

1 **Abstract**

2
3 Discordance between physicians and patients' health beliefs can impede health communication
4 efforts, particularly for preventable diseases like type 2 diabetes. However, little research
5 considers physicians' perceptions of patient beliefs, despite the importance of perceptions in
6 shaping communication. This work identifies instances of actual and perceived discordance
7 between physicians and patients' beliefs regarding the causes and controllability of type 2
8 diabetes. We surveyed 229 family physicians about their health beliefs and perceptions of their
9 patients' beliefs, and their responses were contrasted against beliefs from a national sample of
10 1,168 U.S. adults. Paired and independent sample t-tests assessed whether (a) physicians' beliefs
11 diverged from the national sample's beliefs (actual discordance), (b) physicians perceived their
12 health beliefs to diverge from their patients' beliefs (perceived discordance), and (c) physicians'
13 perceptions of their patients' beliefs diverged from the national sample's beliefs (accuracy of
14 perceived discordance). Findings revealed that although physicians' perceptions of patients'
15 beliefs were accurate in some instances, physicians generally overestimated discordance.
16 Therefore, although physicians perceived discordance between their own and their patients'
17 beliefs, data from a national survey suggested that these gaps are less substantial than physicians
18 expect. We discuss implications of real and perceived discordance for effective health
19 communication and education.

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27 *Keywords:* doctor-patient relationships; health communication; health beliefs; type 2 diabetes;
28 perceptions; patient education
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30 **Real and Perceived Discordance in Physicians and U.S. Adults' Beliefs Regarding the**
31 **Causes and Controllability of Type 2 Diabetes Mellitus**

32 **1. Introduction**

33 Type 2 diabetes is a growing epidemic that manifests largely due to modifiable lifestyle
34 risk factors, including physical inactivity and poor nutrition habits. Recent estimates suggest that
35 type 2 diabetes currently affects 30.3 million people in the United States, and an additional 84
36 million Americans are estimated to have pre-diabetes (American Diabetes Association, 2017).
37 Given the role of modifiable lifestyle risk factors, as well as the physical, psychological, and
38 financial costs associated with developing type 2 diabetes, many interventions specifically target
39 people who have diabetes risk factors, but have not yet developed diabetes, in order to prevent
40 diabetes onset (Ackermann, Finch, Brizendine, Zhou, & Marrero, 2008; Albright & Gregg, 2013;
41 Diabetes Prevention Program Research Group, 2002). However, these efforts may be impeded if
42 patients' beliefs regarding the development of diabetes diverge from physicians' beliefs (Ogden
43 et al., 2001; Starfield et al., 1981). Moreover, efforts to communicate with patients may be
44 further impaired if physicians' expectations of patients' beliefs, which are often used to shape
45 conversations about prevention and treatment recommendations, differ from patients' actual
46 beliefs (Street, Gordon, & Haidet, 2007; Van Ryn & Burke, 2000). Therefore, the growing
47 prevalence of type 2 diabetes, as well as the consequences associated with inadequate physician-
48 patient communication, underscore the importance of mitigating factors that may impede
49 physicians' ability to effectively educate patients about diabetes treatment and prevention. The
50 current report aims to investigate actual and perceived gaps in physician-patient beliefs that may
51 undermine health communication and subsequently, diabetes prevention, in the United States.

52 Substantial research examines instances of discordance by directly comparing physicians
53 and patients' health beliefs; however, little work considers how physicians' perceptions of
54 patient beliefs may contribute to the development of these gaps (Bleich, Huizina, Beach, &
55 Cooper, 2000; Colgan et al, 2015; Schwarze, Sayla, & Alexander, 2007). Thus, the interventions
56 needed to effectively manage diabetes may be best informed by examining physicians and
57 patients' health beliefs alongside the health beliefs physicians perceive their patients to hold.
58 Understanding physicians' perceptions of patient beliefs is critical because these expectations
59 can shape patient interactions (Van Ryn, Burgess, Malat, & Griffin, 2006). Specifically,
60 perceptions may directly impact the methods used to communicate with patients, the types of
61 conversations that physicians engage in, and the recommendations offered for prevention or
62 treatment. For example, physicians who overestimate patients' health literacy may fail to address
63 gaps in understanding or utilize jargon that can reduce patients' accessibility to health knowledge
64 (Kelly & Haidet, 2007). Moreover, the accuracy with which medical students perceive nonverbal
65 behavior can directly impact their communication behaviors (e.g., posture, nodding, and speech
66 fluency) and rapport with patients (Hall, Blanch, Roter, & Frankel, 2009). Additionally, the
67 (in)accuracy of physicians' perceptions can directly impact their clinical performance; for
68 instance, physicians who misperceive patients' health knowledge may be more likely to
69 undertreat patients or make treatment decisions that are inconsistent with patients' goals (Hall et
70 al., 2014; Platt & Keating, 2007; Street & Haidet, 2011). Therefore, prior research suggests that
71 perceiving discordance may be just as consequential as instances of actual discordance for health
72 communication. However, limited research-to-date has investigated this possibility.

73 In the context of type 2 diabetes, prior research has identified instances of discordance
74 between physicians and patients' treatment goals, preferred treatment strategies, perceived

75 barriers to diet and exercise, and perceived adherence to treatment recommendations (Boyer et
76 al., 1996; Du Pasquier-Fediaevsky & Tubiana-Rufi, 1999; Freeman & Loewe, 2000; Heisler et
77 al., 2003; Shultz, Sprague, Branen, & Lambeth, 2001). However, limited research focuses on
78 discordance between physicians and patients' beliefs regarding the (a) causes, and (b)
79 controllability of diabetes, despite the importance of these beliefs for health communication and
80 diabetes prevention (Coronado, Thompson, Tejada, & Godina, 2004; Hatcher & Whittemore,
81 2007).

82 Although little research has examined health beliefs about the causes and controllability
83 of type 2 diabetes, previous research has documented the implications of these beliefs for other
84 health conditions (e.g., obesity). For instance, prior research shows that physicians' perceptions
85 about the causes of smoking and obesity impact whether they communicate related health risks
86 to patients, as well as the types of treatments they choose to discuss (Ogden & Flanagan, 2008;
87 Thompson, Schwankovsky, & Pitts, 1993). Moreover, other research shows that when physicians
88 believe their patients' health status is caused by lifestyle factors, they may be less likely to
89 discuss and provide guideline-concordant care (Ding et al., 2005; Phelan et al., 2015).

90 Patients' health beliefs about the causes and controllability of health conditions can also
91 directly impact their health behavior (Fishbein, 1980; Hochbaum, Rosenstock, & Kegels, 1952).
92 Goodwin and colleagues (1999) find that when people attribute their health conditions to natural
93 aging, they are less likely to have had regular physician visits or received preventive medical
94 services than people who do not attribute their health conditions to age-related causes.
95 Furthermore, stronger beliefs about disease controllability can facilitate patients' attention to
96 disease-relevant health information, increase engagement in self-directed screening behavior
97 (e.g., breast self-exams), and increase self-monitoring behavior (Bundek, Marks, & Richardson,

98 1993; Huygens et al., 2017). Moreover, beliefs about controllability are associated with several
99 other important patient outcomes, such as compliance with treatment recommendations,
100 utilization of health care services, decision-making, and disease incidence (Fishbein & Cappella,
101 2006; Godin & Kok, 1996; Korin et al., 2013). Therefore, given empirical work showing that
102 physicians and patients' health beliefs have important implications for subsequent
103 communication and behavior, it is just as critical to consider (a) physicians' perceptions of
104 patients' health beliefs, and (b) the accuracy of these perceptions, for disease prevention efforts.

105 The current report examines beliefs about the causes and controllability of type 2 diabetes
106 by comparing and contrasting (a) physicians' beliefs, (b) physicians' perceptions of their non-
107 diabetic patients' beliefs, and (c) beliefs from a national sample of U.S. adults without diabetes.
108 This study focused specifically on beliefs for people without diabetes to identify the ways in
109 which physicians' perceptions may shape preventive care. In particular, this study examined the
110 extent to which (1) physicians' beliefs diverge from the general public's beliefs, (2) physicians
111 perceive their health beliefs to diverge from their patients' beliefs (e.g., by rating patients' beliefs
112 differently from their own), and (3) physicians' perceptions of patients' beliefs diverge from the
113 general public's beliefs. These comparisons have important implications for health
114 communication and prevention efforts; identifying actual instances of belief discordance is
115 critical for directing patient education and communication to increase concordance and improve
116 patient outcomes (Coran, Koropeckyj-Cox, & Arnold, 2013). Physicians' perceptions of patient
117 beliefs, however, may influence where physicians believe the starting point for these
118 conversations are; specifically, physicians may tailor patient education based on what they
119 *believe* patients know, rather than what patients *actually* know.

120 **2. Method**

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122 ***2.1. Physician Recruitment***

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124 After obtaining approval from the Institutional Review Board, an online Qualtrics survey

125 was embedded in a monthly newsletter and disseminated to family physicians through the

126 American College of Osteopathic Family Physicians (ACOFPP) email listserv between December

127 2016 and January 2017. A reminder email was sent to the listserv two weeks after the initial

128 invitation, and survey collection ceased the week after no new responses were collected. Family

129 physicians who managed the care of patients with diabetes were recruited because they have

130 sufficient knowledge of the disease course, as well as how to treat and prevent diabetes.

131 ***2.2. Physician Sample***

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133 ***2.2.1. Participants***

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135 229 physicians completed the survey and were included in the final sample (see Table 1

136 for physician demographics).

137 ***2.2.2. Measures***

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139 Physicians were told that the study assessed their health beliefs and methods for

140 communicating information about type 2 diabetes to non-diabetic patients. The survey focused

141 on non-diabetic patients to understand how physicians perceive the health beliefs of patients for

142 whom preventive care is most impactful. As such, comparing beliefs between physicians who

143 manage diabetes and non-diabetic adults may be most informative for preventive care because

144 physicians who are knowledgeable about the prevention, development, and treatment of diabetes

145 are continuously engaging non-diabetic adults to address modifiable risk factors and prevent the

146 onset of diabetes. Survey items were derived from the survey conducted for the national sample

147 of U.S. adults.

148 ***Physicians' Health Beliefs***

149 Physicians reported their beliefs about (a) the causes of type 2 diabetes (4 items; e.g., In
150 general, how much is a patient's chance of getting type 2 diabetes due to what he/she eats; 1, Not
151 at All; 6, All), and (b) the controllability of type 2 diabetes (3 items; e.g., A person with type 2
152 diabetes will have this illness for the rest of his/her life; 1, Strongly Disagree; 5, Strongly Agree).

153 *Physicians' Perceptions of Patient Beliefs*

154 Physicians reported their perceptions about their patients' beliefs regarding (a) the causes
155 of type 2 diabetes (4 items; e.g., How much do your non-diabetic patients believe their chance of
156 getting type 2 diabetes is due to what they eat; 1, Not at All, 6, All), and (b) the controllability of
157 type 2 diabetes (3 items; e.g., How much would a non-diabetic patient agree with this statement:
158 Someone with type 2 diabetes will have this illness for the rest of their life; 1, Would Strongly
159 Disagree; 5, Would Strongly Agree). The content reflected in these survey items matched the
160 items assessing physicians' own health beliefs.

161 **2.3. National Sample**

162 Data from a national sample of non-diabetic adults was used as a comparison group
163 against physicians' responses. Using a national sample highlights the wide-ranging and diverse
164 beliefs that may be encountered by physicians, increasing generalizability of findings to other
165 U.S. samples and clinical settings.

166 *2.3.1. Participant Recruitment*

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168 The presented data is based on an analysis of selected variables from the Genetic
169 Explanations for Type 2 Diabetes: Prevention Implications project, which focused on
170 respondents' beliefs, attitudes, and behaviors related to obesity and type 2 diabetes. The study
171 was approved by the Health and Behavioral Sciences Institutional Review Board. Professionally
172 trained interviewers obtained informed verbal consent and conducted structured telephone

173 interviews with participants through list-assisted, random-digit-dialed, landlines selected by a
174 computer between August 2011-February 2012.

175 2.3.2. *Survey Participants*

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177 This national survey included a sample of 1,168 non-diabetic U.S. adults aged 18-75 who
178 self-identified as non-Hispanic Black (n=387), non-Hispanic White (n=396), or Mexican
179 American (n=385; see Table 1 for demographics).¹ Inclusion criteria were individuals within the
180 48 contiguous states of the U.S. (excluding Hawaii and Alaska) who (a) self-identified as non-
181 Hispanic White, non-Hispanic Black, or Mexican American, (b) were between the ages of 18 and
182 75, and (c) did not have a diagnosis of any kind of diabetes, excepting a history of gestational
183 diabetes. Due to the main study's focus on diabetes prevention, all participants were screened for
184 non-diabetic status ("Have you ever been told by a doctor or health professional that you had
185 diabetes?"). Data were weighted to be nationally representative of the targeted ethnic and racial
186 groups. For the sake of brevity, additional information regarding recruitment and creation of the
187 sampling weights are reported in the online supplement (Appendix A).

188 2.3.3. *Measures*

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190 To assess the general public's beliefs about the causes and controllability of type 2
191 diabetes, participants answered survey items identical to those used in the physician survey about
192 (a) the causes (4 items), and (b) the controllability of developing type 2 diabetes (3 items).
193 Complete wording for all survey items is reported in the online supplement (Appendix B).

194 2.4. *Statistical Analysis*

¹ During data cleaning, 31 participants were dropped from analysis due to ineligibility (diabetic status: n=4; race/ethnicity status: n=27)

195 Physician survey data were analyzed using SPSS (version 24.0). Because data from the
196 national sample used complex sampling weights, weighted means and standard errors were
197 obtained using Stata (version 14.2). Paired t-tests compared physicians' health beliefs with their
198 perceptions of their patients' beliefs, and independent samples t-tests compared the national
199 sample's health beliefs with (a) physicians' beliefs, and (b) physician's perceptions of patient
200 beliefs. Paired t-test comparisons were analyzed in SPSS, and independent samples t-test
201 comparisons were analyzed using an external t-test calculator. Means and standard errors for the
202 following results are presented in Table 2, and effect sizes are reported as Cohen's d.

203 In the survey conducted for the national sample, a small subset of participants
204 volunteered responses (e.g., "I neither agree nor disagree") that were incorporated into the
205 dataset. We included these response options in the physician survey to directly match the range
206 of responses reported by the national sample. However, given the disproportionately higher rates
207 at which physicians chose these "volunteered" responses, two adjustments were made at the data
208 analysis stage. First, we collapsed across "Almost All" and "All" (a volunteered response), and
209 second, we dropped any responses of "Neither agree nor Disagree" (a volunteered response). The
210 adjusted survey response scales are reported in Table 2.

211 To mitigate concerns about the time lag in data collection between the physician and
212 national surveys, we conducted a follow-up survey in September 2018 using 101 non-diabetic
213 U.S. adults recruited online. Recruitment efforts sought to match the racial demographics of the
214 national sample after sampling weights were applied. Analyses generally replicated the study
215 findings, and any discrepancies are reported below. Additional information about this sample,
216 including means and test statistics, are reported in the online supplement (Tables S1a-S1b).

217 **3. Results**

218 To assess beliefs about the causes and controllability of type 2 diabetes, comparisons
219 were made at three levels: (a) physicians' beliefs versus the national sample's beliefs (actual
220 discordance), (b) physicians' beliefs versus physician's perceptions of patients' beliefs
221 (perceived discordance), and (c) physicians' perceptions of patients' beliefs versus the national
222 sample's beliefs (accuracy of perceived discordance).

223 ***3.1. Perceived Causes of Type 2 Diabetes***

224 *3.1.1. Comparing Physicians' Beliefs with the National Sample's Beliefs*

225 Physicians' beliefs about the causes of type 2 diabetes generally diverged from the
226 national sample's beliefs (see Figure 1). Compared to physicians, the national sample was less
227 likely to believe that the development of type 2 diabetes is due to genes ($t(1386)=8.51$, $p<.001$,
228 $d=.46$). Moreover, when weighing the causes of type 2 diabetes to genetics versus lifestyle and
229 health habits, the national sample attributed diabetes to lifestyle factors more than physicians
230 ($t(1373)=-2.07$, $p=.040$, $d=-.11$). However, the national sample was also less likely than
231 physicians to attribute the development of diabetes to diet and exercise ($t_{\text{diet}}(1385)=8.85$, $p<.001$,
232 $d=.48$; $t_{\text{exercise}}(1388)=3.36$, $p=.001$, $d=.18$). Collectively, findings suggest that although U.S. adults
233 are more likely to attribute the development of type 2 diabetes to lifestyle factors (versus
234 genetics) than physicians, there are significant gaps in understanding the role of specific
235 behaviors that may constitute these lifestyle factors.

236 *3.1.2. Comparing Physicians' Beliefs with Their Perceptions of Patient Beliefs*

237 Physicians perceived that their beliefs about the causes of type 2 diabetes strongly
238 diverged from their patients' beliefs. Physicians reported that, compared to themselves, their
239 patients would be more likely to (a) believe that diabetes is caused by genetics ($t(228)=-3.06$,
240 $p=.002$, $d=-.21$) (b) believe that diabetes is due more to genetics than to lifestyle and health

241 habits ($t(227)=10.83, p<.001, d=.72$), and (c) underestimate the role of diet and exercise in the
242 development of diabetes ($t_{\text{diet}}(228)=10.58, p<.001, d=.71$; $t_{\text{exercise}}(228)=10.48, p<.001, d=.70$). Thus,
243 physicians generally believed that patients would overestimate the role of genetics, versus
244 lifestyle factors, in the development of diabetes.

245 *3.1.3. Comparing Physicians' Perceptions of Patient Beliefs with the National Sample's Beliefs*

246 In direct contrast to physicians' perceptions, the national sample was less likely to believe
247 that genetics had a role in the development of type 2 diabetes ($t(1386)=10.24, p<.001, d=.55$),
248 and was more likely to believe that diabetes is due to lifestyle and health habits than genetics
249 ($t(1372)=-11.98, p<.001, d=-.65$). Although physicians accurately perceived patients' beliefs
250 regarding the role of diet in developing diabetes ($t(1385)=-.34, p=.733, d=-.02$), the national
251 sample attributed the development of diabetes to exercise more than physicians expected
252 ($t(1388)=-6.14, p<.001, d=-.33$). Therefore, although physicians perceived discordance between
253 their own and patients' beliefs, these gaps were not as substantial as physicians expected.

254 Although study results using the national sample showed a non-significant finding
255 regarding the role of diet, findings using the online sample revealed a different pattern; when
256 physicians' perceptions of their patients' beliefs were compared against the online sample, study
257 means showed that the online sample attributed the development of diabetes to diet more than
258 physicians expected ($t(328)= 3.38, p<.001, d=.37$).

259 ***3.2. Perceived Controllability of Type 2 Diabetes***

260 *3.2.1. Comparing Physicians' Beliefs with the National Sample's Beliefs*

261 The national sample reported more fatalistic beliefs about diabetes than physicians (see
262 Figure 2). As such, they were more likely to (a) agree that they could not avoid diabetes if it ran
263 in one's family ($t(1376)=-6.23, p<.001, d=-.34$), (b) believe that people with diabetes would have

264 the illness for the rest of their life ($t(1338)=-3.20, p=.002, d=-.17$), and (c) report having less
265 control over developing diabetes ($t(1391)=5.68, p<.001, d=.30$). Taken together, these findings
266 identify real, significant gaps between physicians and the general public's beliefs about the
267 controllability of type 2 diabetes.

268 *3.2.2. Comparing Physicians' Beliefs with Their Perceptions of Patient Beliefs*

269 Physicians expected that patients would report more fatalistic beliefs about type 2
270 diabetes. Thus, physicians perceived that patients would (a) be more likely to agree that if
271 diabetes runs in a person's family, there's not much they can do to avoid getting it ($t(170)=-$
272 $18.43, p<.001, d=-1.41$), (b) report beliefs that people with diabetes would have the illness for
273 the rest of their life ($t(161)=-5.56, p<.001, d=-.44$), and (c) underestimate how much control they
274 have over the development of diabetes ($t(228)=12.47, p<.001, d=.84$). As such, physicians
275 perceive their patients to hold more fatalistic beliefs about developing type 2 diabetes, consistent
276 with the gaps that actually exist.

277 *3.2.3. Comparing Physicians' Perceptions of Patient Beliefs with the National Sample's Beliefs*

278 Although physicians accurately perceived the direction of patients' beliefs about the
279 controllability of type 2 diabetes, they generally underestimated the extent to which patients
280 believe diabetes to be controllable. Responses from the national sample revealed that, compared
281 to physicians' perceptions, U.S. adults (a) were less likely to endorse beliefs that they cannot
282 avoid diabetes if it ran in one's family ($t(1336)=10.73, p<.001, d=.59$), (b) were less likely to
283 endorse beliefs that people will have diabetes for the rest of their life ($t(1342)=2.88, p=.004,$
284 $d=.16$), and (c) perceived greater control over the development of diabetes ($t(1391)=-5.02,$
285 $p<.001, d=-.27$). Therefore, physicians perceived that the gaps in beliefs regarding the
286 controllability of diabetes were larger than they actually are.

287 **4. Discussion and Conclusion**

288 *4.1 Discussion*

289 Although physicians are motivated to engage patients in high-quality communication to
290 promote preventive care, prior research demonstrates that discordant health beliefs between
291 physicians and patients can impede this aim, facilitating poorer patient outcomes (Meropol et al.,
292 2003). The present work shows that physicians and U.S. adults report significant differences in
293 their beliefs regarding the causes and controllability of type 2 diabetes. By examining another
294 factor that may impact diabetes management, physicians' perceptions of their patients' beliefs,
295 these findings also identify the extent to which physicians may be overestimating these gaps.
296 Therefore, the present research identifies two possible intervention points, physicians'
297 perceptions and patients' beliefs, for improving health communication and diabetes prevention.

298 Across study measures, physicians perceived that their health beliefs regarding the causes
299 and controllability of type 2 diabetes were strongly discordant from their patients' beliefs.
300 Although the data comparing physicians and the national sample's responses confirmed that
301 these differences actually exist, analyses also revealed that physicians' perceptions of patient
302 beliefs were largely inaccurate in direction or degree. Although physicians perceived that their
303 patients underestimate the role of lifestyle factors and overestimate the role of genetics in
304 developing type 2 diabetes, responses from the national sample showed that U.S. adults actually
305 attributed diabetes to lifestyle factors (versus genetics) more than physicians, and perceived
306 genetics to have a smaller role than even physicians believed. Furthermore, although physicians
307 overestimated the gap between their own and patients' beliefs regarding the role of exercise in
308 developing diabetes, physicians accurately perceived patients' beliefs regarding the role of diet;

309 the national sample was less likely than physicians to attribute the development of diabetes to
310 diet.

311 Additionally, although physicians were accurate about the direction of people's responses
312 regarding fatalistic beliefs about type 2 diabetes, they overestimated the degree to which their
313 own beliefs diverged from their patients' beliefs. Thus, compared to physicians' perceptions, the
314 national sample reported greater control over developing diabetes, were less likely to endorse the
315 inevitability of familial diabetes, and were less likely to believe that someone with diabetes will
316 have the condition forever.

317 Collectively, findings show that physicians' perceptions generally led them to
318 overestimate discordance between their own and patients' beliefs across survey items. In the
319 context of physician-patient communication, one direct implication of these presumptions is that
320 physicians may expend more time than is necessary focusing on small gaps in health beliefs,
321 which may detract from their ability to discuss health beliefs where there are more substantive
322 gaps (e.g., the role of diet in developing diabetes). Moreover, overestimating discordance may
323 discourage physicians from initiating conversations with patients if physicians expect that they
324 will be unable to bridge gaps in beliefs, particularly when time is limited. Finally, overestimating
325 discordance can increase patients' perceptions that their voice is not being heard, which may
326 result in more negative physician-patient relationships, increased stress, and worse adherence to
327 treatment recommendations (Coran et al., 2013; Jagosh, Donald Boudreau, Steinert, Macdonald,
328 & Ingram, 2011).

329 Considering the role of physicians' perceptions for health communication and disease
330 prevention is imperative because perceptions have consistently been identified as a predictor of
331 subsequent behavior (Pittet et al., 2004; Zimmerman, Rees, Posick, & Zimmerman, 2016). For

332 instance, physicians engage in greater patient-centered communication with patients whom they
333 perceive to be better communicators or more likely to adhere to recommendations (Street et al.,
334 2007). Moreover, physicians' perceptions of their patients' education levels and physical activity
335 preferences can directly impact their treatment recommendations (e.g., offering surgery to
336 patients with coronary artery disease; Van Ryn et al., 2006). Because physicians' perceptions
337 have important behavioral implications for patients' outcomes, perceptions may be particularly
338 problematic when they do not reflect patients' actual beliefs or behaviors.

339 *Limitations and Future Directions*

340 Although the effect sizes, consistent with other research, were small-to-medium in
341 magnitude, small effect sizes can have important practical and clinical significance (Prentice &
342 Miller, 1992). For instance, discordant health beliefs among physicians and patients can directly
343 undermine communication and prevention efforts (Kronish, Leventhal, & Horowitz, 2012).
344 Additionally, although there was a low physician response rate (2.7%), this response rate is
345 somewhat comparable to other response rates that have been identified when surveying health
346 professionals online (Braithwaite, Emery, De Lusignan, & Sutton, 2003; Ernst, Brand, Lhachimi,
347 & Zeeb, 2018).

348 Additionally, the national sample is not matched or directly connected to the physician
349 sample. However, both the physician and patient samples are nationally distributed, decreasing
350 concerns that the effects are localized. In addition, multiple efforts were made to increase the
351 comparability between the physician and national sample, such as using survey items for the
352 physician sample that matched the survey items used for the national sample, and excluding
353 physicians whose patient population was lower than 90% White, Black, or Latino. However,

354 because the pattern of means was identical after this exclusion, we retained the full physician
355 sample.

356 Finally, there was a 5-6 year time lag in data collection between the physician and
357 national sample surveys. To alleviate concerns about making direct comparisons across samples,
358 we collected additional data using an online sample. This more recent data collection generally
359 replicated the findings reported for the national sample and offered additional support for our
360 conclusions.

361 Future research should aim to replicate the present findings, which focus on physician
362 beliefs, among physician populations who diverge in training (e.g., allopathic physicians) and
363 specialty (e.g., internists). Moreover, because empirical testing of the specific ways in which
364 beliefs about diabetes influence diabetes-related communication is limited, future research
365 should test how physicians' health beliefs about the perceived causes and controllability of type
366 2 diabetes translate into communication efforts with patients. In particular, future work should
367 examine how health beliefs regarding the causes and controllability of type 2 diabetes are
368 expressed within clinical settings to investigate the bi-directional exchange of information during
369 clinical encounters (e.g., how communication efforts may shape both physicians and patients'
370 health beliefs simultaneously).

371 ***4.2 Conclusion***

372 Although physicians perceive discordance between their own and their patients' health
373 beliefs regarding the causes and controllability of type 2 diabetes, their beliefs are in greater
374 concordance than expected. Because extensive research identifies the implications of
375 discordance for health communication and behavior, presuming discordance, particularly when
376 these perceptions are overestimated, may further inhibit efforts to prevent the development of

377 diabetes. Given the instances of actual and perceived discordance in health beliefs identified in
378 this study, efforts should be made to increase the alignment between physicians and patients'
379 beliefs to enhance patient education and improve patient care.

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401 **Disclosure statement:** The authors do not have any disclosures to report.

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403 **Data availability:** The data that support the findings of this study are available from the
404 corresponding authors (V.D. or A.E.) upon reasonable request.

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590 Table 1. Reported demographics for the physician and national sample.
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PHYSICIAN DEMOGRAPHICS					
Race	%	Gender	%	Age	Years
European American/White	89.5	Male	52.8	Range	29-82
African American/Black	1.3	Female	46.7	Mean	47.87
Asian American	5.2	Other Identification	0.4	SD	14.07
Latino/a	0.4				
Other Race not Listed	2.2				
Multiracial	1.3				
Patient Insurance	Mean %	Patient Race	Mean %	Patients Cared for with Type 2 Diabetes (per month)	Mean %
Medicaid	23.3	White	57.6	< 25	24.0
Medicare	30.7	Black	15.0	26-50	38.4
Private	33.4	Latino	15.4	51-100	23.1

Uninsured	8.5	Asian	6.2	>100	13.5
Other	7.2	Other	3.9	Not Reported	0.9
Practice Setting	%	Practice Region	%	Practice Environment	%
Single Specialty Group	28.4	West	23.1	Rural	29.3
Hospital Employer	21.4	South	17.5	Suburban	51.5
Multi-Specialty	14.0	Midwest	31.9	Urban	15.7
University Academic	12.7	Northeast	24.9	Inner City	3.1
Solo Practitioner	14.0	Other	2.6	Not Reported	0.4
Military or Government	3.9				
Other	5.7				
NATIONAL SAMPLE DEMOGRAPHICS					
Education Level	%	Gender	%	Age	Years
Completed 8 th grade or less	2.6	Male	49.6	Range	18-75
Grades 9-11	6.0	Female	50.4	Mean	45.13
Grade 12 or GED	35.9			SD	15.83
Some college, no degree	15.3				
Associate's or technical degree	8.5				
Bachelor's degree or equivalent	19.4				
Master's degree	9.3				
Doctorate or professional degree	3.0				

592 *Note.* Physicians were told that their estimates for patient insurance and patient race should add up to
593 100%. However, the cumulative percentages do not equal 100% because some participants
594 underestimated and/or overestimated the percentage values. Demographics for the national
595 sample includes sampling weights.

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Table 2. Study means: Comparing physicians' beliefs, physicians' perceptions of their patients' beliefs, and the national sample's beliefs.

Survey Items	Item Scale	Physicians' Beliefs Mean (SE)	Physicians' Perceptions About Patient Beliefs Mean (SE)	National Sample's Beliefs Mean (SE)
Perceived Causes				
In your opinion, how much is <i>a patients'</i> chance of getting type 2 diabetes due to his/her genes or genetic make-up?	1, Not at all, to 5, Almost all/All	3.40 _s (.053)	3.65 _s (.068)	2.68 _s (.066)

In your opinion, how much is <i>a patients'</i> chance of getting type 2 diabetes due to what he/she eats?	1, Not at all, to 5, Almost all/All	3.98 _a (.047)	3.24 _b (.059)	3.27 _b (.065)
In your opinion, how much is <i>a patients'</i> chance of getting type 2 diabetes due to how much he/she exercises?	1, Not at all, to 5, Almost all/All	3.62 _a (.050)	2.87 _b (.060)	3.37 _c (.055)
In your opinion, is type 2 diabetes due more to <i>a patient's</i> genes or more to their lifestyle and health habits?	1, A lot more to genes, to 5, A lot more to lifestyle and health habits	3.77 _a (.077)	2.51 _b (.090)	4.01 _c (.087)
Perceived Controllability				
If type 2 diabetes runs in a patient's family, there's not much they can do to avoid getting it.	1, Strongly disagree, to 4, Strongly agree	1.67 _a (.039)	2.84 _b (.047)	2.08 _c (.053)
A patient with type 2 diabetes will have this illness for the rest of his/her life	1, Strongly disagree, to 4, Strongly agree	2.57 _a (.059)	3.03 _b (.041)	2.83 _c (.056)
In your opinion, how much can your patients control whether or not they get type 2 diabetes?	1, Not at all, to 5, Almost Completely/Completely	3.92 _a (.045)	3.04 _b (.061)	3.48 _c (.063)

620 *Note.* Significant differences are denoted by subscripts. The listed survey items measured
 621 physicians' beliefs.

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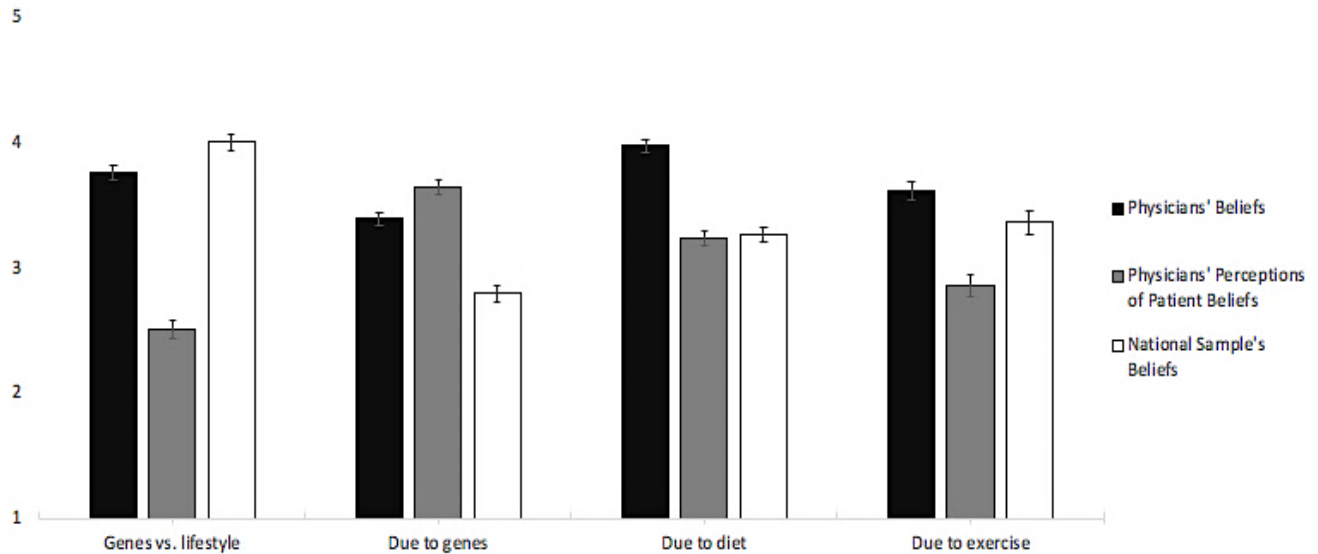
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639 Figure 1. Study results: Physicians and the national sample's beliefs regarding the perceived

640 causes of type 2 diabetes

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645 *Note.* “Genes vs. lifestyle” is reported on a scale ranging from 1, a lot more to genes, to 5, a lot

646 more to lifestyle and health habits. “Due to genes”, “due to diet”, and “due to exercise” are

647 reported on a scale ranging from 1, not at all, to 5, almost all/all. Error bars represent ± 2 SE.

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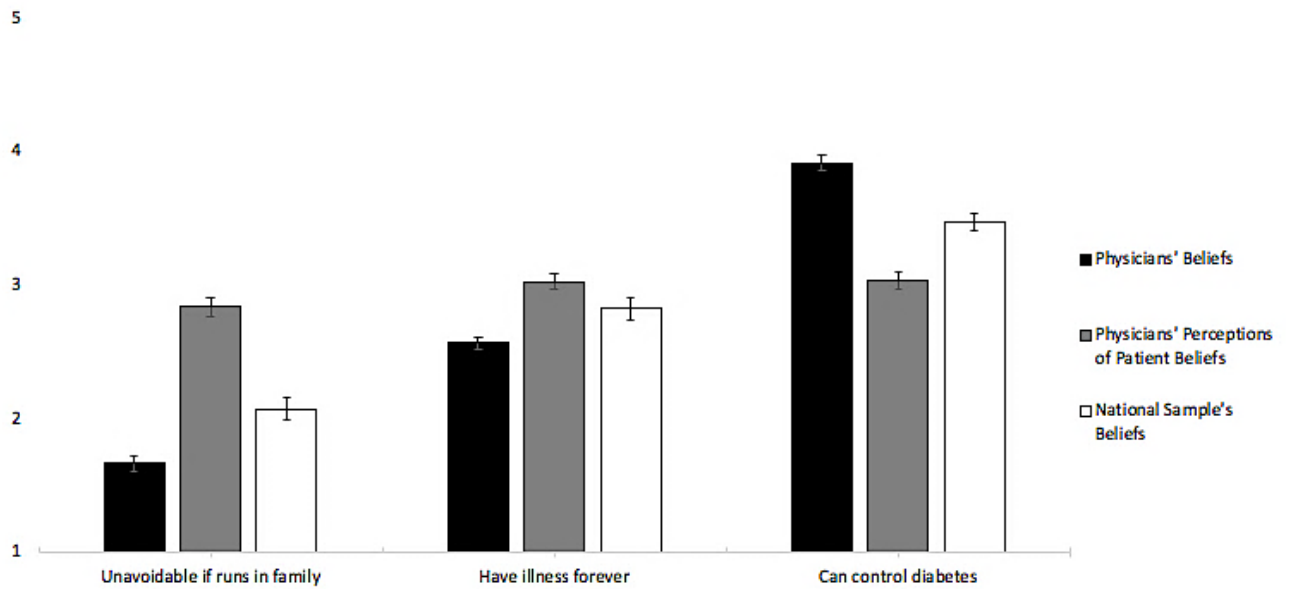
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654 Figure 2. Study results: Physicians and the national sample’s beliefs regarding the perceived

655 controllability of type 2 diabetes

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Note. “Unavoidable if runs in family” and “Have illness forever” are reported on a scale ranging from 1, strongly disagree, to 4, strongly agree. “Can control diabetes” is reported on a scale ranging from 1, not at all, to 5, almost completely/completely. Error bars represent ± 2 SE.