Racial Disparities in Cleanliness Attitudes Mediate Purchasing Attitudes Toward Cleaning Products: a Serial Mediation Model

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Abstract The present study has three objectives (1) to examine whether there are differences in cleanliness concerns between African Americans and European Americans toward kitchen items that are known to be vectors of disease, (2) to examine whether disparities in cleanliness attitudes have an impact on purchasing attitudes toward kitchen cleaning products, and (3) to explore the mechanisms that may account for these differences utilizing a serial mediation model. Five hundred participants, 50% African American and 50% European American were shown a picture of a sponge cleaning product and filled out multiple survey instruments relating to cleanliness attitudes. We found greater concern with cleanliness of kitchen items \( (d = .46) \) and a greater willingness to purchase cleaning products among African Americans compared to European Americans \((17 \text{ vs } 10\%)\). A serial mediation analysis revealed that general cleanliness concerns account for the increased willingness to spend money on cleaning products among African Americans. These results suggest that African Americans are more sensitive to issues of cleanliness compared to European Americans and, in particular, are more sensitive to cleanliness of kitchen items such as sponges, which can be vectors of food-borne pathogens. Potential reasons for the observed racial disparities in cleanliness attitudes and the implications of these results for public health are discussed.

Keywords Racial disparities · Cleanliness attitudes · Contamination attitudes · Public health · African Americans

Cleanliness is a key public health concern. Lack of cleanliness in the home, and in the kitchen in particular, is in part responsible for food-borne illness and the spread of contagious disease \([16, 27]\). The Centers for Disease Control and Prevention (CDC) reports that more than 9 million people suffer from food-borne illnesses per year in the USA, resulting in over 1000 deaths \([26]\). Identifying factors that are associated with cleanliness concerns and behaviors can have important implications for understanding the mechanisms of disease proliferation, and can potentially provide insight into ways of controlling such proliferation of disease.

In recent years, a number of studies have demonstrated significant racial disparities in cleanliness attitudes (cognitions relating to personal and environmental hygiene, cleanliness, and grooming). Specifically, African Americans have higher concerns relating to cleanliness compared to European Americans \([32–34]\). Afrocentric values emphasize the importance of cleanliness, which is transmitted intergenerationally through racial socialization practices \([30]\). This has been explicated in the OCD literature, where greater concerns about contamination among African Americans have been observed across several psychometric studies \([35, 36]\). Although
this has not been the subject of much research, there is some evidence that African Americans invest more effort into cleaning, grooming, and personal hygiene. For example, despite large differences in mean incomes, African Americans spend more than European Americans on laundry [6], illustrating both the importance of being physically clean and also appearing clean to others. Additionally, African American women are more likely to engage in douching as a means of physical cleanliness and state that they learned this practice from their mothers [2, 4].

However, the precise way in which these general attitudes toward cleanliness translate into specific concerns about handling objects that are likely to spread food-borne illnesses has not been examined. Additionally, whether general attitudes toward cleanliness among African Americans affect purchasing attitudes and behavior has likewise not been investigated.

**Kitchen Sponges**

Within the home, the most significant source of contaminations is in the kitchen [12, 23], including items such as the refrigerator doors and sponges [12]. Sponges pose a heightened health risk compared to other kitchen items since direct routes exist from sponges to surfaces that come into contact with food. For example, sponges are commonly used to clean cutting boards which are used for meat and poultry. Used sponges from homes have been found to have high levels of *Staphylococcus aureus* compared to wash cloths, likely due to their porous microstructure [10]. Studies have also shown that *Salmonella* is found in sink areas and cutting boards that are likely to come into contact with sponges [29]. Sponges were also found to be the most likely source of enteric bacteria associated with fecal matter and were also shown to transfer organisms onto items that come into contact with food [1].

Simple rinsing does not result in a significant reduction of microorganisms on sponges [10], as opposed to wash cloths. Thus, common cleaning products may not be able to eliminate the microbial content of sponges [13] due to bacteria deeply embedded within the porous microstructure of the sponge. For these reasons, various commercially available products are available to clean sponges. In this study, we examine racial differences in attitudes toward sponges and toward sponge cleaning products, including how much money individuals are willing to spend on such products.

**Purpose of the Present Study**

In the present study, we develop a model of how general cleanliness attitudes of African Americans may influence concerns about specific kitchen items, and how these specific concerns translate into purchasing attitudes. Our models’ starting point is the link between racial group and cleanliness concerns [32]. Specifically, we expect that African American participants will have greater cleanliness concerns compared to European American participants. We additionally predict that (a) African American participants will be more concerned about the cleanliness of sponges and (b) that they will be willing to spend more money on purchasing a product that will disinfect sponges. We then test a model of mediated mediation in which general cleanliness attitudes affect specific attitudes toward the cleanliness of sponges, which in turn affect spending attitudes.

Figure 1 presents a model of relations between race, cleanliness attitudes, attitudes toward sponges, and purchasing attitudes. In this model, increased willingness to spend on cleanliness-related products by African Americans is predicted to be mediated by cleanliness concerns toward sponges, which in turn will be mediated by general cleanliness attitudes. Specifically, the model predicts that African Americans will spend more on sponge cleaning products, and that this effect will be fully mediated by general cleanliness concerns and specific concerns about the cleanliness of sponges.

**Method**

**Participants**

Five hundred participants were recruited from the Amazon Mechanical Turk (MTurk) platform. Mechanical Turk is increasingly being used for online participant recruitment in the social and behavioral sciences for fast access to high-quality data [5, 14]. Researchers first began utilizing Mechanical Turk in 2010 [18], and since then it has been used in thousands of published papers [7], across over 30 academic disciplines [3]. Participants were recruited in four equal groups of 125 by race (African American or European American) and gender. African American and European American participants were emailed invitations to participate in the study using TurkPrime [15] software. All participants were paid $1 for completing the task, which took 13 minutes on average.

**Design**

This study was cross-sectional and involved the use of survey instruments and a number of demographics questions. Participants were provided with a link that took them directly to the survey, hosted on Qualtrics. Every participant who accepted the invitation completed the full study.
Procedure

To examine sponge concerns, we utilized a picture and a description of a product that is able to clean sponges and remove bacteria and sponge odors.

We then asked participants how much they would be willing to spend on this product. At the start of the study, participants were told that they would see a description of a product and then be asked questions about that product. They were then presented with the following description:

**BathB is a sponge cleaner and a sponge holder and sits on your countertop or inside the sink and cleans your sponge by soaking it in a solution of citric acid and silver ion, killing the odor causing bacteria.** They were also shown a picture of a kitchen product that fits this description (see Fig. 2).

Stimuli

**Predictor** Self-identified race was utilized as the predictor. Participants were asked “Which best describes your ethnic

indirect effects are shown in Table 1. Path $a^1 \rightarrow a^2 \rightarrow a^3$ is the full serial mediation path. Path $a^1 d^1$ is the path from racial group to consumer attitudes through general cleanliness. Path $b^1 a^3$ is the path from racial group to consumer attitudes through attitudes toward sponges.

**Outcome Measures** Two outcome measures, one dichotomous and one continuous, were utilized to examine attitudes toward sponge cleaning products. To increase the ecological validity of the study, a picture of an actual sponge cleaning product was utilized (as shown in Fig. 2). The dichotomous measure asked participants whether they were willing to purchase the sponge cleaning product for $29.99. This price reflects the actual value of this product. The continuous outcome measure asked participants how much they were willing to pay for the sponge cleaning product from $0 to $40, in $5 increments.

**Mediators**

**Sponge Concerns Questionnaire** The Sponge Concerns Questionnaire (SCQ) was created specifically for this study in order to assess concerns about the cleanliness of sponges. Sponge concerns were assessed using four questions relating to concerns about the cleanliness of a sponge: (1) How concerned are you about the cleanliness of the sponges in your home? (2) How concerned are you about the smell of the sponges in your home? (3) How concerned are you about the germs on the sponges in your home? and (4) How concerned are you about the food-borne illness on the sponges in your home? Response options included (1) extremely concerned, (2) somewhat concerned, (3) slightly concerned, and (4) not at all concerned. The SCQ had high internal reliability for both African American and European American participants ($\alpha = .930$ and $\alpha = .918$, respectively).

**Cleanliness and Grooming Scale** General cleanliness was assessed using the Cleanliness and Grooming Attitude scale [32]. This scale consists of 12 Likert items and provides 0 = not at all through 4 = very much response options. Items
on this scale include “I would hate to wear the same clothes two days in a row” and “I can’t stand to be in my home if it’s messy”. Items were summed and averaged for a total score. Cronbach’s alpha scores in our sample were .624 for the European American sample and .635 for the African American sample, indicating moderate internal consistency. Cronbach’s alpha scores that were reported in previous studies are .667 for European American participants and .741 for African American participants [32]. This instrument was developed by Williams and Turkheimer [32] to assess cleanliness concerns separately from contamination concerns.

**Covariates**

**Padua Inventory Contamination Scale** Contamination concerns were assessed using the ten-item Padua Inventory for OCD Contamination Subscale [25] items, as utilized in Williams and Turkheimer [32]. These Likert items provide 0 = not at all through 4 = very much response options. Items on this scale include “I feel my hands are dirty when I touch money” and “I sometimes have to wash or clean myself simply because I think I may be dirty or contaminated.” The Chronbach’s alpha scores in our sample were .887 for the European American sample and .832 for the African American sample. Previously reported Chronbach’s alpha scores were .866 for European American participants and .849 for the African American participants [33]. The items were summed and combined into a total score. This instrument was developed by Williams and Turkheimer [32] to assess contamination concerns separately from cleanliness concerns, particularly among African Americans.

**Neuroticism and Conscientiousness** Participants filled out the neuroticism and conscientiousness Big Five Inventory (BFI) subscales. The BFI consists of 44 short declarative statements such as “Is talkative.” The Big Five Inventory is a common measure in the assessment personality [19]. Participants were given five response options ranging from strongly agree to strongly disagree and were asked to rate the extent to which each statement applies to them. The BFI measures the five major personality traits (OCEAN) and contains an approximately equal number of items that measure each of the five traits. Approximately half of the items for each trait are reverse coded (John, Robins, & Pervin, 2008). For neuroticism, Cronbach alpha = .930 for African American participants and .822 for European American participants. For conscientiousness, Cronbach alpha = .891 for African American participants and .816 for European American participants.

**Demographic Covariates** Other covariates included in the model were age, education level, and annual household income.

**Statistical Analysis Approach**

Race was explored as a predictor of differences in the willingness to purchase a sponge cleaning product, general cleanliness attitudes, concerns about the cleanliness of sponges, and contamination attitudes. A $\chi^2$ test was utilized to examine the dichotomous outcome of willingness to purchase the sponge cleaning product, and $t$ tests were used to examine continuous outcomes.

After examining whether racial group was associated with general cleanliness attitudes, sponge-specific cleanliness attitudes, and consumer attitudes toward cleaning products, a mediation model was tested in which general cleanliness attitudes and cleanliness concerns toward sponges were hypothesized to mediate the relationship between race (European American and African American) and purchasing attitudes toward cleaning products (purchasing attitudes).

These questions were examined in the context of a multiple serial mediation model, in which the general cleanliness attitudes mediator (mediator 1) serially proceeded the cleanliness concerns toward sponges mediator (mediator 2) in the serial mediation model (see Fig. 1). The main goals of this mediation model were to test for (1) whether racial group directly predicts purchasing attitudes toward cleaning products independent of the mediators (i.e., whether there is a direct effect of racial group on purchasing attitudes toward cleaning products), (2) whether racial group affects purchasing attitudes through general cleanliness attitudes, (3) whether race affects consumer attitudes through increased cleanliness concerns toward sponges, and (4) whether the mediating effect of cleanliness concerns toward sponges is mediated by the general cleanliness attitudes (serial mediation).

**Mediation Model**

Serial mediation was utilized to simultaneously examine three separate paths (see Fig. 1). The first path (Path $a^1d^1$) examines the indirect path from racial group to purchasing attitudes, through general cleanliness attitudes. This model tests the hypothesis that African American race increases general cleanliness attitudes, which in turn affects purchasing attitudes toward cleaning products. The second mediator model (Path $b^1a^3$) examines the indirect path from race to purchasing attitudes, through cleanliness concerns toward sponges. This model tests the hypothesis that African American race increases cleanliness concerns toward sponges, which in turn affects purchasing attitudes. The third model examines serial mediation (Path $a^2a^3$) in which the indirect path from race to purchasing attitudes is serially mediated by general cleanliness attitudes and cleanliness concerns toward sponges. This model tests the hypothesis that African American race increases general cleanliness attitudes, which increases
cleanness concerns toward sponges, which in turn affect purchasing attitudes.

Two separate serial mediation models were utilized. The first used a continuous outcome measure of how much money participants were willing to spend on the sponge cleaning product as a measure of consumer attitudes. In the second model, willingness to purchase the product at $29.99 was utilized as the dependent variable. For the second model, serial mediation was examined using logistic regression.

Multiple covariates were controlled for in the mediation model. Variables were included as covariates in the model if they were (a) known to be correlated with racial group and cleanliness or (b) could be reasonably expected to correlate with these variables either directly or indirectly through other correlated variables. Covariates that were added to the model included the Padua Inventory Contamination Scale, which covaries with both race and cleanliness concerns [32]. It is critical to include contamination concerns as a covariate in the model, since we are specifically interested in whether cleanliness attitudes per se, as opposed to variables that are associated with pathological concerns with contamination, are associated with purchasing attitudes. Neuroticism and conscientiousness correlate with neatness [11] and were thus included as additional covariates in the model. Demographic covariates in the model included age, yearly income, and education level.

Mediation models were computed utilizing PROCESS, which is a mediation and moderation SPSS add-ons [9]. To test mediation effects, we followed the bootstrapping method, utilizing 5000 iterations [9, 21]. The bootstrapping procedure tests the null hypothesis that the indirect path from the independent to the dependent variable via the mediators does not significantly differ from zero. If zero is not contained within the confidence intervals (CI) computed by the bootstrapping procedure, one can conclude that the indirect effect is indeed significantly different from zero at \( p < 0.05 \). In addition to the confidence intervals, \( p \) values based on the Sobel method for evaluating the significance of an indirect effect were also utilized.

## Results

### Correlations between Measures

Table 1 presents zero-order correlations between measures used in this study, separately for racial groups. General cleanliness attitudes were correlated with the Padua contamination subscale, the attitudes toward sponges scale, neuroticism, conscientiousness, and ratings of product worth. Neuroticism was associated with key variables such as general cleanliness and the Padua scale. Conscientiousness was associated with sponge concerns and general cleanliness. Because neuroticism and conscientiousness were associated with key outcome variables, they were entered as covariates in the mediation model. Sponge concerns were also associated with conscientiousness and age.

### Attitudes Toward the Cleanliness of Sponges Scale

Attitudes toward the cleanliness of sponges were significantly correlated with general cleanliness attitudes, the Padua contamination scale, and conscientiousness (see Table 1). Attitudes toward sponges also correlated with age, indicating that these concerns are less common among younger participants.

### Race as Predictor of Cleanliness Attitudes

Seventeen percent of African American participants reported a willingness to purchase the sponge cleaning product for $29.99, compared to 10% of European American participants, \( \chi^2(1, N = 500) = 5, p = .024 \). No significant differences between African Americans \( (M = 14.0, SD = 8.5) \) and European Americans \( (M = 13.0, SD = 8.2) \) were observed when a continuous measure was utilized to assess how much participants were willing to spend on the sponge cleaning product \( t(498) = 1.2, p = .21 \).

African Americans \( (M = 3.23, SD = .50) \) had more general cleanliness concerns compared to European Americans \( (M = 2.76, SD = .48), t(498) = 9.7, p < .001 \). African Americans \( (M = 3.06, SD = .91) \) also had more sponge cleanliness concerns compared to European American \( (M = 2.62, SD = 1), t(498) = 4.8, p < .001 \). African Americans \( (M = 3.08, SD = .73) \) scored higher on the Padua contamination scale compared to European American \( (M = 2.55, SD = .80), t(498) = 6.9, p < .001 \). No racial differences were observed in neuroticism \( t(498) = .03, p = .97 \), or conscientiousness, \( t(498) = .38, p = .7 \).

### Serial Mediation Model

The weights for the paths in the serial mediation models are presented in Table 2.

The models were consistent in showing that the 95% confidence interval for the direct effect \( (c') \) between race and consumer attitudes always included zero, \( p \) (model 1) = .187, \( p \) (model 2) = .437.

For the indirect effect, with general cleanliness attitudes as the single mediator \( (Path a'd') \), the 95% confidence interval included zero, indicating that general cleanliness attitudes alone is not a significant mediator of the association between racial group and purchasing attitudes. The models were also consistent in showing that the attitudes toward sponges as the single mediator \( (Path b'a') \) was also not a significant mediator.
of racial group on purchasing attitudes, as the 95% confidence interval included zero in both models.

The serial mediation path (Path a 1a 2 a 3) was significant with both purchasing attitudes outcome variables (i.e., 95% confidence interval did not include zero), indicating that the indirect effect for serial mediation was significantly different from zero at the $p < .05$ level. Reversing the order of the serial mediators resulted in non-significant indirect effects. These results show that African Americans have an increased interest in cleanliness, which in turn affects attitudes toward specific kitchen cleaning products, leading to a willingness to spend more money on those products.

### Discussion

#### Interpretation of Findings

African Americans were significantly more likely to report being willing to purchase a $29.99 sponge cleaning product compared to European Americans. Specifically, 17% of African Americans reported being willing to spend $29.99 on a sponge cleaning product compared to 10% of European Americans. These differences in purchasing attitudes toward cleaning products between African and European Americans were fully mediated by two serial mediators: general cleaning Table 1 Serial mediation results

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product worth</td>
<td>–</td>
<td>.417**</td>
<td>.203**</td>
<td>.135**</td>
<td>.142*</td>
<td>.051</td>
<td>−.115</td>
<td>.069</td>
<td>.108</td>
</tr>
<tr>
<td>Sponge concerns</td>
<td>.289**</td>
<td>–</td>
<td>.378**</td>
<td>.234**</td>
<td>.014</td>
<td>.208**</td>
<td>−.082</td>
<td>−.048</td>
<td>.206**</td>
</tr>
<tr>
<td>Cleanliness attitudes</td>
<td>.181*</td>
<td>.295**</td>
<td>–</td>
<td>.581**</td>
<td>.114**</td>
<td>.299**</td>
<td>−.057</td>
<td>−.075</td>
<td>.080</td>
</tr>
<tr>
<td>Padua OCD cleanliness subscale</td>
<td>.111</td>
<td>.144</td>
<td>.509**</td>
<td>–</td>
<td>.153**</td>
<td>.130*</td>
<td>−.056</td>
<td>.009</td>
<td>.066</td>
</tr>
<tr>
<td>Neuroticism subscale</td>
<td>−.073</td>
<td>−.080</td>
<td>.197**</td>
<td>.215**</td>
<td>–</td>
<td>−.362**</td>
<td>−.041</td>
<td>−.217**</td>
<td>−.219**</td>
</tr>
<tr>
<td>Conscientiousness subscale</td>
<td>.049</td>
<td>.278**</td>
<td>.108</td>
<td>−.019</td>
<td>−.434**</td>
<td>−</td>
<td>.017</td>
<td>.082</td>
<td>.207**</td>
</tr>
<tr>
<td>Education</td>
<td>−.015</td>
<td>.108</td>
<td>−.026</td>
<td>−.036</td>
<td>.026</td>
<td>.123</td>
<td>–</td>
<td>.349**</td>
<td>.036</td>
</tr>
<tr>
<td>Annual salary</td>
<td>.149*</td>
<td>.065</td>
<td>.150*</td>
<td>.045</td>
<td>−.126</td>
<td>.015</td>
<td>.197**</td>
<td>–</td>
<td>.130*</td>
</tr>
<tr>
<td>Age</td>
<td>−.026</td>
<td>.202**</td>
<td>.066</td>
<td>−.061</td>
<td>−.282**</td>
<td>.337**</td>
<td>.014</td>
<td>.050</td>
<td>–</td>
</tr>
</tbody>
</table>

**Note:** The correlations above the diagonal are the European American group. The correlations below the diagonal are the African American group. **$p < .01$; *$p < .05$**
attitudes and concerns about the cleanliness of sponges. African Americans had greater cleanliness concerns compared to European Americans relating to both of these mediators. These results show that African Americans are more concerned about general cleanliness, and to the extent that they are more concerned about general cleanliness, their specific concerns about the cleanliness of kitchen cleaning products such as sponges increases. In turn, to the extent that cleanliness concerns about sponges increase among African Americans, they are more likely to want to purchase a sponge cleaning product and to spend more money on that product. A number of other variables were shown to be associated with cleanliness concerns and purchasing attitudes, including annual salary, age, conscientiousness, and neuroticism. These variables were included as covariates in the mediation model.

Previous studies have shown that African Americans have greater general cleanliness concerns compared to European Americans. Initial research into this issue was borne out of an apparent racial disparity, where African Americans endorsed contamination ideation items on obsessive compulsive disorder (OCD) measures at a higher rate compared to European Americans. These indicators of OCD in the African American population did not appear to be valid however, as they did not predict actual OCD occurrence among African Americans (see [31, 32]). Further research into this apparent discrepancy using item analysis of the OCD scales revealed that ethnic differential outcomes on contamination measures were due primarily to items that related to cleanliness concerns and were not associated with pathology. When OCD items were used as covariates, non-pathological cleanliness concerns items completely accounted for the racial differences in the OCD measure. Indeed, African Americans with no OCD scored as high on cleanliness items as White participants who had been diagnosed with OCD [32].

To make sure that the effects observed in this study are not driven by contamination concerns, but instead reflect non-pathological cleanliness attitudes, the Padua contamination scale was used as a covariate in the mediation models. Overall, our results showed that increased non-pathological cleanliness-related concerns among African Americans lead to increased concerns about the cleanliness of kitchen sponges and are associated with a greater willingness to purchase sponge cleaning products.

Because of the importance that the cleanliness of sponges has on food contamination, we developed the Concerns Toward the Cleanliness of Sponges scale to examine whether the general cleanliness attitudes that are assessed by the Cleanliness and Grooming Attitude scale are a mediator for attitudes and behaviors that are directly relevant to public health. Our data shows that general cleanliness attitudes are directly associated with the greater levels of concern toward the cleanliness of kitchen items that can spread disease, and the greater willingness to purchase such products, among African Americans. Our results thus provide an important extension of previous findings in that we show that general cleanliness attitudes among African Americans affect health-relevant consumer cognitions.

We want to be clear that we do not believe that the differences we have observed in this investigation are due to any inherent differences between racial groups, but rather reflect cultural differences that are correlated with race [32]. In terms of why groups may differ with respect to cleaning attitudes, it has been hypothesized that because of historical attitudes concerning segregation, which justified separation of races on the presumption that Whites could become contaminated by sharing facilities with people of color, African Americans have attempted to compensate by adopting excessive cleaning practices [33]. One study illustrated this via a behavioral avoidance task, finding that African Americans were more likely to avoid touching items in a public restroom after being primed with Jim Crow images [17]. Another possibility is that African values and practices placed a greater importance on avoiding contaminants for religious [37], social, or medical reasons, which in turn remain a part of African American culture today.

**Public Health Implications**

The results presented here may suggest that food-borne illness should be less frequently observed among African Americans compared to the European American population. Increased concerns about general cleanliness and increased specific concerns about kitchen objects that can spread food-borne disease such as the kitchen sponge may have an impact on cleanliness behaviors and can lead to a cleaner food-handling environment, which may lead to overall reductions in the spread of food-related pathogens. A comprehensive recent review of racial and ethnic differences in food-borne illnesses is provided by Quinlan [22]. Consistent with this interpretation, studies show that rates of *Escherichia coli* infections are the lowest among African Americans [8]. *Campilobacter* infections are likewise lowest among African Americans compared to White, Asian, and Latino groups [24]. Listeria rates among African Americans are similar to Whites [22]; however, both Whites and African Americans have lower rates of Listeria infection compared to the Hispanic population [20, 28].

Taken together, this suggests that higher cleanliness concerns among African Americans may lead to lower rates of at least some forms of food-borne illness. Public education about the dangers of food-borne pathogens posed by sponges should be focused on those at highest risk, such as White, Asian, and Hispanic American groups. Advertisements via major media outlets would be an effective way to reach European Americans, but messages would likely need to be culturally tailored for Asian and Hispanic Americans (i.e., Spanish-language public service messages, educational presentations...
in Asian American communities, etc.). However, much more research is needed to better understand the role that cleanliness attitudes may play in the rates of specific food-borne infections.

**Conclusion**

In conclusion, our results show that African Americans are more sensitive to issues of cleanliness compared to European Americans, and in particular that they are more sensitive to cleanliness of kitchen items such as the sponge, that can be vectors of food-borne pathogens. Whether these cleanliness-related concerns mediate the rate of food-borne illnesses in the African American community however is not known and should be further investigated in future studies. A combination of cultural practices, food-handling practices and attitudes, and cleanliness practices and attitudes, as well as food-handling practices at the retail level are likely to contribute to the overall explanation as to why racial differences in the rate of food-borne illness emerge. The extent to which each of these factors can account for observed differences in food-borne illness can help inform public health campaigns. As such, future studies should more closely examine the specific ways in which cleanliness attitudes may mediate rates of food-borne illness.

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**Compliance with Ethical Standards**

**Conflict of Interest** Leib Litman, Monnica T. Williams, Zohn Rosen, Sarah Weinberger-Litman, and Jonathan Robinson declare that they have no conflict of interest.

**Studies Involving Human Participants** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**References**


