

# “Who needs an app? Fertility patients’ use of a novel mobile health app”

Digital Health  
Volume 8: 1–10  
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DOI: 10.1177/20552076221102248  
journals.sagepub.com/home/dhj



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## Abstract

**Objective:** The number of couples experiencing infertility treatment has increased, as has the number of women and men experiencing infertility treatment-related stress and anxiety. Therefore, there is a need to provide information and support to both men and women facing fertility concerns. To achieve this goal, we designed a mhealth app, *Infotility*, that provided men and women with tailored medical, psychosocial, lifestyle, and legal information.

**Methods:** This study specifically examined how fertility factors (e.g. time in infertility treatment, parity), socio-demographic characteristics (e.g. gender, education, immigrant status), and mental health characteristics (e.g. stress, depression, anxiety, fertility-related quality of life) were related to male and female fertility patients’ patterns of use of the *Infotility* app.

**Results:** Overall, the lifestyle section of the app was the most highly used section by both men and women. In addition, women without children and highly educated women were more likely to use *Infotility*. No demographic, mental health or fertility characteristics were significantly associated with app use for men.

**Conclusion:** This study shows the feasibility of a mhealth app to address the psychosocial and informational needs of fertility patients.

## Keywords

infertility, mhealth app, psychosocial health

Submission date: 24 September 2021; Acceptance date: 4 May 2022

## Introduction

Infertility is a medical condition that refers to the inability to conceive a child after a year of regular sexual intercourse without the use of contraception.<sup>1</sup> Today, approximately one in six couples in Canada experience infertility.<sup>2</sup> There are many treatments available to individuals experiencing fertility issues including those made possible by assisted reproductive technologies, such as in vitro fertilization.<sup>3</sup>

Although infertility impacts both men and women equally,<sup>2</sup> it is often assumed to be a woman’s issue and

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many of the fertility treatments available focus on women's bodies, regardless of who in the couple is infertile.<sup>4</sup> In contrast, men are often considered to take a secondary or supportive role during fertility treatment.<sup>4</sup> As a result, much of the literature on the psychosocial experience of infertility centers on the experiences of women.<sup>4</sup>

Infertility and its treatment can be distressing for both men and women and is often associated with feelings of isolation, loss of control, and stigmatization.<sup>5,6</sup> For many women, motherhood is central to identity, and those who do not have children have been shown to experience greater stress during infertility treatment than those with at least one child.<sup>4,7,8</sup> For men, sociocultural factors, like identifying as religious, are better indicators of infertility-related concern,<sup>9</sup> and specifically infertility-related gender identity concerns.<sup>7</sup> These differences in factors related to identity concerns in men and women point to a need to tailor infertility support measures to address the unique needs of men and women.

The impacts of infertility on mental health along with the variety of complex treatment options suggest that there is a strong need for accessible and reliable fertility information. eHealth, health information that is delivered online, may help address the informational needs of fertility patients,

especially in minority populations that have difficulty accessing fertility treatments.<sup>10</sup> Fertility patients do access fertility information and support online<sup>11–13</sup> and accessing specific online programs developed for fertility patients may decrease levels of distress.<sup>14–16</sup> However, existing online resources may not fully meet the needs of all fertility patients.<sup>11</sup> This unfulfilled need may be especially true for men as there is a dearth of high-quality online information that is tailored to the male fertility experience.<sup>17</sup> In addition, the anonymity of using online information may help to mitigate some of the stigma that men may feel as a result of an infertility diagnosis as it will provide them an anonymous way to access the information.<sup>11</sup> Thus, there is a continued need to develop online resources that address men and women's informational and support needs.

One way to do so is through a mobile health application (mHealth app). mHealth apps have been shown to be effective at delivering health care information and improving patients' experiences.<sup>18,19</sup> The present study assessed the feasibility of a mHealth app (*Infotility/Infotilité*), developed by our research team, which provided infertility-related information and support to address the unique experiences and needs of both men and women undergoing fertility

**Table 1.** Informational pages on the app.

Category of information	Types of information
Medical information	Reproduction 101
	Fertility tracking
	Male and female causes of infertility
	Treatment options (including information about gamete donation)
	Genetic testing
	Pregnancy loss
Lifestyle information	Physical well-being (i.e. exercise, nutrition, environmental risks)
	Complementary and alternative medicine
Psychosocial information	Information on mindfulness, infertility counseling resources and other psychosocial interventions
	Coping with pregnancy loss
	Deciding when to stop treatment
	Couple relationships and infertility treatment
Legal information	Canada's Assisted Human Reproduction Act (including surrogacy and gamete donation laws)
	Embryos as property and human life
	Information about provincial coverage for treatment

treatment (more details provided in *Methods*). We were particularly interested in how fertility factors (e.g. time in infertility treatment, parity), socio-demographic characteristics (e.g. gender, education, immigrant status) and mental health characteristics (e.g. stress, depression, anxiety, and fertility-related quality of life) impacted app usage as our app was designed to meet the needs of a diverse fertility patient population. This information would help to determine whether our app would be feasible to implement in fertility patient populations that may have less access to traditional fertility resources due to their lack of education, immigrant status and/or racial or ethnic identity. To assess feasibility, we used the number of unique and total pageviews as our key performance indicators to track app usage.<sup>20</sup>

## Methods

### *The mobile health app: Infotility/Infotilité*

The mHealth app Infotility was developed in English and French by our research team. To develop the app, our team performed an extensive review of the infertility literature and a need assessment survey of fertility patients and health care professionals in Ontario and Quebec.<sup>21</sup> The app contained informational pages on the medical, lifestyle, psychosocial, and legal aspects of infertility and its treatment (see Table 1 for the information provided in each section), as well as a forum that allowed participants to connect with trained peer supporters who had previously undergone fertility treatment.<sup>21</sup> There were two interfaces of the app: one that was targeted toward men and another towards women. Although participants could access all of the app's information on either interface, the men's interface highlighted male fertility information while the women's interface focused on female fertility information. The content in these informational sections and the user interface was reviewed by physicians, nurses, psychologists, experts in patient-centered care, and fertility patients.

### *Sampling procedures*

We recruited participants from four fertility clinics in Toronto and Montreal, Canada, between October and December 2018. Our study was approved by the institutional ethics review boards of each clinic.

Our team approached fertility patients in the clinic waiting rooms, described the study, and screened for eligibility. To be eligible, participants had to be over the age of 18; in a heterosexual relationship; able to read English or French; have access to the Internet; and identify as male or female. We limited our sample to those in a heterosexual relationship and who identified as male or female because individuals in same-sex relationships and who do not identify as either male or female may have different fertility concerns that the app did not adequately address.

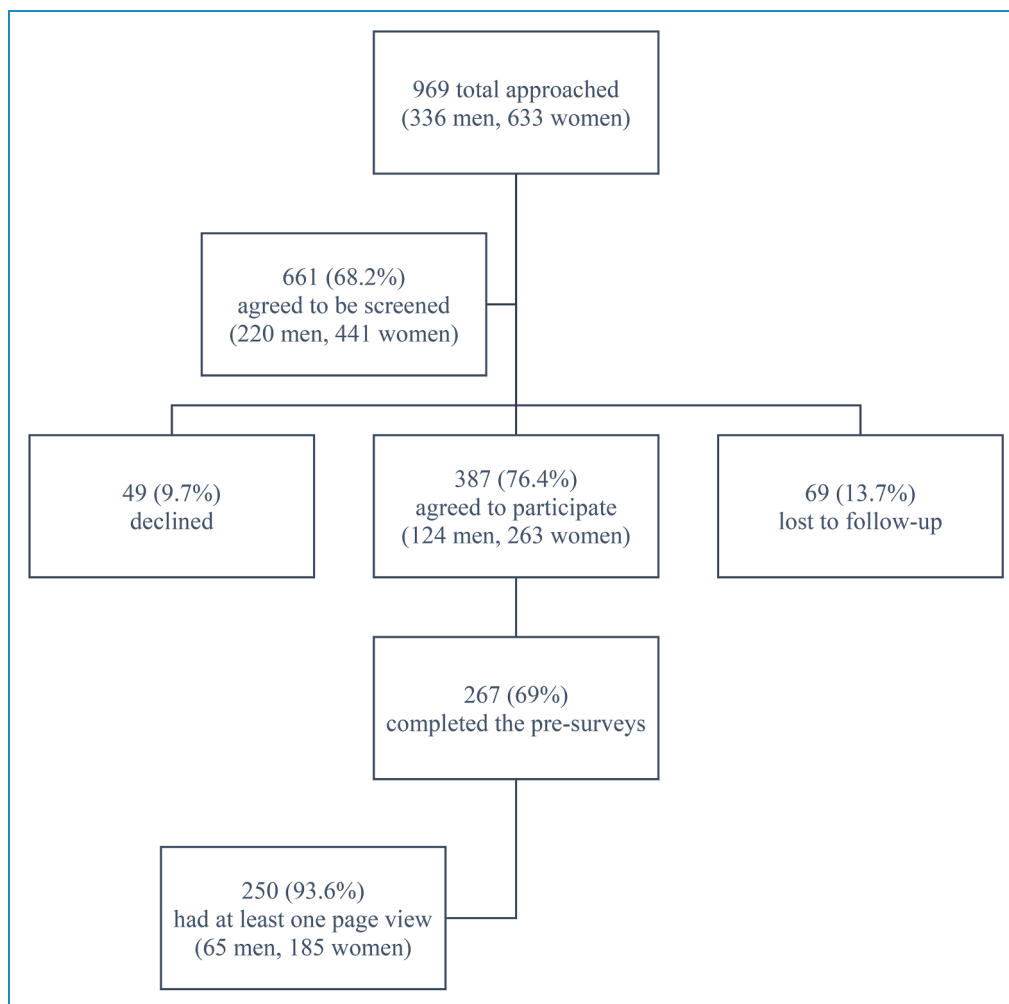
Patients were recruited as individuals, not as couples. We approached 969 people (336 men, 633 women), of whom 661 (68.2%, 220 men, 441 women) agreed to be screened for eligibility, and 505 (76.4%; 164 men, 341 women) were eligible. Of the eligible individuals, 387 (76.6%; 124 men, 263 women) agreed to participate, whereas 49 (9.7%) declined, and 69 (13.7%) were lost to follow-up. In total, 267 (69%) of the 387 enrolled completed the pre-surveys and 250 (93.6%) went on to have at least one pageview on the app (65 men, 185 women) (see Figure 1).

Participants who were eligible provided written informed consent and filled out questionnaires, which took approximately thirty minutes to complete. Upon completion of the questionnaires, participants were sent a link to access the app. We then tracked their app use for 8 weeks using Google Analytics and asked them to complete a follow-up survey (data not presented in this article). Participants who completed the follow-up survey were sent a \$25 gift card. This paper reports on app use and the demographic and mental health characteristics collected in the pre-app use survey.

### *Measures*

**Demographic questions.** Participants were asked about their ethnicity, immigration status, education, income, and age. Ethnicity was dichotomized into "White" and "Black, Indigenous, and people of color (BIPOC)," immigrant status was dichotomized as "immigrant" or "born in Canada," and education was dichotomized into "Collège d'enseignement général et professionnel (general and vocational college) (CEGEP) and below" and "university and above." In Quebec, CEGEP is a 2-year college preparatory program or a 3-year technical program that individuals enroll in after high school. Based on the median household income bracket of our sample (\$100,000–\$119,000), income was dichotomized into "above \$100,000 Canadian dollars (CAD)" and "below \$100,000 CAD."

**Fertility questions.** Participants were asked about the number of children they currently had. Parity was dichotomized into "no children" or "one or more children." Participants were also asked the date that they first saw an infertility specialist, which was converted into a number of months for the variable "time in treatment." The participant's sex and reported cause of fertility were used to create a variable that signified whether the diagnosis was congruent or incongruent. For example, a participant who reported their sex as female and their cause of infertility as female-factor would be classified as having a "congruent diagnosis," while a participant who reported their sex as female and having a partner who was infertile would be categorized as having an "incongruent diagnosis." Participants who reported that the cause of their fertility was "unknown" were categorized as having an "incongruent diagnosis." Those who reported that the cause of their



**Figure 1.** Recruitment of fertility patients.

fertility was both male and female were categorized as having a “congruent diagnosis.”

**Mental health questions.** The Perceived Stress Scale (PSS-4) was used to measure participants’ self-reported stress. This questionnaire measures the extent to which a participant views personal events in the last months as stressful (0 = never; 4 = very often).<sup>22</sup> The four items of the PSS-4 are summed providing a total score ranging from 0 to 16. In a general sample of men and women, Warttig et al.<sup>23</sup> found the mean score for women to be 6.36 (SD = 3.15) and 5.56 (SD = 3.04) for men. The Patient Health Questionnaire (PHQ-9) measures individuals’ self-reported depression. Items are based on the nine Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV) criteria (0 = “not at all”; 3 = “nearly every day”) and individual total scores range from 0 to 27. Kocalevent and Hinz<sup>24</sup> found the mean PHQ-9 score to be 3.1 (SD = 3.5) for women and 2.7 (SD = 3.5) for men in a general population. The General Anxiety Disorder (GAD-7) Scale is a self-reported questionnaire that measures a participant’s

feelings of anxiety (0 = “not at all”; 3 = “nearly every day”). Scores range from 0 to 21 with a score between 10 and 14 representing “moderate anxiety” and a score between 15 and 21 representing “severe anxiety.”<sup>25</sup> In a general population, women reported higher anxiety scores as compared with men 3.2 (3.5) versus 2.7 (3.2).<sup>26</sup> Fertility quality of life (FertiQoL) is a self-reported questionnaire with 36 items that measure individuals’ core (24 items) and treatment-related quality of life (10 items) along with physical health (2 items). Scores are reversed, summed, and scaled to range from 0 to 100 with higher scores indicating a better quality of life.<sup>27</sup> In an analysis of 41 published articles with 35 independent samples of fertility patients, the median scores ranged from 60 to 75 with men reporting higher FertiQoL scores.<sup>28</sup> All scale scores have acceptable internal consistency ( $\alpha > 0.70$ ) and have been validated by comparing their results to other similar scales.<sup>25–27,29</sup>

**Mobile app usage.** Each participant’s eight-week usage of the app was captured by the metrics of total informational pageviews and unique pageviews. Total informational

**Table 2.** Sample characteristics.

Variable	Total sample (N = 250)		Male fertility patients (N = 65)		Female fertility patients (N = 185)	
	N	Valid % or M (SD)	N	Valid % or M (SD)	N	Valid % or M (SD)
Sex	250					
Male	65	26.0				
Female	185	74.0				
Perceived stress (PSS-4)	247	6.81 (3.19)	65	5.58 (3.08)	182	7.24 (3.12)
Perceived depression (PHQ-9)	237	6.67 (5.26)	64	5.00 (5.24)	173	7.29 (5.14)
Anxiety (GAD-7)	239	7.03 (5.54)	60	5.07 (4.80)	179	7.68 (5.63)
FertiQoL	202	62.78 (14.63)	55	69.34 (13.48)	147	60.32 (14.32)
Type of Diagnosis	250		65		185	
Incongruent diagnosis	113	45.2	23	35.4	90	48.6
Congruent diagnosis	137	54.8	42	64.6	95	51.4
Time in treatment (months)	241	20.15 (21.47)	62	16.90 (18.14)	179	21.27 (22.45)
Number of Children	247		64		183	
No children	194	78.5	56	87.5	138	75.4
1 or more children	53	21.5	8	12.5	45	24.6
Age	248	35.45 (4.82)	65	36.28 (5.09)	183	35.15 (4.69)
Income	245		65		185	
Below median income	94	38.4	21	32.3	73	40.6
Above median income	151	61.6	44	67.7	107	59.4
Ethnicity	247		65		182	
BIPOC	96	38.9	23	35.4	73	40.1
White	151	61.1	42	64.6	109	59.9
Immigrant status	245		65		180	
Not an immigrant	143	58.4	40	61.5	103	57.2
Immigrant	102	41.6	25	38.5	77	42.8
Education	248		65		183	
CEGEP or below	62	25.0	21	32.3	41	22.4
University or above	186	75.0	44	67.7	142	77.6

M: mean; SD: standard deviation; PSS: Perceived Stress Scale; PHQ-9: Patient Health Questionnaire; GAD-7: General Anxiety Disorder; FertiQoL: fertility quality of life; BIPOC: Black, Indigenous and people of color.

**Table 3.** Mhealth app use among female and male participants.

Variable	Total sample (N=250)			Male fertility patients (N=65)			Female fertility patients (N=185)		
	N	Range	Med (SD)	N	Range	Med (SD)	N	Range	Med (SD)
Total informational pageviews	250	0–137	7.00 (18.65)	65	0–113	4.00 (17.11)	185	0–137	8.00 (19.00)
	<i>W</i> = 4398.5, <i>p</i> = 0.0012								
Unique informational pageviews (N=110)	250	0–53	5.00 (10.03)	65	0–40	3.00 (8.27)	185	0–53	7.00 (10.41)
	<i>W</i> = 4309, <i>p</i> < 0.001								
Unique psychosocial pageviews (N=33)	250	0–23	0.00 (4.18)	65	0–16	0.00 (2.89)	185	0–23	1.00 (4.48)
	<i>W</i> = 4464, <i>p</i> < 0.001								
Unique medical pageviews (N=52)	250	0–18	1.00 (4.01)	65	0–18	0.00 (3.18)	185	0–18	2.00 (4.18)
	<i>W</i> = 4259.50, <i>p</i> < 0.001								
Unique lifestyle pageviews (N=18)	250	0–13	2.00 (3.37)	65	0–13	1.00 (3.58)	185	0–13	2.00 (3.30)
	<i>W</i> = 5367.5, <i>p</i> = 0.19								
Unique legal pageviews (N=7)	250	0–5	0.00 (1.17)	65	0–5	0.00 (0.98)	185	0–5	0.00 (1.22)
	<i>W</i> = 5676, <i>p</i> = 0.34								

Med: median; SD: standard deviation; W: Wilcoxon rank test statistic; p: significance value.

pageviews were captured by summing the number of times a user visited a page in the following sections: psychosocial, medical, lifestyle, and legal. Unique informational pageviews (N=110) captured the unique times a user visited a page in one of the sections (see Table 3, column 1 for the number of total pages in each section). Table 1 displays the type of information that each section contained. Pages were categorized based on the type of information contained on the individual page. For example, if the page contained information about treatment options or biological mechanisms of fertility it was assigned to the “medical information” category while if the page contained information on how to improve one’s fertility through behavioral changes it was assigned to “lifestyle information.” Psychosocial information included information about improving one’s mental health (i.e. perceived depression, anxiety) and relationships through mindfulness, counseling, and other mental health interventions. Laws or financial information was categorized as “legal information.” Pages were only assigned to one category.

### Statistical analysis

The sample included participants who accessed the app (N=250). As the app had different interfaces for men and women, we stratified the statistical analysis by sex. R Version 3.6.1

was used for data management and analysis. If a case did not have full data for the variables, list-wise deletion was performed as there was less than 10% of missing data.<sup>30</sup> The distributions of the mobile app use variables were assessed using one-sample Kolmogorov–Smirnov tests. As the distribution was non-normally distributed, we performed non-parametric tests.

To address how fertility factors, demographics and mental health influence individuals’ app usage, we used Spearman’s rank-order correlations and Kruskal–Wallis tests.

## Results

### Sample characteristics

A total of 250 participants used the mHealth application, including 185 females (74%) and 65 (26%) males. Most male participants reported stress, anxiety, and depression levels that were within one standard deviation of previously reported levels in the general population. While women reported within normal ranges for perceived stress, they had slightly elevated levels of anxiety and depression as compared to the general population.<sup>23,24,26</sup> Both men and women reported FertiQol scores that were similar to scores reported in other fertility populations<sup>28</sup> (see Table 2).

Most participants either had a female-factor only diagnosis or a male-factor only diagnosis, with more males

**Table 4.** Demographic, fertility, and psychosocial characteristics of app users.

Variable	Women's total informational pageviews (N = 185)		Men's total informational pageviews (N = 65)	
	n	r <sub>s</sub> , H, or Mdn (SD)	n	r <sub>s</sub> , H, or Mdn (SD)
Perceived stress (PSS-4)	182	r <sub>s</sub> = 0.08, p = 0.28, 95% CI : -0.07 to 0.22	65	r <sub>s</sub> = 0.04, p = 0.74, 95% CI : -0.2 to 0.28
Perceived depression (PHQ-9)	173	r <sub>s</sub> = 0.07, p = 0.39, 95% CI : -0.08 to 0.21	64	r <sub>s</sub> = 0.06, p = 0.62, 95% CI : -0.18 to 0.3
Anxiety (GAD-7)	179	r <sub>s</sub> = 0.04, p = 0.56, 95% CI : -0.1 to 0.19	60	r <sub>s</sub> = 0.15, p = 0.27, 95% CI : -0.11 to 0.39
FertiQoL	147	r <sub>s</sub> = -0.02, p = 0.81, 95% CI : -0.18 to 0.14	55	r <sub>s</sub> = 0, p = 0.99, 95% CI : -0.26 to 0.27
Type of diagnosis	185	H = 0.06, p = 0.8	65	H = 1.68, p = 0.2
Incongruent diagnosis	90	Mdn = 9.50 (12.37)	23	Mdn = 2.00 (11.67)
Congruent diagnosis	95	Mdn = 8.00 (23.45)	42	Mdn = 5.00 (19.44)
Time in treatment	179	r <sub>s</sub> = -0.14, p = 0.065, 95% CI : -0.28 to 0.01	62	r <sub>s</sub> = -0.05, p = 0.71, 95% CI : -0.29 to 0.2
Number of children	183	H = 11.24, p < 0.001***	64	H = 2.6, p = 0.11
No children	138	Mdn = 12.00 (20.77)	56	Mdn = 5.00 (17.71)
1 or more children	45	Mdn = 3.00 (8.86)	8	Mdn = 0.00 (13.21)
Age	183	r <sub>s</sub> = -0.07, p = 0.33, 95% CI : -0.21 to 0.07	65	r <sub>s</sub> = -0.09, p = 0.46, 95% CI : -0.33 to 0.15
Income	180	H = 1.13, p = 0.29	65	H = 0.47, p = 0.49
Below median income	73	Mdn = 5.00 (22.53)	21	Mdn = 5.00 (25.64)
Above median income	107	Mdn = 11.00 (16.4)	44	Mdn = 3.50 (10.9)
Ethnicity	182	H = 0.76, p = 0.38	65	H = 2.04, p = 0.15
BIPOC <sup>a</sup>	73	Mdn = 8.00 (17.8)	23	Mdn = 5.00 (25.01)
White	109	Mdn = 11.00 (19.95)	42	3.50 (9.32)
Immigrant Status	180	H = 3.52, p = 0.061	65	H = 1.96, p = 0.16
Not an immigrant	103	Mdn = 11.00 (17.98)	40	Mdn = 3.50 (9.35)
Immigrant	77	Mdn = 4.00 (20.32)	25	5.00 (24.09)
Education	183	H = 4.96, p = 0.026*	65	H = 1.5, p = 0.22

(continued)

Table 4. Continued.

Variable	Women's total informational pageviews (N=185)		Men's total informational pageviews (N=65)	
	n	r <sub>s</sub> , H, or Mdn (SD)	n	r <sub>s</sub> , H, or Mdn (SD)
CEGEP or below	41	Mdn = 4.00 (18.36)	21	Mdn = 6.00 (10)
University or above	142	Mdn = 11.00 (19.22)	44	Mdn = 2.00 (19.72)

BIPOC: Black, Indigenous, and people of color; M: median; SD: standard deviation; r<sub>s</sub>: Spearman's correlations; H: Kruskal-Wallis test statistic; p: significance value; CI: confidence interval; PSS: Perceived Stress Scale; PHQ-9: Patient Health Questionnaire; GAD-7: General Anxiety Disorder; FertiQoL: fertility quality of life.

experiencing a congruent diagnosis (64.6%; 42/65) and about half of females experiencing a congruent diagnosis (51.4%; 95/185). The average time in treatment was 16.90 months (SD = 18.14) for men and 21.27 months (SD = 22.45) for women. Most participants, regardless of sex, did not have children (78.5%; 194/250) and were in their mid-thirties ( $M = 35.45$ ,  $SD = 4.82$ ). Men and women were similar in terms of demographic characteristics including education, household income, ethnicity, and immigrant status (Table 2). Both men and women were highly educated, on average earned above \$100,000 CAD, and were diverse in terms of their racial and ethnic status (see Table 2).

### Overall app use

The median number of unique informational pageviews was 5.00 (SD = 10.03) out of 110 possible unique pages (4.5%). The number of informational pageviews for both women and men was non-normally distributed ( $kurtosis_{females} = 10.38$ ,  $SE = 0.36$ ;  $skewness_{females} = 2.60$ ,  $SE = 0.18$ ;  $kurtosis_{males} = 21.6$ ,  $SE = 0.59$ ;  $skewness_{males} = 3.83$ ,  $SE = 0.30$ ). On average, women viewed significantly more unique informational pages (Med = 7.00, SD = 10.41, 6.4% of possible unique pages) than men (Med = 3.00, SD = 8.27, 2.7% of possible unique pages,  $W = 4309$ ,  $p < 0.001$ ) (see Table 3).

For both women and men, the most uniquely accessed section of the app was the lifestyle content (see Table 3). This access did not significantly vary by sex. On average, the section with the least number of unique pageviews for both women and men was the medical section of the app. Despite the low frequency of visits, women were more likely than men to use this section (see Table 3).

### Demographic, fertility, and psychosocial characteristics of app users

Demographic characteristics and their association with app use for women can be seen in Table 4. Having a higher educational attainment and not having children were significantly associated with viewing more informational pages for female participants. Being an immigrant was marginally

associated with greater app use while mental health indicators were not significantly correlated to total informational pageviews (see Table 4).

Demographic, fertility, and psychosocial characteristics were not significantly associated with app use for men (see Table 4).

### Discussion

The Infertility app provided medical, psychosocial, lifestyle, and legal information to fertility patients who were undergoing treatment. The medical information was the least accessed section, perhaps due in part to the fact that patients may be receiving this type of information from their fertility clinics or this information may be more easily accessible through other resources. Among both men and women, the most accessed part of the app was the lifestyle section, suggesting that fertility patients are looking for information on how to manage stress and improve their reproductive health through lifestyle changes and that this information may be less accessible online and/or not fully addressed during conversations with their health care providers. Thus, recommendations found in the lifestyle section could be important for helping fertility patients evaluate what lifestyle changes (e.g. diet, exercise) may be helpful in managing distress related to fertility treatment and possibly improving treatment outcomes. Future research should evaluate the impact of receiving information about lifestyle changes on fertility patients' mental and reproductive health.

As childless women, who often have higher levels of stress than multiparous women,<sup>7,8</sup> viewed more pages on the app, the app may be uniquely positioned to provide them with information that could ease their anxiety during treatment. We also found that females with higher educational attainment demonstrated greater use of the app. This finding is consistent with other research which shows that individuals with higher educational levels are more likely to seek out information.<sup>31,32</sup>

Our study, which aimed to test the feasibility of a mhealth app designed for a diverse patient population, had notable strengths. We were able to recruit a diverse patient sample and found that there was little demographic



variability in app usage. These findings suggest that a mHealth app that is designed to be attentive to a diverse population's needs and written in accessible language may be a feasible way to meet the informational needs of these populations. We also found that the lifestyle information was particularly of interest to app users, suggesting that a mHealth app may be an accessible way to deliver this information. While we designed and implemented this study before the coronavirus disease 2019 (COVID-19) pandemic, we believe that *Infotility* would be even more relevant and used today as online health care delivery and information provision have become more widespread.<sup>33</sup> Thus, patients may feel more comfortable receiving information online and a mhealth app tool could be used by fertility clinics to deliver information that may have once been provided in the clinic or through paper materials.

Despite the strengths of the present study, it was not without limitations. The app was only tested among male and female fertility patients who were currently undergoing treatment and/or evaluation. Future research should examine how the information found in the app may impact treatment decisions and how this information may or may not be helpful to individuals who are thinking about fertility treatment. One may expect that those who have not started treatment may find the medical section of the app more helpful than individuals who have already been to a fertility clinic. Future research and app development could also focus on providing information about fertility treatment options for same sex couples who are undergoing fertility treatment for social and/or medical reasons.

In addition, there was little variability in the number of unique and total pages participants read. This lack of variability in mobile app usage may have made it more challenging to detect significant relationships between app usage and fertility, socio-demographic and mental health characteristics, especially in the small sample of male participants. Future research should examine if providing an interactive way of tracking changes to health behaviors may make the app more desirable for repeat use.

## Conclusions

Our study shows that a mhealth app may be a useful way to provide fertility information to patients. The lifestyle information found on the app may be especially helpful to fertility patients who are looking for ways to change their daily health behaviors to improve their chances of treatment success and/or their mental health. In addition, the curated medical information found on the app may provide patients with an accessible and reliable way to continue to learn about fertility treatment. A mhealth app designed by health care professionals and researchers may be an efficient way to provide this information to patients as it offers them with the opportunity to access collated and evidenced-based information from a trusted source.

**Acknowledgments:** The authors would also like to thank the Montreal and Toronto fertility clinics and their staff for help recruiting participants, including Karolanne Gagné, Rachel Idelson, and Asa Kazerani. Thank you to Pivot, our app design partner, for turning our app into reality.

**Contributorship:** SAM carried out data conceptualization, data analysis, editing, and writing. ENG carried out data analysis, editing, and writing. AL performed data analysis. SW and DS carried out literature review and editing. FB performed data conceptualization, recruitment, and editing. SD carried out data conceptualization and recruitment. SR performed study design coordination and editing. SBLO created the study design and coordination. PC, KL, and NM handled study materials, recruitment, and editing. CE, HH, SO, and TT handled study materials and editing. ZR handled study materials. Phyllis Zelkowitz handled study conceptualization and editing. PZ is the Guarantor


**Declaration of conflicting interests:** The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.


**Ethical approval:** The ethics committee of McGill University Health Center (MP-37-2019-4664) and Mount Sinai Hospital Toronto (18-0170-E) approved this study.

**Funding:** The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Institute of Gender and Health (grant number 13-18296).

**Informed consent:** Participants who were eligible provided written informed consent and filled out questionnaires.

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