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Understanding the influence of social norms on health behavior: Testing a conceptual model

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Abstract

41 **Objective.** Although many interventions aim to reduce engagement in unhealthy behavior,
42 failing to consider the role of factors in the social environment, such as social norms, may reduce
43 the efficacy of these efforts. Social norms are consistently identified as a determinant of health
44 behavior (e.g., seeing others engage in unhealthy behavior increases one's own unhealthy
45 behavior); however, there is limited understanding of the process through which, and for whom,
46 this relationship emerges. Therefore, this paper identifies a conceptual model, derived from
47 identity-based motivation theory, through which social norms influence eating behavior.

48 **Methods.** A national sample of 1,168 non-diabetic European Americans, African Americans,
49 and Mexican Americans completed structured telephone interviews between August 2011 and
50 February 2012.

51 **Results.** Perceiving norms that other people do not eat healthy foods increased perceptions of
52 structural, external barriers to eating healthy. Increased barriers predicted stronger beliefs that
53 weight is uncontrollable, which subsequently predicted greater engagement in unhealthy eating
54 behavior. Furthermore, participants' perceived weight status moderated the relationship between
55 external eating barriers and beliefs about weight, such that participants who perceived
56 themselves to be very overweight reported the strongest beliefs that their weight is
57 uncontrollable.

58 **Conclusions.** Perceiving norms about others' unhealthy eating habits can facilitate one's own
59 unhealthy eating behavior by increasing perceptions of barriers and beliefs about the
60 uncontrollability of weight. Moreover, this process was strongest for adults who perceived
61 themselves to be overweight. Understanding variations in this process (e.g., how barriers may
62 interact with weight identities) gives interventions more power to impact behavior.

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72 *Key Words: social norms, identity, eating behavior, barriers, health beliefs*

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80 Introduction

81 Poor eating habits have been associated with negative psychosocial and health outcomes,
82 such as increased stress levels, greater rates of depression and anxiety, worse cardiovascular
83 functioning, high blood sugar levels, decreased immune system functioning, lowered bone
84 density, and high blood pressure (CDC; [https://www.cdc.gov/chronicdisease/resources/](https://www.cdc.gov/chronicdisease/resources/publications/factsheets/nutrition.htm)
85 [publications/factsheets/nutrition.htm](https://www.cdc.gov/chronicdisease/resources/publications/factsheets/nutrition.htm)); Jacka et al., 2010). Additionally, engagement in unhealthy
86 lifestyle behaviors has been linked with an increased risk of developing chronic health
87 conditions, such as Type 2 diabetes, heart disease, hypertension, some forms of cancer, and
88 obesity [1]. Despite the development of interventions to reduce the incidence of chronic health
89 conditions, recent reports show that the prevalence of many of these conditions is increasing [2,
90 3]. For example, the National Health and Nutrition Examination Survey showed that obesity
91 rates among U.S. adults increased from 33.7% in 2007-2008 to 39.6% in 2015-2016 [4]. Because
92 clinical discourse has framed many chronic health conditions, such as obesity, as preventable
93 conditions that are determined primarily by people's behavior (e.g., having a poor diet), many
94 health researchers, clinicians, and government agencies are actively working to identify effective
95 intervention strategies that motivate behavior change.

96 To date, many interventions have focused on targeting behavior directly, or through
97 person-level factors, such as low motivation, that may impede healthy behavior engagement [5,
98 6, 7]. One reason why intervention efforts may show low efficacy in the long-term, as evidenced
99 by the growing prevalence of preventable diseases, is that behavior change is complex and
100 multiply determined. Thus, in addition to targeting behavior directly, it is equally important for
101 interventions to consider the role of contextual factors on health behavior engagement [8, 9]. For

102 instance, prior research demonstrates that contextual factors, such as the granularity of food
103 labels (e.g., describing portion sizes as “servings” or by the number of pieces), receiving food
104 that has been pre-portioned, or being in the company of close others, impact subsequent eating
105 behavior [10, 11, 12]. The present research focuses on another factor in the social environment
106 that shapes health behavior: how other people are behaving. Empirical research has examined
107 how people respond to social information derived from environmental cues, such as other
108 people’s behavior, and demonstrates that people generally exhibit greater uptake of observed
109 behavior because it reflects a social norm [13].

110 Social norms develop from explicit or inferred perceptions about how one should behave
111 based on what others are doing, and there are two types of social norms, descriptive and
112 injunctive, that can influence behavior through different processes. Whereas descriptive norms
113 reflect perceptions about how people actually behave, injunctive norms signal the behaviors that
114 people (dis)approve of (Cialdini, Reno, & Kallgren, 1990; Cialdini & Trost, 1998). The
115 predictive power of norms is evident: several health behavior models, such as the theory of
116 reasoned action and the health belief model, have identified norms as an important determinant
117 of health behavior [14, 15, 16]. Because people frequently detect and adhere to normative
118 information in their environments, social norms that reflect healthy behavior (e.g., seeing people
119 eat vegetables) can increase engagement in healthy behavior, whereas norms that reflect
120 unhealthy behavior (e.g., seeing people eat fast food) can increase engagement in unhealthy
121 behavior [17, 18]. Consistent with theory, empirical research shows that perceiving social norms
122 predicts subsequent behavior across a range of health domains, such as smoking, food selection,
123 and physical activity [19, 20, 21]. The relationship between norms and behavior is so well-
124 established that norms are often leveraged in behavioral interventions [22, 23, 24, 25]. For

125 example, adults who received normative feedback about other people's step counts, as well as an
126 evaluative signal about their own performance relative to others, engaged in greater physical
127 activity than adults who did not receive this feedback [25]. Despite an extensive body of research
128 showing that norms impact behavior, little work has considered *how* norms may shape behavior.

129 Meta-analytic data examining the constructs utilized across several health behavior
130 models show that barriers are a particularly compelling predictor of subsequent behavior (and
131 according to the theory of planned behavior, the most proximate predictor of behavior alongside
132 behavioral intentions; Carpenter, 2010). As such, one route through which social norms may
133 impact behavior is by changing perceptions of barriers [26]. For instance, if people see others
134 eating healthy foods, they may subsequently infer that eating healthy foods is feasible, and thus,
135 relatively easy to do. In contrast, if people do not see others eating healthy foods, they may infer
136 that eating healthy foods is not feasible, and thus, is relatively difficult to do. Perceived and
137 actual barriers can, in turn, inhibit behavior [27, 28, 29]. However, although prior literature
138 suggests that perceiving barriers has a uniformly negative effect on behavior, this may not
139 always be the case. For instance, although some people may perceive barriers as unsurmountable
140 obstacles and subsequently disengage effort from healthy eating, other people may be motivated
141 to eat healthy foods when they believe that barriers can be overcome with sustained effort [30].
142 Given this possibility, it is imperative to understand whether, and for whom, barriers impede
143 health behavior engagement.

144 One factor that may directly influence the relationship between barriers and behavior is
145 social identities. Social identities are often defined as people's sense of who they are with regard
146 to their group membership (e.g., race/ethnicity, gender), and in the context of eating and
147 exercise, weight status (e.g., being average weight or obese) is a particularly relevant social

148 identity [31, 32]. People across weight statuses may exhibit divergent responses to the same
149 social information due to differences in shared experiences (e.g., discrimination) and/or
150 stereotypes and beliefs about how “people like me” behave. Specifically, because stereotypes
151 suggest that people with obesity have unhealthy lifestyle habits compared to people without
152 obesity, responses to perceived barriers may vary as a function of weight status [33]. For
153 example, it is possible that when people perceive that healthy eating is difficult, individuals with
154 average weight may believe that they can succeed with persistence, whereas people with obesity
155 may feel pessimistic about the likelihood of effort leading to success for someone like them.
156 Therefore, despite an extensive body of literature demonstrating that social norms predict health
157 behavior engagement, responses to barriers, which may vary as a function of weight status, can
158 produce heterogeneity in the relationship between norms and behavior.

159 Although norms are identified as an important antecedent to behavior, there is limited
160 understanding of (a) the processes through which norms may influence behavior, and (b) the
161 extent to which social identities modify the link between norms and behavior. Although there are
162 many pathways through which norms may impact behavior, the current study explores one
163 possibility, derived from identity-based motivation (IBM) theory. IBM proposes that when
164 behaviors feel congruent with one’s identity (e.g., “people like me do yoga”), people are
165 motivated to interpret any difficulty associated with engaging in these behaviors as signaling
166 importance and thus, continue engaging in the behavior (e.g., “This yoga class is difficult, but I
167 will keep going because no pain, no gain”) [34, 35]. When behaviors feel incongruent with one's
168 identity, however, (e.g., “people like me do not do yoga”), any experienced difficulty when
169 attempting these behaviors may be interpreted as impossibility, which subsequently reduces
170 motivation to engage in the behavior (e.g., “This yoga class is difficult and I will never be able to

171 do these poses, so I will stop attending”). In prior work, Oyserman et al. (2007) find that making
172 racial identities salient increases sensitivity to race-specific norms about health behavior (e.g.,
173 smoking and eating fried foods); consequently, African American and Latino students reported
174 less favorable evaluations of foods and health behaviors perceived to be inconsistent with their
175 racial identities (e.g., watching one’s diet), and exhibited stronger beliefs about health fatalism
176 (e.g., beliefs that “Some people are healthy; others die young; that is just the way it is”) [34].
177 Similar identity-based processes have been documented for alcohol use, food evaluations, and
178 eating behavior among undergraduates, Europeans, and European Americans, respectively [36,
179 37]. Thus, prior research on IBM suggests that activating beliefs about how “people like me”
180 behave can impact interpretations of difficulty, which may directly influence subsequent
181 behavior engagement.

182 To extend previous research, we propose a conceptual model derived from IBM theory
183 that examines a process through which perceived eating norms influences eating behavior, and
184 the extent to which this process is moderated by social identities (weight status). Specifically, the
185 model assesses the extent to which (a) perceived norms that other people do not engage in
186 healthy eating behavior increase perceived barriers to eating healthy foods, (b) perceived barriers
187 increase beliefs about the uncontrollability of weight status, and (c) beliefs about the
188 uncontrollability of weight status predict engagement in unhealthy eating behavior. We predicted
189 that perceived barriers may not produce a unilateral response on behavior because the
190 consequences associated with different interpretations of difficulty, which can vary as a function
191 of social identities, may elicit divergent behavioral outcomes. Therefore, we hypothesized that
192 the relationship between perceived barriers and beliefs about the uncontrollability of weight
193 would be moderated by participants’ weight status (operationalized using participants’

194 perceptions of their weight status, such that barriers would predict stronger beliefs about the
195 uncontrollability of weight for adults who perceived themselves to be overweight. These beliefs,
196 in turn, would influence subsequent eating behavior.

197 The knowledge gained from examining this process will improve our understanding of
198 why, and for whom, perceiving norms that other people do not engage in healthy eating behavior
199 facilitates poorer health behavior. Furthermore, this model can inform the ways in which social
200 norms, and their ensuing consequences, can be targeted in health behavior interventions.

201 **Method**

202 *Sample*

203 This report is based on an analysis of selected variables from the Genetic Explanations
204 for Type 2 Diabetes: Prevention Implications project. This NIDDK/NIH-funded project was
205 approved by the University of Michigan Health Sciences and Behavioral Sciences Institutional
206 Review Board and focused on respondents' self-reported perceptions, attitudes, and behaviors
207 related to obesity and Type 2 diabetes. Inclusion criteria were individuals within the 48
208 contiguous states of the U.S. (excluding Hawaii and Alaska) who (a) self-identified their
209 racial/ethnic identity as non-Hispanic White, non-Hispanic Black, or Mexican American, (b)
210 were between the ages of 18 and 75, and (c) did not have a diagnosis of any kind of diabetes,
211 excepting a history of gestational diabetes. Individuals who were currently pregnant with
212 gestational diabetes were screened out. Furthermore, because respondents were contacted using
213 landline telephone numbers, an additional requirement for inclusion was access to a landline
214 during the time interviews were conducted.

215 Thirty-nine trained professional interviewers conducted structured telephone interviews
216 with respondents identified using list-assisted, random-digit-dialing methods between August

217 2011-February 2012. A sample of 1,168 non-diabetic U.S. adults aged 18-75 who self-identified
218 as non-Hispanic Black (n=387), non-Hispanic White (n=396), or Mexican American (n=385)
219 completed the survey after planned exclusions (e.g., ineligibility due to diabetic status (n=4) and
220 race/ethnicity status (n=27); see Supplementary Materials Appendix A for details). Additional
221 information regarding the sample's demographics is reported in Table 1.

222 The data were weighted to be nationally representative of the targeted ethnic/racial
223 groups (except for their non-diabetes status). Additionally, sample weights were generated to
224 compensate for several recruitment limitations (e.g., unequal selection probability, nonresponse,
225 and noncoverage). For the sake of brevity, additional details regarding the methods used to
226 recruit this sample and generate the sample weights are reported in the Supplementary Materials
227 (Appendix A).

228 During data analysis, 3 participants who failed to provide their perceived weight status
229 were dropped from analyses. Additionally, due to the exclusion of participants who did not
230 respond to one or more of the demographic variables that were controlled for in the analyses
231 (age, gender, race/ethnicity, and household income), our final sample included 991 participants¹.

232 *Measures*

233 In addition to other questions, interviewers asked participants about their (a) perceptions
234 that most people they know do not eat healthy foods, (b) perceived barriers to eating healthy, (c)
235 beliefs about the uncontrollability of weight, and (d) eating behavior. After conducting a
236 literature search, newly constructed survey items were rigorously piloted both informally and
237 with professional interviewers using a sample of respondents who were similar demographically

¹ Because 23.9% of participants included in the analysis reported that they did not know their household income, efforts to minimize missing data during the interview are reported in the Supplementary Materials (Appendix C). The pattern of all reported analyses held when income was excluded as a covariate, and these results are presented in the Supplementary Materials (Table S4).

238 to the study sample to ensure comprehension and validity of the measures. All measures used
239 Likert-type scales ranging from 1, *Strongly disagree*, to 5, *Strongly agree*, unless otherwise
240 noted. Complete wording for survey items is reported in the Supplementary Materials (Appendix
241 B).

242 *Perceived Social Norms.* Using one item, participants reported the extent to which most
243 people they know do not eat healthy foods (e.g., “Most of the people I know don’t eat healthy
244 foods”).

245 *Structural Barriers to Healthy Behavior.* Participants reported their perceptions of
246 external, structural barriers to eating healthy using three items (e.g., “There is no place to
247 exercise in my neighborhood”). Because these items showed inadequate reliability (Cronbach’s
248 $\alpha=.59$), we measured external barriers by counting the number of survey items for which
249 participants reported “Agree” or “Strongly agree”. As such, external eating barriers were
250 measured using a range of 0, *zero perceived barriers*, to 3, *three perceived barriers*.

251 *Uncontrollability of Weight.* Participants reported their agreement with four items
252 regarding the uncontrollability of weight (e.g., “Some people will become very overweight no
253 matter what they do”). Three additional items used Likert-type scales ranging from 1, *Not at all*,
254 to 6, *All* (“How much do you think that your current weight is due to your genes or genetic
255 make-up?”). All seven items were summed into an index, with higher numbers indicating
256 stronger beliefs ($\alpha =.77$).

257 *Participants’ Self-Reported Eating Behavior.* We assessed several eating behaviors that
258 have strong associations with weight gain and poorer health outcomes [38]. First, using a Likert-
259 type scale ranging from 1, *Never*, to 5, *At least once a day*, participants reported how often they
260 consumed foods across 7 categories (e.g., sweets). Interviewers gave examples of the kinds of

261 food in each category. Although we made efforts to aggregate these items into food categories
262 (e.g., healthy and unhealthy foods), these items showed insufficient reliability ($\alpha = .67$). As such,
263 these outcomes remained separate in subsequent analyses. []

264 *Statistical Methods*

265 We conducted path analyses using Stata 15.0 to test our hypothesized model (Figure 1).
266 Specifically, the model tested the extent to which (a) norms that other people do not engage in
267 healthy eating behavior predicted external barriers to eating healthy foods, (b) external barriers
268 predicted beliefs about the uncontrollability of weight and whether this relationship was
269 moderated by participants' perceived weight status, and (c) beliefs about the uncontrollability of
270 weight predicted unhealthy eating behavior. For the following analyses, separate models were
271 run for each type of food. Unstandardized coefficients, test statistics, and p-values for all model
272 predictors are reported in the Supplementary Materials (Table S1).

273 To measure participants' perceived weight status, participants described their perceived
274 weight using five options: underweight, about right, slightly overweight, somewhat
275 overweight, and very overweight². We operationalized weight identity using participants' self-
276 perceptions because previous research suggests that personal beliefs about weight status have a
277 strong influence on how people perceive themselves and their surrounding environment. As
278 such, perceived weight status can serve the function of social identities (i.e., personal
279 characteristics that help organize beliefs and behavior that subsequently impact how people
280 navigate the world) [42, 43].

² We also calculated participants' BMI (body mass index) using their self-reported height and weight. BMI was highly correlated with perceived weight status ($r = .72$), and analyses using BMI in place of weight perception are reported in the Supplementary Materials (Table S3).

281 Some participants volunteered responses (e.g., Neither Agree nor Disagree) that we
282 retained in the dataset to mitigate a substantial loss of statistical power. Exclusion of these
283 responses showed no significant impact on the pattern of reported analyses, and these results are
284 reported in the Supplementary Materials (Table S3).

285 **Results**

286 **Eating Norms**

287 *Do Eating Norms Impact Barriers to Healthy Eating?*

288 A significant main effect revealed that perceiving norms that other people do not eat
289 healthy foods predicted stronger external barriers to eating healthy ($b=0.13$, $SE=.03$, $t=3.60$,
290 $p<.001$, 95% CI [.0569, .1934]).

291 *Do External Barriers Impact Beliefs About the Uncontrollability of Weight as a Function of* 292 *Perceived Weight Status?*

293 Path analyses revealed a non-significant main effect of external eating barriers on
294 participants' beliefs about the uncontrollability of weight ($b=-1.24$, $SE=.31$, $t=-1.27$, $p=.204$,
295 95% CI [-3.1500, .6735]). However, a main effect of perceived weight status showed that
296 participants who perceived themselves to be more overweight reported weaker beliefs that they
297 lack control over their weight ($b=-1.21$, $SE=.51$, $t=-2.37$, $p=.018$, 95% CI [-2.2092, -.2058]).
298 These main effects were qualified by a significant *External Barriers x Perceived Weight*
299 interaction ($b=0.77$, $t=2.42$, $SE=.32$, $p=.016$, 95% CI [.1462, 1.3950]); external barriers predicted
300 the strongest beliefs that weight status is uncontrollable among participants with higher (versus
301 lower) perceived body weights.

302 *Do Beliefs About the Uncontrollability of Weight Impact Self-Reported Eating Behavior?*

303 Stronger beliefs about the uncontrollability of weight predicted self-reports that indicated
304 greater consumption of sweets ($b=.02$, $SE=.01$, $t=2.48$, $p=.013$, 95% CI [.0046, .0395]), greater
305 consumption of snacks, such as chips ($b=.03$, $SE=.01$, $t=2.02$, $p=.044$, 95% CI [.0007, .0501]),
306 and marginally more frequent fast food restaurant visits ($b=.02$, $SE=.01$, $t=1.91$, $p=.057$, 95% CI
307 [-.0006, .0447]),. However, these beliefs were not associated with the consumption of French
308 fries ($b=.01$, $SE=.01$, $t=0.65$, $p=.516$, 95% CI [-.0132, .0262]), soda ($b=-.00$, $SE=.02$, $t=-0.19$,
309 $p=.851$, 95% CI [-.0373, .0308]), or healthy foods, such as fruits ($b=-.00$, $SE=.01$, $t=-0.41$,
310 $p=.681$, 95% CI [-.0198, .0130]) or vegetables ($b=-.01$, $SE=.01$, $t=-1.14$, $p=.253$, 95% CI [-.0186,
311 .0049]).

312 Discussion

313 The goals of the present work were to offer a conceptual model identifying one process
314 through which perceived eating norms may increase unhealthy eating behavior, and to assess the
315 extent to which the strength of this process varies across social identities (e.g., weight status).
316 The current study focused specifically on the moderating role of weight status given the ways in
317 which people's weight identities can shape perceptions of, and responses to, their environments
318 [29]. These findings offer an important contribution to extant literature; although previous
319 research has modeled the independent relationships between norms, barriers, health beliefs, and
320 behavior, many of the theoretical models to date have failed to consider the role of social
321 identities as a factor that may interact with these constructs [14, 16, 44]. Therefore, the presented
322 model can improve our understanding of (a) the theoretical mechanisms that may drive behavior,
323 and (b) the pathways through which commonly studied mechanisms may influence or interact
324 with each other.

325 Using a large, national dataset, we find some support for the hypothesis that perceiving
326 norms that others do not engage in healthy eating behavior differentially impacts health behavior
327 engagement as a function of weight status. Specifically, the model showed that perceiving norms
328 that other people do not engage in healthy eating behavior predicted stronger perceptions of
329 external, structural barriers to eating healthy. External barriers predicted stronger beliefs about
330 the uncontrollability of weight status, and this relationship was moderated by participants'
331 perceived weight status: participants who perceived themselves to be overweight and perceived
332 stronger external barriers to eating healthy foods reported the strongest beliefs that weight is
333 uncontrollable. Finally, these beliefs predicted self-reports that indicated greater engagement in
334 unhealthy eating behaviors. Collectively, study findings demonstrated that perceiving barriers to
335 healthy eating facilitated downstream consequences that negatively impacted health behavior
336 engagement, particularly for adults with higher (versus lower) body weights. These findings are
337 consistent with identity-based motivation theory, which argues that when health behaviors are
338 perceived to be inconsistent with salient social identities (e.g., an overweight weight status),
339 people may be particularly likely to interpret difficulty associated with engaging in healthy
340 behavior as impossible, subsequently leading to beliefs about low controllability over their
341 outcomes (e.g., I have no control over my weight) that ultimately impede health behavior
342 engagement [Oyserman et al., 2007].

343 Importantly, it is not always the case that (a) people with higher body weights have
344 unhealthy habits, and (b) people with higher body weights perceive engaging in health behaviors
345 to be difficult. However, we argue that pervasive stereotypes about people with higher body
346 weights may activate beliefs about what “people like me” are expected to do, and those
347 expectations, consequently, can shape interpretations of barriers.

348 Results indicated that beliefs about the uncontrollability of weight predicted some
349 unhealthy eating behaviors; however, these beliefs did not predict consumption of soda, French
350 fries, or healthy foods (e.g., fruits and vegetables). Although the reasons underlying these null
351 effects are unclear, beliefs may not have predicted soda or French fry consumption because the
352 measures were localized on specific food items (e.g., French fries), rather than broad food groups
353 (e.g., sweets). As such, these findings are consistent with prior research showing that beliefs have
354 low predictive power for behavior when they are low in compatibility (e.g., the specificity of
355 beliefs does not match the specificity of the predicted behavior) [46]. Additionally, beliefs about
356 the uncontrollability of weight did not predict fruit and vegetable consumption. Although fruits
357 and vegetables are broad food groups, examination of the response frequencies suggests that one
358 possible explanation for non-significance is a ceiling effect. The percentage of participants who
359 reported eating fruits and vegetables “at least once a week” or “at least once a day” (90.58-
360 96.82%) was higher than the percentage of participants who reported these responses for the
361 other eating behaviors (37.54-72.74%). As such, future research should consider how the levels
362 of frequency scales may differ across certain types of foods. Despite non-significant findings for
363 some eating behaviors, the implications of this work are particularly important because there is
364 evidence that this process is strongest for the population at greatest risk of developing weight-
365 related health problems in the future: adults who perceive themselves to be very overweight.

366 The present findings are also consistent with prior research demonstrating that people
367 across weight statuses may be particularly likely to exhibit differential sensitivity to information
368 about food. For instance, adults with higher (versus lower) weights generally experience greater
369 difficulty regulating food consumption and show greater reactivity to food cues, which may
370 result in differential processing when perceiving food-related norms [49, 50, 51].

371 **Limitations and Future Directions**

372 An important limitation of this study is that the conceptual model is based on
373 correlational data and causality, as well as bi-directionality, cannot be inferred. Although we
374 accounted for direct effects of the predictors at each stage of the model and trued out alternative
375 models, future research should replicate these findings by manipulating the model constructs
376 using an experimental design. Additionally, the eating outcomes were assessed using self-report.
377 Future research should obtain objective measures of behavior by asking respondents to record
378 their eating habits in a daily diary. Another limitation of this work is that we were only able to
379 assess a limited number of factors that may influence eating behavior. Although we controlled
380 for demographic characteristics (e.g., socioeconomic status) to account for the influence of some
381 of these factors, it is important to note that eating behavior can be driven by many factors (e.g.,
382 family influence, home and neighborhood environment, history of food scarcity, etc.).

383 Another limitation of this work is that we were unable to identify characteristics of the
384 populations on which the perceived norms are based. Consequently, it is unclear whether the
385 individuals who are perceived as not engaging in healthy eating behavior are also overweight, or
386 whether relational closeness affects the development and subsequent impact of norms. The
387 current data showed no evidence that adults with higher (versus lower) perceived body weights
388 knew more people who did not engage in healthy eating behavior, suggesting that differential
389 exposure to obesity in social networks cannot explain this model. Thus, future work should
390 identify the populations on which these norms are based to understand when perceptions of
391 norms are most meaningful. For example, perceptions that family members or “people like me”
392 do not engage in healthy behavior may have a stronger impact on norms and/or barriers than
393 norms based on strangers or “people not like me”, and these differences may have implications

394 for the strategies used to intervene with the public. Additionally, future research should consider
395 (a) the existence of actual, rather than perceived, barriers to healthy behavior, and (b) whether
396 this model generalizes to other social identities and behaviors, such as exercise, to examine the
397 role of these factors in the context of the larger questions currently explored.

398 **Implications and Interventions**

399 This study identifies one route through which social norms can facilitate unhealthy eating
400 behavior and suggests that this process can be stronger among adults who perceive themselves to
401 be overweight. Identifying the process through which norms influence behavior has important
402 implications for educating the public and developing future behavioral interventions. For
403 example, clinicians and public health campaigns can intervene on norms by encouraging people
404 to look for and/or provide examples of peers who are engaging in healthy eating behavior to
405 mitigate the strength or direction of perceived norms. However, when people's perceptions of
406 norms are accurate (e.g., when others are not eating healthy foods), more intense interventions
407 may be needed. Employing group-based or community-level interventions (e.g., personal and
408 team goal-setting), for instance, may change the perceived norms and increase engagement in
409 healthy behaviors [52, 53].

410 Although intervening on norms is one possibility for changing health behavior, behavior
411 change is complex and multiply determined. As such, this work identifies other possible
412 intervention points, such as barriers, on which public health efforts can redirect their focus. For
413 instance, intervention efforts can leverage established interventions, such as increasing the
414 appetitiveness of healthy foods, utilizing peer-led education, and disseminating culturally
415 relevant communication, to reduce real and perceived barriers to healthy behaviors [54, 55, 56].
416 Furthermore, identity-based motivation theory suggests that reframing messages to be identity-

417 congruent may be another viable intervention strategy by changing how people respond to
418 experienced difficulty [35]. For instance, increasing perceptions that behavior is possible for
419 “people like me” (e.g., by depicting people with higher body weights who have healthy eating
420 habits) may weaken the link between barriers and beliefs about uncontrollability, facilitating
421 healthy behavior. Finally, these findings suggest a need for further intervention testing and
422 refinement. For instance, future work should test the efficacy of interventions designed to
423 mitigate barriers across different contexts because perceived barriers may be more difficult to
424 overcome in contexts where other people are engaging in unhealthy behavior.

425 **Conclusion**

426 This paper demonstrates that although health behavior is frequently targeted in
427 interventions without consideration of contextual factors, social environmental cues have
428 important influences on the extent to which people engage in such behavior. Specifically, this
429 research offers a conceptual model to improve our understanding of how, and for whom,
430 normative information can facilitate unhealthy eating behavior. By identifying the downstream
431 consequences associated with perceiving norms that other people do not engage in healthy eating
432 behavior and demonstrating how identities, such as weight status, may play a role in this process,
433 this work can inform health behavior interventions to improve their efficacy and mitigate the
434 growing prevalence of chronic, preventable diseases.

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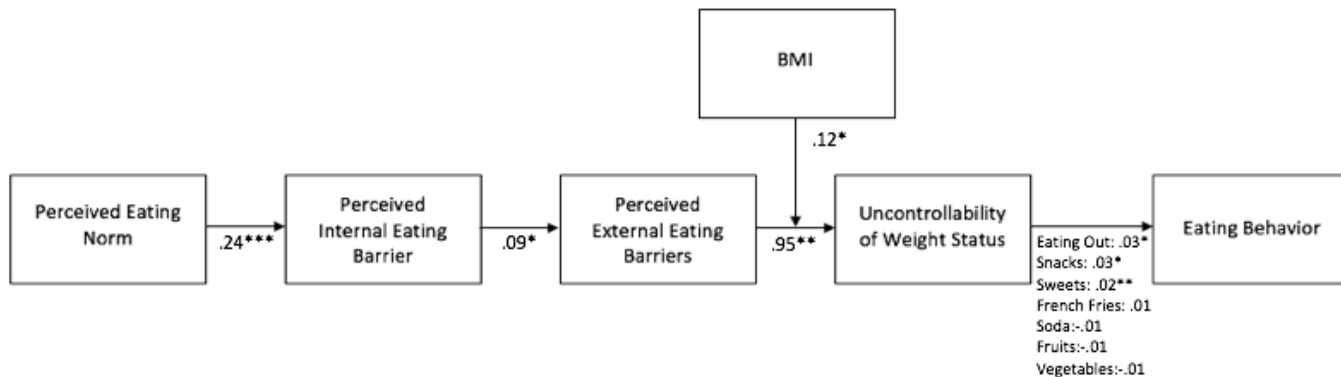
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Figure

Figure 1. Model Identifying the Process Through Which Eating Norms Impact Eating Behavior.



Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Coefficients are unstandardized.