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Citation for final published version:

Koert, Emily, Harrison, China, Bunting, Laura, Gladwyn-Khan, Misbah and Boivin, Jacky 2018. Causal explanations for lack of pregnancy applying the common sense model of illness representation to the fertility context. *Psychology and Health* 33 , pp. 1284-1301. 10.1080/08870446.2018.1494831

Publishers page: <https://doi.org/10.1080/08870446.2018.1494831>

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1 **Causal explanations for lack of conception: Applying the Common Sense Model of**
2 **Illness Representation to the fertility context**

3

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27 **ABSTRACT**

28 **Objective**

29 The current study explored causal explanations for lack of conception and association with
30 help-seeking behaviour. Differences based on gender and country Human Development
31 Index (HDI) were examined.

32 **Design**

33 A mixed method design was used.

34 **Main Outcome Measures**

35 Data was drawn from the International Fertility Decision-Making Study (IFDMS), a cross-
36 sectional study of 10,045 individuals (1,690 men; 8,355 women) from 79 countries.

37 Respondents rated to what extent they believed their lack of conception was due to something
38 they or their partner had done/not done or other factors and described their reasons for
39 making this rating.

40 **Results**

41 Respondents were aged 18-50 (M=31.83) years, partnered and had been trying to conceive
42 for over six months (M=2.8 years). Men and women primarily believed their lack of
43 conception was due to medical problems or chance/bad luck. Thematic analysis of textual
44 responses from 29.7% of the sample found that respondents focused on their personal
45 experience or a salient life event when describing the cause of their lack of conception.

46 Women expressed more regret and helplessness about causes than men. Significant country
47 differences were observed.

48 **Conclusion**

49 Individuals may develop inaccurate causal explanations based on their personal experiences.
50 Access to accurate information is necessary to facilitate timely help-seeking.

51 **Key Words:** causal explanations, lack of conception, gender, country, Human Development
52 Index

INTRODUCTION

53

54 The Common Sense Model (CSM) of illness representation (Leventhal, Meyer, & Nerenz,
55 1980) is a framework for explaining how individuals understand and respond to health related
56 challenges. According to the CSM, when faced with a health problem or threat, people seek
57 information to label or define their experience and develop mental representations or lay
58 theories of their health problem. Research using the CSM has established that the content of
59 these illness representations can be organized into five themes or dimensions: identity, cause,
60 timeline, consequences and cure or control (Leventhal, Leventhal, & Cameron, 2001).
61 Identity refers to beliefs about the symptoms; timeline refers to beliefs about whether the
62 illness is acute, chronic or cyclical; consequences are beliefs about short and long term
63 outcomes of the illness and control or cure refers to beliefs about whether the illness is
64 controllable and/or curable (Leventhal et al., 2001).

65

The focus of this study, the cause dimension, involves using what concrete and
66 abstract information is available to develop a theory of the cause of the illness (Hagger &
67 Orbell, 2003). In turn, how they understand the cause of their illness influences their help-
68 seeking behaviours and outcomes (Bishop & Converse, 1986). Therefore, three predictions
69 from the model are that people generate causes for their illness, that causes are shaped by
70 socio-cultural factors and personal histories and that these causes are associated with help-
71 seeking behaviour. These predictions were tested using a mixed-method study with an
72 international sample of men and women who had been trying to conceive for at least six
73 months. Understanding people's causal explanations can direct patient education, especially
74 debunking myths about their health problem, which may impact people's help-seeking
75 behaviour.

76

Causal Explanations

77 As many as 70-95% of people make causal explanations when presented with a
78 health-related challenge (Grayson et al., 2014). Research on cancer, heart disease and
79 diabetes have commonly found respondents to report biological (e.g., genetics), lifestyle (e.g.,
80 smoking) and psychological/emotional (e.g., stress) causes (Dumalaon-Canaria, Hutchinson,
81 Prichard, & Wilson, 2014; French, Senior, Weinman, & Marteau, 2001; Searle, Norman,
82 Thompson, & Vedhara, 2007). Some variations across illnesses have been identified. For
83 example, a systematic review of breast cancer studies found family history to be the most
84 frequently cited cause (Dumalaon-Caneria et al., 2014), whereas a systematic review on heart
85 disease reported causes related to lifestyle and stress (French et al., 2001).

86 Within the fertility context, the available literature has examined the perceived risk
87 factors or causes of infertility among individuals of reproductive age or individuals diagnosed
88 with infertility and seeking treatment. People with fertility problems generally endorse
89 medical reasons as causes whereas individuals of reproductive age (presumed fertile) report a
90 wide range of factors. In a sample of American men and women experiencing fertility
91 problems (80% of whom were in treatment) biological and medical causes were most often
92 endorsed (Tennen, Affleck, & Mendola, 1991). In an interview study of (presumed fertile)
93 Canadian men and women of reproductive age, the major causal themes were advanced
94 maternal age, lifestyle factors (e.g., smoking, drinking) and genetics (Sabarre, Khan, &
95 Whitten, 2013). Regardless of fertility level and treatment stage, cross-sectional research
96 suggests that people often attribute fertility problems to inaccurate causes. For example,
97 although there is no conclusive evidence that long-term oral contraceptive use deleteriously
98 affects fertility (Mikkelsen et al., 2013), in a sample of women seeking treatment for
99 infertility, 43% inaccurately believed that prolonged use of the contraceptive pill causes
100 fertility problems (Swift & Liu, 2014). In a cross-sectional study of presumed fertile

101 Canadian women, 41% attributed the contraceptive pill to be a cause of infertility (Daniluk &
102 Koert, 2015).

103 According to the CSM, causal explanations are formulated from general knowledge,
104 cultural understandings of the illness and personal experience (e.g., symptomatic information;
105 Leventhal et al., 1980; Leventhal, Nerenz, & Steele, 1984). Cross-cultural surveys on causal
106 explanations for illness are limited, but those that exist suggest that socio-cultural factors may
107 shape causal explanations. For example, within the fertility context, research in less
108 developed countries has found that people attribute causes of fertility problems to gods or
109 supernatural causes, often as punishment for wrong doings like promiscuity, improper sexual
110 acts (e.g., masturbation) or abortion (Ali et al., 2011; Ola, Aladekomo, & Oludare, 2010). In
111 contrast, in more developed countries, research with infertility patients shows fertility
112 problems to be attributed to medical causes, chance, age and emotional problems (Swift &
113 Liu, 2014; Tennen et al., 1991). Such differences in causal explanations could possibly be
114 due to increased access to medical treatment in more developed countries, wherein a medical
115 reason for lack of conception is often sought and provided (Hammarberg et al., 2017).

116 Gender has been found to play a role in the formation of causal explanations with men
117 more likely to attribute the causes of their illness to their behaviours and lifestyle (e.g., diet)
118 and women to blame biological factors, stress or destiny (Dunkel, Kendel, Lehmkuhl, Hetzer,
119 & Regitz-Zagrosek, 2011). Some inconsistencies have been found in the fertility context.
120 Tennen and colleagues (1991) found female infertile patients to be more likely to believe
121 their behaviour caused their infertility compared to males, a finding they suggest to be
122 indicative of women taking more responsibility for fertility problems. That said, Dutch
123 research found men to attribute the causes of fertility problems to their behaviour (van Balen,
124 Trimbos-Kemper, & Verdurmen, 1996).

125 Taken together, these findings suggest that we must consider the influence of socio-
126 cultural factors and personal experience (e.g., country of origin and gender) when examining
127 the causal explanation process so that we can respond appropriately and effectively in
128 education campaigns aimed at improving health knowledge and help-seeking. However, few
129 studies comparing causal explanations between socio-cultural groups exist. Available
130 research must be interpreted with caution given that studies tend to be conducted in
131 individual countries using different samples of interest (e.g., couples, individual men and/or
132 women) at various stages of reproduction (e.g., reproductive age, infertile), limiting our
133 understanding of how socio-cultural factors shape causal explanations.

134 **Help-Seeking Behaviour**

135 The CSM posits that causal explanations are linked with the help-seeking behaviour
136 individuals adopt to deal with their illness, which directly impacts health outcomes (Hagger
137 & Orbell, 2003). For example, people who believe the causes to be unmodifiable (e.g.,
138 genetics) are less optimistic (Dumalaon-Canaria, Prichard, Hutchinson, & Wilson, 2016) and
139 less likely to engage in help-seeking behaviour. The CSM suggests that the relationship
140 between causal understandings and help-seeking is bi-directional with help-seeking (e.g.,
141 medical diagnosis and/or treatment) influencing people's understanding of the cause of their
142 illness (Hammarberg et al., 2017; Leventhal et al., 1980). Socio-cultural factors and personal
143 histories have also been suggested to shape the relationship between causal explanations and
144 help-seeking (Thompson et al., 2016).

145 The link between causal explanations and help-seeking is particularly salient in the
146 fertility context given that fertility problems can often be remedied with medical intervention.
147 However, a large proportion of men and women delay or do not seek help. A review of 17
148 population studies across less and more developed countries revealed only a small proportion
149 (22%) actually sought medical treatment for infertility (Boivin, Bunting, Collins, & Nygren,

150 2007). Research suggests a poor understanding of the causes of infertility may explain low
151 rates of treatment uptake (Bunting & Boivin, 2007). If people misunderstand the cause of
152 their lack of conception (e.g., contraceptive pill use; abortion), timely medical assistance may
153 not be sought which could ultimately hinder their parenthood goals.

154 Other factors that may influence help-seeking in the fertility context are perceived
155 (and actual) socio-cultural and personal barriers. For example, individuals in less developed
156 countries may not have access to medical treatment. Areas with the highest levels of
157 infertility often have the lowest number of fertility centers (e.g., Africa; Inhorn & Patrizio,
158 2015) and only the more affluent members of the population may have access to these clinics
159 (Sundby, Mboge, & Sonko, 1998). Gender may also help explain help-seeking behaviour in
160 the fertility context with women being more likely to seek help compared to men (Greil,
161 Slauson-Blevins, & McQuillan, 2010), however its influence is difficult to ascertain because
162 individuals often seek treatment as a couple and research commonly samples female patients.

163 **OBJECTIVE**

164 The purpose of the present study was to test the CSM predictions in the fertility
165 context in an international sample of men and women trying to conceive. Research to date
166 provides data on percentage of people that endorse broad causes (e.g., medical causes,
167 emotional problems) on structured lists of reasons for fertility problems but not much detail
168 about specific causes and the meaning respondents ascribed to these. The lack of specificity
169 hinders the development of fertility educational material aimed at improving healthy fertility
170 behaviour. We utilized a mixed-method design to generate a more detailed and nuanced
171 understanding of the causal explanations and help-seeking process in the fertility context in
172 countries with varying development status.

173 Participants were drawn from the International Fertility Decision-Making Study
174 (IFDMS), which was a study about parenthood decision-making, sampling men and women

175 from 79 countries (sample size >100 in 18 countries) who had been trying to conceive for at
176 least six months (Bunting, Tsibulsky, & Boivin, 2013). In this mixed-method study
177 participants rated the extent to which they considered broad causes of fertility problems to
178 apply to them, and textual replies about why they perceived these broad causes to apply to
179 their lack of conception after 6 months of trying to conceive. The mixed-method design is a
180 useful method to answer questions and build knowledge about complex phenomenon
181 (Creswell, Klassen, Plano Clark, & Smith, 2011). In particular, online qualitative data
182 collection methods offer an opportunity to collect rich, descriptive data in international
183 samples that might otherwise not be accessible due to practical constraints (e.g., financial
184 costs, language barriers, Mann & Stewart, 2000). Based on the literature reviewed, we
185 hypothesized that: 1) people would generate causal explanations for their lack of conception,
186 2) causal explanations would vary according to socio-cultural factors and personal experience
187 (measured by gender and country Human Development Index (HDI) and 3) causal
188 explanations would be associated with help-seeking (i.e., engagement in treatment) and that
189 this relationship would be moderated by gender and HDI.

190 **DESIGN**

191 The IFDMS methodology has been described in detail elsewhere (Bunting et al.,
192 2013) and is briefly reviewed here. Only questions relevant to the current secondary analysis
193 are described.

194 **Participants**

195 The inclusion criteria used in the IFDMS required participants to be between 18 and
196 50 years of age, currently married or living with their partner, currently trying to conceive for
197 at least six months and not pregnant (see Bunting et al., 2013). The 6-month duration of
198 trying criteria was used to recruit participants that could be feeling susceptible to fertility

199 problems and therefore considering causal explanations for their lack of fertility. The final
200 sample comprised of 10,045 participants (8,355 women, 1,690 men).

201 **Main Outcome Measures**

202 *Socio-demographic variables*

203 Participants stated their country of residence, age and number of years they had been
204 living with their partner. In order to make country comparisons, countries with over 100
205 respondents were grouped using the Human Development Index (HDI; United Nations
206 Development Program (<http://hdr.undp.org/en/statistics/>)). The HDI ranks countries
207 according to an index of life expectancy, educational attainment and income. Countries
208 ranked as Very High HDI were grouped together (VHHDI) as were those that were not (Not
209 Very High; NVHHDI).

210 *Fertility status*

211 Participants indicated duration of trying to conceive and whether they had ever given
212 birth/fathered a child.

213 *Causal explanations*

214 Participants rated their agreement with the following causal statements using a five
215 point response scale (1='strongly agree' to 5='strongly disagree'): 'I think I have not
216 conceived because of a) something I have done (or not done) in the past; b) something my
217 partner has done (or not done) in the past; c) my lifestyle; d) my partner's lifestyle; e) chance
218 or bad luck; f) medical problems; g) emotional problems; h) God's will; i) my age; or d) my
219 partner's age'. Those who indicated they 'strongly agree' or 'somewhat agree' were
220 classified as having agreed. Two open-ended questions asked participants that agreed with
221 statements a) or b) to describe those causes. Individuals who did not agree could also provide
222 a textual response if they wished. Participants could describe additional causes in a third
223 separate text box ('Other reasons, please describe'). No restrictions were placed on the length

224 of textual replies. A review of the literature and previous studies on causal explanations (e.g.,
225 Tennen et al., 1991) informed the selection of causal statements.

226 *Help-seeking*

227 Participants were asked to indicate all forms of medical help or treatment they had
228 sought for their fertility. Medical help-seeking included undergoing fertility diagnostic
229 testing, ovulation induction, insemination, surgery and/or treatment with assisted
230 reproductive technologies (ART). Respondents were categorized as either help-seekers
231 (engaged with treatment) or non-help-seeking (not engaged with treatment) and coded 1 or 0
232 respectively.

233 **Procedure**

234 The data collection period was from July 2009 to April 2010 using various methods
235 (social research panel, fertility clinic or online). The survey was produced in English and then
236 translated to 12 languages (see Bunting et al., 2013 for full procedural details). The
237 University Ethics Committee approved the IFDMS study procedure and additional ethical
238 approval was gained from each clinic as per country requirements.

239 **Data Analysis**

240 Descriptive statistics were used to determine the degree of endorsement for each
241 quantitative causal explanation. A 2x2 multivariate analysis of variance (MANOVA) was
242 used for comparisons between gender and Human Development Index (HDI) for ratings of
243 causal explanations. Due to the large sample size, Rosenthal (r') was used to examine effect
244 size ($r'= 0.10, 0.30, 0.50$; small, medium, large effect size, respectively).

245 A hierarchical logistic regression analysis was used to examine associations between
246 quantitative causal explanations and help-seeking and moderation by gender and HDI. In the
247 regression, the causal explanations were entered to examine whether they predicted help-
248 seeking (model 1), followed by interactions to examine whether the association between

249 causes and help-seeking was moderated by gender (model 2) or HDI (model 3). Simple slope
250 analysis was used to examine moderation effects. Only relationships that were significantly
251 moderated by gender or HDI were reported.

252 The textual replies about causal explanations were analyzed using thematic analysis
253 with inductive coding to identify patterns or themes that captured a salient aspect of the
254 research question (Braun & Clarke, 2006). In the first step of the analysis, two independent
255 researchers familiarized themselves with the data through reading the textual replies. Next
256 they assigned each reply an initial code that reflected its content and meaning and facilitated
257 an initial organization of data into groups. The researchers then grouped the codes into more
258 abstract broad themes with a focus on identifying commonalities and differences within
259 replies. The themes were assigned a descriptive title. Any inconsistencies between
260 researchers were discussed until agreement was reached, and changes were made based on
261 consensus. Next, two health psychologists with knowledge of infertility reviewed and refined
262 the themes by reading the codes and textual replies for each theme and examining differences
263 according to gender, HDI and help-seeking. The final step involved developing detailed and
264 nuanced descriptions of the essence of each theme. This analysis was discussed over several
265 time points to identify possible bias and to encourage researcher reflexivity (Braun & Clarke,
266 2006).

267 RESULTS

268 Socio-demographic and Fertility Characteristics

269 There were 18 countries with over 100 respondents. In total, six countries were
270 categorized as NVHHDI (Brazil, China, India, Mexico, Russia, Turkey), and 12 as VHHDI
271 (Australia, Canada, Denmark, France, Germany, Italy, Japan, New Zealand, Portugal, Spain,
272 United Kingdom, United States; see Supplemental Table 1). Table 1 shows the socio-
273 demographic profile of the total ($N=10,045$) and sub-sample ($n=2,988$) that provided textual
274 replies (hereafter 'textual sample'), according to gender and HDI. On average respondents

275 were in their early 30s, had been with their partner for six years. The majority of the sample
 276 were not yet parents, and had been trying to conceive for over 12 months (75.28%). The
 277 textual sample were significantly younger than those who did not leave a textual response
 278 ($t(10019)=2.65, p=.008$) and had been trying to conceive for longer ($t(998)=-3.83, p<.001$).
 279 There was no significant difference in the number of years together ($t(9990)=-.29, p=.770$)
 280 and whether they had previously given birth/fathered a child ($\chi^2(1)=.97, p=.325$).

281 **1. Causal Explanations for Lack of Conception**

282 When asked the reason for their lack of conception, 24.26% ($n=2,427$) of the total
 283 sample ($N=10,045$) agreed that the cause was due to ‘something I have/have not done’,
 284 ‘something my partner has/has not done’ or both. A total of 72.43% ($n=7,276$) disagreed with
 285 these causes. For those who agreed, 56.71% ($n=1,382$) believed the cause was only due to
 286 ‘something I have/have not done’, 18.14% ($n=442$) believed it to be due to ‘something my
 287 partner has/has not done, and 25.15% ($n=613$) believed it was due to a combination of self
 288 and partner. Of the individual causes, medical problems and chance or bad luck were ranked
 289 the highest (Table 2).

290

291 **2. Causal Explanations for Lack of Conception and Socio-cultural and Personal Factors**

292 **Quantitative Response Scales**

293 A 2 (Gender) x2 (HDI) MANOVA on the quantitative causal explanations showed a
 294 significant main effect for gender ($F(10, 9155)=41.50, p<.001$) and HDI ($F(10,$
 295 $9155)=85.87, p<.001$) and a significant gender by HDI interaction ($F(10, 9155)=5.89$
 296 $p<.001$). Specifically, Table 2 shows men were more likely to endorse lack of conception to
 297 something their partner had or had not done, their partner’s age and their own lifestyle.
 298 Women were more likely to endorse lack of conception as being due to their age, chance or
 299 bad luck, medical problems, emotional problems and God’s will. The main effect of HDI

300 showed that those from NVHDI countries were more likely to endorse lack of conception to
 301 something their partner had or had not done, medical problems, emotional problems and
 302 God's will. Those from VHDI countries were more likely to endorse chance or bad luck,
 303 their age and partner's age.

304 Significant interactions between gender and HDI suggested that the gender difference
 305 in causal explanation differed according to HDI. Specifically, in comparison to women, men
 306 from VHDI countries reported their lack of conception was due to something they had or
 307 had not done ($p<.01$), their partner's lifestyle ($p<.05$) and emotional problems ($p<.001$)
 308 whereas in the NVHDI group the reverse was true with women more likely to endorse these
 309 causes than men. In comparison to men and women in VHDI countries, men and women
 310 from NVHDI countries endorsed God's will ($p<.001$) as the cause of their lack of
 311 conception, whereas those in the VHDI group endorsed chance or bad luck ($p<.001$).

312 **Textual Replies**

313 Of the 10,045 participants, 2,988 provided 3,900 textual replies for the three questions
 314 about causal explanations for lack of conception. The majority of textual replies were given
 315 in response to something the respondent had personally done or not done in the past
 316 ($n=1,589$, 40.7%) or were given as other reasons ($n=1,498$, 38.4%). Fewer possible causes
 317 were attributed to the respondents' partner's actions ($n=813$, 20.9%). The main themes within
 318 each question and the similarities and differences according to gender and HDI are presented
 319 next. Supplementary Tables 2 to 4 provide the complete list of themes, sub-themes and
 320 illustrative quotes for each of the questions.

321 ***Textual replies to the question: Because of something I have done (or not done)***

322 Overall 20.7% ($n=2,058$) of the total sample ($N=10,045$) somewhat or strongly agreed
 323 that their lack of conception was due to something they had or had not done. Of these, 71.6%
 324 ($n=1474$, 146 men, 1328 women) provided an accompanying textual reply. An additional 115

325 respondents who disagreed or were uncertain also provided a textual reply. These replies
326 were not strikingly different from those who agreed and were included in the analysis.
327 Overall, almost half of the respondents' textual replies to this question highlighted particular
328 reproductive choices (e.g., abortion). Other causes included medical or reproductive history,
329 karma, motivation or ambivalence towards parenthood, and lifestyle practices, as described
330 below (see Supplementary Table 2 for all causes).

331 Across all countries, women commonly stated that historical reproductive choices
332 about abortion or birth control were the main causes of their lack of conception. Some
333 believed these choices had impacted their fertility on a biological level: *'taking birth control*
334 *from an early age has played with my hormones'*. Others believed this choice impacted them
335 on a 'karmic' level: *'I am being punished for having an abortion ten years ago.'* Women
336 expressed a sense of responsibility and self-blame for past reproductive choices and losses
337 whereas men did not describe causes in this way. For example, women described having
338 undergone abortions at *'too young'* an age, undergoing a *'voluntary'* abortion or taking birth
339 control (usually the pill) for *'too long'*. Women from NVHDI countries tended to cite
340 infections (*'Perhaps [I] had an infection [in reproductive organs] I didn't know about.'*)
341 while women in VHDI countries commonly reported *'miscarriage'* (*'I had a miscarriage in*
342 *the past when I was younger'*).

343 In addition, women from VHDI countries described feelings of ambivalence,
344 uncertainty or *'waiting too long'* to become a parent as a cause of their lack of conception.
345 Delayed conception was coupled with regret: *'I think I should have tried to get pregnant*
346 *sooner'* and *'I have many regrets about it'*. Respondents from Brazil and Turkey also
347 provided similar causes but not participants in the other NVHDI countries.

348 The causes related to 'karma' or punishment for past behaviours men and women
349 provided included risky sexual practices (e.g., unprotected sex) and contracting sexually

350 transmitted infections (STIs). Men also listed ‘masturbation,’ as a cause whereas women did
351 not. Lifestyle factors cited by both genders across HDI included weight, smoking, alcohol
352 and drug use. Some described ambivalence to change their unhealthy states or behaviours as
353 affecting their chances of conception: for example: ‘*I am overweight and I haven’t bothered*
354 *to lose it*’.

355 ***Textual replies to the question: Because of something my partner has done (or not done)***

356 Within the total sample ($N=10045$), 10.6% ($n=1,062$) somewhat or strongly agreed
357 their lack of conception was related to something their partner had or had not done. Of these,
358 68.4% ($n=726$, 109 men, 617 women) provided textual replies. The most commonly reported
359 causes were their partner’s lifestyle practices, choices, motivation and ambivalence towards
360 parenthood. Additionally, respondents cited their partner’s medical history and infertility
361 diagnosis (see Supplementary Table 3 for all causes).

362 Women from all countries expressed a sense of frustration, lack of control and
363 helplessness over their partner’s lifestyle behaviour. They said, ‘*He should stop smoking,*’ or
364 ‘*[He] did not want to stop smoking and so his sperm are dim*’. In contrast, men tended to cite
365 their partner’s past abortions, contraceptive use, and lifestyle behaviours with uncertainty
366 rather than blame or helplessness. For example, ‘*took pill too long possibly*’. Women also
367 voiced frustration and helplessness with their partner’s lack of readiness for parenthood,
368 which they believed led to delay and caused lack of conception: ‘*Making us put off having*
369 *children until now.*’ Women from VHHDI countries commonly provided reasons such as
370 ‘*waiting too long*’ or their partner’s readiness as cause of their lack of conception whereas
371 women from NVHHDI countries did not and instead more likely provided reasons such as
372 their partner’s lifestyle behaviours.

373 A further 87 respondents who disagreed or were unsure their fertility problems were
374 due to something their partner had done provided a textual reply. Within the responses, some

375 respondents further indicated their partner's lack of responsibility: *'problem stems from me,*
376 *my husband is very healthy.'*

377 ***Textual replies to the question: Other reasons***

378 In total, 14.9% ($n=1,498$, 173 men, 1325 women) of the total sample ($N=10,045$)
379 provided an answer to the 'Other reasons' question. There was less variability in these replies
380 with almost 40% referring to an infertility diagnosis as a cause of lack of conception. Other
381 reasons included medical and reproductive history and emotional problems.

382 Respondents provided medical diagnoses of fertility problems such as polycystic
383 ovary syndrome (PCOS), endometriosis and male factor infertility (sperm motility,
384 morphology, and mobility) and medical issues known to cause fertility problems (e.g., cancer
385 treatment, mumps). Others cited medical reasons not known or not conclusively known to
386 cause fertility problems (e.g., allergies, anti-depressants, *'I had a ruptured appendectomy'* or
387 *'a fever of 40 degrees'*). These responses did not differ based on gender or HDI. When
388 referring to reproductive causes, women tended to refer to adverse reproductive events like
389 ectopic pregnancies, miscarriages, and menstrual problems, whereas men tended to refer to
390 their sexuality, for example, *'premature ejaculation'*, frequency of sexual intercourse or
391 *'masturbation'*

392 Emotional problems were commonly provided in 'other causes' including general
393 stress, work-related stress, and stress related to fertility problems and previous miscarriages:
394 *'I think it is mainly due to stress'* or *'too much stress.'* There was a clear country trend with
395 those from VHHDI countries citing stress more than those from NVHHDI countries. Across
396 HDI, women described the psychological impact and anxieties related to trying to conceive as
397 the cause of their lack of conception: *'I am anxious every month with the idea of being*
398 *pregnant'* or *'because I am too obsessed'*. Men stated more generally, *'I think it is mainly due*
399 *to stress'*.

400 3. Association between Causal Explanations and Help-Seeking Behaviour

401 Quantitative Results

402 In total, 62.1% of the sample reported that they had sought medical help for their lack
403 of conception. Of those who sought help, the level of medical engagement was: 49.9%
404 underwent diagnostic work-up or first line treatments (e.g., ovulation induction,
405 insemination), 20.7% underwent fertility medical injections and 29.4% underwent more
406 advanced treatment such as in vitro fertilization. Table 3 shows summary statistics for the
407 logistic regression examining the relationship between causal explanations and help-seeking
408 behaviour including gender and HDI moderation. Endorsing medical causes, own age, being
409 a female and residing in a VHHDI country were positively associated with help-seeking. In
410 contrast, endorsing emotional problems, chance or bad luck, partner's age or lifestyle (self or
411 partner) were found to be associated with a decrease in the odds of help-seeking.

412 Moderation analysis using regression showed the relationship between causal
413 attributions and help-seeking was moderated by gender. Simple slope analysis showed that
414 partner's age significantly hindered help-seeking for women (slope= $-.13$, $p<.001$) but was
415 not significant for men (slope= $.06$, $p=.510$). Similarly, emotional causes in women hindered
416 help-seeking (slope= $-.09$, $p<.01$) but was not significantly associated for men (slope= $.08$,
417 $p=.232$). Endorsing chance or bad luck was found to significantly hinder help-seeking for
418 men (slope= $-.30$, $p<.001$) and women (slope= $-.09$, $p<.01$) whereas endorsing God's will
419 was found to facilitate help-seeking for men (slope= $.20$, $p<.01$), but not women (slope= $.02$,
420 $p=.531$). Own age was found to facilitate help-seeking for women (slope= $.18$, $p<.001$) but
421 not men (slope= $-.14$, $p=.213$).

422 Simple slope analysis also revealed the relationship between causal attributions and
423 help-seeking was moderated by HDI. Perceiving God's will facilitated help-seeking in the
424 VHHDI group (slope= $.22$, $p<.001$) and the NVHHDI group (slope= $.35$, $p<.001$). Perceiving

425 medical causes also facilitated help-seeking for both VHHDI (slope= .47, $p<.001$) and
426 NVHHDI (slope= .56, $p<.001$) countries.

427 **Textual Replies**

428 Those in the help-seeking group commonly provided a specific infertility diagnosis as
429 an explanation for lack of conception (e.g., endometriosis, PCOS). In this group, respondents
430 believed that the stress associated with trying to conceive or undergoing treatment was also
431 associated with lack of conception, with women more likely than men to provide this cause
432 (e.g., *'because I want it too bad and I am not relaxed'*). Respondents provided feelings of
433 regret that they had not sought treatment earlier and attributed this delay to feelings of
434 ambivalence, uncertainty, and fear of parenthood: *'I should have paid attention sooner.'*
435 Women expressed more regret than men. Respondents also believed their fear of discovering
436 they were infertile delayed seeking help: *'Not being proactive enough about my reproductive*
437 *health because I was scared of the answer.'* Finally, women tended to provide reasons such
438 as their/their partner's lack of compliance and/or continuation with treatment as the cause of
439 their fertility problems: *'I did not complete the full course of treatment'* or *'[my partner] did*
440 *not take the medication'*.

441 Those in the non-help-seeking group commonly described being unable to access the
442 necessary treatment as an explanation for lack of conception (*'I have not proposed it and do*
443 *not have health care'* or *'not having the proper orientation and means'*) with a small trend
444 for higher frequency of responses among those from NVHHDI countries. Women in the non-
445 help-seeking group commonly believed their lack of conception was due to their partner's
446 refusal to undergo fertility treatment (e.g., *'no interest in treating infertility'*), or to lack of
447 care for his general health (e.g., not being tested/treated for STIs).

448 **DISCUSSION**

449 Regardless of cause, fertility problems are often unexpected and accompanied by
450 feelings of puzzlement, active denial and distress (Greil et al., 2010). These reactions have
451 been shown to stimulate the search for causal explanations (Tennen et al., 1991). Our
452 findings show support for the CSM model and its predictions in the fertility context.

453 First, men and women readily make causal explanations for their lack of conception.
454 When making these causal explanations, they appear to be influenced by their culture,
455 experiences and available information (Leventhal et al., 1980). Our results demonstrate that
456 people make causal explanations for lack of conception similarly to how people respond to
457 other health problems with medical causes endorsed most highly. However, the qualitative
458 findings demonstrate that these medical causes may not all be legitimate causes, highlighting
459 the need for patient education strategies to ensure people are making educated decisions
460 about how to respond to their lack of conception (e.g., help-seeking).

461 Of the total sample, only 28% believed lack of conception was due to factors relating
462 to themselves, their partner or the couple. The majority of the sample (72%) did not agree
463 with this pattern of attribution. The qualitative results provide additional insight. The majority
464 of textual replies referred to an infertility diagnosis, medical or reproductive history in line
465 with the higher percentage of couples having sought medical help. However, fate, chance
466 and God's will also figured prominently. It seems clear from this pattern of causal explaining
467 that many individuals search for a reason beyond themselves or their partners to make sense
468 of their lack of conception (Leventhal et al., 1980).

469 Second, consistent with the CSM (Leventhal et al., 1980), our study showed that
470 causes are shaped by socio-cultural factors and personal histories. The results highlight how
471 the majority of women use their personal history or a 'highly salient environmental event'
472 (e.g., miscarriage) to understand the cause of their health problem (Leventhal et al, 1980).
473 However, although personal experience is a readily available source of information, it may

474 not be accurate. In the current study, ‘abortion’ and ‘birth control use’ were some of the most
475 frequently spontaneously reported causes for lack of conception, despite a lack of conclusive
476 evidence that these procedures or methods deleteriously affect fertility (Mikkelsen et al.,
477 2013).

478 Fertility education campaigns are needed to address misconceptions but also to tackle
479 the emotional impact of causal processing. Some reported causes (e.g., abortion, extended
480 pill use, ambivalence about parenthood) were coupled with feelings of self-blame and
481 responsibility, in particular by women. Messages from the external social environment may
482 also contribute to misconceptions and increase feelings of self-blame for lack of conception.
483 For example, negative media representations of abortion as ‘risky’ are common (Purcell,
484 Hilton, & McDaid, 2014) and may be highly influential (and accessible) sources of inaccurate
485 information influencing the generation of causal explanations for lack of conception. These
486 misconceptions come at a cost given that lack of conception may be due to other causes that
487 could be remedied by medical help-seeking and/or behaviour modification (e.g., reducing
488 smoking; Leventhal et al., 1980). These results suggest a need for provision of education
489 about legitimate risks to conception alongside reproductive health services to women in
490 particular (Bunting & Boivin, 2010; Fulford, Bunting, Tsibulsky, & Boivin, 2013).

491 Although our results identified significant differences in the ratings of causal
492 explanations according to HDI, closer examination suggests important similarities. For
493 example, although those from both HDI groups ranked medical problems as the most
494 frequent cause of lack of conception, those from VHHDI ranked ‘chance or bad luck’ and
495 NVHHDI ranked ‘God’s will’ as the second most frequent cause respectively. These results
496 indicate that regardless of HDI levels, lack of conception is often believed to be due to
497 uncontrollable, and arguably predetermined causes. As such, across countries, the causal
498 explanation process may be motivated by a similar search for meaning (i.e., a cause beyond

499 themselves). These findings can inform the development of targeted educational strategies
500 and patient support for lack of conception.

501 Our findings offer insight into the causal explanation process for men and women
502 when a health problem or illness is experienced as a couple. For example, in both members of
503 the dyad, quantitative findings showed that responsibility for lack of conception (i.e., the
504 cause or source) was more commonly directed towards the female. Qualitative findings
505 suggest that women experience more emotional costs in the causal explanation process.
506 Women more commonly attached emotional significance to causes related to themselves,
507 having more regret about their personal reproductive choices (e.g., previous abortion(s) and
508 contraceptive use). When attributing the cause of lack of conception to their partner, women
509 felt frustrated with decisional imbalances in their relationship, seemingly feeling helpless to
510 change their partner's behaviour (e.g., smoking), to influence his readiness for parenthood, or
511 to convince him to seek or comply with fertility treatment. In contrast, men did not express
512 the same degree of helplessness when attributing their lack of conception to their partner.
513 That said, given that only 28% of the sample attributed the cause of lack of conception to
514 themselves, their partner or both, the finding needs to be interpreted with caution.

515 Finally, results also support the CSM in finding that causal explanations are
516 associated with medical help-seeking. Overall medical problems were the most commonly
517 rated causes which is consistent with the sample profile. As noted the majority of respondents
518 in the sample (75%) had met the threshold for clinical definition of infertility, and the
519 majority had engaged in medical help-seeking (62%). As expected, the results suggest that
520 regardless of HDI those who had sought help were more likely to provide a medical reason
521 for their fertility problems (i.e., infertility diagnosis) pointing to the bi-directional influence
522 of authoritative others (e.g., doctors) on people's causal explanations (Hammarberg et al.,
523 2017; Leventhal et al., 1980). The textual replies demonstrate that despite having sought help,

524 many respondents possessed misunderstandings about potential medical causes of lack of
525 conception. There are different ways to interpret this finding. It may provide evidence for the
526 robust and pervasive tendency for personal theories for their health problem to supercede
527 what doctors tell them. Alternatively, it may point to a pervasive misperception about causes
528 of lack of conception present in many countries (e.g., propagated through media, e.g., effect
529 of abortion; Purcell et al., 2014). Whichever is the explanation there is a need for fertility
530 education across the globe. More research is needed to understand trajectory of help-seeking
531 and its effect on outcomes, and the role of causal understanding at different time points in this
532 process.

533 In line with the third hypothesis, results showed the relationship between causal
534 explanations and help-seeking behaviour to be moderated by gender and HDI. Individuals
535 from VHHDI countries were more likely to seek help than individuals in NVHHDI countries,
536 a result that indirectly suggests access to care and economic status may have an impact on
537 help-seeking behaviour. This suggestion was echoed by the qualitative findings that found
538 individuals from NVHHDI countries who had not sought help for their lack of conception felt
539 unable to do so. Beyond access to care, moderation effects suggested that help-seeking for
540 women is hindered by more factors than seems to be the case for men. For example,
541 attribution to emotional causes, partner's age, and chance or bad luck hindered help-seeking
542 in women. The only factor that was found to significantly hinder help-seeking for men was
543 chance or bad luck. Previous research consistently showed that women were more likely to
544 seek help than men (Thompson et al., 2016; White & Witty, 2009). While this is reflected in
545 the current study's findings, the moderation effects argue for a more complex causal frame
546 for women given the multiplicity of determinants associated with their help-seeking
547 behaviour.

548 Although moderator analysis showed differences in strength of association for
549 medical causes between NVHHDI and VHHDI countries, the simple slopes were strong in
550 both groups (slopes= .56, .47, respectively) and this cause was more strongly associated with
551 help-seeking than any other moderator. Aside from medical causes, perceiving God's will
552 had similar effects, with it being facilitative for both NVHHDI and VHHDI groups. Together,
553 the results of the study suggest that future research into help-seeking needs to examine
554 diversity of perceived causes and not just strength or type of cause. There is a need to
555 increase access to fertility care where access for medical treatment is limited as well as the
556 development of gender-specific strategies to promote help-seeking behaviour.

557 **Limitations**

558 The limitations for the overall IFDMS study have been reported elsewhere (Bunting et
559 al., 2013) and are briefly reviewed here. In the current analysis, lack of conception (i.e., 'had
560 not conceived') was used as a comparison to infertility and/or fertility problems. Given that
561 75% of the sample met the clinical definition for infertility, we believe this interpretation was
562 warranted.

563 The cross-sectional nature of the IFDMS which means the direction of the
564 relationship between causal explanations and help-seeking cannot be determined. The
565 analysis of individual countries was limited because countries were grouped according to
566 HDI. If we had compared across specific countries (e.g., Mexico versus Turkey) we may
567 have found different results. Within country differences (e.g., different economic levels) may
568 have also been missed as a result of country groupings. Caution must be made when
569 interpreting the qualitative results as only 29% of the larger sample opted to answer one or
570 more of the open-ended questions. However, the qualitative findings were based on 2,988
571 participants, and illuminate the subjective aspect of the explanation and help-seeking process
572 that may have relevance for others, and point to future directions for research and practice. In

573 addition, within the group of help-seekers, there may be value in comparing fertility
574 treatment outcomes (live birth versus no live birth) in relation to causal explanations to
575 determine whether health outcome influences the causal attribution process.

576 **CONCLUSION**

577 People develop causal explanations for their health problem to try to restore the world
578 as coherent, cohesive and predictable (Leventhal et al., 1980). They rely on available
579 information to make sense of the cause and to inform their help-seeking behaviour. Our
580 findings suggest that although those who seek help are more likely to believe that their lack
581 of conception is due to medical reasons, individuals may develop inaccurate causal
582 explanations based on their personal experiences. For women in particular, causal
583 explanations are coupled with feelings of responsibility and self-blame. This is problematic
584 given that causal explanations of illness have direct impact on help-seeking and subsequent
585 outcomes. The current results point to the need to increase provision of information specific
586 to common misconceptions about causes of lack of conception so that people are less likely
587 to blame themselves and can seek timely and appropriate medical advice and treatment. Our
588 findings also confirm the relevance of applying the CSM model in the infertility context and
589 suggest that examining other components of the model in this setting could be of value. Other
590 researchers have already begun to examine these areas including illness perceptions in
591 particular (e.g., Benyamini, Gozlan, & Kokia, 2009).

592

593 **FUNDING ACKNOWLEDGEMENTS**

594 This work was supported by Merck KGaA, Darmstadt, Germany (no grant number) and the
595 Economic and Social Research Council (ESRC, UK) under grant RES-355-25-0038,
596 'Fertility Pathways Network'.

597 **DECLARATION OF CONFLICT OF INTEREST**

598 This study was funded by a pharmaceutical company, Merck GCaA, Darmstadt, Germany.

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Table 1

Socio-demographic and Fertility Characteristics of the Total and Textual Sample According to Gender and Human Development Index*

Variable	Total Sample					Textual Sample				
	Total	Gender		Human Development Index		Total	Gender		Human Development Index	
		Men	Women	NVHHDI	VHHDI		Men	Women	NVHHDI	VHHDI
<i>N</i>	10,045	1,690	8,355	3793	6171	2,988	337	2,651	1,202	1,759
Age	31.83 (5.91)	33.15 (6.27)	31.56 (5.80)	31.38 (5.94)	32.11 (5.87)	31.59 (6.11)***	33.31 (6.75)	31.37 (5.99)	31.30 (6.12)	31.80 (6.10)
Years together Given birth/fathered a child (% , n)	5.90 (4.18)	5.91 (4.54)	5.90 (4.10)	5.57 (4.22)	6.10 (4.13)	5.88 (4.23)	6.19 (4.83)	5.84 (4.15)	5.77 (4.29)	5.96 (4.17)
Years trying to conceive	26.30 (2581)	27.10 (453)	26.10 (2128)	23.30 (861)	28.10 (1700)	27.00 (781)	30.00 (99)	26.60 (682)	27.10 (312)	26.70 (460)
Years trying to conceive	2.77 (2.90)	2.87 (3.39)	2.76 (2.79)	3.03 (3.27)	2.62 (2.6)	2.95 (3.05)***	3.14 (3.48)	2.92 (2.99)	3.38 (3.50)	2.65 (2.63)
Time trying (% , n)										
<12 months	24.30 (2421)	24.10 (404)	24.30 (2017)	24.20 (914)	24.20 (1484)	24.20 (719)	23.50 (78)	24.30 (641)	23.0 (276)	24.70 (430)
1-2 years	25.70 (2569)	28.70 (481)	25.10 (2088)	25.10 (947)	26.20 (1603)	23.10 (685)	24.70 (82)	22.90 (603)	21.10 (253)	24.40 (426)
2-3 years	16.10 (1606)	15.10 (252)	16.30 (1354)	15.00 (566)	16.80 (1029)	16.30 (483)	13.90 (46)	16.60 (437)	15.2 (182)	17.30 (301)
3+ years	33.90 (3387)	32.10 (537)	34.30 (2850)	35.80 (1353)	32.80 (2011)	36.4 (1081)	38.00 (126)	36.20 (955)	40.70 (487)	33.60 (586)
Help-seeking (% , n)	62.10 (6169)	51.50 (857)	64.20 (5312)	60.80 (2268)	63.10 (3865)	62.90 (1860)	57.30 (192)	63.70 (1668)	63.80 (757)	62.80 (1095)

Note. *N*=sample size, data are mean (standard deviation) unless otherwise specified. *Owing to missing data *n* varies per variable. *** $p < .001$ for MANOVA comparisons between those who did and did not leave qualitative data.

NVHHDI: Not Very High Human Development Index; VHHDI: Very High Human Development Index

Table 2

Mean (standard deviation) and effect size for Causal Explanations According to Total Sample (N=10045), Gender and Human Development

Index

I think I have not conceived because of:	Total	Gender		<i>r</i> '	Human Development Index		<i>r</i> '
		Men <i>n</i> =1,690	Women <i>n</i> =8,355		NVHHDI <i>n</i> =3,793	VHHDI <i>n</i> =6,171	
Medical problems	3.22 (1.46)	2.98 (1.37)	3.27 (1.47)***	0.07	3.27 (1.47)	3.19 (1.45)***	0.03
Chance or bad luck	3.16 (1.42)	2.94 (1.40)	3.20 (1.42)***	0.07	2.87 (1.49)	3.32 (1.35)***	0.15
God's will	2.77 (1.55)	2.68 (1.48)	2.78 (1.56)***	0.02	3.40 (1.51)	2.39 (1.45)***	0.32
Emotional problems	2.80 (1.41)	2.65 (1.30)	2.83 (1.42)***	0.05	2.91 (1.44)	2.74 (1.38)**	0.06
My Self	2.23 (1.36)	2.21 (1.21)	2.24 (1.38)	0.01	2.32 (1.42)	2.18 (1.32)	0.05
My age	2.37 (1.43)	2.05 (1.18)	2.43 (1.46)***	0.10	2.22 (1.39)	2.45 (1.44)***	0.08
My lifestyle	2.37 (1.33)	2.50 (1.29)	2.34 (1.34)***	0.04	2.41 (1.40)	2.34 (1.29)	0.03
My Partner	1.93 (1.18)	2.08 (1.14)	1.90 (1.19)***	0.06	2.00 (1.24)	1.88 (1.14)*	0.05
Partner's age	1.99 (1.23)	2.06 (1.22)	1.97 (1.23)**	0.03	1.90 (1.21)	2.04 (1.24)***	0.06
Partner's lifestyle	2.26 (1.30)	2.32 (1.23)	2.25 (1.31)	0.02	2.33 (1.37)	2.22 (1.25)	0.04

Note. * $p < .05$; ** $p < .01$; *** $p < .001$ for gender or HDI MANOVA comparisons.

NVHHDI: Not Very High Human Development Index; VHHDI: Very High Human Development Index

Table 3

Multiple Logistic Regression Summary Statistics for Help-Seeking as the Dependent Variable and Causal Explanations as the Predictors with Gender (Model 2) and HDI (Model 3) Interactions

Specific Casual Explanations	Model 1			Model 2			Model 3		
	B	SE B	e ^B	B	SE B	e ^B	B	SE B	e ^B
Gender	.46***	.06	1.59						
Human development index	.15**	.05	1.16						
Medical problems	.58***	.02	1.79				.16**	.05	1.17
Emotional problems	-.07*	.03	.94	-.17*	.07	.85			
God's will	.04	.03	1.04	-.19**	.07	.83	-.32***	.05	.73
Chance or bad luck	-.13***	.03	.88	.21**	.07	1.23			
My lifestyle	-.25***	.03	.78						
Partners lifestyle	-.15***	.03	.86						
My age	.15***	.03	1.17	.32**	.12	1.37			
Partners age	-.11***	.03	.89	-.19**	.10	.82			
R ²		.15			.16			.17	
X ²		1093.50***			1129.98***			1190.01***	

Note. Coding was help-seeking =1, non-help-seeking = 0. Gender female =1, male =0. NVHDI =0, VHDI =1 ***p<.001, **p<.01, *p<.05, R² = Nagelkerke R Square. B=32standardized beta coefficient, SE B = standard error, eB = odds ratio. HDI: Human Development Index