A 2-part study examines the influence of normative messages on college males’ hand washing perceptions and behaviors. Study 1 tests for the appropriateness of hand washing as a target of social norms campaigns and tests messages designed to change perceived descriptive norms. Results indicated that hand washing behavior is appropriate for health promotion through normative influence. Study 2, a field experiment observing frequency and efficacy of hand washing behaviors, manipulates behavioral privacy and normative messages in public restrooms. Results provided no evidence for the hypothesis that social norms should be most influential for publicly enacted behaviors. Messages increased hand washing frequency, length of time water was run, and attitudes relative to control. Across all conditions, poor-quality hand washing was evidenced.

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The social norms approach is often used for the development of messages designed to modify perceived norms and associated behaviors in a variety of domains. In the main, this literature consists of large-scale campaigns or message-testing experiments in which researchers manipulate the normative information presented to message recipients and assess the impact of this information on subsequent attitudes and behaviors. Wechsler, Seibring, Liu, and Ahl (2004) reported that social norms campaigns had been adopted by nearly half of all colleges and universities in the United States to promote healthy and prosocial behaviors across campuses, primarily in efforts to reduce excessive drinking. These studies generally predict main effects for normative information on behavior with mixed results; some indicating a substantial link between social norms and behavior (e.g., Atkin, Martell, Smith, & Greenamyer, 2004; Bator & Cialdini, 2000; Smith, Atkin, Martell, Allen, & Hembroff, 2006), others reporting no impact on attitudes (e.g., Bagozzi, Wong, Abe, & Bergami, 2000;
Kallgren, Reno, & Cialdini, 2000) or behavior change in the opposite of the predicted direction (Campo & Cameron, 2006; Wechsler et al., 2003).

To explain these mixed effects, researchers have considered not only the main effects of normative influence but also the moderators of the norm–behavior relationship (Lapinski & Rimal, 2005; Rimal, 2008). This article presents the results of two studies that seek to extend efforts in this direction by isolating a potential moderator of this relationship, behavioral privacy, and testing its combined effects with descriptive norms messages using a field experiment in which hand washing frequency and quality are the observed dependent variables.

Social norms and behaviors

Extensive theoretical work has addressed the role of social norms in predicting individual behaviors. The theory of reasoned action (Ajzen & Fishbein, 1980), focus theory (Cialdini, Reno, & Kallgren, 1990; Reno, Cialdini, & Kallgren, 1993), and the theory of normative social behavior (TNSB; Rimal & Real, 2005), all discuss the influence of social norms on behaviors. These theories address different types of norms that play various roles in influencing behaviors. As described by Park and Smith (2007), “pressure from one’s reference groups (i.e., subjective norms) can be differentiated from approval (i.e., injunctive norms) and popularity (i.e., descriptive norms), and these norms are further separated to personal and societal levels” (p. 198). Social descriptive norms are of particular interest in this study. Most successful social norms campaigns to promote behavior change among members of a population of interest have designed messages based on the descriptive norm (e.g., Lapinski, Rimal, DeVries, & Lee, 2007; Stewart et al., 2002).

Furthermore, some evidence suggests that although injunctive norms influence behavior, changing the perceptions of a descriptive norm is much easier than changing perceptions of an injunctive norm with exposure to a single message (Lapinski et al., 2008). This suggests that descriptive norms messages may be more effective in limited exposure social norms campaigns. Thus, messages used in this study are limited to descriptive normative content, rather than expanding into information about injunctive and subjective norms.

Descriptive norms were originally termed in Cialdini et al.’s (1990) focus theory to delineate what is commonly done within a given context. Descriptive norms are thought to promote behavior by providing information about the adaptive behavior in a particular situation (Reno et al., 1993) and serve as a decisional shortcut for behavior (Cialdini et al., 1990). Cialdini (2007) has pointed out that when a behavior is prevalent, people assume that engaging in the behavior must be the wise thing to do and, thus, will be more likely to do it.

Much of the support for the connection between descriptive norms and behavior has been limited to examining the association between existing perceptions of descriptive norms and self-reported behavior using cross-sectional survey designs (e.g., Borsari & Carey, 2003; Neighbors, Lee, Lewis, & Fossos, 2007; Rimal & Real,
Several studies have attempted to manipulate perceptions of descriptive norms experimentally (e.g., Barnett, Far, Mauss, & Miller, 1996; Campo & Cameron, 2006; Cialdini et al., 1990; Goldstein, Griskevicius, & Cialdini, 2007), and some experimental studies have included manipulation checks of normative perceptions (e.g., Lapinski et al., 2007; Smith et al., 2006) to determine whether changes in normative beliefs are linked with behavioral outcomes.

Controlled experiments designed to test the effects of descriptive norms may have limited external validity, however (e.g., Lapinski et al., 2007). Moreover, in field experiments without manipulation checks, alternative explanations for findings are plausible (e.g., Cialdini et al., 1990). In Lapinski et al.’s work, laboratory message-testing experiments did not approximate real-world message exposure in that participants were asked specifically to evaluate a message instead of being left to notice the message in their own environment. In Cialdini et al.’s field experiments, whether normative perceptions or some other variable was manipulated was not clear.

To overcome the methodological shortcomings of previous research, this article presents two studies including a lab experiment and a field experiment to examine the connection between manipulated descriptive norms and behavior. The design includes a manipulation check to improve confidence that behavioral differences can be attributed to the experimental induction and not other factors. The study, however, was also designed to maximize experimental realism. This study also expands the scope of TNSB by examining the role of behavioral privacy as a moderator of the descriptive norm–behavior relationship.

Before conducting the field experiment, several questions regarding the appropriateness of the topic of hand washing for a social norms intervention were addressed. Steps were also taken to ensure that the potential messages actually modified perceptions of descriptive norms among members of the population of interest. Study 1 was designed to achieve this.

**Study 1**

The goal of Study 1 was to provide the data necessary to design a social norms campaign (Smith et al., 2006) and to test the effectiveness of messages designed to modify perceptions of descriptive norms. Social norms campaigns are typically appropriate when there are misperceptions among the population of interest with regard to the behavior being promoted. Berkowitz (2004) categorized these misperceptions into three types. Pluralistic ignorance (Prentice & Miller, 1986), the most common type of misperception, refers to instances in which the majority of members of the population of interest hold healthy attitudes, and/or engage in healthy behaviors, but they mistakenly believe that most others in the population hold different attitudes and/or engage in different behaviors from themselves. False consensus occurs when the minority of members of the population hold unhealthy attitudes and engage in unhealthy behaviors and they mistakenly believe that most members in the population...
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hold similar attitudes and engage in similar behaviors as themselves. False uniqueness occurs when individual members of the majority in the population of interest who hold healthy attitudes and engage in healthy behaviors feel that the difference between their own attitudes and behaviors and the attitudes and behaviors of the majority of the population are more different than they are. The purpose of a descriptive social norms campaign is to eliminate these misperceptions by communicating the actual prevalence of an attitude or behavior within a population, thereby reducing the likelihood of people engaging in the unhealthy behavior.

There are attributes of certain behaviors that are believed to make the enactment of these behaviors more or less susceptible to normative influence (Lapinski et al., 2007; Rimal, Lapinski, Turner, & Smith, 2011). Hand washing was selected as the focus of this study because the behavior has characteristics that may make it susceptible to normative influence. First, hand washing is a behavior that can be enacted publicly, which may make normative influence more salient (Lapinski & Rimal, 2005). Moreover, data suggest that hand washing rates in the general population studies are less than optimal, but above 50%; with some studies indicating 77% of men wash their hands after using a public restroom, in comparison to 93% of women (American Society for Microbiology, 2010). Finally, effective hand washing is a behavior that has substantial public health outcomes (Centers for Disease Control and Prevention [CDCP], n.d.), thus making it an important focus of study.

Hand washing in men’s restrooms was identified as a focal behavior because of its potential for theoretical and practical import; the theoretical import is discussed in Study 2 in some detail. To determine further the appropriateness of hand washing in male restrooms for a social norms campaign, a research question about the existence of a mismatch between normative perceptions and prevalence of the behavior was posed:

RQ1: How do male college students’ self-reported hand washing behaviors compare to perceptions of hand washing prevalence in the population of male students on campus?

Normative messages and potential confounds

Communicating the prevalence of behavior among the population of interest is not likely to affect behavior if message recipients do not interpret the normative information in the message correctly. Field experiments may have limited internal validity because the real-world setting in which data are collected contains a number of uncontrolled alternative explanations to outcomes observed. To eliminate obvious alternative explanations, Study 1 was designed to determine whether the messages influenced the normative beliefs of the target audience. A number of other potential confounding factors were also examined to rule them out as plausible alternative explanations for the nature of the data obtained.

Previous research has successfully manipulated perceived descriptive norms (e.g., Lapinski et al., 2007) by modifying information about the prevalence of a behavior among group members. To test whether participants’ normative beliefs
were influenced by normative information, we designed two separate messages: one demonstrating a high prevalence of hand washing (four of five students) and one demonstrating a low prevalence of hand washing (one of five students). Consistent with these messages, we posed the following hypotheses:

H1: Participants who receive high-prevalence norm messages will perceive that the message indicates a higher prevalence of hand washing in the population than participants who receive low-prevalence norm messages.

Humor was used as a tool to gain attention to the messages (Markiewicz, 1974) by varying the referent groups pictured. Research on the social identification approach suggests that including both in-group and out-group members to highlight differences in behavior will increase the likelihood that people will be likely to favor their group identities over their personal identities (Turner, 1982), which has been shown to facilitate conformity to perceived group norms (Hogg & Reid, 2006). People are likely to be influenced by the norms of groups with whom they identify and unlikely to be influenced by the norms of groups with whom they do not identify (Rimal & Real, 2005). Based on this, messages were designed using pictures of in-group and out-group members to demonstrate the prevalence of hand washing. The high-prevalence norm message inferred that most members of one’s in-group wash their hands when using the restroom. The low-prevalence norm message inferred that most members of one’s out-group do not wash their hands when using the restroom.

To determine the impact that the additional variable of group composition (the use of in-group and out-group members) had on message interpretation, Study 1 tested two versions of each type of message: a version in which all five college students depicted in the poster wore hats from the university at which the study was conducted, and one in which either four of five (in the high-prevalence norm condition) or one of five (in the low-prevalence norm condition) wore hats from the university at which the study was conducted. All others pictured in the posters wore hats from a rival university.

Messages in which all students pictured wore hats from the university at which this study was conducted are referred to as the homogeneous condition, and messages in which some students wore hats from the university at which the study was conducted and some wore hats from a competing university are referred to as the heterogeneous condition. Because group composition in the messages was varied (either a homogeneous group of all in-group members or a heterogeneous group with in-group and out-group members) but not the focus of the main study, examining the role of the group composition on normative perceptions and group identification was critical.

RQ2: Will group homogeneity in message content influence perceptions of descriptive norms?

RQ3: Will group homogeneity in message content influence group identification?
Cialdini (2007) has argued that people use normative information as a heuristic guide to behavior. Research in information processing suggests that the degree to which people process information heuristically is highly dependent on their motivation or involvement with the issue (e.g., Chaiken, 1980; Petty & Cacioppo, 1979). Thus, because message recipients’ levels of involvement with hand washing may have implications for normative influence, the following research question was asked:

RQ4: What are participants’ levels of involvement with hand washing?

Finally, given the proposed field experiment for Study 2, as noted previously, humor was used as a mechanism for gaining attention to the messages (Markiewicz, 1974). The degree to which messages were considered humorous, however, may differ by message, introducing a confound to the assessment of the effectiveness of the social norms messages. Therefore, to control for this variable in the subsequent experiment, perceived humorousness of the message (Glazer & Smith, 2004) was included as a measured variable to determine whether any of the message conditions were considered more humorous than the others.

RQ5: Will messages vary in perceived humorousness?

Method

Participants
Participants in Study 1 were 80 male students enrolled in undergraduate communication courses at a large university in the Midwestern United States. Most participants who reported race or ethnicity self-identified as White/Caucasian (35.1%), 15% African American/Black, 1.3% Asian, 9.1% other, and 38.8% did not report race or ethnicity. Participants’ ages ranged from 18 to 32 (M = 21.33, SD = 2.31). Students received extra credit in the course in exchange for their participation.

Design
A 2 (descriptive norm: high prevalence vs. low prevalence) by 2 (group composition: homogeneous vs. heterogeneous) between-subjects design was employed. Participants were randomly assigned to conditions. All messages and measures were pilot tested (N = 79) before study implementation resulting in modifications to the message content (see Lapinski et al., 2008, for more detail on message modification); thus, pilot data were not included in the Study 1 results. Pilot data may be obtained from the authors on request.

Messages
Study messages were color posters in which the message content varied the descriptive norm, and the pictorial content varied group composition. Each poster contained a descriptive norm message and a picture of either a homogeneous group of males from participants’ university (in-group) or a heterogeneous group of males composed of four in-group members and one out-group member from a rival university. The CDCP guidance for effective hand washing appeared at the bottom of all posters.1
**High-prevalence message.** The poster with the high-prevalence message depicted the backs of five males who appear to be college students in a restroom facing urinals. In the heterogeneous group condition, four of these men were wearing backward baseball caps from the university at which the study was conducted and one person was wearing a backward baseball cap from a rival university. In the homogeneous group condition, all the men were wearing backward baseball caps from the university at which the study was conducted. The text at the bottom of the poster read, “Four out of five college students wash their hands EVERY time they use the bathroom.”

**Low-prevalence messages.** The poster with the low-prevalence message depicted the backs of the same five males who appear to be college students in a restroom facing urinals. In the heterogeneous group condition, one of these men was wearing a backward baseball cap from the university at which the study was conducted and four men were wearing baseball caps from a rival university. In the homogeneous group condition, all men were wearing backward baseball caps from the university at which the study was conducted. The text at the bottom of the poster read, “One out of five college students wash their hands EVERY time they use the bathroom.”

**Measures**

All items were 5-point Likert-type and subject to confirmatory factor analysis unless otherwise noted. The CFA approach we used was that outlined by Hunter and colleagues (e.g., Hunter & Gerbing, 1982). Theory that was specified a priori drove the development of the items and the subsequent measurement model tests. Item removal was based on errors between predicted and obtained inter-item correlations and size of factor loadings. This technique involves establishment of both internal consistency and parallelism (see Levine, Hullett, Turner, & Lapinski, 2006). All study items may be accessed in the online version of this article.

**Prevailing descriptive norm.** Participants were asked what percentage of students at their university had washed their hands most of the time in various contexts (e.g., after using the bathroom, blowing nose, and before cooking) in the previous month. These items were modified from a work by Lapinski et al. (2007; e.g., “What percentage of men at [University Name] do you think wash their hands every time they use the bathroom?”). Answers were open-ended. The specific trigger events (i.e., times when CDCP recommends hand washing) are presented in Table 1.

**Self-report behavior.** Participants were asked what percentage of the time they washed their hands for various events during the previous month; these items mirrored the prevailing descriptive norm questions but asked people to report their own behavior.

**Issue involvement.** Four Likert-type items adapted from previous research (Lapinski, 2000) were used to measure issue involvement. CFA indicated a three-item unidimensional solution when one item was removed from the scale ($M = 3.47$, $SD = 0.76$, $\alpha = .72$). Higher scores indicated higher involvement with hand washing.
Table 1 Prevailing Descriptive Norms for Hand Washing and Self-Reported Hand Washing Behaviors in Study 1

<table>
<thead>
<tr>
<th>In the Last Month, What Percentage of Male Students (Prevailing Descriptive Norm)/Percentage of Time Did You (Self-Reported Behavior) Wash Hands?</th>
<th>Prevailing Descriptive Norm</th>
<th>Self-Reported Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
</tr>
<tr>
<td>After going to the bathroom</td>
<td>80</td>
<td>52.19</td>
</tr>
<tr>
<td>After coughing or sneezing</td>
<td>80</td>
<td>18.05</td>
</tr>
<tr>
<td>After eating or drinking</td>
<td>80</td>
<td>18.33</td>
</tr>
<tr>
<td>After handing dirty equipment/utensils</td>
<td>80</td>
<td>48.78</td>
</tr>
<tr>
<td>After using a tissue to blow nose</td>
<td>80</td>
<td>23.18</td>
</tr>
<tr>
<td>Before preparing food</td>
<td>80</td>
<td>75.11</td>
</tr>
</tbody>
</table>

Group identification. To assess identification with the referent group, four Likert-type items were used for “(University Name)” as the source of identification (e.g., “Being a (University Name) student is an important part of my identity”). CFA indicated a two-item unidimensional solution ($M = 3.58$, $SD = 0.82$, $\alpha = .72$). Higher numbers indicated greater identification.

Perceived descriptive normative content in the message. A modified version of the 5-point Likert-type descriptive norms items from Lapinski et al. (2007) was used. The items addressed the content of the message. One item was dropped due to unreliability, resulting in a two-item scale ($M = 3.01$, $SD = 1.07$, $\alpha = .85$). Higher numbers indicated higher perception of descriptive norm in messages content.

Humor. Humor was measured using six Likert-type items adopted from the study by Glazer and Smith (2004). CFA indicated a six-item unidimensional solution ($M = 3.38$, $SD = 0.94$, $\alpha = .92$). Higher numbers indicated greater humor perceived in the message.

Results
Research Question 1
The first research question addressed participants’ perception of the descriptive norm in the population relative to their self-reported behavior in the month before the study. Participants estimated that 52.19% of men ($SD = 21.34$) washed their hands every time they used the bathroom. According to their self-reported behavior, however, participants washed their hands on average 73% of the time.

Hypothesis 1 and Research Question 2
Hypothesis one predicted that participants who received a high-prevalence message would perceive a higher descriptive norm than those who received a low-prevalence message; RQ2 addressed the role of group heterogeneity in this relationship. A two-way (Prevalence $\times$ Group Composition) analysis of variance (ANOVA) was
computed to compare the effects of the two inductions and their interactions on participants’ perceptions of descriptive normative content in the message. A significant main effect for prevalence was found, $F(1, 75) = 11.47, p < .001, \eta^2_p = .13$. Participants who received a high-prevalence message ($M = 3.39, SD = 0.83$) perceived that the message depicted a high prevalence of hand washing among men significantly more than participants in the low-prevalence message condition ($M = 2.63, SD = 1.15$). There was no significant main effect for group composition ($p = .50$) and no significant interaction between prevalence message and group composition on perceptions of message content, $p = .93$.

Research Question 3
A two-way (Prevalence $\times$ Group Composition) ANOVA indicated no main effects for group composition ($p = .40$) or prevalence ($p = .19$) on the degree to which participants identified with the hand washers in the pictures. There was also no significant interaction between prevalence and group composition on the degree to which participants identified with the hand washers, $p = .29$.

Research Question 4
The fourth research question asked whether participants were psychologically involved with hand-washing behaviors. The mean score for issue involvement was not particularly high, ($M = 3.39, SD = 0.73$), suggesting that participants may be more likely to use heuristic processing on this issue, rather than scrutinizing the information presented.

Research Question 5
A two-way (Prevalence $\times$ Group Composition) ANOVA testing for the effects of these variables on perceived humor of the message indicated small, but significant main effects for group composition, $F(1, 75) = 5.25, p = .03, \eta^2_p = .07$, and prevalence, $F(1, 75) = 7.98, p = .01, \eta^2_p = .10$, on perceived humorousness of the message. The heterogeneous group was viewed as more humorous than the homogeneous group, and the high-prevalence message was considered more humorous than the low-prevalence message. There was no significant interaction between prevalence and group composition, $p = .09$.

Discussion
Study 1 sought to answer several substantive questions about the nature of messages designed to influence normative beliefs and the appropriateness of hand washing as a topic for a social norms intervention among college men. A comparison of participants’ perceptions of the descriptive norm surrounding hand washing on campus to participants’ self-reported hand-washing behavior indicated that participants reported believing that few other males on campus wash their hands, but that they themselves wash their hands regularly.

There are several possible interpretations of this information. One is that pluralistic ignorance about the prevalence of hand washing behaviors exists; that is, hand
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washing is actually more prevalent than people believe making this issue one in which normative misperceptions can be corrected. The other is that self-reported hand washing is inflated; observational data in general population studies suggest that hand washing rates and self-report data often do not match (American Society for Microbiology, 2010). In either case, rates of reported hand washing found here and in other data reviewed indicate opportunity for improvement in washing frequency.

In line with the predictions, participants in the high-prevalence condition perceived the descriptive norm conveyed in the messages they received to be significantly higher than those in the low-prevalence conditions. This finding lends confidence in the attempt to manipulate descriptive normative perceptions using message content. Participants did not infer that the message showing an in-group member as the sole hand washer among five students as indicative that most members of their in-group washed their hands after using the bathroom.

Findings for group composition indicate that modifications of the composition of the group members pictured in the poster (by testing homogeneous and heterogeneous messages) did not result in significant effects on normative perceptions or on group identification. As a result, this variable will not be considered in the design of Study 2, and the messages will remain the same. Main effects for both manipulated variables on perceived message humor warrant additional consideration in the second study.

The findings for involvement indicate mean scores are moderate with most clustering around the midpoint pointing to the possibility that information about this issue may be processed primarily heuristically, making this population susceptible to influence of normative content in messages (Cialdini, 2007). This provides additional evidence for the choice of hand washing as an appropriate topic for testing normative influence.

The combination of the findings from Study 1 is promising from a formative standpoint, but does not address the norms-related questions that led to the initiation of this research. A second study was designed to determine whether these messages could modify people’s actual hand washing behavior, and whether one proposed moderator of the descriptive norm–behavior relationship, behavioral privacy, plays a role in the process.

Study 2
A field experiment was designed to test whether messages designed to modify perceived descriptive norms could affect hand-washing behavior in men’s public restrooms under private and nonprivate conditions. This work was guided by the experimental findings from TNSB (e.g., Lapinski et al., 2007) and focus theory (e.g., Cialdini et al., 1990), both of which indicate that simple behaviors can be modified with normative information indicating high prevalence. The dependent variables of interest in this study were observed frequency of hand washing (whether participants washed their hands) and quality of hand washing (defined as the extent to which
participants washed their hands consistent with CDCP’s guidance for hand washing). Thus, Hypothesis 1 was advanced to examine whether the main effects for descriptive norms (e.g., Cialdini et al., 1990) replicate with hand washing behaviors.

H1a: Participants in the high-prevalence message condition will be more likely to wash their hands after going to the bathroom than participants in the low-prevalence and control message conditions.

H1b: Participants in the high-prevalence message condition will exhibit better quality of hand washing than participants in the low-prevalence and control conditions.

Aside from normative messages affecting normative perceptions and behaviors as predicted in focus theory, there is evidence for the influence of social norms on attitudes (e.g., Lapinski et al., 2007). Accordingly, we predict attitudes toward hand washing will be influenced by prevalence messages such that higher prevalence messages will result in more positive attitudes toward hand washing than low-prevalence messages:

H2: Participants in the high-prevalence message condition will have more positive attitudes toward hand washing than participants in the low-prevalence message and control conditions.

Behavioral privacy
One factor that may play a moderating role in the influence of normative messages on behaviors is the whether the behavior is enacted in the presence of other people or in private (Bagozzi et al., 2000; Lapinski & Rimal, 2005). If the mere presence of others can influence behavior, researchers need to determine whether normative influence attempts have differential effects depending on whether the behavior is enacted privately or in the presence of a visible other (Lapinski & Rimal, 2005). Some behaviors are typically enacted in complete or almost complete privacy (e.g., condom use and dental hygiene). These behaviors cannot be scrutinized by others, making it difficult for one to form impressions of the behavioral prevalence of an action due to the lack of direct observation.

Moreover, social sanctions are unlikely to be attached to the performance (or nonperformance) of the behavior because members of the social system would not have the opportunity to observe the enactment of the behavior. Indeed, members of the social system might only have knowledge of the behavior through communication on the part of the actor, which may or may not be shared and may or may not accurately reflect actual behaviors. Thus, normative pressure should be less significant for private behaviors.

Other behaviors, however, are enacted regularly in the context of other people (e.g., hand washing in public restrooms and eating). Both these allow for the observation of others’ behaviors to influence normative perceptions (e.g., One can observe whether others wash their hands after using the bathroom), and leave one’s own
behavior open to public scrutiny. When scrutiny is likely to be high, the pressure to conform to normative influences should also be high (Lapinski & Rimal, 2005). Thus, the presence of others is likely to increase the influence of perceived norms on behavior compared with when there is no referent other present (Bagozzi et al., 2000). Furthermore, normative messages should make the role of norms more salient and increase the magnitude of normative influence.

H3a: Behavioral privacy will moderate the normative message–behavior relationship such that participants will be more likely to wash their hands in the high-prevalence message, visible other present condition than in other experimental conditions.

H3b: Behavioral privacy will moderate the normative message–behavior relationship such that participants will have better quality of hand washing in the high-prevalence message, visible other present condition than in the other conditions.

Method
A 2 (privacy condition: visible other present/private) × 3 (message type: high-/low-descriptive norm/no message control) independent groups field experiment was employed to test the hypotheses. The observed dependent variables were quantity and quality of hand washing and attitudes; manipulation check variables were measured via self-report.

Participants
Observations were completed for 252 men who used a men’s restroom in the center of a large college campus in the Midwestern United States; a subsample of participants completed the entire self-report questionnaire (n = 95); however, skip patterns and missing data for some questionnaire items can be noted by the variable degrees of freedom reported in the results section. When an individual entered and used the restroom, and the room was vacant of other people, he was selected as a participant. Men who entered the restroom but did not urinate or defecate or who entered with another person were not selected as participants. Participant ages for those who completed the questionnaire ranged from 18 to 62 years old (M = 25.57, SD = 9.54). Sixty-seven percent of the sample self-identified as White/Caucasian, 3.8% Black/African American, 17.9% Asian, 2.6% Latino, 5.1% Native American/Indian, and 2.6% did not answer the question. A chi square test of independence indicated that there was no significant relationship between washing one’s hands and agreeing to complete the survey, \( \chi^2(1) = .002, p = .967 \).

Behavioral privacy
Private behavior was construed as behavior the participant enacted when no one else was in view of the participant. In the private behavior condition (n = 144), an observer was stationed in a bathroom stall with the door closed, but had a partial view of the
sink to observe the hand-washing behavior of the participants. The observer was not clearly visible to participants. In nonprivate, or public condition, there was a visible other present \((n = 108)\). In this condition, a confederate was stationed inside of the restroom in view of the participant. The confederate pretended to be rubbing a stain out of his shirt, but did not stand near the sink, nor did he use the sinks or paper towels during the time the participant was in the bathroom. The observer was again stationed inside the stall with the door closed, and a partial view of the participant and the sink.

**Descriptive norm messages**
The two messages used in this study were the heterogeneous high- and low-prevalence messages described in Study 1. A no-message control condition was employed to determine the effects of the visible other present/private manipulation without messaging present. Before each data collection session, researchers removed all existing signs or posters from the bathroom. A randomization sheet was used to assign the descriptive norm condition (high prevalence \(n = 113\), low prevalence \(n = 66\), or control \(n = 73\)) for the experimental session and posters containing the messages were hung above the urinals, inside stall doors, and above each sink. The unequal cell size is due to variation in foot traffic during the times in which these data were collected. The posters were 8.5 by 11" in size and were mounted on foam board. Across the two message conditions, 89% of the subsample who completed the survey recalled seeing the posters. Six people in the control condition recalled seeing posters despite the fact that there were no posters in the room. The messages are described in detail in Study 1.

**Procedure**
All procedures were approved by the full institutional review board for the university in which the data were collected. These data were collected over a period of three regular session semesters. Message condition was randomly assigned by experimental session because the process of changing posters in an active bathroom was challenging. Participants were assigned to the public/private condition on entering the bathroom. Observers were in the bathroom before the participant entered it.

A researcher and the confederate remained outside of the bathroom, approximately 30 feet from the bathroom door, and waited for a participant to enter. Once a lone participant entered the bathroom, the researcher used a random numbers table to determine the privacy condition. In the condition in which a visible other was present, the confederate entered the bathroom immediately after the participant and stood 5 feet from the sinks pretending to scrub at a stain on his shirt. The confederate did not look at or speak with the participant but looked at his shirt. In the private condition, no one entered the bathroom after the participant. To prevent additional men from entering, a researcher stationed outside of the bathroom hung a sign on the bathroom door after the participant entered that stated, “Out of Order” or “Closed for Cleaning” and interceded if anyone tried to enter the restroom.

Once the participant entered the bathroom, the observer noted the participant’s behavior and completed the Observer Checklist (OC). The OC contained items assessing whether the participant washed his hands and the quality of hand washing. In all
conditions, the observer was instructed to observe participants at the bathroom sinks unobtrusively from a restroom stall with the door closed. This process was intended to reduce the likelihood that participants would feel their behaviors were being monitored. While in the stall, the observer had a view of the sinks and could monitor the frequency and quality of hand washing. The observers were rigorously trained on observational procedures. All observers completed practice observations in the field, which were not included in the final analysis; observers were blind to study hypotheses.

When the participant left the bathroom, the researcher approached him, explained that he was part of a study, and asked him to complete a survey. If the participant agreed to complete the survey, the researcher guided him away from the bathroom to a seating area and gave him a consent form and questionnaire containing the items designed to measure believability, perceived normative message content, perceived descriptive norms, attitudes toward hand washing, and a number of demographic items. Once the participant completed the questionnaire, he was thanked and debriefed. The researcher was stationed several feet from the bathroom and had no knowledge of whether participants had or had not washed their hands.

Measures

To bolster participation in the postobservation survey, the number of items measuring the variables was minimized. Previous studies have provided evidence for the validity of each of the scales from which the items used in this study were drawn. Confirmatory factor analytic procedures were performed on these items in Study 1 and in a series of pilot tests conducted before Study 1. The measurement results are available from the first author.

Dependent measures

Presence or absence of hand washing. Observers in the bathroom completed the OC for each person they observed, including whether the person washed their hands. A participant was considered to have washed his hands if the water was run for more than one second and the participant’s hand or hands entered the water. Washing was coded as did not wash hands = 0 or washed hands = 1.

Thoroughness of hand washing. The OC contained a list of behaviors that coincided with each of the CDCP recommended hand washing steps that were included in the poster. Participant behaviors were coded in terms of their conformity with the CDCP’s hand washing guidelines. These variables included time spent washing hands using a silenced stopwatch, soap usage, drying of hands with a paper towel, and use of paper towels to turn off the faucet. Whether participant used a stall or urinal and whether the participant defecated or urinated was also coded. For each of these factors, presence of the behavior was coded as a 1 and absence of the behavior was coded as a 0, with the exception of time spent washing, which was recorded in number of seconds.

Attitudes. Attitudes toward hand washing were assessed using three items from an attitude measure used in previous research (Lapinski et al., 2007), including “I
think hand washing after using the bathroom is a good idea,” “I feel strongly that washing your hands after using the bathroom is important,” and “I think washing your hands after going to the bathroom is important.” The reliability of the three items was acceptable ($\alpha = .92, M = 4.39, SD = 0.87$).

**Manipulation checks**
All manipulation check items were measured using 5-point Likert-type scales that ranged from strongly disagree to strongly agree.

*Perceived descriptive normative content in the message.* Participants’ perceptions of the normative content in the message were assessed using the same three-item measure that was used in Study 1. The reliability of these items was acceptable ($\alpha = .89, M = 3.17, SD = 1.01$).

*Believability.* The extent to which participants believed the statistics presented in the message was assessed using the item: “The statistics in this poster seemed believable.” Higher scores indicate greater belief in the statistics presented ($M = 3.31, SD = 1.05$).

*Perceived injunctive normative content in the message.* Participants were asked about their beliefs regarding the injunctive norms portrayed in the message [i.e., “The poster showed that men at (University Name) approve of hand washing.”]. Higher scores indicate a greater perceived injunctive norm ($M = 3.35, SD = 1.10$).

*Perceived descriptive norm.* Two items Lapinski et al. (2007) were used to assess participants’ perceptions of the descriptive norm of hand washing among men at the university: “I think that most men at (University Name) wash their hands when they use the bathroom” and “Most men at (University Name) wash their hands after using the bathroom.” Higher numbers indicated greater perceived descriptive norm. Previous CFA procedures, including tests of internal consistency and parallelism provide evidence for validity of the scale; the items were highly correlated ($\alpha = .91, r = .93, M = 2.97, SD = 1.11$).

*Humor.* Humor was measured using a single item (“I thought the poster was amusing”) from the scale adopted from the study by Glazer and Smith (2004), which was used in Study 1. Higher numbers indicated greater humor perceived in the message ($M = 3.78, SD = 1.03$).

**Results**

**Preliminary analyses**
Perceptions of the message manipulations were assessed using a series of two-way ANOVAs. Due to the significant differences in perceptions of message humor between the messages in the pilot test, a two-way (Prevalence × Privacy) ANOVA was computed to compare perceptions of message humor across all message conditions. No main effects for prevalence ($p = .87$), behavioral privacy ($p = .35$), nor an
interaction between them ($p = .12$) emerged. For this reason, humor was not considered in the rest of the analyses.

A two-way ANOVA (Prevalence $\times$ Behavioral Privacy) was calculated to test for differences in perceptions of normative message content as well as believability of the message. A significant main effect for message condition was found for perceptions of normative message content, $F(1, 84) = 63.58, p < .001, \eta^2_p = .43$. Participants in the high descriptive norm condition perceived that the content of the message they viewed indicated a high descriptive norm of hand washing among students at the university ($M = 3.75, SD = 0.80$) significantly more than participants in the low-descriptive norm condition ($M = 2.21, SD = 0.88$). No significant main effect was found for the privacy condition ($p = .80$), and there was no significant interaction between message condition and privacy condition with regard to participants’ perceptions of normative content on the message ($p = .20$).

A similar trend was found for perceived descriptive norm. Participants in the high-prevalence condition reported greater perceived prevalence of hand washing ($M = 3.18, SD = 0.94$) than participants in the low-prevalence condition ($M = 2.76, SD = 1.28$), but this effect did not reach statistical significance ($p = .07$) possibly due to the small sample size. There was no significant main effect for the privacy condition ($p = .08$), or an interaction between privacy condition and message type ($p = .09$), on perceptions of descriptive norms.

A small but statistically significant main effect for message condition was found for believability of the message, $F(1, 83) = 9.81, p = .002, \eta^2 = .11$, such that participants in the low prevalence condition reported that the statistics used in the message were significantly more believable ($M = 3.78, SD = 0.81$) than participants in the high prevalence condition ($M = 3.07, SD = 1.06$). The main effect for privacy condition was not significant ($p = .88$) nor was the interaction between message and privacy conditions ($p = .20$) on believability of the messages.

**Hypothesis tests**

H1a, which was tested with the entire sample, predicted that a greater proportion of participants would wash their hands in the high-prevalence message condition than in the low-prevalence and control conditions. Across conditions, the majority of participants washed their hands (80%). Logistic regression was used to test for the effects of the manipulated variables on hand-washing frequency (wash/not wash); for message type, control group was the reference category, in the behavioral privacy condition, private condition was the reference category. Message believability was included as a covariate. These analyses indicated that the overall chi square for the model was significant, $\chi^2(4) = 10.22, p = .04$; Cox and Snell $R^2 = .10$.

Examination of the regression coefficients and Wald significance tests indicated that the message condition was the only significant predictor of whether a participant did or did not wash their hands when holding other variables in the model constant (Table 2). A review of a cross-tabulation table (Table 3) indicates that participants in
Table 2  Results of Logistic Regression Analysis for Study 2, Hypothesis 1a; Dependent Variable is Whether Participant Washed Hands; Independent variables are Descriptive norms (Low/High Prevalence, Control) and Publicness of Behavior (Public/Private); Believability of Message Is Covariate

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low prevalence</td>
<td>2.965</td>
<td>1.079</td>
<td>7.561</td>
<td>1</td>
<td>0.006</td>
<td>19.388</td>
</tr>
<tr>
<td>High prevalence</td>
<td>1.876</td>
<td>0.881</td>
<td>4.534</td>
<td>1</td>
<td>0.033</td>
<td>6.527</td>
</tr>
<tr>
<td>Public</td>
<td>0.488</td>
<td>0.615</td>
<td>0.630</td>
<td>1</td>
<td>0.427</td>
<td>1.629</td>
</tr>
<tr>
<td>Believability</td>
<td>0.140</td>
<td>0.276</td>
<td>0.256</td>
<td>1</td>
<td>0.613</td>
<td>1.150</td>
</tr>
<tr>
<td>Constant</td>
<td>−1.079</td>
<td>1.242</td>
<td>0.755</td>
<td>1</td>
<td>0.385</td>
<td>0.340</td>
</tr>
</tbody>
</table>

Note. For the reference-group-coded norm conditions (low = 1/high = 2 prevalence), the control group = 3 was the referent. For the publicness condition (public = 1, private = 2), private was the referent. All observed participants (N = 252) were included in these analyses.

the control condition were significantly less likely to wash their hands than people in the other message conditions.

As indicated by the exponentiated βs in Table 2, and counter to the prediction made in H1a, the odds ratio associated with an increased likelihood of hand washing was greater in the low-prevalence norm condition (vs. control) than the high-prevalence norm condition (vs. control). A second logistic regression analysis indicated that when controlling for perceived normative message content, perceived descriptive and injunctive norms, and believability, the coefficients for message were still significant predictors of washing/not washing, indicating the message effects were not likely due to perceived norms. Importantly, statistical power was reduced for these tests.

Table 3  Frequency of Hand Washing Observed in Each Condition and Percentage Within Message Condition

<table>
<thead>
<tr>
<th></th>
<th>Did Wash Hands</th>
<th>Did Not Wash Hands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low prevalence</td>
<td>58 (88%)</td>
<td>8 (12%)</td>
</tr>
<tr>
<td>High prevalence</td>
<td>92 (81%)</td>
<td>21 (19%)</td>
</tr>
<tr>
<td>Control</td>
<td>51 (70%)</td>
<td>22 (30%)</td>
</tr>
</tbody>
</table>

Main effects for privacy condition and believability were not significant predictors in the logistic regression analysis. Post hoc analysis indicated that participants in the privacy condition were less likely to wash their hands (75% washed) relative to those in the condition where another was present, 86% washed; χ²(1) = 4.7, p = .03. In sum, the data were consistent with a predicted main effect for message relative to a control, but the low- and high-descriptive norms messages did not yield differential
influence on hand-washing frequency.\textsuperscript{8} There was a small main effect for whether another was present in the bathroom on hand washing.

H1b, which dealt with quality of hand washing, was tested with multiple indicators. First, a 3 (control/high/low prevalence) × 2 (public/private) ANOVA was conducted with “time in seconds” that the water was run as the dependent variable. These analyses indicated a small but statistically significant main effect for message condition, \( F(2, 246) = 3.26, p = .04, \eta^2_p = .03 \), such that participants in the high descriptive norm condition (\( M = 9.94, SD = 9.48 \)) and low descriptive norm condition (\( M = 9.57, SD = 7.78 \)) ran the water for significantly longer than people in the control condition (\( M = 6.04, SD = 7.58 \)). The large standard deviations for this variable are notable. The high and low descriptive norm means did not differ significantly from one another (\( p > .05 \)). The main effect for privacy condition was not significant (\( p = .74 \)), nor was the interaction between privacy condition and message (\( p = .21 \)). Means, standard deviations, and confidence intervals for length of time water ran (in seconds) are reported in Table 4.

Logistic regression was used to examine the effects of the manipulations on the other categorical variables designed to measure hand washing quality; believability was included as a covariate in the analyses. For these analyses, people who did not wash their hands were removed because including them would have artificially inflated the effect size. The overall chi squares for these analyses were not significant. Whether a person used soap was not significantly affected by the message conditions (\( p = .54 \)). The messages did not affect whether participants used a paper towel (\( p = .24 \)), or whether participants turned off the water with a paper towel as recommended by CDCP (\( p = .39 \)). Thus, in the main, the data indicated only weak support for the effect of the messages on hand-washing quality; analysis revealed that for most of the measures, data were not consistent with the predicted relationship.

\textit{Attitudes toward hand washing.} It was hypothesized (H2) that there would be a main effect for message condition on attitudes toward hand washing. Specifically, people in the high-prevalence condition would report more favorable attitudes toward hand washing than those in the low-prevalence or control condition. A 3 (message condition: high prevalence vs. low prevalence vs. control) × 2 (privacy

\begin{table}[h]
\centering
\caption{Mean, Standard Error, and Confidence Interval for Length of Time Water Ran (in seconds) by Message Condition}
\begin{tabular}{lccccc}
\hline
Message Condition & Mean & SE & Lower Bound & Upper Bound \\
\hline
Low prevalence & 9.26 & 1.13 & 7.03 & 11.48 \\
High prevalence & 9.49 & 0.87 & 7.78 & 11.20 \\
Control & 6.25 & 1.03 & 4.22 & 8.27 \\
\hline
\end{tabular}
\end{table}
condition: public vs. private) between-subjects analysis of covariance was used to test this prediction; believability of the message was included as a covariate. Thus, adjusted means and standard errors are reported.

The analysis indicated a significant main effect for message condition, $F(2, 67) = 5.35, p = .01, \eta^2_p = .14$, such that participants in the high-prevalence condition ($M = 4.57, SE = 0.19$) exhibited more positive attitudes than those in the low-prevalence condition ($M = 4.39, SE = 0.14$) and the control ($M = 3.13, SE = 0.36$). Examination of the 95% confidence intervals around the means indicated that the significant difference was between the control condition and the high descriptive norm condition. The main effect for privacy condition was not significant, $p = .57$, nor was the interaction between message and privacy conditions, $p = .69$. The believability covariate had a statistically significant impact on attitudes, $F(1, 67) = 6.29, p = .02, \eta^2_p = .09$.

The data were consistent with the predicted difference between the control and high prevalence conditions but not for a difference between the high- and low-prevalence conditions. Post hoc analyses using single-sample $t$ tests indicated that average attitude scores for each condition were significantly above the midpoint ($p < .005$). Thus, across conditions, attitudes toward hand washing were already positive, making it difficult to bring about a significant increase in the mean score on attitudes.

Hypothesis 3a predicted a moderating effect of behavioral privacy on the message frequency of washing relationship such that participants in the public, high prevalence condition would be more likely to wash their hands than people in other conditions. To simplify this analysis, an interaction term was created that included only the High Descriptive Norm and Control Condition $\times$ the Private Versus Public Condition. The logistic regression model described earlier was rerun. The results indicated that the inclusion of the interaction term in the model did not improve prediction of whether a person washed his/her hands ($p = .46$); thus, the data were not consistent with the predicted interaction between the independent variables.

Similarly, H3b predicted better quality hand washing among people in the high prevalence/public condition relative to other conditions. The results of the logistic regression model described in the preceding paragraph with whether a participant used soap as a dependent variable was not significant ($p = .57$), nor was whether the person used a paper towel ($p = .68$) or turned off the faucet with it ($p = .99$). An ANOVA to test for the effect of the interaction term on time in seconds the water was run was also nonsignificant ($p = .21$).

In sum, there is a consistent pattern to the results that the messages had an impact on whether people washed, and their attitudes toward hand washing, but limited impact on hand-washing quality. Furthermore, whether the behavior was enacted in the presence of another as opposed to in private had limited impact on behaviors influencing whether they washed but not the quality of hand washing.
Discussion
This article was designed to extend theories of social norms to test new moderators of the descriptive social norm–behavior relationship by presenting the results of two studies from the lab and field. The results from Study 1 provided evidence that hand washing among college males was a promising behavior to target with social norms messaging. It also provided evidence that the messages designed using theories of social norms were effective in modifying normative beliefs. Evidence for normative misperceptions among participants and the fact that involvement in the behavior was low indicated normative information would function heuristically. Given the data from Study 1, the second study, a field experiment, tested the theoretical advances to TNSB about the interaction between normative messages and whether a behavior was enacted in private or in the presence of others (e.g., Lapinski & Rimal, 2005; Rimal et al., 2011). The experiment yields several interesting results and directions for additional theoretical development.

The results show that, in general, both the high and low prevalence descriptive norm messages were effective in influencing hand washing frequency, length of time the water was running, and attitudes relative to the control. The pattern of findings was consistent across these three very different indicators (the first two were observed and the last was self-reported). Analysis controlling for the perceptions of message content, perceived norms, and believability as covariates suggests that this effect is not due to the normative content of the messages, but likely due simply to the guidance on hand washing presented in the message.

This is interesting from both a theoretical and practical standpoint. This interpretation suggests that the nuances of the norms manipulations, despite being perceived by members of our sample in two tests of the messages, were not consequential for behaviors. Rather, the mere presence of these posters may have served as a cue to action to drive hand washing. Thus, this study is evidence that these messages acted as a heuristic cue, prompting people to remember to wash their hands, regardless of message content.

The extent to which normative influence occurs through heuristic as opposed to careful cognitive processing of information remains an open and important question for additional research. Certainly, the literature on involvement would suggest that the extent to which one is motivated to process information about an issue should influence whether normative cues function informationally or as a simple decision cue. Among those participants who did wash their hands, most did not adhere to the CDCP guidelines presented in the poster. The observational data indicated that these outcomes did not vary by condition and quality was uniformly bad.

The interaction between the messages and privacy condition was predicted based on recent theoretical and empirical work indicating that social norms should be most influential when a behavior is enacted in the presence of others as opposed to in privacy (Rimal et al., 2011). There was a main effect for behavioral privacy on washing such that when another was present, people were more likely to wash than
First, in the Bagozzi et al. (2000) study, the normative influence under scrutiny was subjective norms and the behavior was considered socially unacceptable—eating fast food. Bagozzi et al. found that in public, people were less willing to eat fast food as opposed to in private and that subjective norms had the strongest influence when the behavior was public. The behavior under scrutiny in the current study, hand washing, is one that is socially acceptable; attitudes toward the behavior were very positive in both studies presented here. Consequently, the interaction between norms and behavioral privacy may only occur when the behavior under question is a socially unacceptable behavior. Perhaps the threat of social sanctions (not necessarily implied by descriptive norms messages in this case) has the strongest effect on whether someone enacts a behavior.

Alternatively, the effect for privacy on behavior, although small statistically, suggests there may be something to the fact that the mere presence of others can influence our behavior and that descriptive normative mechanisms may not be the cause of this effect. A recent study by Henningsen, Henningsen, Braz, and Davies (2011) found that men spent less time washing their hands when one other person was present versus when they were alone or when multiple people were present in the restroom. The authors concluded that when alone, men feel that they can linger in the restroom unobserved, and when multiple people are present, they can blend in without being closely observed. Again, the current study suggests that other forms of normative influence may be driving hand washing behavior, depending on the context and other actors; additional theoretical development in this area is needed.

The notion that men may have spent less time washing their hands when they felt that they did not feel that they were being directly observed may also serve as an explanation for the weak privacy effect in our data. As stated in the manipulation description, the confederate in the “public” behavioral privacy condition pretended to be scrubbing a stain out of his shirt, while standing away from the sink. Perhaps because the confederate appeared to be preoccupied, participants did not feel that their behavior was being scrutinized, thereby reducing the effect of the privacy manipulation.

**Limitations and additional avenues for future research**

Field research clearly has advantages and disadvantages when compared with lab-based research. Certainly, the design presented here was carefully scripted and conducted under rigorous conditions. Nevertheless, the challenges of research of this nature may have influenced the findings. First, because the study took place in a busy area on campus, we did not have the luxury of including long self-report scales to assess the inductions and possible covariates. We acknowledge that the results based on single-item measures must be interpreted cautiously; the use of items drawn from scales for which there is published validity and reliability evidence was designed to deal with this limitation. For those scales that included multiple items, the reliabilities...
were high \((.89 < \alpha < .92)\). Furthermore, the simple nature of the behavioral coding did not allow for multiple measures of these factors.

Messages used to manipulate normative perceptions in this experiment are similar to messages used in previous successful attempts to change normative perceptions through messaging (e.g., Martell et al., 2006). However, in an effort to eliminate potential for confounds, this field experiment only used a single type of message to promote hand washing. This limits the generalizability of the findings from the study beyond this field experimental setting. The intentional limitations of the design sought to balance trade-offs between internal and external validity. Nonetheless, we feel that this study design is valuable in that it provided a tightly controlled experiment with high experimental realism.

The findings of Study 1 suggest an inconsistency in the perceptions of prevalence and actual prevalence of hand washing among males on a college campus exists. Specifically, our data indicate that perceptions of frequency of hand washing among referent others is lower than actual rates of hand washing reported by men and by observational data. This inconsistency remained largely unaffected by an attempt to clarify the true norm with exposure to a message at a single point in time. Results of Study 2 indicated that although students interpreted the message statistics correctly as they did in Study 1, they did not necessarily believe the statistics presented. The believability induction check was influenced by message type and subsequently included as a covariate. This effect may have several explanations.

Smith et al. (2006) demonstrated that social norms campaigns are likely to be most effective when they are based on a norm that falls within participants’ latitude of noncommitment (as defined by Sherif & Hovland’s (1961) Social Judgment Theory), as opposed to when the norm falls within participants’ latitudes of acceptance or rejection. The fact that people did not believe the high-prevalence statistic presented suggests that this statistic may have fallen in their latitude of rejection. The finding that people believed the statistic presented in the low-prevalence condition, but their behavior did not change, suggests that this statistic may have fallen in participants’ latitude of acceptance. Changing people’s perceptions about the prevalence of a behavior they can observe on a daily basis is a difficult task. The norm may have fallen within participants’ latitude of noncommitment, but changing perceptions of a norm requires repeated exposure over time, as opposed to a one-time single message. Future research should work to pinpoint the number of exposures that may be necessary to change normative perceptions about a behavior the population of interest can observe firsthand on a regular basis.

In sum, despite its limitations, this study extends our understanding of the boundary conditions under which descriptive social norms influence actual behaviors. The attitudinal and hand washing frequency data suggest that the high-prevalence messages were effective, but that the presence or absence of others had little influence on behaviors. Future research can consider the parameters under which behavioral privacy should matter in light of the current results and refinements to theorize in this area should be considered.
Acknowledgments

The authors wish to acknowledge Jenn Anderson, Sang Yeon Kim, Ed Glazer, Katie Klein, and a team of undergraduate students for their help with this research.

Notes

1 The CDCP guidelines stated, “Hands should be washed using soap and warm, running water. Hands should be rubbed vigorously during washing for at least 20 seconds. Hands should be rinsed well while leaving the water running. With the water running, hands should be dried with a paper towel. Turn off the water using a paper towel, covering washed hands to avoid germs.”

2 The researchers tried to keep the process of assigning participants to public or private conditions as random as possible. During some data collection sessions, however, some confederates showed up late, had to leave early, or were unable to attend. Owing to time constraints, in situations in which only one confederate was at the session, we collected all private condition. Then, during the following week at the same session time, we collected all public conditions to keep cell sizes as even as possible. The location for the study was chosen based on mapping of all high-traffic study bathrooms to determine those with appropriate layout given study procedures.

3 The exact words used by the experimenter were: Excuse me, I was wondering if you had a few minutes to complete a questionnaire for me about bathrooms on college campuses because I am doing a really important research project and I need your help. [If yes,] Great, thanks! Let’s go over here so you can sit down. My name’s . [If no,] It won’t take long and I could really use your help. [If still no,] Okay thank you.

4 When data collection began, the complete set of items used to assess the study variables in previous studies was included in the questionnaire. This made the survey very long and impractical for a field experimental setting and researchers were concerned about reducing response rate. The survey was shortened and items were removed. This questionnaire is available in the online version of the article.

5 In discussing the project design with some male colleagues, it was suggested that there may be a difference in hand-washing behavior among men depending on whether participants urinated or made a bowel movement. Therefore, in accordance with a recommendation made by the Institutional Review Board, it was also noted on the checklist whether participants’ behavior could be classified as “Number 1” (urination) or “Number 2” (bowel movement). This variable was included in model tests and did not add explained variance to the models.

6 Participants in the control condition were not exposed to a message about which they could judge the normative content. The questionnaire directed people who did not recall seeing a poster in the restroom to skip the questions about message content. Only two participants in the control condition reported that they recalled seeing posters in the restroom. Neither of these participants reported that the posters were about the issue that was addressed in the stimulus materials used in the study. Both participants’ answers reflected the content of posters that were hung in other restrooms elsewhere on campus. Therefore, participants in the control condition were excluded from the manipulation check analysis.
The addition of perceived injunctive normative content of the posters was included in every model test, but it did not add additional explanatory power to the model. Results of these analyses are available from the first author.

Formal mediational analysis using logistic regression following Barron and Kenny’s (1986) recommendations indicated whether participants washed their hands was due to experimental condition, but this relationship was not mediated by perceived norms ($p = .14$).

**Supporting Information**

Additional supporting information may be found in the online version of this article:

Appendix S1 Study 1 Questionnaire Items.
Appendix S2 Study 2 Questionnaire Items.

**References**


