

ORIGINAL RESEARCH

Fertility concerns and COVID-19 Vaccines: Community-informed infographic design in urban Waterloo Region, Ontario, Canada

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ABSTRACT

Introduction: Vaccine hesitancy, including concerns about possible fertility side-effects, caused delay in the uptake of COVID-19 vaccines in Canada and elsewhere. One way of tackling vaccine hesitancy is the use of infographics that explain key issues and address concerns. The aim of this study was to explore the collaborative process of rapidly developing an infographic that was informed by community feedback and tailored to address fertility concerns during urgent COVID-19 pandemic conditions.

Methods: A survey promoted through social media and focus group discussion with community contacts were used to iteratively consult target audiences and gather feedback on interpretation of the infographic's content and meaning. Survey results were analysed using descriptive methods. A focus group discussion was analysed using inductive thematic and sentiment analysis. Feedback guided infographic development.

Results: A draft infographic and survey were shared online. 33 of 37 survey respondents expressed that they trusted the information provided in infographics. Survey respondents and focus group participants both wanted simple language and additional information to address concerns about the long-term effect of COVID-19 vaccines on fertility. Opinions indicated that more effort was needed to address varying levels of health literacy within communities. There was conflicting feedback on whether use of inclusive language by removing gender labels and focusing on biology, was helpful or confusing.

Conclusions: This study shows public feedback can help tailor content and design of vaccine confidence building tools making them more accessible to the general population. In addition, efforts to resolve specific concerns can be augmented by modifying and/or creating different versions of infographics.

Keywords: COVID-19; vaccine; confidence; hesitancy; infographic; fertility, side-effect; misinformation

Abstract in Español at the end of the article

INTRODUCTION

Vaccine hesitancy is a growing global problem. In Canada, before the COVID-19 vaccines were approved in December 2020, approximately 1 in 4 Canadians were unsure if they would receive a vaccine [1]. Three years after the approval of the vaccines, 80.5% of the eligible Canadian population have completed their primary series of vaccination [2], while 9% are completely unvaccinated [3].

Concerns about side-effects from COVID-19 vaccines are among the top reasons for COVID-19 vaccine hesitancy [4,5] defined by the WHO as 'delay in acceptance or refusal of vaccines despite availability of vaccination services [6]. Myths about the harmful impact of COVID-19 vaccines on fertility are some of the most persistent rumours shared on social media [7]. These include specific concerns, for example about cross reactivity between syncytin-1, a protein required for placenta formation, and the mRNA vaccine's spike protein [7]. Other concerns question increased risk of miscarriages, female and male infertility following vaccination [7-9]. An anecdotal tweet by influential rapper, Nicki Minaj, about a remote acquittance's alleged vaccine response - "became impotent...his testicles became swollen" - exemplifies concerns about the spread of misinformation despite growing availability of strong evidence to support the safety and effectiveness of vaccines [10]. In Canada, statements published by the Canadian Pediatric Society (CPS), the National Advisory Committee on Immunization (NACI), the Society of Gynaecologists and Obstetricians Canada (SOGC), and the Canadian Fertility and Andrology Society (CFAS) reassure patients that vaccines do not impact fertility. Indeed, these expert organisations strongly recommend vaccination for pregnant women and those who plan to become parents [7,11,12].

It is well established that infographics can improve vaccine confidence and combat misinformation [13-17]. Early in the pandemic, it became clear infographics could play an important role in rapid dissemination of knowledge via social media [18,19]. A 2021 study assessed the effect of a World Health Organisation (WHO) infographic in combating COVID-19 misinformation [20]. The authors reported the WHO infographics reduced misperceptions regardless of whether they were shared by experts or unknown social media users, and concluded organisations can effectively debunk misinformation by sharing high quality graphics. While infographics can be valuable knowledge translation tools, it is a challenge to create appealing materials with information displayed appropriately for differing levels of health literacy. Care must also be taken to choose images that reinforce rather than distract from the core message. Finally, selected images must be culturally acceptable, reflecting the target audience and their values [21-23].

The importance of listening to and engaging with communities to address concerns that prompt vaccine hesitancy is also well established [22,23]. Critically, involving representatives of targeted communities as de-

signers, creators, and advocates of knowledge translation materials builds trust and credibility in the message [22]. Acknowledging the benefits of community involvement and codesign practices, our study aimed to analyse how feedback was gathered rapidly and used to tailor messaging to the target audience during the iterative development of an infographic designed to combat real-time misinformation about COVID-19 vaccines impact on fertility.

METHODS

Co-design and development of infographics

The Connect, Collaborate, and Tailor (CCT) project, funded by the Public Health Agency of Canada's Immunization Partnership Fund, created multimedia materials dedicated to combatting vaccine hesitancy through a collaborative co-design process [24]. CCT team members included those with expertise in vaccines, public health, frontline healthcare, pharmacy, knowledge translation, infographic design, digital communication, community engagement and community members. CCT team members were organised in four working groups: Trust and Relationship Building Group, Product Design Group, Media Engagement Group and Research Group. Through consultation with representatives of underserved/ marginalized populations in Waterloo Region, gaps in knowledge, and topics of concern about COVID-19 vaccines were identified by the Trust and Relationship Building Group. Evidence-based information tools to inform attitudes and beliefs surrounding vaccination were created through a process of iterative co-design and feedback cycles and disseminated. This process (Figure 1) was adapted depending on the audience, community groups involved, and the vaccine hesitancy issue raised; rapid turnaround was encouraged to facilitate responsive dissemination of evidence-based information about COVID-19 infection and vaccines. Key audiences and collaborators included the public, vaccine advocates, pharmacists and healthcare workers actively involved in delivering vaccination services.

The first version of the COVID-19 vaccine fertility infographic was developed by a primary care physician, pharmacist, and graphic designer (Product Design Group) following discussion in Trust and Relationship Building Group about rife misinformation about vaccine side effects on fertility. The infographic, incorporating published evidence from clinical trials and peer reviewed research, was subsequently shared with the whole CCT project team widening input sources to public health officials, communication and outreach experts, and community members. Feedback from the CTT was used to modify the infographic, primarily by reducing text content. Two versions were subsequently circulated on social media among the wider public to obtain further feedback. Public feedback data were obtained through an online survey and later via a community focus group discussion. These sources of community feedback guided further infographic modifications. A

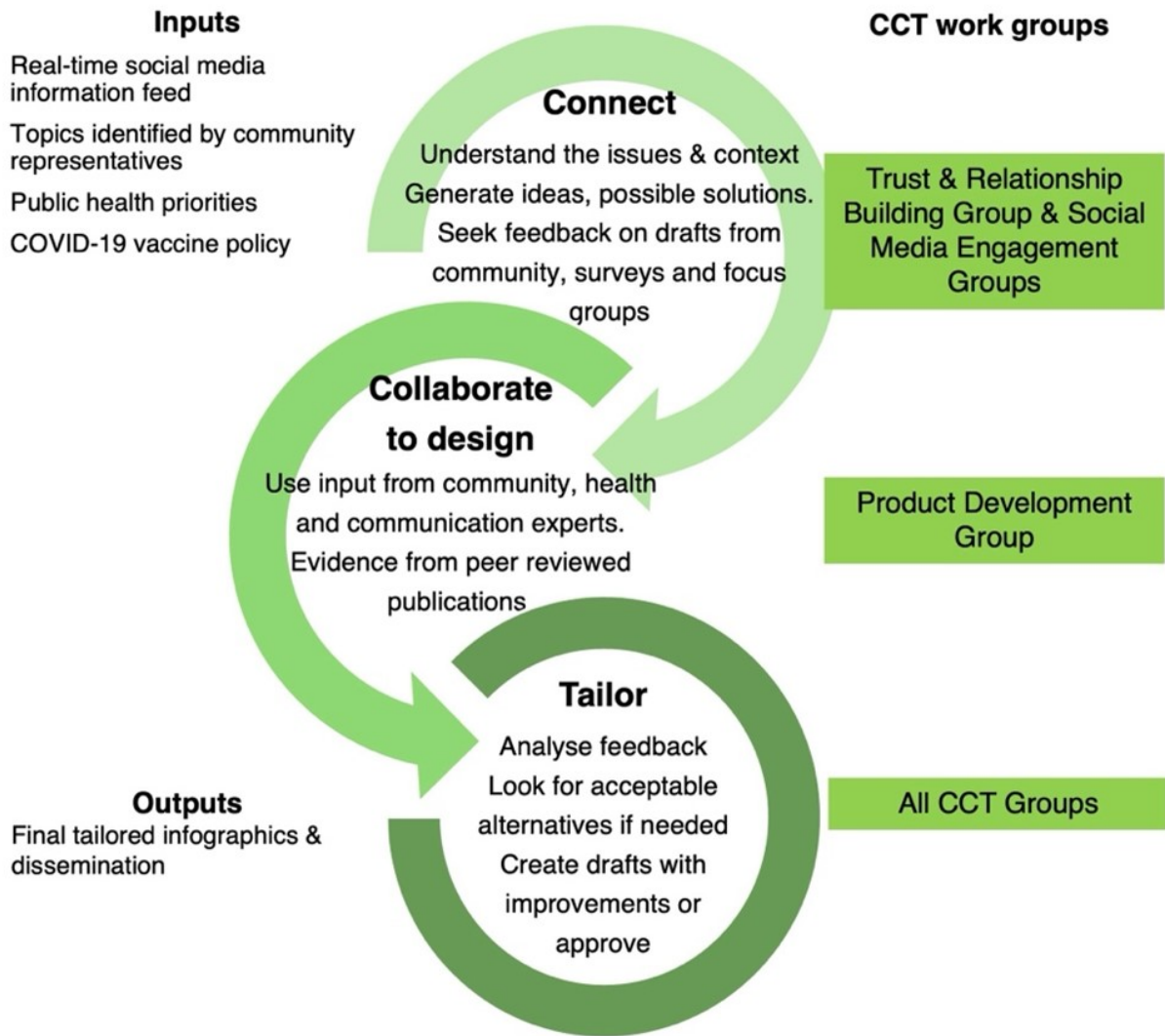


Figure 1. Outline of the co-creation framework.

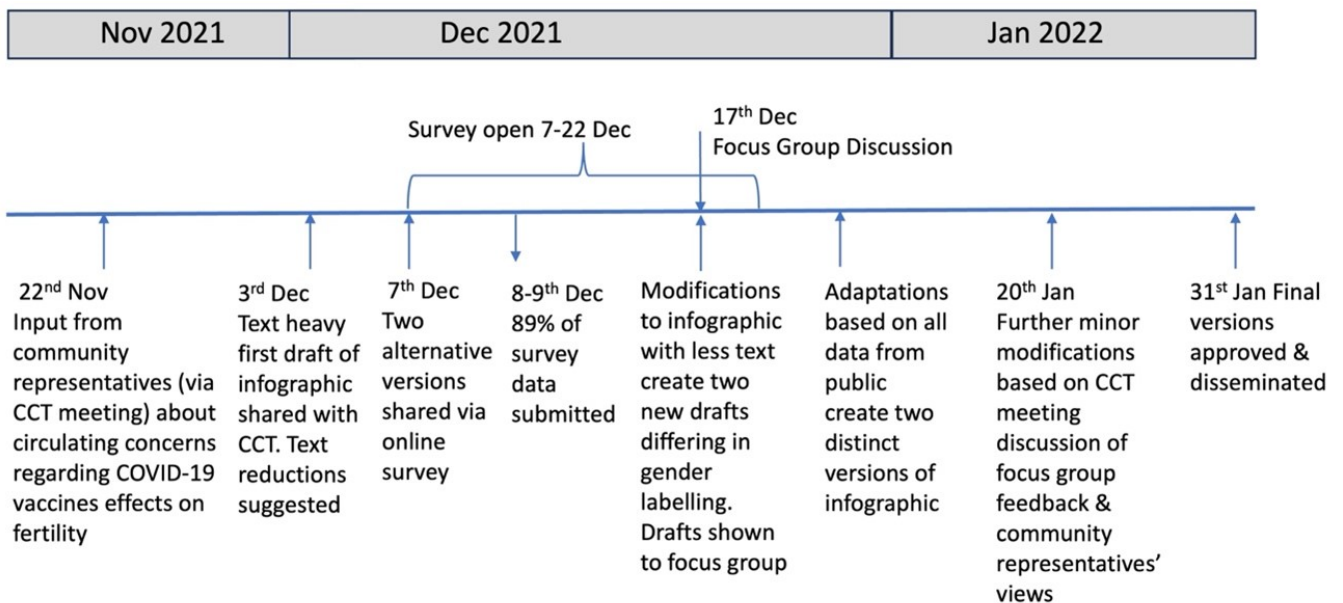


Figure 2. Timeline for the development of evidence-based infographics in response to community concerns about the impact of COVID-19 infection and vaccination on fertility.

timeline detailing infographic development and points of community input is presented in Figure 2.

Survey design, delivery, and data collection

An 11-item survey was designed by the lead pharmacist/physician pair to gather citizen's impressions of two fertility infographic versions differing in amount of text and layout (Figure 3 panel A, Figure 4 panel E). Questions probed respondents' confidence in information validity and willingness to share the infographic. Free text entry was provided where open questions invited respondents to indicate what they liked or disliked about infographics and what further information was needed. The survey was designed using Qualtrics software and could be accessed via a QR code or webpage link shared widely on social media platforms (Facebook, Twitter, Instagram) hosted by Waterloo Region of Public Health, University of Waterloo and individual CCT members' accounts. The survey was available 7-22 December 2021.

Survey analysis

Statistical analysis of anonymous data from completed surveys was performed using SPSS version 25 (IBM). Descriptive statistics were calculated and data were inspected for trends in related questions. Qualitative data collected from the open-ended survey questions were examined for common ideas. Predominant themes were reported to CCT infographic design group and discussed by the Trust and Relationship Building Group.

Focus group discussion recruitment, facilitation and data collection

To refine infographics for target audiences in ethnic minority communities of Waterloo Region, focus group participants were identified through community leader contacts participating in the CCT project team. The group discussion was held virtually, facilitated by the study coordinator, and observed by two researchers and the graphic designer. During the session, participants were presented with modified infographics following earlier feedback from survey respondents and the CCT team (Figure 3 panels B and C). The focus group participants were asked to select their preferred infographic and give reasons supporting their choices. The facilitator's questions probed participants' impressions of infographic clarity, cultural safety, and ease of comprehension by the general public. The discussion took place on 17th December 2021; it was recorded and transcribed using Microsoft Teams software (Version 1.5.00.6181).

Focus group analysis

To make sense of the focus group data and identify top priority concerns about infographic content and presentation, thematic analysis and sentiment analysis of the discussion transcript were undertaken. Thematic analysis was accomplished in six stages [25]. An anonymised transcript was read and reread to establish researchers' familiarity with the content. Reflexive

inductive open coding was undertaken independently by RH and EVW who, by approaching the data from different ethnic and professional backgrounds, and comparing and discussing codes generated, were able to explore overt and implicit meaning in the data. Codes were grouped as categories around common topics or shared meaning independently and then between researchers. Connections between categories were explored and joint reflection undertaken to reach consensus and create representative themes. Analysis was reviewed by a third author. Reflexivity and bias were discussed and addressed by reflection with other authors who collectively represented broad and diverse backgrounds and experience. Open coding and code organization were supported by use of NVIVO software (Version 12.7).

In a similar way, manual sentiment analysis [26-28] of the transcript was initially conducted independently by two authors. Statements were assessed for emotion detected, and polarity of affect. Authors conferred on these analyses to reduce bias and grouped statements where positive or neutral tone were identified separating these from data expressing negative affect. Through iterative discussion, statements were placed into groups where content gave rise to positive/neutral affect (e.g. approval) or negative affect such as concern, uncertainty or frustration.

Ethics

The survey and focus group discussion questions were designed in accordance with the principles of the Helsinki Declaration of 1975, as revised in 2008 taking care to first do no harm. Ethics approval was obtained from the University of Waterloo Ethics Committee (ORE #43633). The social media post about the infographic survey gave participants brief information about the study including a statement confirming anonymity and confidentiality, eligibility criteria and a link to the questionnaire. On opening the survey link, respondents gave consent to data collection and reporting before completing questions. No identifying information was collected; demographic data was not linked respondents' answers.

Before meeting, focus group participants were provided with study information informing them that potentially sensitive fertility issues would be discussed. All participants gave informed consent to be recorded and have their discussion analysed and reported anonymously. Prior to starting the discussion, participants were reminded that they could abstain from answering questions or withdraw from the study at any time.

RESULTS

Survey analysis

The majority of people who completed the survey did so within 48 hours of it being posted online, 8-9th December 2021. Respondents' demographic details are presented in Table 1.

Typically, respondents reported understanding the infographics' message purpose – 85% used the word

‘fertility’ to describe the content, 60% noted the comparative information about COVID-19 vaccination safety compared to COVID-19 infection. A high number of

respondents trusted the information provided (89%) but only half were satisfied that the information provided was clear.

Table 1. Demographic data on survey respondents and discussion group participants.

Demographic	Survey Respondent	Focus Group Participant
Total number	39	5
Age	Average 39 years Range 20-63 years	Age Range 28-50 years
Gender	Women 29 Men. 4 Non-binary. 2 Prefer not to say 1	Women 1 Men 4
Background	European 28 Black 2 South Asian 2 Southeast Asian 2 West Asian or Arab 2 South American 2 North American 1 (Other groups not used include Aboriginal and prefer not to say)	Black 2 South Asian 2 Southeast Asian 1
Highest level of education	High school 4 College or university 16 Higher degree 16	

Additional text comments included one indication that the language might be too specialised or complex for the public to understand. Another respondent suggested the use of certain words like ‘some’ or ‘may’ made the infographic’s message uncertain or questionable.

Information presented about whether COVID-19 infection or COVID-19 vaccines affected female reproductive health drew specific requests for more information. Asked “What else would you like to know?” respondents indicated more about COVID infection and vaccine effects on menstruation, pregnancy, stillbirth and child development and potential side effects for those undergoing hormone treatments. The inclusion of references linking claims to evidence from published studies was commended; several respondents wanted further information summarising cited studies.

Overall, when comparing the two infographics, respondents stated simple infographic structure with clear headings and fewer words (Figure 3 panel A) was preferred to gendered images, longer paragraphs, and more complex language (Figure 4 panel E). Most respondents (71%) indicated they would be willing to share the infographic with others, with social media dominating as the preferred vehicle for sharing this information (61%).

Focus group analysis

As the majority of survey respondents were college-educated women with a European background, a focus group discussion (FGD) was undertaken to obtain additional, specific feedback from a targeted audience in Wa-

terloo Region. Five participants were recruited through ethnic minority community leaders involved with the CCT project (Table 1).

To interpret explicit and implicit meaning in group discussion data, comments were coded, then categorized into seven sub-themes and three overarching themes; infographic endorsements, ways to improve message and understanding engagement. The relationships between themes and sub-themes are presented in Figure 5, examples of coded text are presented in Table 2.

Infographic endorsements drew together codes related to understanding the infographics’ message content and describing participants’ preferred format. As with the survey, participants appreciated the aim of debunking misinformation about the vaccines through evidence-based infographics that referenced clinical data. They praised the presentation of information “everything is clear here” (FGD01) stating clear separation of the possible effects of COVID-19 infection and vaccination aided comprehension.

“The effects of the vaccine versus the effect of the infection...they break down the differences of it. Yeah, I thought that was a good breakdown.”
(FGD 2)

Notably, all participants preferred the infographic with information separated into sections labelled “male” and “female” (Figure 3, panel B) over a non-binary language version that separated text by sex that didn’t explicitly label these (Figure 3, panel C). Participants com-

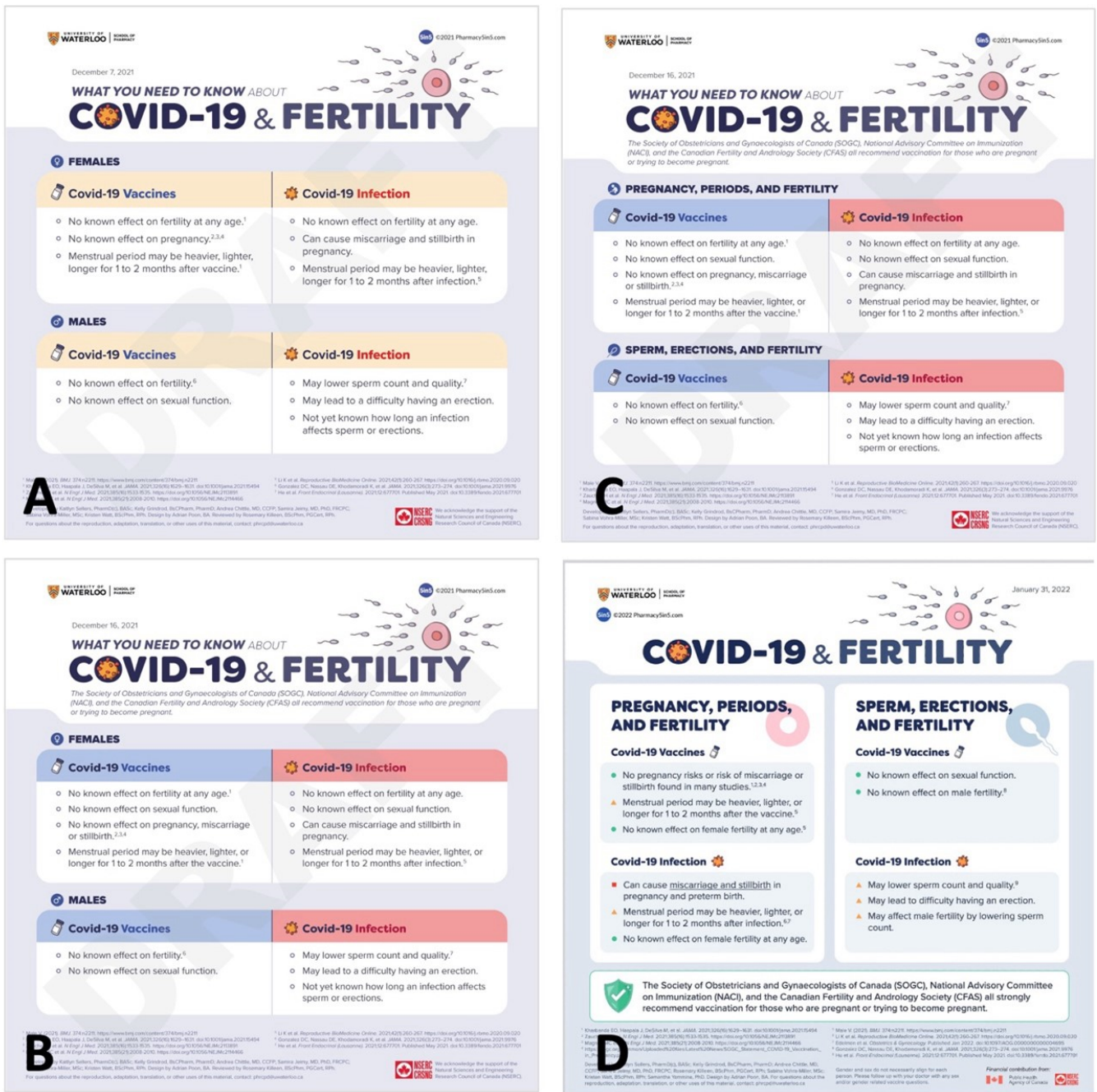


Figure 3. Versions of infographics presenting information on the effects of COVID-19 infection and side effects of COVID-19 vaccine on fertility and reproductive health. Panel A- initial version shared by online survey (7 Dec 2021). Panels B and C intermediate versions shown to focus group using headings that identify information by sex (panel B) or non-binary biofunctional groups (panel C) (16 Dec 2021). Panel D final version (Jan 2022).

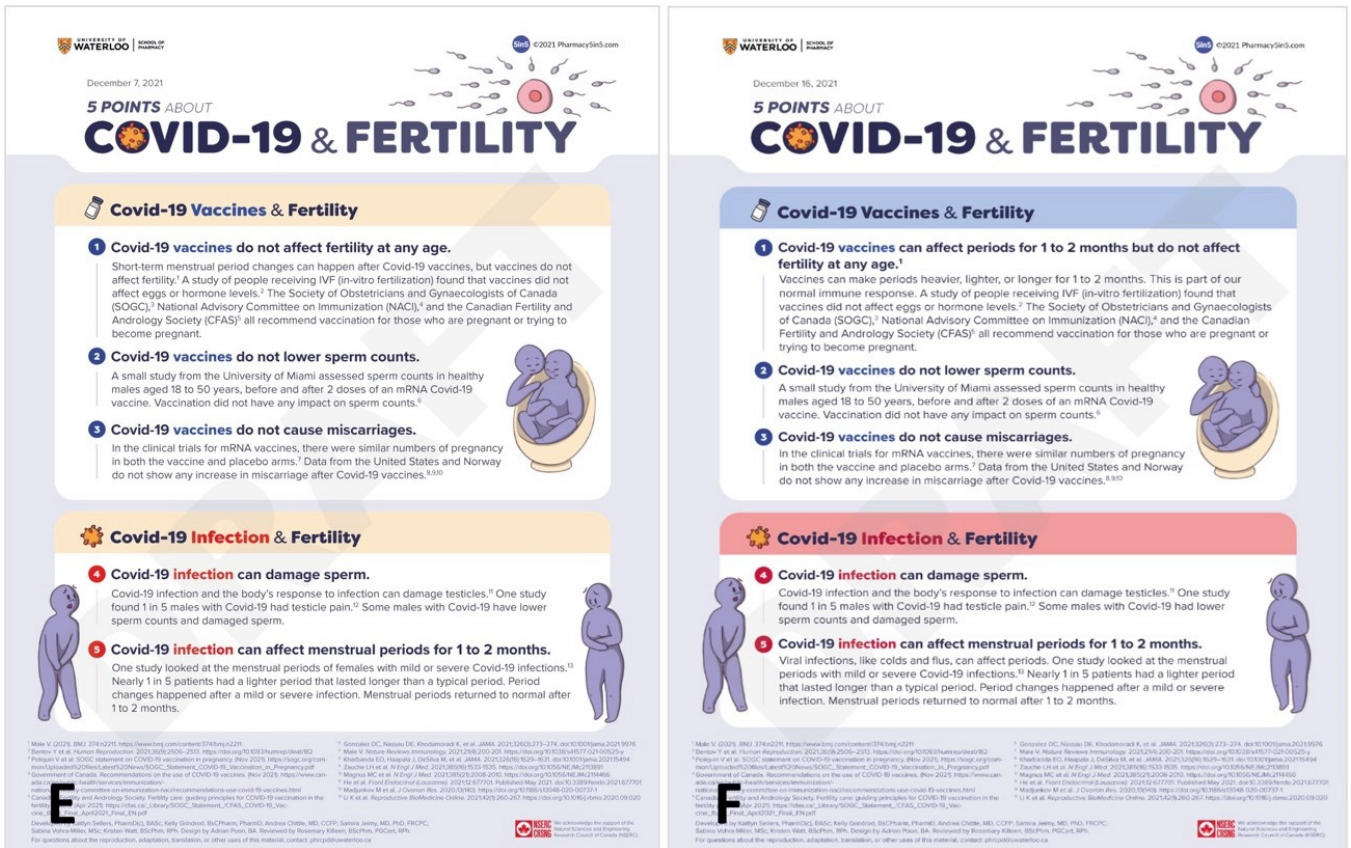


Figure 4. COVID-19 and fertility infographics. Panel E shows version shared via online survey (7 Dec 2021). Panel F modified version (16 Dec 2021).

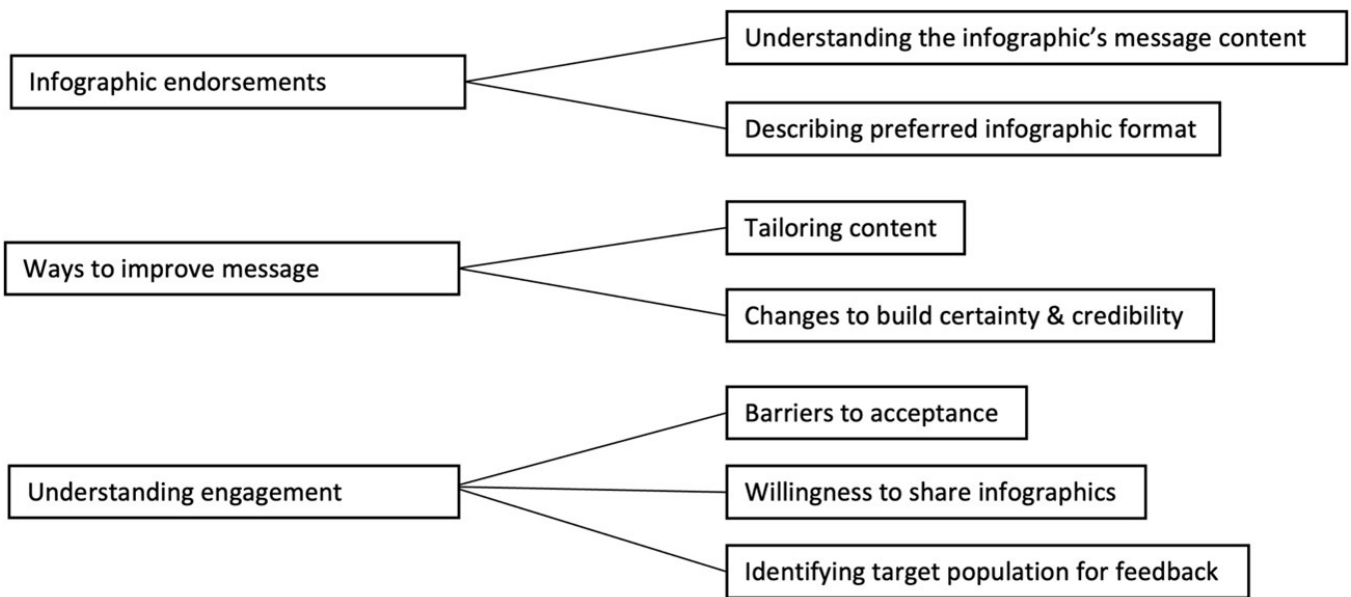


Figure 5. Themes and sub-themes based derived from thematic analysis of FGD transcript.

mented on how these labels added specificity and clarity that aided quick reference.

"I like the one that's been charted male female. It's clear at a glance. I know what information I will get." (FGD 1)

Ways to improve message collated sub-themes that grouped participants' suggestions for improvement; changes that built certainty and credibility, and tailored content. This included a proposal to summarise the data from cited studies so that their impact could be understood "at a glance".

"numbers speak for itself...general public wants to know their numbers." (FGD 1)

More information about the long-term effects of vaccines on pregnancy and children's health was also suggested. The importance of responding to citizens' concerns regarding the vaccine, communicating transparently and acknowledging what information is, or is not, available was emphasized.

"Get the information out there that no information is available on this area, the birth defect... even if there is nothing there just reach out the information because we are always looking for what's going to happen to the unborn child." (FGD 1)

Feedback about tailoring content focused on modifying infographics to meet audience requirements better. Images and language were critiqued for cultural appropriateness. Additionally, the merits of presenting citations and references were discussed. Citations and references were considered more valuable if the intended audience included university educated individuals rather than the wider public.

"...[a] lot of public do not understand what the numbers are for; that it is a reference." (FGD 1)

"If you just put it [the infographic] in the sub-way area, nobody is going to focus on references. Maybe if you put it in a university community... maybe it increases credibility." (FGD 3)

The theme understanding engagement addressed how the process of collaborative infographic development and use can be enhanced by appreciating barriers to acceptance, exploring individuals' willingness to share infographics and seeking ongoing feedback from target audiences.

Participants reinforced survey findings that wording choices like 'not known', demonstrating incomplete evidence or uncertainty, stimulated concern or wariness in the reader and potentially created barriers to message acceptance. Despite misgivings about expressing this degree of uncertainty, the community representatives

uniformly showed willingness to share the infographics with their peers. They indicated the infographics provided a useful "baseline" even if "clarification" was needed later as participants felt that their communities were "hungry" for information.

Participants were willing to assist in giving feedback on future versions following discussions infographics with target audiences whose views would be pertinent. In this respect, participants noted the role of extended family and community members in influencing vaccination decisions.

"Medical doctors, nurses and even close family members like father, mother, sister, brother, friend. That is a secondary group who can influence the behaviour of the people who have the plan to get kids. They need to be the target that is messaged." (FGD 3)

Sentiment analysis

The tone used in discussion comments was examined to help define which elements of the infographic were most helpful to readers. Comments were grouped as either positive/neutral or negative (Table 3). Positive or neutral tones were used when participants described their preferred infographic layout or were satisfied with the content. This included participants' preferences for male and female headings over non-binary labels; they indicated group labelling by sex enabled easier location of relevant information.

"Males, females exactly separated. I know where to look at.. Yeah, I would prefer this one, [it] is more clearer, at a glance you know which ones related to me and which ones related to the other sex." (FGD 1)

Encouraging or neutral tones were also used when people talked about potential improvements to infographics or ways of sharing information. Similarly, comments about meeting community information needs about COVID-19 and vaccine effects on reproductive health evoked warm or neutral tones.

"I work with lots of new immigrant families and some of them were pregnant women and they were scared, not only for fertility but overall health so in the future they might not be able to become pregnant. Lots of concerns... so maybe targeting those people." (FGD 4)

In contrast, negative tones were detected when infographic content or layout was considered overly complex. Negative tone was also detected when the limited evidence about COVID-19 vaccination side effects was referred to in ways that allowed for uncertainty, such as "no known effect". This expression didn't convey confidence and was found to be unconvincing about the benefits of vaccination.

Table 2. Thematic analysis of focus group discussion transcript; example quotes.

Theme	Sub-theme	Example Quote
Infographic endorsements	Understanding the infographics' message content	"This poster is basically about the relationship of human fertility and the effects and consequences, if any, of the COVID-19 infection. They're giving like the pros and cons, and also there's some in highlights and information about the vaccines and the infection and their effect on the pregnancy, and then the fertility." (FGD 1)
		"The top part of the other one talks about sperm, erection and fertility so that is directed at men...Lots of men had an issue with [fertility concerns] when the vaccine just came out. You know, they're going to get sterile and all those other things. This is debunking those myths based on the science that is available." (FGD 2)
	Describing preferred infographic format	"I really like the second one 'cause it specifies what the target is, who it is and who is male and female. And so I like the second one." (FGD 5)
Ways to improve message	Changes to build certainty and credibility	"One thing that comes to my mind is the long-term effect of vaccine. There are no data or no comment at all touching on the long-term effect of the vaccine on pregnant ladies -we are more and more concerned about the child that's going to be born, their unborn child..." (FGD 1)
	Tailoring Content	It all depends on the target. If we target the common people, I don't think the difference is important [to them] because usually we don't give it [the references] attention if you just put it [the infographic] in the subway area, nobody is going to focus on references. Maybe if you put it [the infographic] in a university, in targeting university community maybe it increases credibility, so, it all depends on your target." (FGD 3)
Understanding engagement	Barriers to acceptance	"Most of the things that says, "not known". Not known for so many different areas. Still, I know it's new and any effects can happen to a pregnant woman after taking the vaccine, so that's a concern with lots of people and that could be the reason they are not interested in taking it." (FGD 4)
		"The bad thing (about which I do agree with the other speakers) is "no known" effect because at a glance you might think OK, "no known [effect]" but because this is a new area, we're all sceptical and like concerned, because it's like we're Guinea pigs in one sense." (FGD 1)
	Willingness to share infographics	"I'll be willing to share with the families like I work with... and other community agencies and other programs" (FGD 4)
	Identifying target population for feedback	"Those newly married couples or those couples who are trying to conceive or trying to you know, increase their family size so it's directly concerning them. Or you know the women of childbearing age, so those group who are really in need of this information and wants to get a reliable information from there. Probably would be a good target population" (FGD 1)

"I don't feel confidence because they say 'no known effect' ..what if something happens towards [us]. It's not a sure thing. It doesn't communicate confidence." (FGD 3)

Additionally, negative anxious tones were used in comments seeking greater provision of information about vaccine safety.

"After we get pregnant what will happen? What's the long-term?." (FGD 1)

Infographic refinement

Feedback from CCT members, survey results and focus group discussion facilitated progressive adjustments to infographics' text and appearance (Figure 2). Based

on feedback from survey respondents, a non-binary infographic was designed using gender-neutral tone where binary sex-specific headers were replaced with more inclusive terminology focused on anatomy, such as pregnancy / periods or sperm, rather than sex / gender (Figure 3, panel C). Next, images were designed in a neutral way without any stereotypical features associated with sexual characteristics. Participants in this study provided contrasting feedback about these accommodations; some focus group participants found non-binary language confusing and preferred 'clearer' binary gender specific language. To overcome this dilemma, "male/female" terms were included, and a footnote added to recognise the complexity of gendered language. The initial and final versions of the infographics can be found in Figures 3 and 4, a summary of changes is presented in Table 4.

Table 3. Sentiment analysis of focus group discussion transcript; example quotes.

Tones		Example quotes
Positive/neutral	Affirming, Approving	"The information are very simple and understanding." (FGD 3)
		"It's clear, it's easily comprehensible, legible, everything is OK, good." (FGD 1)
	Encouraging	"I see the top part of the other one talks about sperm, erection and fertility so that is directed at men.... Lots of men had an issue with... they're going to get sterile and you know all those other things... This is debunking those myths based on the science that is available. (FGD 2)
Negative Tones	Lack of confidence	When I see this poster, I don't feel confident, especially with how the wording is.... because they say that [there's] 'no known effect'. No known effect, what if something happens toward [us]...It's not a sure thing. It doesn't communicate confidence..." (FGD 3)
	Cautious, uncertain or hesitant	"It's still saying there is a [knowledge] gap. We know that science is not 100%. If today something may [be] considered to be a known [that] may not be known tomorrow it's not assuring." (FGD 3)
	Confused	"What part I'm reading? ...I missed it. OK, was it like vaccine, or was it infection? Because there are so many things I read, Then I confused myself because I saw it for a second. The second one is like clearly speaking out for itself." (FGD 1)
	Discouraging, unconvinced tone	"Reading too much, it's sometimes scary. Generally, people, if they are almost ready to get it [vaccination] and then when they read it, that sticks in their mind like over might have that or this [side effect]." (FGD 4)
	Critical advisory tone	"Yeah, a little more phrasing, a little more words at the end, and then you put the reference number. That's my opinion. Otherwise you need a reference for the credibility." (FGD 1)
		"People might not have time to read the whole thing, they just want the key highlight points of like what is the pros, what is the cons and all of that? But this one seems way too detailed, so I actually like the second one." (FGD 5)

The refinements also reflect the decision to retain detailed information and references in the "5 points about COVID-19" infographic (Figure 4) for those with good health literacy and to simplify information in "What you need to know about COVID-19 and fertility" (Figure 3) to convey meaning to users with lower health literacy. Inclusivity was additionally sought by using translations to accommodate more identities; both infographics were made available in commonly spoken languages in Canada (Arabic, French, Farsi, and Chinese).

DISCUSSION

This study examines the rapid, iterative, collaborative development of an infographic to address misinformation surrounding COVID-19 vaccine side effects on reproductive health. Consultation with representatives of targeted communities during the infographic development process quickly generated feedback that potentially helped meet the needs of community members with diverse levels of health literacy. Challenges included how to integrate feedback from two different methods potentially representing different populations and how to resolve conflicting suggestions while still meeting different community needs and cultural prefer-

ences in a timely way. This study adds to the literature by providing specific insight into those problems and their resolution through iterative refinement of infographics based on feedback from representatives of target audiences. We present this alongside lessons learned in developing educational interventions in terms of content, layout and language deployed.

One challenge in designing educational infographics is how to achieve the right balance between providing sufficient information without overwhelming users with differing levels of health literacy [23]. Most participants of both the survey and focus group reported that the infographics were clear, but some people requested additional information about the studies referenced and on the long-term effects of vaccines. In contrast, other participants felt the information or language was complex and potentially over-whelming for their community peers. By combining text and visuals, infographics can enhance comprehension of complex data, especially among those with low health literacy [17,29,30]. However, limiting text and replacing it with visuals to simplify the health message can strip away valuable context making interpretation harder and meaning more ambiguous [29]. Images added to highlight key points and linked to simple text rather than replacing text are preferable [23].

Table 4. Refinements to infographics based on feedback from survey and FGD.

Infographic	Feedback source	Improvement
What you need to know about COVID-19 and fertility	Survey	Simplified version with fewer words and bullet points created to improve clarity for those with low medical literacy/knowledge and support easier translation.
		The non-binary version replaced original headers “Females”/“Males” with Pregnancy, periods, fertility/ “Sperm, erections and fertility”
5 points about COVID-19 and fertility	Survey	Heading 1 expanded wording about vaccine side effects on menstruation- “can affect periods for 1 to 2 months but do not affect fertility at any age”
		Adjustment to wording about COVID-19 infection “Viral infections, like colds and flus, can affect periods”.
Non-binary version of What you need to know about COVID-19 and fertility	FGD	Addition of “male” and “female” before fertility in each section for clarification- “No known effect on female fertility”, “No known effect on male fertility”
		“No known effect on sexual function” removed from section Periods, pregnancy, female fertility
		In Sperm, erections, and fertility section, the statement “Not yet known how long an infection affects sperm or erection” was replaced with “May affect fertility by lowering sperm count”
		Bullet point indicators redesigned to indicate potential impact of information- green circle bullet before positive statement, red square before detrimental statement and yellow triangle bullet before comment about possible impact
		Footnote added; “Gender and sex do not necessarily align for each person. Please follow up with your doctor with any sex and/or gender related vaccine questions.”

Choosing suitable, acceptable images requires careful consideration. It is also important to find appealing pictures that draw the observer in. Selected pictures should reflect the target audience, be culturally acceptable and yet not distract from key message content [22]. In this instance, two infographics were created and modified to better suit the different health literacy needs of diverse audiences with collaborative input from target community representatives, frontline healthcare professionals and pharmacists providing vaccination services, and health communication experts. Infographics were disseminated by varied intermediaries and channels influenced by community preference expressed in the CCT group. These included using paper copies and social media applications including WhatsApp and Instagram from health care professionals and community leaders.

Another challenge was finding language and images that supported gender diversity and inclusivity that could be understood easily by all community members [22]. Based on survey feedback, steps were taken to improve gender diversity and inclusion in labelling infographic text, yet community representatives critiqued this gender-neutral language and promoted what they felt to be ‘simpler’ male/female terminology. To resolve this issue, multiple versions of infographics were developed and shared, with translations, to healthcare providers and other intermediaries. This enabled those

with communication roles to select the most culturally appropriate materials for end-users.

Refreshing the content of infographics to provide accurate, updated information that reflects the latest scientific evidence in the rapidly changing circumstances of a pandemic is difficult [31,32]. As our understanding of COVID-19 infection and vaccination evolve, published information becomes outdated or inaccurate. The phrase “unknown effect” received mixed reactions but was used to reflect a point in time when limited information was available. The feedback from participants to have “more” answers and less ambiguity means that while data about long-term effects of COVID-19 vaccination on fertility are currently lacking, there is public appetite to see evidence grow and be shared. This is important as it provides an example of how communities want to guide and engage with research in a continuing fashion, a goal that can be approached through community partnerships like the CTT [24, 33, 34]. To keep the public informed, it will be important to create updated infographics, share these with healthcare providers and other influencers [35,36]. Removing outdated infographics that don’t reflect new evidence is another consideration.

This study has several limitations related to the need to create informative material quickly at a time of public anxiety during the COVID-19 pandemic. The survey was only available for a short time to ensure rapid data collec-

tion and fast turnaround of feedback to inform iterative stages of infographic development. Consequently, the survey had limited responses; the sample size is small and does not fully reflect the age and cultural diversity of people in Waterloo Region. To counter this, community representatives were invited to comment through CCT meetings and the focus group discussion. While efforts were made to contact a greater diversity of people for focus group discussions, the small number of participants who attended reflects the difficulty of recruiting people in a short window of time when social contact was constrained. The number and diversity of viewpoints available and participants ability to reflect wider population beliefs was limited. This limitation reflects how a balance must be drawn between broadening population input and achieving a quick turnaround in creating tailored materials. Analysis of focus group discussion data suggested saturation was reached when discussing infographics with this group, but it is acknowledged that groupthink bias may have limited new ideas arising; focus group members may have agreed with group consensus to maintain group cohesion [37].

Conclusion

This study found that feedback received from community members, via online surveying and virtual focus group discussion, was important for understanding real-time opinion and knowledge about vaccines. Community feedback was effective in supporting the development of infographic content, presentation, acceptability, and appropriateness. To meet the contrasting needs of different communities in areas such as health literacy and gender dynamics, it may be necessary to modify content, language, delivery and/or develop different formats of infographics on a single topic.

DECLARATIONS

Publication Consent

Not applicable.

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KG & NW conceptualized the work and contributed to manuscript revisions. MT coordinated the research, contributed to data collection and manuscript revisions. EVW & RH performed analyses and composed the original manuscript text. SM & BW contributed to analyses and manuscript revision. AP designed infographics. All authors attest they meet the ICMJE criteria for 362 authorship and approved the final article.


Data availability

Reasonable requests can be made to the corresponding author Nancy Waite.

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Preocupaciones en materia de fertilidad y vacunas COVID-19: Diseño de infografía comunitaria en la región urbana de Waterloo, Ontario (Canadá)

RESUMEN

Introducción: Las dudas sobre las vacunas, incluida la preocupación por los posibles efectos secundarios sobre la fertilidad, han retrasado la adopción de la vacuna COVID-19 en Canadá y otros países. Una forma de abordar las dudas sobre las vacunas es el uso de infografías que expliquen las cuestiones clave y aborden las preocupaciones. El objetivo de este estudio fue explorar el proceso de colaboración para desarrollar rápidamente una infografía basada en aportes comunitarios y adaptada para abordar las preocupaciones sobre la fertilidad durante las condiciones urgentes de la pandemia de COVID-19.

Métodos: Se utilizó una encuesta promovida a través de los medios sociales y una discusión de grupo focal con contactos de la comunidad para consultar iterativamente a las audiencias objetivo y recopilar comentarios sobre la interpretación del contenido y el significado de la infografía. Los resultados de la encuesta se analizaron mediante métodos descriptivos. Un grupo de discusión se analizó mediante un análisis inductivo temático y de sentimientos. Los comentarios orientaron el desarrollo de la infografía.

Resultados: Se compartieron en línea un borrador de infografía y una encuesta. 33 de los 37 encuestados expresaron que confiaban en la información proporcionada en la infografía. Tanto los encuestados como los participantes en los grupos de discusión querían un lenguaje sencillo e información adicional para abordar las preocupaciones sobre el efecto a largo plazo de las vacunas COVID-19 en la fertilidad. Las opiniones indicaron que era necesario un mayor esfuerzo para abordar los distintos niveles de alfabetización sanitaria dentro de las comunidades. Hubo opiniones contradictorias sobre si el uso de un lenguaje inclusivo, eliminando las etiquetas de género y centrándose en la biología, era útil o inducía a confusión.

Conclusiones: Este estudio muestra que las opiniones del público pueden ayudar a adaptar el contenido y el diseño de las herramientas de fomento de la confianza en las vacunas, haciéndolas más accesibles para la población general. Además, se pueden aumentar los esfuerzos para resolver preocupaciones específicas modificando y/o creando diferentes versiones de las infografías.

Palabras clave: COVID-19; vacuna; confianza; dudas; infografía; fertilidad, efectos secundarios; desinformación

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