether prior contact through usage has occurred. In Study 3b, previously-owned but never-used objects (instead of brand-new products) served as the comparison group for used products. This design offered us the opportunity to conservatively replicate Study 3a by controlling for prior ownership and age; it also potentially highlights the role of usage history (and not mere association with others) as a component of disease processing.

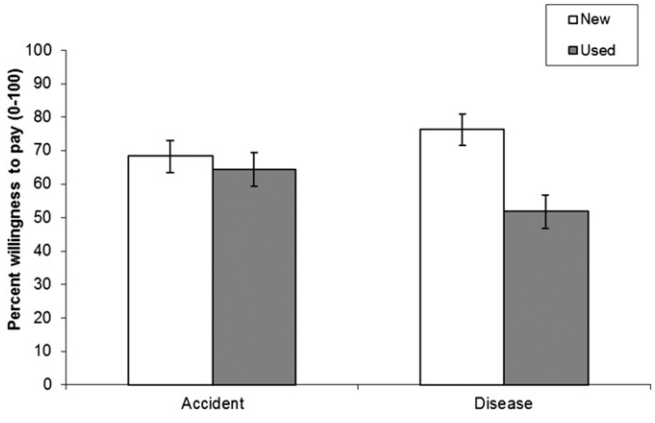

Fig. 1. Mean percent willingness-to-pay by disease and product condition (Study 3a). Error bars represent standard errors.

4.2.1. Method

One-hundred-forty-eight Mturk participants (77 female, 68 male, 3 no report) receiving monetary compensation were randomly assigned to one of four conditions in a 2(threat: disease, accident) × 2(product: never-used, used) level between-participants design. We aimed to recruit 160 participants within 24 h (approximately 40–50 participants per condition), eventually recruiting 148. One participant who had completed the survey in an unusually long time-frame was excluded from analysis.

Half of the participants were assigned to read a passage describing a recent flu threat and related statistics such as, "the CDC claims that over 2 million people could be hospitalized because of flu-related illness" (modeled after Huang, Sedlovskaya, Ackerman, & Bargh, 2011). Remaining participants read a similar passage about automobile accidents (see S.I.).

Next, participants were asked to imagine being at a yard sale. They were given the original retail price and age of three items common to that setting: a microwave, an office chair, and a sweater. Participants randomly assigned to the used product condition read that they were "used, and in good condition." Participants assigned to the never-used condition were asked to evaluate products which had been purchased but were described as "never used, and in good condition" (presumably, because the owner never found occasion to use them). Participants then reported their willingness-to-pay for each product in dollar amount. To account for differences between the products, we obtained *Z*-scores for each and averaged them as a measure of used product valuation, $\alpha = 0.886$.

4.2.2. Results and discussion

An analysis of variance revealed no effect of threat ($F(1,143) = 0.341$, $p = 0.560$), but a main effect of product condition ($F(1,143) = 6.188$, $p = 0.014$), qualified by a marginal threat-by-product interaction, $F(1,143) = 2.855$, $p = 0.093$, $\eta_p^2 = 0.020$. Planned contrasts replicated patterns observed in Study 3a: Participants exposed to disease-related cues reported decreased willingness-to-pay for secondhand merchandise ($M = -0.26$, $SD = 0.75$) compared to never-used versions ($M = 0.36$, $SD = 1.03$), $F(1,143) = 8.538$, $p = 0.004$. Conversely, for control participants, no differences existed in willingness-to-pay for used versus never-used products at the yard sale ($Ms = -0.094$ and 0.025; $SDs = 0.87$ and 0.94), $F(1,143) = 0.325$, $p = 0.569$.

Once again, the data indicate that the interaction of threat and product condition appears to be driven by the relative devaluation of used products (compared to newer products) by disease-threatened participants. As in Study 3a and contrary to expectations, no significant differences emerged between participants in the disease threat versus accident threat condition for used products, $F(1,143) = 0.625$, $p = 0.430$. Similarly, the simple effect of threat within the newer product condition was not significant, $F(1,143) = 2.529$, $p = 0.114$. Once again, however, the mean willingness-to-pay for used merchandise was lower in the disease threat condition than the accident threat condition, while ratings for the newer products were higher in the disease threat condition than in the accident threat condition.

The findings from two experimental studies support our prediction that disease cues decrease expressed preferences for used products relative to never-used versions. This is not the case when people are exposed to other forms of threat which are not perceived to spread through contact. Moreover, these biases are likely driven by associations with prior usage, as people exposed to disease-related cues devalued used products even compared to previously owned, but not used, versions. In the next section, we investigate whether potential boundary conditions for these biases also offer theoretically-informed interventions against this relative devaluation.

5. Intervening against disease-related devaluation

Thus far, our studies have found multiple forms of empirical support for the idea that disease threats can produce devaluation of secondhand products. The remaining studies build on this support in addressing a complementary question: What factors can interrupt or minimize behavioral immune responses to such objects? By attempting to down-regulate these responses, we are both able to test boundary conditions that target theoretically-meaningful cues and to provide practical means of intervention. We examine two avenues towards down-regulation—manipulating seller identity and manipulating evaluator perceptions of vulnerability.

5.1. Study 4: targeting wariness of the seller

Previous work on interpersonal disease threats suggests that unfamiliar people are more likely than friends or family to carry infectious diseases to which one's immune system has not adapted, which accounts for much of the disease-prompted negativity expressed towards foreigners (Faulkner et al., 2004; Navarrete & Fessler, 2006). Study 4 examines whether participants actively avoiding disease would be less likely to devalue secondhand products relative to newer versions, if they had substantial exposure to the prior owners.

5.1.1. Method

One-hundred-ninety-nine participants from Mturk (94 female, 99 male, 6 no report) participated in a survey for monetary compensation. This experiment employed a 2(seller: stranger, friend) × 2(threat: disease, accident) × 2(product: never-used, used) between-participants design. The sample sizes were determined in order to maximize power given data collection costs with participant availability. Two participants completed the survey in an unusually long time-frame and were excluded.

All participants saw an advertisement which had ostensibly been posted on Craigslist.org by either a person they didn't know (stranger condition) or a friend (friend condition). The product for sale was a previously-owned DVD player described as in good condition and bearing an original retail price of $69.99 when it had been purchased two years ago (see S.I.). We additionally randomly varied whether the product was described as never-used or used, and whether a disease or accident ad banner was displayed in the upper right corner. Participants reported their willingness-to-pay for the DVD in percentage of the original retail price (0 = 0% *of original retail price*; 100 = 100% *of original retail price*).

5.1.2. Results and discussion

We conducted a Seller X Threat X Product analysis of variance on willingness-to-pay. This analysis indicated no significant main effects of seller ($F(1,189) = 0.049$, $p = 0.826$), threat ($F(1,189) = 0.078$, $p = 0.780$), nor product condition ($F(1,189) = 1.370$, $p = 0.243$). Similarly, no significant two-way interactions emerged between threat and seller conditions ($F(1,189) = 0.128$, $p = 0.721$), threat and product conditions ($F(1,189) = 2.000$, $p = 0.159$), nor seller and product conditions ($F(1,189) = 0.410$, $p = 0.523$). However, the data indicated our predicted three-way interaction between threat, seller, and product condition, $F(1,189) = 5.290$, $p = 0.023$, $\eta_p^2 = 0.027$.

We observed the following when decomposing the three-way interaction by seller: when a stranger was described as selling the merchandise, a significant threat X product interaction emerged, replicating the findings from Studies 3a-3b, ($F(1,189) = 6.677$, $p = 0.011$). No such interaction occurred when the seller was a friend, $F(1,189) = 0.405$, $p = 0.525$ (Fig. 2; see S.I. for additional analyses).

When examining the data for stranger-sold products, we observed that participants in the disease threat condition were less interested in a used DVD player compared to a never-used version (*M*s = 31.58 and 41.36; *SD*s = 15.00 and 17.97), $F(1,189) = 4.224$, $p = 0.041$.

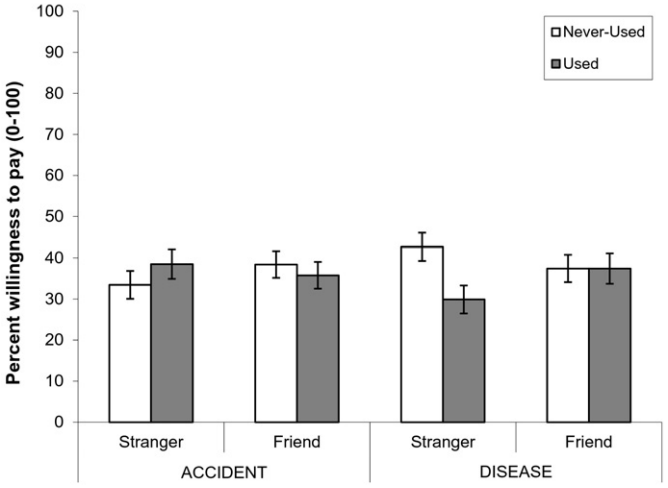

Fig. 2. Mean percent willingness-to-pay by disease, seller identity, and product condition (Study 4). Error bars represent standard errors.

Participants exposed to an accident threat, however, did not differ in their willingness-to-pay for used versus never-used versions (*M*s = 39.96 and 32.63; *SD*s = 16.95 and 13.02), $F(1,189) = 2.535$, $p = 0.113$.

As with Studies 3a–b, we also examined whether accident versus disease threatened participants differed when rating used products sold by strangers, and when rating new products from these sellers. Interestingly, though the simple effects from Studies 3a-3b did not meet the criteria for statistical significance, here both contrasts were marginally significant. Consistent with our original predictions, disease-threatened participants were marginally less willing-to-pay for the used DVD player than were participants in the accident condition, $F(1,189) = 3.306$, $p = 0.071$. Moreover, participants in the disease threat condition were also marginally *more* willing than their accident condition counterparts to pay for a never-used product, $F(1,189) = 3.372$, $p = 0.068$.

To sum up the results of Study 4, when the seller of a particular product is a stranger, disease cues differentially affect people's evaluations of used versus new products, replicating the effects observed in earlier studies. When the seller is a friend, however, disease cues no longer trigger the devaluation of used products.

5.2. Study 5: effectively washing away infected preferences

In Study 5, we examine whether actions that satisfy the motivation to avoid disease subsequently lessen people's aversion to secondhand goods. Arguably, the most commonly recommended method of reducing infection risk is washing one's hands. Hand washing is generally recognized as an effective preventative measure against disease transmission, assuming proper techniques are used (Curtis & Cairncross, 2003). Moreover, previous research demonstrates that hand washing can interrupt behavioral immune biases associated with interpersonal perception (e.g., disease-sensitive people who cleaned their hands exhibited less negativity towards outgroups; Huang et al., 2011). Because washing one's hands is associated with disease protection, disease-primed people who perform this act may become less reactive to secondhand items. This finding provocatively suggests that cleansing behaviors act as a protection heuristic and not a rational solution to prevent infection, as having clean hands does not immunize against future germ transmission.

Based on prior research, however, we also suspected that the power of personal safety interventions might vary based upon whether the intervention itself is perceived as effective. Research suggests that receiving a flu vaccination (which should diminish feelings of disease vulnerability) predicted decreased endorsement of prejudicial attitudes in an earlier study, but depended on participants' perceptions that vaccinations are an effective way to combat disease threats (Huang et al.,

2011). If the threat of contracting illnesses elicits negativity towards secondhand items, then people who feel like they are particularly protected from potential illness through hand-washing should be most likely to exhibit weaker associations between disease threat and secondhand preferences. For this reason, Study 5 also included participants' ratings of hand-washing effectiveness, as this individual difference variable might moderate the influence of disease and hand-washing on used product evaluations.

5.2.1. Method

One-hundred-twelve undergraduates from a Canadian university participated for course credit. The experiment employed a threat (accident, disease) X hand-washing (no, yes) X rated hand-wipe effectiveness (continuous) between-participants design. The sample sizes were determined by the constraints of the participant pool available over an academic semester. Three participants failed to complete the survey and were excluded from analyses.

Participants were randomly assigned to one of two conditions where they read a passage describing seasonal flu or automobile accidents. Next, all participants received a hand-wipe; half were instructed to use it, while the other half were not. All participants then rated the hand-wipe on a variety of dimensions, including packaging (1 = *Unattractive*; 8 = *Attractive*) and the product's effectiveness at preventing disease (1 = *Not at all*; 9 = *Extremely*). Lastly, participants reported their willingness-to-pay (in CAD) for four used products commonly found on Amazon.ca (microwave; sweater; office chair; DVD player). To account for differences between the products, we again calculated *Z*-scores for each product and averaged them into a composite index for used product value ($\alpha = 0.76$).

5.2.2. Results and discussion

Preliminary findings suggested that the hand-washing manipulation did not affect participants' general impressions regarding whether hand-wipes were effective at disease-prevention, $p = 0.79$, which allowed for the inclusion of this variable in our model as a predictor. Similarly, the hand-washing manipulation did not appear to affect attractiveness ratings of the hand-wipe package, $p = 0.88$.

We dummy coded threat (0 = accident, 1 = disease) and hand-washing (0 = no, 1 = yes) variables, and mean-centered hand-wipe effectiveness ratings. Next, we used model 3 of Hayes' (2013) PROCESS macro to predict participants' reported willingness-to-pay with threat, hand-washing, rated hand-wipe effectiveness, and all of the two- and three-way interactions as predictors. The analysis indicated no main effects of threat ($b = -0.203$, $SE = 0.207$, $t(101) = -0.981$, $p = 0.329$, $\beta = -0.072$), hand-washing ($b = -0.034$, $SE = 0.214$, $t(101) = -0.158$, $p = 0.875$, $\beta = 0.039$) nor effectiveness ratings ($b = -0.026$, $SE = 0.053$, $t(101) = -0.497$, $p = 0.621$, $\beta = -0.084$). The two-way interactions of threat and hand-washing, $b = 0.187$, $SE = 0.298$, $t(101) = 0.627$, $p = 0.532$, $\beta = 0.061$, threat and hand-wipe effectiveness, $b = -0.109$, $SE = 0.101$, $t(101) = -1.085$, $p = 0.281$, $\beta = 0.096$, and hand-washing and hand-wipe effectiveness, $b = -0.075$, $SE = 0.094$, $t(101) = -0.795$, $p = 0.429$, $\beta = 0.144$, all failed to reach significance. However, analyses revealed a three-way interaction of threat, hand-washing, and effectiveness ratings on willingness-to-pay, $b = 0.355$, $SE = 0.148$, $t(101) = 2.398$, $p = 0.018$, $\beta = 0.250$, which we describe below (note that for ease of interpretation, analyses were performed on *Z*-scored data, but we present the non-transformed outcome measure in Fig. 3).

Specifically, for disease-threatened participants, an interaction emerged between whether they had washed their hands and how effective they generally perceived that intervention to be, $b = 0.280$, $SE = 0.114$, $t(101) = 2.455$, $p = 0.0158$, $\beta = 0.393$. For disease threatened participants who believed that hand-washing served as an effective form of disease prevention (1 *SD* above the mean on the effectiveness measure), using the hand-wipe increased their willingness-to-pay, relative to those who had not used it ($b = 0.755$, $SE = 0.282$, $t(101) = 2.679$, $p = 0.009$, $\beta = 0.493$). When disease-threatened participants did not perceive using hand wipes as an effective prevention (1 *SD* below the mean), no differences emerged between the two hand-washing conditions ($b = -0.449$, SE = 0.356, $t(101) = -1.261$, $p = 0.210$, $\beta = -0.293$.

For accident-threatened participants, no relationship existed between hand-washing and effectiveness ratings on willingness-to-pay ($b = -0.075$, SE = 0.094, $t(101) = -0.795$, $p = 0.429$, $\beta = -0.106$), supporting the notion that infection-specific interventions, and subjective perceptions of them, should matter only for participants concerned with thwarting disease.

It is important to note that while our data did not offer support that hand-washing alone was capable of interrupting disease-triggered negativity towards secondhand products, they are nevertheless consistent with a motivational model and prior research. For instance, in a prior test of the hand washing manipulation, effects were contingent on perceived effectiveness (Huang et al., 2011). Beliefs about the efficacy of hand-washing are motivationally-relevant constructs since they represent ways to fulfill an active goal to avoid disease; to the extent that people perceived hand-washing as an effective means of protection against disease, performing this act tempered disease-triggered aversions.

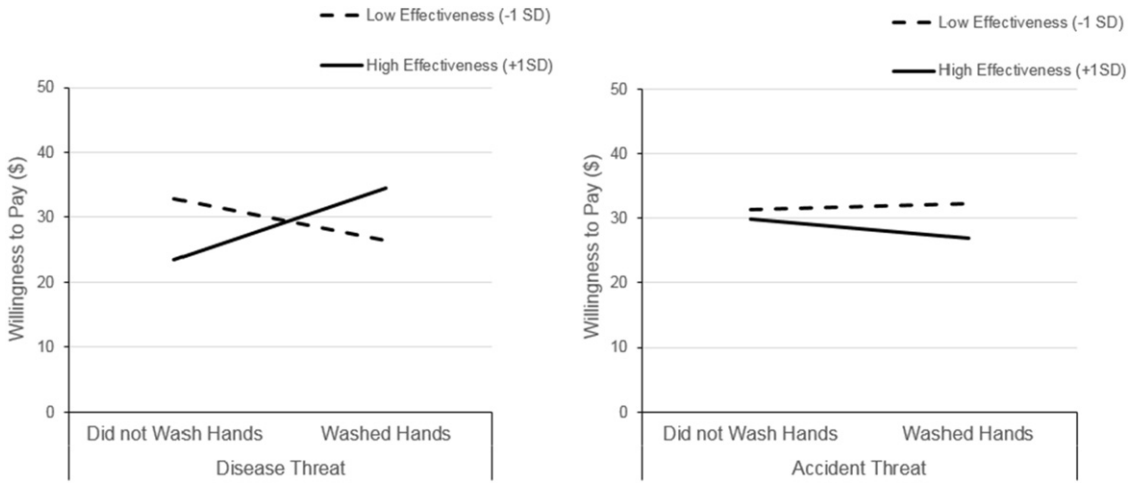

Fig. 3. Three-way interaction between perceived effectiveness of hand-washing (centered), hand-washing, and disease threat experimental manipulation on mean willingness-to-pay (Study 5).

These findings also point to processes implicated when motivations overgeneralize. The act of hand-washing technically protects a person from germs which currently reside *on* the body; importantly, it provides no immunization against germs s/he may encounter on surfaces touched in the future. This suggests that people may be relying on more heuristic associations between hand-washing and safety from infections, rather than rational deliberations, to assuage their disease-triggered aversions.

6. Internal meta-analyses

The studies in our manuscript were meant to test whether disease threats lead people to devalue previously used products. We additionally predicted a boundary condition: that valuation of new products should not be affected in the same manner as their used counterparts. This hypothesis was most directly tested within the Threat Type X Product Type experimental designs of Studies 3a, 3b, and 4, and appeared to be driven by differences between used and newer products within threat type condition. It remains possible, however, that observed interaction effects in these studies were also driven—if inconsistently—by: 1) devaluation of used products by disease-threatened versus accident-threatened participants, or 2) increase in valuation for new products (rather than explicit devaluation of used products) among participants in the disease threat versus accident threat conditions. To better inform our understanding of our data, we conducted a series of internal meta-analyses to verify the reliability of these simple effects.

Research suggests that using internal meta-analyses can provide a meaningful summary of the reliability and direction of relationships between variables of interest (Rosenthal & Rosnow, 1991). First, we examined the reliability of the overall interaction effect between threat and product condition observed in Studies 3a, 3b, and 4 (Study 5 employed similar manipulations but its effects relied on moderation by perceived effectiveness of the intervention, and so it was not included here). Following Rosenthal and Rosnow, we converted the p values for each study into Z scores, weighted by each test's degrees of freedom. The Z-standardized significance levels all had the same sign and were as follows: $Z_{\text{Study 3a}} = 2.12$ ($df = 95$); $Z_{\text{Study 3b}} = 1.68$ ($df = 143$); $Z_{\text{Study 4}} = 2.485$ ($df = 92$). The overall interaction effect (comparing disease vs. control participants' product ratings for used vs. newer products) was highly significant across studies, $Z = 3.44$, $p = 0.0003$.

Next, we examined the reliability of a contrast that may have contributed to the overall interactions observed in our experimental studies. Relevant data (addressing whether being exposed to disease threat reduced evaluations of used products, relative to being exposed to accident threats) available from Studies 3a, 3b, 4, and 5. Specifically, the results from Study 4 suggested that disease-threatened participants were less willing to pay for used products, compared to control participants. Studies 3a–b employed very similar experimental designs, but the equivalent comparisons failed to reach significance (but trended in the same direction). Study 5 employed a slightly different study design, but offered an equivalent comparison with disease versus accident-threatened participants which similarly trended in the same direction without achieving statistical significance; for this reason, we included Study 5 in this analysis. To assess the reliability of this across studies, we converted studies' p values into one-tailed Z scores weighted by each test's degrees of freedom. The Z-standardized significance levels all had the same sign and were as follows: $Z_{\text{Study 3a}} = 1.75$ ($df = 95$); $Z_{\text{Study 3b}} = 0.79$ ($df = 143$); $Z_{\text{Study 4}} = 1.83$ ($df = 92$); $Z_{\text{Study 5}} = 1.52$ ($df = 56$). The results revealed that, across studies, disease-threatened participants were less positive towards used products than their accident-threatened counterparts, $Z = 2.63$, $p = 0.0045$. To maintain consistency with the prior meta-analysis, we additionally calculated the reliability of this effect across our experiments excluding Study 5. Our analyses revealed confirmed that when examining only Studies 3a, 3b, and 4, disease threat (versus accident threat) continued to be statistically associated with used product devaluation, $Z = 2.30$, $p = 0.0110$.

Finally, we examined whether data from our studies reliably demonstrated that disease threat actually *increases* favorability towards newer products (relative to control threat) as the data across individual studies provided intriguing (if not consistently significant) evidence for this effect. While Study 5 did not include ratings of new products, Studies 3a, 3b, and 4 offered relevant data. We obtained Z-standardized significance levels and relevant degrees of freedom for each study. All studies showed effects in the same direction and thus Z's had the same sign: $Z_{\text{Study 3a}} = 1.24$ ($df = 95$); $Z_{\text{Study 3b}} = 1.58$ ($df = 143$); $Z_{\text{Study 4}} = 1.72$ ($df = 92$). Results from our internal meta-analysis revealed that indeed, the overall comparison between disease-threatened versus control participants' ratings of newer products was significant ($Z = 2.58$, $p = 0.0051$) such that when compared to control-primed participants, participants across studies who were exposed to disease cues were not only more negative towards used products, but also more positive towards newer products.

While we did not explicitly predict that disease cues would increase positivity towards newer products, this finding is consistent with existing research on infectious disease threat management. Indeed, while models of disease management are largely avoidance-based, research suggests that individual approach-based behaviors can also function to facilitate disease avoidance (see Griskevicius & Kenrick, 2013; Schaller & Murray, 2008). We address this issue further in the General discussion.

7. General discussion

Across six studies, we leveraged historical and experimental data to elucidate how infectious disease threats influence people's judgments of used and newer products. Studies 1 and 2 showed that real-world consumer decisions towards secondhand products appear influenced by the ecological prevalence of diseases at a state-by-state level. Studies 3a–3b replicated this effect in the laboratory and found that situational cues to disease threat trigger immediate devaluation of used but not new products. Studies 4 and 5 probed boundary conditions to better understand how and when disease threats extend towards product evaluations. Specifically, people motivated to avoid disease did not devalue secondhand products when they were familiar with the prior owner, and hand-washing proved an effective barrier against overgeneralized behavioral immune responses—provided people viewed that act as effectively protecting them from disease.

Internal meta-analyses revealed that across four experiments, disease-threatened participants were reliably less willing-to-pay for used products, compared to control-primed participants. These meta-analytic findings remain consistent with our broader expectations, especially in light of the data from our archival studies. Studies 1 and 2 demonstrated that states with higher disease rates (vs. lower rates) reported lower used merchandise retailer revenues. That participants who were threatened with disease in our experiments (vs. those in the control condition) also devalued used products arguably provides the individual-level complement to a population-level effect.

Interestingly, observed results from Studies 3ab–4 suggested that no differences existed between control participants' willingness-to-pay for previously-owned versus new products. We surmise that this nonsignificant pattern may have emerged due to the fact that the between-participants designs involved rating only used or new products, without direct comparisons between the two. Alternately, it may be that the positive product attributes given to all participants (all products were described as "in good condition") inhibited direct devaluation of used versions. Finally, the study context may have artificially suppressed willingness-to-pay for new products as evidenced most strongly by Study 3a, where willingness-to-pay for new products reached only approximately 68–76% of the retail value. These are all areas that are open for future research.

7.1. Theoretical implications

The results from our internal meta-analyses suggest that participants exposed to disease cues (compared to control-primed participants) may be not only more negative towards used products, but also more positive towards newer products. We recommend caution when interpreting this data since we did not explicitly predict this finding; however, we note that our findings are consistent with existing perspectives regarding how people have evolved to manage disease threats. Indeed, a growing area of research suggests that the behavioral immune system is aided by avoidance-based psychological mechanisms (which encourage one to maintain distance from potential disease sources) as well as approach-based tendencies (which encourage one to adopt disease-mitigating rituals and practices; see Griskevicius & Kenrick, 2013). For example, to the extent that local rituals and rules evolved to neutralize pathogen threats, people increasingly endorse traditional cultural norms under conditions of high disease salience (e.g., Murray & Schaller, 2012; Schaller & Murray, 2008). Temporary exposure to disease cues may increase approval of social practices which help avoid disease; it may similarly spur approach tendencies towards stimuli which bear cues associated with disease safety. For individuals, safety cues are likely to be associated with general traits such as physiological health or life stage (as proxies of reduced vulnerability to disease threats). In the face of a disease threat, people may be more likely to selectively attend to and approach those bearing features associated with reduced vulnerability to disease threats, including general physical attractiveness (Gangestad & Buss, 1993), facial symmetry (Rhodes, Proffitt, Grady, & Sumich, 1998), sexual dimorphism (DeBruine et al., 2010), and unblemished skin. Future research would be well-aimed at exploring these possibilities.

Note, however, that we did not observe a positive relationship between infectious disease prevalence and new product revenues in our archival studies. This discrepancy points to the intriguing possibility that separate mechanisms—approach towards new products and avoidance of used products—may be operating or measurable at different levels of analysis. It may be the case that increased positivity towards new products may stem from product newness acting as a safety cue, especially when people are making explicit, in-the-moment evaluations. Yet, when it comes to actual choice behavior, ecological disease threat may not push people to make purchases at new merchandise retailers by signaling "Shop now!" Therefore, it is possible that disease threat exerts differential effects on individuals at different stages of decision making. In other words, disease salience may not compel potential people to shop more frequently at new merchandise retailers (vs. used retailers), but it may affect their subsequent and explicit evaluations of objects within those stores once they are there.

7.2. Practical implications

In our studies, we examined how processes which specifically evolved to address disease-related challenges can 'spill-over' onto everyday judgments, particularly towards used merchandise; from this knowledge, we created realistic and actionable interventions to mitigate against that bias. This logic, however, has the potential to translate across different evolutionarily-adaptive domains. Psychological research has increasingly found that processes evolved to address evolutionary challenges like mate selection, self-protection, and disease avoidance have implications for how people make decisions across a wide variety of modern contexts, from policy endorsement (Faulkner et al., 2004), to art appreciation (Griskevicius & Kenrick, 2013; for a review, see Kenrick, Griskevicius, Neuberg, & Schaller, 2010). Our research complements this rich field in social psychology and suggests that researchers may be able to leverage this knowledge to inform future interventions geared towards a wide variety of judgments.

Indeed, parasite and pathogen threat may be more common in less developed areas of the world, but even in relatively modernized countries, infectious disease is a fact of life. As shown here, even cues to minor illnesses (e.g., colds) can trigger psychological responses that affect decisions about products and other non-social stimuli. As such cues wax and wane (e.g., over the seasons), we may expect real-world decision and consumption patterns to follow suit—and, as suggested by our data, even in modern, developed countries. This research demonstrates how, when pathogenic transmission is a factor, public health outcomes can have important impact on people's attitudes towards non-social stimuli.

While we focused on used merchandise as a vehicle for examining how mechanisms for inhibiting germ transfer overgeneralize to durable objects, our research has practical implications as well. The U.S. secondhand goods market has grown in recent decades and is expected to continue expanding (James, Brown, Goodsell, Stovall, & Flaherty, 2011; Sutherland, 2009; Waggoner, 2009). The present studies demonstrate a potential way that local ecology can affect this billion-dollar market.

Across brick-and-mortar stores, neighborhood yard sales, and e-commerce websites, retailers large and small may benefit from knowledge of their consumers' local contexts. Retailers weigh many factors when making operational decisions regarding store location and timing of sales events; those marketing used merchandise may benefit from considering community-level health factors during this process, as for instance by increasing promotional efforts (e.g., coupons) in states with relatively high disease rates. Meanwhile, individuals selling their own belongings through online or yard contexts may heed current flu trends when timing the sale, or emphasize in-group affiliation with potential buyers to increase the likelihood of a purchase.

Research on the behavioral immune system suggests that individuals differ from one another with regards to how sensitive they are to disease (Duncan, Schaller, & Park, 2009). Another implication of our research is that individuals who are particularly leery of disease may be most likely to devalue secondhand products. Used merchandise retailers who wish to target this consumer segment may benefit from highlighting the cleanliness of local stores, or design product packaging to reflect decreased contamination from prior contact (see for example, Morales & Fitzsimons, 2007). Conversely, other retailers may wish to focus on the consumer segments who would be relatively more positive towards previously-owned products. In sum, the multi-method implications of our research suggest that disease salience (whether seasonal, community-based, or within an individual's immediate context) can result in relative disadvantages for used merchandise sales across a variety of different venues, but additionally offer means of potentially addressing such disadvantages.

8. Conclusions

Protection from contaminants such as germs and parasites was of such central concern to our ancestors that they evolved strong defensive mechanisms against such threats. In the current-day, these processes can overgeneralize and affect judgments of objects only heuristically associated with contamination like secondhand products. We documented the various ways and multiple levels at which people's motivations to avoid disease also infect their evaluations of used products. Just as people have methods to protect themselves and their neighbors from disease and pathogens, however, they also possess knowledge with which to cleanse themselves of these influences at multiple levels; this research presents a step in that direction.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jesp.2017.01.001.

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