

## Evaluation of a paediatric gluten-free food guide by children and youth with coeliac disease, their parents and health care professionals

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### Abstract

There are currently no universal evidence-based nutrition guidelines that address the gluten-free (GF) diet for children/youth (4–18 years). A GF food guide was created to help children/youth with coeliac disease (CD) and their families navigate the complexities of following a GF diet. Guide formation was based on pre-guide stakeholder consultations and an evaluation of nutrient intake and dietary patterns. The study objective was to conduct an evaluation on guide content, layout, feasibility and dissemination strategies from end-stakeholder users (children/youth with CD, parents/caregivers and health care professionals). This is a cross-sectional study using a multi-method approach of virtual focus groups and an online survey to conduct stakeholder evaluations. Stakeholders included children/youth (4–18 years), their parents/caregivers in the coeliac community ( $n$  273) and health care professionals ( $n$  80) with both paediatric and CD experience from across Canada. Thematic analysis was performed on focus group responses and open-ended survey questions until thematic saturation was achieved.  $\chi^2$  and Fisher's exact statistical analyses were performed on demographic and close-ended survey questions. Stakeholders positively perceived the guide for content, layout, feasibility, ethnicity and usability. Stakeholders found the material visually appealing and engaging with belief that it could effectively be used in multi-ethnic community and clinical-based settings. Guide revisions were made in response to stakeholder consultations to improve food selection (e.g. child-friendly foods), language (e.g. clarity) and layout (e.g. organisation). The evaluation by end-stakeholders provided practical and patient-focused feedback on the guide to enable successful uptake in community and clinical-based settings.

**Key words:** Coeliac disease: Gluten-free food guide: Formative evaluation: Nutrition guidelines: Paediatrics

Coeliac disease (CD) is an autoimmune disease where the ingestion of gluten drives the autoimmune process. The only treatment for this disease is a strict gluten-free (GF) diet. Consuming this diet requires a major lifestyle change as adherence is necessary to avoid long-term health complications (e.g. poor bone health, lymphoma)<sup>(1,2)</sup>. This also means a major behavioural shift in food selection, food literacy and food purchasing patterns<sup>(3–6)</sup>. While it is possible to consume a nutritious GF diet<sup>(7)</sup>, this is a major challenge for children/youth and their families. Recent evidence has shown that the GF diet is characterised by high levels of added sugar,

saturated fat, low intakes of several micronutrients (e.g. folate, vitamin D) and low diet quality<sup>(8–15)</sup>. The lack of nutrient fortification in processed GF grains (e.g. folate) and suboptimal dairy intake are major contributors to low micronutrient intake in children/youth with CD<sup>(8,16–18)</sup>.

Food literacy education on the GF diet in newly diagnosed children/youth and their families is critical to manoeuvre the nutritional complexities of following a GF diet. However, access to dietitians with specialised knowledge in CD and the GF diet can be limited within the community<sup>(19)</sup>. The 2019 Canada's Food Guide (CFG) provides Canadians with voluntary guidance

**Abbreviations:** CD, coeliac disease; CFG, Canada's Food Guide; GF, gluten-free; HP, health care professional.

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**Fig. 1.** The gluten-free food guide for children and youth with coeliac disease. This guide is a two-page document. Illustrated above is the first page which includes the gluten-free plate model and the following four key messages: (1) fill more than half your plate with fruits and vegetables to meet your nutrient needs, (2) eat protein foods from plant and/or animal-based sources, (3) eat gluten-free grain foods, (4) include a vitamin D and calcium fortified and unsweetened milk or plant-based beverage with your meal. The second page of the gluten-free food guide (not shown) includes an additional six key messages: (5) choose foods that are rich sources of folate, iron and fibre, (6) eat less gluten-free processed foods to limit saturated fat, added sugar and sodium intake, (7) read food labels and ingredient lists for gluten and nutrition content, (8) cook at home more often, (9) drink water throughout the day, (10) enjoy gluten-free foods. All key messages were adapted based on the recommendations outlined in the 2019 Canada's Dietary Guidelines<sup>(21)</sup>.

regarding healthy eating behaviours for chronic disease prevention; however, these guidelines do not take into account the unique nutritional considerations of the GF diet<sup>(20,21)</sup>. To address this important gap, our team has reported on the methodological and nutritional considerations of a newly developed GF food guide for Canadian children and youth with CD (4–18 years)<sup>(7)</sup>. This report illustrates that a GF plate model which reflects > 50 % fruits and vegetables, 25 % protein and < 25 % GF grains is

recommended to support children/youth in meeting their nutritional needs (Fig. 1)<sup>(7)</sup>. The key messages of the GF food guide focus on fruit and vegetable intake, limiting highly processed GF foods and emphasising key nutrients (e.g. vitamin D, folate, iron, calcium, fibre)<sup>(7)</sup>. In addition, messaging that encourages children/youth to enjoy their food is important to foster healthy eating habits. One major difference between the plate model of the GF food guide compared with the 2019 CFG is the recommendation



**Table 1.** Stakeholder inclusion criteria

Focus Group Stakeholders	Inclusion Criteria*
Children/Youth	A current resident of Canada, has a diagnosis of CD, between 8–18 years of age, has not previously completed a survey on the GF food guide.
Parents/Caregivers	A current resident of Canada, has a child/youth (4–18 years) diagnosed with CD, has not previously completed a survey on the GF food guide.
Health Care Professionals	A current resident of Canada, currently practicing or has previously practiced with a paediatric population, experience in CD (primary or specialty care), has not previously completed a survey on the GF food guide.
Survey Stakeholders	Inclusion Criteria*
15–18 years	A current resident of Canada, has a diagnosis of CD, has not previously participated in a focus group on the GF food guide.
≥ 19 years†	A current resident of Canada, has a diagnosis of CD.
Parents/Caregivers	A current resident of Canada, has a child/youth (4–18 years) diagnosed with CD, has not previously participated in a focus group on the GF food guide.
Health Care Professionals	A current resident of Canada, currently practicing or has previously practiced with a paediatric population, experience in CD (primary or specialty care), has not previously participated in a focus group on the GF food guide.

CD, coeliac disease; GF, gluten-free.

\* Exclusion criteria: non-Canadian resident; focus group: ≤ 7 years of age; survey: ≤ 14 years of age.

† Survey eligibility was expanded to include all adults ≥ 19 years of age with CD (even those without a child with CD) to ensure that all perspectives were ultimately considered.

to include fortified and unsweetened milk or a plant-based alternative to ensure that growing children/youth with CD meet their calcium and vitamin D needs<sup>(7,20)</sup>.

Formative evaluations have previously been used to refine healthcare innovations before being widely distributed to end-stakeholders. This helps researchers make timely and appropriate changes to improve uptake<sup>(22–24)</sup>. We used this approach to ensure that the GF food guide and the supplementary educational materials translated into feasible and useable materials within multi-ethnic community and clinical-based settings across Canada. The study objective was to conduct an evaluation on the GF food guide for content, layout, feasibility and dissemination strategies from end-stakeholder users (children/youth, their parents/caregivers and health care professionals (HP)). We hypothesise that the GF food guide for children/youth with CD will contain evidence-based content that is feasible and usable with understandable nutritional information for children/youth, their families and HP.

## Methods

This is a cross-sectional study using a multi-method approach of virtual focus groups and Internet surveys to conduct post-guide formative evaluations. Stakeholders were consulted from across Canada to obtain their perception on the content and layout of the GF food guide for children and youth (4–18 years). This included a convenience sample of the coeliac community (e.g. children/youth with CD, parents/caregivers) and HP (e.g. dietitians, physicians and nurses). The detailed inclusion criteria are outlined in [Table 1](#).

### Gluten-free food guide for children and youth

The GF food guide consists of a two-page visually appealing document that is accompanied by twenty-two educational handouts and four video resources ([Fig. 1](#), online Supplementary [Table S1](#)). These materials provide education related to a variety of important topics (e.g. food preparation, food shopping and

micronutrients). The first page of the food guide shows the GF plate model which illustrates the recommended distribution of food groups on the plate with four key messages ([Fig. 1](#)). The second page provides a total of six key messages targeted towards children/youth living with CD on the GF diet. These messages were based on the healthy eating recommendations for the Canadian population (≥ 2 years) outlined in the 2019 Canada's Dietary Guidelines that were vetted and validated by Health Canada<sup>(21)</sup>. The supplementary educational materials cover a variety of different nutrient and lifestyle topics (> 20 topics) to support the unique needs of children/youth with CD.

### Participant recruitment

Focus group participants and Internet survey respondents were recruited using recruitment flyers and newsletters that were disseminated through a variety of electronic communication channels across Canada. These included health organisations (e.g. Alberta Health Service), provincial regulatory bodies (College of Dietitians of Alberta), professional organisations (Canadian Celiac Association, Canadian Association of Gastroenterology,) and/or community run social media pages.

### Focus groups

Focus groups were conducted virtually between September 2020 to January 2021 using Zoom Video Communications Inc® V5.54<sup>(25)</sup>. Each focus group was approximately 60-minutes in duration. Separate focus groups were conducted for youth alone (12–18 years), parents and their children (8–18 years), parents of children/youth (4–18 years) and for HP alone. Focus groups were facilitated by two trained and arm's length moderators including a graduate student (S.C, RD) and a research assistant (C.L, BSc) who also made field notes during each focus group. An interview guide was used that consisted of twelve open-ended questions which were vetted by experts in the field. Questions were used to formally probe participants on



**Table 2.** Demographic data (Numbers and percentages)

Variables, n (%)	Focus group participants*													
	Coeliac Community (n 29)						Health Care Professionals (n 38)							
	Child†		Youth‡		Parent		Dietitian		Physician		Nurse			
	n	%	n	%	n	%	n	%	n	%	n	%		
Sample Size	4		10		15		33		4		1			
Sex														
Female	3	75	9	90	15	100	33	100	3	75	1	100		
Male	1	25	1	10	–	–	–	–	1	25	–	–		
Location§														
Western Canada	3	75	7	70	9	60	21	64	2	50	–	–		
Eastern Canada	1	25	3	30	6	40	12	36	2	50	1	100		
Area of Practice														
Clinical	–	–	–	–	–	–	30	91	4	100	1	100		
Community	–	–	–	–	–	–	3	9	–	–	–	–		
Age, years														
Median		11		14		–		–		–		–		
IQR		10.8–11		13–16		–		–		–		–		
Min:Max		10:11		12:16		–		–		–		–		
	Survey respondents													
	Coeliac Community (n 244)¶						Health Care Professionals (n 42)¶¶							
	15–18 y		≥ 19 y¶¶		Parent (+)¶¶		Parent (-)¶¶		Dietitian		Physician		Nurse	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Sample Size**	3		140		22		79		33		6		2	
Location§,**														
Western Canada	3	100	86	61	15	68	48	61	19	58	2	33	–	–
Eastern Canada	–	–	54	39	7	32	31	39	14	42	4	67	2	100
Years of Practice**														
Median	–	–	–	–	–	–	–	–	13		11		25	
IQR	–	–	–	–	–	–	–	–	5–18		6–13		21–30	
Min:Max	–	–	–	–	–	–	–	–	1:33		5:18		16:34	

CD, coeliac disease; IQR, interquartile range; y, years.

\* A total of 19 focus groups were conducted: n 11 with health care professionals and n 8 with the coeliac community (n 2 with youth only, n 3 with parents and children, n 3 with parents only).

† 8–11 years.

‡ 12–18 years.

§ Western Canada: British Columbia, Alberta, Saskatchewan, Northwest Territories, Yukon. Eastern Canada: Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, Nunavut.

¶ n 28 health care professionals and n 149 coeliac community members completed all survey responses; n 14 health care professionals and n 95 coeliac community members completed partial survey responses. Respondents were not required to answer all survey questions.

¶¶ ≥ 19 y: an adult with CD but who does not identify as a parent of a child/youth with CD; Parent (+): a parent with CD who has a child/youth with CD; Parent (-): a parent without CD who has a child/youth with CD.

\*\* n 1 health care professional responded 'prefer not to answer' to the survey question.

their perception about the guide and the supplementary educational materials (e.g. handouts, videos) developed by our team.

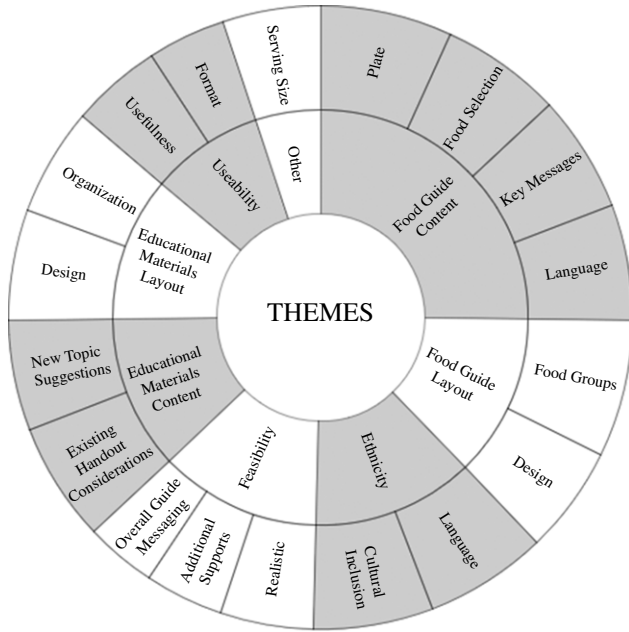
### Thematic analysis

Each focus group was audio recorded using two external voice recorders (Sony IC recorder ICD PX312®) with permission from all participants. Recordings were transcribed verbatim, de-identified and audited independently for accuracy by three trained reviewers. Data were collected until data saturation was achieved. Transcripts were independently reviewed by two co-investigators. Data were evaluated by an investigator (C.L) and coded to identify themes. This was cross verified by a second investigator (S.C) and then data were sorted into themes and sub-themes. Themes were sorted using Microsoft Excel. Both deductive and inductive coding

approaches were applied to identify themes<sup>(26)</sup>. Data were reviewed until thematic saturation was achieved.

### Internet surveys

Redcap® software was used to administer an anonymous Internet survey to the coeliac community and HP between November 2020 and February 2021<sup>(27,28)</sup>. The thirty-one item survey contained open and close-ended questions related to the GF food guide for children/youth and the supplementary educational materials. Ethics approval was obtained from the Human Research Ethics Board at the University of Alberta (Pro00103128). Informed consent and/or assent was obtained from all focus group participants, and implied consent was obtained from all eligible Internet survey respondents.



**Fig. 2.** Themes and sub-themes identified post stakeholder consultations. A total of eight themes and eighteen sub-themes were identified from the consultations conducted with virtual focus group participants and online survey respondents.

### Statistical analysis

Statistical analysis was performed using Statistical Analysis Software (SAS; version 9.4 SAS Institute).  $\chi^2$  and Fisher's exact statistical analyses were performed on demographic and close-ended survey questions. Statistical significance was set at  $P < 0.05$ .

## Results

### Stakeholder consultations

**Demographic factors.** The coeliac community ( $n$  273) and HP ( $n$  80) provided their perceptions on the GF food guide and the supplementary educational materials (Table 2, online Supplementary Fig. S1). No significant differences in geographic location were noted between focus group participants and survey respondents and/or between survey respondents whose responses were included in the analysis versus those excluded ( $P > 0.05$ ).

**Themes and sub-themes.** Similar themes and sub-themes were identified from the focus group participants and survey respondents (Fig. 2, Table 3, online Supplementary Table S2). All stakeholders provided comprehensive evaluations and few differences were noted between the feedback received from children *v.* youth.

**Gluten-free food guide content.** Focus group participants, including children/youth, supported the GF plate model and appreciated the variety of GF foods shown on the plate. Survey respondents also reported satisfaction with the food items (community members (94%,  $n$  211 out of 225) and HP (89%,  $n$  34 out of 38)). The fruits and vegetables were described by children/youth from the focus groups as colourful and

encouraging to eat, but additional favorites were suggested (e.g. strawberries, melons). Red meat was a key item that HP and parents from across Canada considered important due to its iron content. Certain GF foods on the plate (e.g. quinoa, yogurt) were not easily identifiable by some focus group participants, but it was acknowledged that this was the same case for these individuals regarding the 2019 CFG plate model as well. HP believed that the inability to identify some foods on the plate could help spark positive conversation among children/youth and their parents related to food preferences and food literacy including nutritional composition.

A stronger emphasis to include more affordable food options on the plate such as frozen or canned varieties of fruits and vegetables was suggested. Root-based vegetables were also suggested, especially potatoes which were noted as staples in the North American diets of children<sup>(29)</sup>. Feedback also advocated towards addressing seasonal availability and accessibility, particularly for families living in rural settings and/or in northern Canada.

Focus group participants, including children/youth supported fortified and unsweetened fluid milk or a plant-based alternative as the beverage of choice to increase their calcium and vitamin D intake. However, parents and HP also wanted additional clarification on why this piece differed compared with the 2019 CFG and more information on the recommended servings compared with water. HP also wanted to see more guidance on calcium, whereby initially, the message in the guide primarily targeted vitamin D.

Community (91%,  $n$  160 out of 175) and HP (82%,  $n$  28 out of 34) survey respondents agreed that the key messages outlined in the guide were understandable. Yet, they also desired more information on why these recommendations were made along with clearer language and examples of nutrient specific food items (e.g. folate) to help families put the recommendations into context. Focus group participants felt similarly but also believed that the supplementary educational materials would likely address some of these concerns.

**Gluten-free food guide layout.** Focus group participants appreciated that the GF plate model was visually comparable with the 2019 CFG. Yet, children/youth particularly liked that this guide only provided GF food options. Parents and HP thought the volume of food depicted on the plate was overwhelming for younger children, but younger children did not directly comment on this concern. Survey respondents shared this viewpoint and suggested to reduce the volume but keep the same variety to address this concern.

There was agreement on the design features of the guide with minor suggestions to improve spatial organisation, scaling and graphic elements. The feedback was similar for the supplementary educational materials. Focus group participants, including children/youth, described the guide as appealing, colourful and concise (i.e. two pages). Parents did not consistently notice that the proportion of fruits and vegetables on the plate was  $> 50\%$  and differed from the 2019 CFG. Children/youth more readily noticed this difference which some attributed it to being very familiar with the 2019 CFG. Parents felt that larger 'spaces' between the



**Table 3.** Selected quotes from focus groups illustrating themes generated by stakeholders

Themes	Sub-themes	Child/Youth	Parent	Health Care Professional
Food Guide Content	Plate	<i>I think it looks pretty good and it gives a good explanation and it shows the food groups pretty well. (C10, 16 y)</i>	<i>There's lots of different colours, there's lots of different (food) options. (P1)</i>	<i>The question is, will (the message) get misinterpreted ... that water is less important (than milk)? (HP41)</i>
	Food Selection	<i>Yeah, like it looks good. It ... like encourages me like that I want to eat more fruits and vegetables. (C15b, 15 y)</i>  <i>... yeah I'm familiar with both (buckwheat and quinoa) and now that I look at it -it does look like quinoa. I just didn't recognize them at first. (C14, 14 y)</i>	<i>... it was just all the fresh. but also, more expensive. vegetables and fruit. So, it would be nice if we could have ... some cabbage or some of the root vegetables on there. it's more economical. (P2)</i>  <i>I'd like to see more variety of meats and maybe a few less beans. But I understand that beans are really important, but I don't think that that's reflective of what people would really be eating. like on a day to day basis. (P13)</i>	<i>I know what the rice and the pasta is, I'm not totally clear what the other three things are (on the plate). (HP40)</i>  <i>(Where is cheese?) Kids love cheese too, so. (HP8)</i>
	Key Messages	<i>I like the extra information on why...some things are different from the normal food guide. (C9, 16 y)</i>	<i>I guess as a parent I didn't understand. point number three there 'be aware marketing can influence your food choices.' To me it (is) all about like reading the ingredients and about BROW. (P5)</i>	<i>... maybe when you emphasize the fact that you want ... more folate, should we be giving actual food examples? Because that might make it a bit more useful than just seeing the words. (HP24)</i>
	Language	<i>... it says 'include milk or fortified unsweetened plant-based beverages with your meal' -like I understand what milk is, but I don't understand what the next part is. (C14, 14 y)</i>	<i>... my feeling is that (the term plant-based beverage has) become mainstream with many of my non-coeliac acquaintances and friends. (P16)</i>	<i>... 'children with coeliac disease need more specific foods high (or) fortified in folate, vitamin D, and iron.' I found that a little confusing. (HP38)</i>
Food Guide Layout	Food Groups	<i>I did see that it was more than half, I have (Canada's Food Guide) on my fridge ... so I see it every single day. I could spot the difference right away. (C14, 14 y)</i>	<i>I actually didn't even notice there was more fruit and vegetables on it until you pointed it out. (P10)</i>	<i>It looks similar to (Canada's Food Guide) plate, aside from the fruits and veggies being bigger. (HP24)</i>
	Design	<i>... the information (is) really good because there's a visual component which is nice and easy to just take a glance at. (C9, 16 y)</i>  <i>... the glass of milk just like looks like a rounded egg, maybe have like more dimensions? (C4, 14 y)</i>	<i>I find the plate to be very busy. I have to look super careful to see what is there ... it's not crystal clear where those dividing lines are and ... a little more space. between the food groups would be helpful. (P7)</i>  <i>I like(d) the colours and I liked the layout of it personally. I thought it was appealing to the eye. (P10)</i>	<i>Green is ... a colour that's associated with. 'go' and 'good' so I think that it's nice that it's highlighted in green. (HP31)</i>
Ethnicity	Language			<i>I'm just wondering. will these resources be translated (to) other languages? (HP23)</i>
	Cultural Inclusion	<i>I think the rice is good because it's ... a universal food and I think vegetables and fruit they're all over the world. it's seems to be okay. (C3, 13 y)</i>  <i>Maybe sushi. (C5, 10 y)</i>	<i>I would say ... there is a huge variety of food on that plate that you could incorporate into different meals. ... I think you've done a good job with that. (P7)</i>  <i>... more Asian vegetables and maybe some bok choy, some daikon, something that would be more recognizable to people from that culture. (P1)</i>	<i>So long as it's foods that are familiar ... you know. foods that they can get in rural communities and that apply (to) First Nations would be helpful. (HP11)</i>  <i>... the breads, the wraps, the flatbreads of various ethnic cuisines aren't represented at all. (HP14)</i>
Feasibility	Realistic	<i>I don't think (eating more fruits and vegetables would be challenging). ... I just think making more of an effort. (C15b, 15 y)</i>	<i>I personally really like the proportions here and I'm lucky with my coeliac child that this is how (they) eat. ... I think it's great and it is representative of where we're at this point. (P16)</i>	<i>I think as much as any healthy food message is feasible and realistic for kids, right? (HP38)</i>

**Table 3.** (Continued)

Themes	Sub-themes	Child/Youth	Parent	Health Care Professional
		... only time I eat vegetables is at supper because in the morning I just rush out the door with whatever for breakfast. And then at lunch I usually don't bring any vegetables to school. <b>(C4, 14 y)</b>	Definitely there would be ... not enough grains... (my child) likes to have ... more, and I would say we definitely don't have half of the plate of veggies... I need to pay more attention to that. <b>(P9)</b>	I don't know that it's really realistic. I'll be honest. I would say kids would... (gravitate towards) more of the fruits ... v. the veggies and this is just a common thread amongst kids in general, so ... not sure how realistic it is, but I'm hopeful. <b>(HP42)</b>
	Additional Supports	... maybe you should add a page in the (guide) with like some ... recipes that people can make. <b>(C5, 10 y)</b>	... it was nice to see the photos (of different meal ideas) because it made me think 'oh we haven't made that in a while.' ... so, it is always nice to have just something to remind you or suggest a different option. <b>(P16)</b>	I think the Bento box ideas were really good. ... if you can include (that) as an addendum at the back of the guide?... <b>(HP13)</b>
	Overall Guide Messaging			I think people need to know what they should be eating. I think we shouldn't be changing a food guide because we think it will be too challenging for people to meet. They need to know what's the expectation of what they should be eating. <b>(HP41)</b>
Educational Material Content	Existing Handout Considerations	In the restaurant dining part, do you have like restaurants listed that you could eat gluten free at? It would be really helpful if you could maybe do a little bit of research ... It's kinda hard to eat out sometimes. <b>(C6, 13 y)</b>	I had never heard of pulses until I read this document... But I can say that once I read the definition it makes complete sense to me ... I think it was worded well to understand what it is now. <b>(P14)</b>	... we don't really want to have families too focused on the numbers (for nutrient requirements). more so just kinda thinking broadly about what foods are high. Maybe you could have a list of foods that are higher (compared) to the foods that are lower. <b>(HP33)</b>
	New Topic Suggestions	I think a handout with gluten-free flours would be good too. <b>(C3, 13 y)</b>	... a handout for like extended family would be helpful. Because I know when my (child) was first diagnosed they just kinda thought I was over the top. <b>(P8)</b>	I definitely would add in the cross-contamination. ... having a cross-contamination sheet they can go back to and review would be really helpful. <b>(HP21)</b>
Educational Material Layout	Design	I like how they made like the titles bold and like easy to find. <b>(C8, 11 y)</b>	... my one thought was it might be helpful to have handouts on how to cook the different type of grains. <b>(P2)</b> ... the bottom is it fruit? ... that might be something you can take out ... because that does make it a little bit busier and that might help take away from the busyness. <b>(P2)</b>	... the dark on the dark is a little bit..hard to see for anyone who'd be visually impaired... not much contrast. <b>(HP38)</b>
	Organisation	... it's very easy (to) read and it was very clear to me. <b>(C15a, 12 y)</b>	It almost looks like it needs to be spread over another page. Feels a bit like there's too much crowded, the colours are a bit much. <b>(P1)</b>	I think it looks pretty good..it's quite clear and there isn't too much writing on it which is nice. <b>(HP2)</b>
Useability	Usefulness	I like the guide and I think it would've been really really helpful when I was first diagnosed, and it'll really help other people. <b>(C5, 10 y)</b>	I think it's really really well done..one thing I noticed in this is there's such a focus and emphasis on fruits and vegetables and ... those are often the most expensive foods so I feel like this could be really limiting for people who are on a budget, people affected especially by COVID and job loss. <b>(P12)</b> ... we probably use... the actual plate and food guide less... because... we're quite familiar with... what we need in our diet. But I think definitely the handouts would be important. <b>(P15)</b>	... the plate... does look so similar to (Canada's Food Guide) plate. ... it might make the person that's newly diagnosed feel like part of the big population right? It's just that little tweak they have to make now. <b>(HP14)</b>  I think having it would be a good tool ... I try to see ... (patients/clients) as soon as possible but ... it could definitely get them started on (their) own and then you could clarify once you've seen them. <b>(HP1)</b>



Table 3. (Continued)

Themes	Sub-themes	Child/Youth	Parent	Health Care Professional
Format	I enjoy having paper more, but you don't always carry it around with you... So, the electronic version would be a lot easier. (C10, 16 Y)	...really important to have both because lots of people don't have access to printers or even for us, I feel like it took a lot of ink to print out... And it's nice to have it just up on your fridge or on your bulletin board or what not so I think both are really important. (P12)	I think an app would be amazing as well... it would be a great..support or resource for (my child). (P16)	... (If) English isn't (a family's) first language, ... sometimes it's good to have that paper copy that you can write on if you're working with an interpreter. (HP31)
Other	Personally, I think the visual representation is better because six servings in my head does not mean anything at all. (C3, 13 Y)	...if you made it into a website it would be a lot easier ... to find everything there. (C10, 16 Y)	... it would still be nice to know the minimum (servings)... so that I know my teenager's ... getting what they need, or I can at least work towards that. (P14)	I think a combination would be good ... especially right now with COVID-19... So, having a digital copy we can email a client ... and then when we do have (a) one on one in the office, it is nice to have that paper copy. (HP14)

C: child/youth; y: years old; P: parent; HP: health care professional.

food groups and that strategically placing foods on the plate would make this more apparent.

**Ethnicity.** Children/youth and parents from the focus groups expressed that the plate model showed a good representation of cultures and food traditions. They felt that the food items (e.g. vegetables, rice, legumes) could easily be incorporated into a variety of traditional dishes. Additional considerations on cultural representation (e.g. South Asian) and food suggestions (e.g. roti, bok choy, melons) were equally provided to better represent the Canadian population.

**Feasibility.** Children/youth acknowledged that eating > 50 % of fruits and vegetables at meals and snacks would require more effort to prepare but could be achieved. Parents felt that more planning and preparation would be required and acknowledged that their children typically eat more GF grains due to preferences and convenience. Feasibility was not a theme frequently brought up by survey respondents.

**Supplementary educational material content.** Parents and HP felt that the educational materials would help meet the unique needs of children/youth with CD. Survey respondents (community members (96 %, n 161 out of 168), HP (97 % n 31 out of 32)) shared similar viewpoints. However, some additional topics were requested by children/youth, parents and HP. This included information related to social events, cross-contamination, GF grains and flours (e.g. listing different types, how to cook and/or bake with them). Younger children also wanted more information on GF recipes while youth wanted information on eating out safely while on the GF diet (e.g. fast foods, restaurants). It was also agreed upon that these materials should be available in different languages (e.g. French).

**Useability.** Focus group participants felt that the guide and the supplementary handouts would be useful to educate children/youth with CD. This was confirmed by survey respondents (community members (86 %, n 128 out of 149), HP (90 %, n 25 out of 28)). Video-based resources were not as popular (community members (77 % n 114 out of 149), HP (54 %, n 15 out of 28)). HP survey respondents were concerned about video length during clinic visits whereby parents felt that uptake would depend on the exact topic and the target audience of the videos (i.e. children/youth, parents and both). Still, most agreed that access to any of these resources would have been beneficial at time of diagnosis and that they will benefit future children/youth with CD. Survey respondents (70 %, n 123 out of 177) reported that both electronic and paper-based documents should be available to ensure equitable and convenient access to all demographics. This mixed response was shared by focus group participants.

Discussion

The intent of the GF food guide is to provide general nutrition guidelines for children/youth following the GF diet. The plate model is to illustrate what proportions of food should be consumed to ensure a healthy GF diet. Transitioning to a GF diet



can be challenging for children/youth with CD since dietary restrictions can impact their psychosocial well-being and differences in the nutrient density of GF foods may adversely impact macronutrient and micronutrient intake<sup>(8,30)</sup>. Gluten restrictions can also result in stigmatisation and social withdrawal among the paediatric population especially at school<sup>(30,31)</sup>. Non-adherence by children/youth with CD can increase risk of health complications (e.g. poor bone health) as they struggle to restrict gluten-containing foods<sup>(32)</sup>. The GF food guide and the supplementary educational materials address the unique nutritional needs for children/youth on the GF diet<sup>(7)</sup> (Fig. 1, online Supplementary Table S1). Therefore, these resources will help children/youth and their families of diverse cultures all around the world navigate the complexities of following the GF diet. Stakeholder consultations were conducted through a formative evaluation process to ensure that concepts related to content, layout, feasibility, usability and dissemination would be addressed within the GF guideline process. This evaluation was unique because it gathered feedback from children/youth with CD, their parents and HP to evaluate these concepts.

Overall, stakeholders positively perceived the GF food guide and the associated educational materials. Children/youth liked that the GF plate model mirrored the plate model from the 2019 CFG because it made them feel less 'different' than their non-CD peers. Since the stakeholders perceived children/youth to already face many dietary restrictions, they advocated to display certain GF foods on the plate that they perceived children/youth to really enjoy (e.g. cheese, potatoes). Cheese is an important component of the diet in North America, is a rich source of calcium and some hard cheese can be a good options for those with CD who experience lactose intolerance<sup>(33–36)</sup>. While plant-based protein intake was emphasised within the GF food guide, parents and HP felt that animal-based sources (e.g. lean cuts of red meat) were also important in relation to the risk of suboptimal iron status at time of CD diagnosis<sup>(11)</sup>. While this may be perceived to add to saturated fat intake in children/youth, saturated fat intake in the diet simulations that included these food choices were well below current recommendations (< 10% energy intake)<sup>(7)</sup>.

Stakeholders wanted additional clarifications as to why the GF food guide encourages fortified and unsweetened fluid milk or a plant-based alternative as the beverage of choice, while the 2019 CFG encourages water. In growing children/youth, calcium and vitamin D are key nutrients for bone health<sup>(37)</sup>. Since this guide solely targets children/youth on the GF diet and they are at risk of suboptimal vitamin D intake, this can be a practical solution to increase intake<sup>(7,13)</sup>. These sources also contain protein, riboflavin, vitamins A and B<sub>12</sub> to contribute to nutritional adequacy in the diets of children/youth<sup>(34)</sup>. For additional hydration, water is a healthy choice and is still encouraged to be consumed *ad libitum* throughout the day. Dietary supplementation for calcium and vitamin D is an alternative option, but inconsistent adherence has been reported<sup>(38)</sup>.

### Knowledge translation

**Dissemination strategies.** The dissemination plan was made with an intent to increase awareness about the GF food guide

and the supplementary educational materials. This was needed so that children/youth and their families know where to access reliable information since the burden of treatment falls heavily on them to strictly adhere to a GF diet. When Health Canada launched the 2019 CFG, multiple dissemination strategies were observed including a Canada-wide press conference with media coverage, a website re-launch, social media presence and webinars<sup>(20,39,40)</sup>. The use of combined strategies, including one-way and mutually reinforcing strategies, has been shown to help create awareness and discussion<sup>(41)</sup>. Standalone paper or electronic lay resources can be another strategy, but they need to be easily accessible to facilitate awareness and unambiguous and clear to empower families to adopt them<sup>(41)</sup>. Collaborating with frontline HP is another strategy to help reinforce standalone resources to patients/clients during clinic visits, answer their questions and address any misinformation or confusion<sup>(41)</sup>. With support from HP, consistent information and trusted messaging can be better disseminated to Canadians<sup>(42)</sup>. Endorsements made by well-known public figures (e.g. Registered Dietitian), nutrition champions (i.e. past focus group children/youth or parents) or trusted organisations such as provincial or territorial health authorities and/or the Canadian Celiac Association, including local chapters can also facilitate reach<sup>(41)</sup>. Recurring dissemination strategies have also been pursued by Health Canada with the release of monthly newsletters and routine social media posts. This strategy permits the sender to expand, reach and reminds the public that these evidence-based tools exist thus facilitating awareness and uptake<sup>(41)</sup>. Guide dissemination directly to schools can be another strategy to reach families and their children/youth at a critical period of learning and growth. About 20% of surveyed Canadians reported receiving a copy of the CFG from their child's school<sup>(43)</sup>.

**Implications to uptake.** Stakeholder evaluations were proactively used to address potential factors that may inhibit or facilitate future guide uptake. A unique difference compared with the 2019 CFG is the greater proportion of fruits and vegetables shown on the plate. Historically, children/youth have not met their serving recommendations<sup>(44)</sup> due to factors such as preferences, sensory appeal and financial constraints<sup>(45,46)</sup>. Children/youth were key stakeholders to inform food selections and cited that the variety and colours were appealing and engaging. Plates of food that are colourful have been preferred by children, and visually appealing fruits and vegetables have notably promoted intake<sup>(47,48)</sup>. The plate model also includes nutrient-rich examples of relatively affordable food options such as root-based vegetables (e.g. carrots, potatoes)<sup>(49)</sup>. Frozen fruits and vegetables were also included due to increased accessibility, longer shelf-life and year-round availability<sup>(50)</sup>.

Conducting food literacy interventions will also be important to help support children/youth and their families to voluntarily use these resources and improve the feasibility of recommendations. Interventions related to food skills (e.g. learning how to cook GF grains), label reading, meal planning and overcoming picky eating can empower families to prepare meals at home according to the GF plate model and key messages. Developing knowledge and skill earlier in life can help foster positive eating habits into adulthood and make these

recommendations more feasible on a routine basis<sup>(51,52)</sup>. Other possible facilitators to guide adoption may stem from aesthetic qualities of materials which can influence perceived usability, satisfaction and uptake<sup>(53,54)</sup>. Future interventions may be needed to address behaviour change or time barriers (e.g. full-time employment), which may prevent families from adopting and routinely following the guide.

In this study, strengths included the use of a multi-method approach with virtual consultations that allowed for pan-Canada feedback with cross-cultural input. This method helped obtain perceptions from across Canada where the accessibility and availability of GF foods can differ. Some limitations include the lack of information regarding socio-economic status of study participants and the smaller sample size of the children/youth who participated in focus groups. However, socio-economic status was addressed and highlighted by both parents and HP as an important factor that may influence food guide uptake and adherence to not only food guide recommendations but with the actual GF diet. This is likely due to the high costs associated with GF food<sup>(55)</sup>. One highlighted factor by parents in particular was that the food guide should focus on less expensive food choices within the GF diet (e.g. root-based vegetables). Recruiting a larger sample size of children/youth would have conferred increase rigor to the study design. However, we had a large representation of parents with children in both the focus groups and Internet surveys. This is highly relevant since parents are often the main influencer of the dietary intakes of younger children<sup>(56)</sup> and would be the main users of the guide itself. Additional recruitment of older children/youth would have conferred increased strength as they take more authority over their food choices<sup>(57)</sup>. The feedback included an evaluation of supplementary educational materials and the need for additional content. One important concept will be the inclusion of a bilingual GF food guide (English and French) and translation to other languages to reflect the needs of culturally diverse communities. This is important to ensure that all materials can be used internationally.

### Conclusions

A GF food guide for children and youth addresses a major gap in the literature as there are currently no evidence-based nutrition guidelines that focus specifically on the GF diet. The evaluation of the GF food guide for content, layout, feasibility and dissemination strategies by end-stakeholders (children/youth with CD, their parents/caregivers and HP) provided practical and patient-focused feedback regarding the GF diet. This information is critical to ensure that guide uptake is successful in the community and clinical-based settings. Ongoing work will focus on guideline uptake in children/youth with CD.

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### Supplementary material

For supplementary material/s referred to in this article, please visit <https://doi.org/10.1017/S0007114521002774>

### References

1. Snyder J, Butzner JD, DeFelice AR, *et al.* (2016) Evidence-informed expert recommendations for the management of celiac disease in children. *Pediatrics* **138**, e20153147.
2. Green PH & Cellier C (2007) Celiac disease. *N Engl J Med* **357**, 1731–1743.
3. Russo C, Wolf RL, Leichter HJ, *et al.* (2020) Impact of a child's celiac disease diagnosis and management on the family. *Dig Dis Sci* **65**, 2959–2969.



4. Zarkadas M, Cranney A, Case S, *et al.* (2006) The impact of a gluten-free diet on adults with coeliac disease: results of a national survey. *J Hum Nutr Diet* **19**, 41–49.
5. Zarkadas M, Dubois S, MacIsaac K, *et al.* (2013) Living with coeliac disease and a gluten-free diet: a Canadian perspective. *J Hum Nutr Diet* **26**, 10–23.
6. Case S (2005) The gluten-free diet: how to provide effective education and resources. *Gastroenterology* **128**, S128–S134.
7. Mager DR, Cyrkot S, Lirette C, *et al.* (2021) Nutritional considerations of a paediatric gluten-free food guide for coeliac disease. *Br J Nutr* 1–31. doi: [10.1017/S0007114521000994](https://doi.org/10.1017/S0007114521000994)
8. Mager DR, Liu A, Marcon M, *et al.* (2019) Diet patterns in an ethnically diverse pediatric population with coeliac disease and chronic gastrointestinal complaints. *Clin Nutr ESPEN* **30**, 73–80.
9. Alzaben AS, Turner J, Shirton L, *et al.* (2015) Assessing nutritional quality and adherence to the gluten-free diet in children and adolescents with coeliac disease. *Can J Diet Pract Res* **76**, 56–63.
10. Zuccotti G, Fabiano V, Dilillo D, *et al.* (2013) Intakes of nutrients in Italian children with coeliac disease and the role of commercially available gluten-free products. *J Hum Nutr Diet* **26**, 436–444.
11. Di Nardo G, Villa MP, Conti L, *et al.* (2019) Nutritional deficiencies in children with coeliac disease resulting from a gluten-free diet: a systematic review. *Nutrients* **11**, 1588.
12. Ohlund K, Olsson C, Hernell O, *et al.* (2010) Dietary shortcomings in children on a gluten-free diet. *J Hum Nutr Diet* **23**, 294–300.
13. Mager DR, Qiao J & Turner J (2012) Vitamin D and K status influences bone mineral density and bone accrual in children and adolescents with coeliac disease. *Eur J Clin Nutr* **66**, 488–495.
14. Ballester Fernandez C, Varela-Moreiras G, Ubeda N, *et al.* (2019) Nutritional status in spanish children and adolescents with coeliac disease on a gluten free diet compared to non-coeliac disease controls. *Nutrients* **11**, 2329.
15. Ting A, Katz T, Sutherland R, *et al.* (2020) Evaluating the dietary intakes of energy, macronutrients, sugar, fiber, and micronutrients in children with coeliac disease. *J Pediatr Gastroenterol Nutr* **71**, 246–251.
16. Jamieson JA, Weir M & Gougeon L (2018) Canadian packaged gluten-free foods are less nutritious than their regular gluten-containing counterparts. *PeerJ* **6**, e5875.
17. Cyrkot S, Anders S, Kamprath C, *et al.* (2020) Folate content of gluten-free food purchases and dietary intake are low in children with coeliac disease. *Int J Food Sci Nutr* **71**, 863–874.
18. Pellegrini N & Agostoni C (2015) Nutritional aspects of gluten-free products. *J Sci Food Agric* **95**, 2380–2385.
19. Isaac DM, Wu J, Mager DR, *et al.* (2016) Managing the pediatric patient with coeliac disease: a multidisciplinary approach. *J Multidiscip Healthc* **9**, 529–536.
20. Health Canada (2019) *Canada's Food Guide*. Ottawa, ON: Health Canada.
21. Health Canada (2019) *Canada's Dietary Guidelines for Health Professionals and Policy Makers*. Ottawa, ON: Health Canada.
22. Elwy AR, Wasan AD, Gillman AG, *et al.* (2020) Using formative evaluation methods to improve clinical implementation efforts: description and an example. *Psychiatr Res* **283**, 112532.
23. Kowalski CP, Veaser M & Heisler M (2018) Formative evaluation and adaptation of pre-and early implementation of diabetes shared medical appointments to maximize sustainability and adoption. *BMC Fam Pract* **19**, 109.
24. Stetler CB, Legro MW, Wallace CM, *et al.* (2006) The role of formative evaluation in implementation research and the QUERI experience. *J Gen Intern Med* **21**, S1–S8.
25. Zoom Video Communications Inc (2021) Zoom Home Page. <https://zoom.us> (accessed March 2021)
26. Braun V & Clarke V (2006) Using thematic analysis in psychology. *Qual Res Psychol* **3**, 77–101.
27. Harris PA, Taylor R, Thielke R, *et al.* (2009) Research electronic data capture (REDCap) – a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* **42**, 377–381.
28. Harris PA, Taylor R, Minor BL, *et al.* (2019) The REDCap consortium: building an international community of software platform partners. *J Biomed Inform* **95**, 103208.
29. Beals KA (2019) Potatoes, nutrition and health. *Am J Potato Res: Offic J Potato Assoc Am* **96**, 102.
30. Rashid M, Cranney A, Zarkadas M, *et al.* (2005) Coeliac disease: evaluation of the diagnosis and dietary compliance in Canadian children. *Pediatrics* **116**, e754–759.
31. Olsson C, Lyon P, Hornell A, *et al.* (2009) Food that makes you different: the stigma experienced by adolescents with coeliac disease. *Qual Health Res* **19**, 976–984.
32. White LE, Bannerman E & Gillett PM (2016) Coeliac disease and the gluten-free diet: a review of the burdens; factors associated with adherence and impact on health-related quality of life, with specific focus on adolescence. *J Hum Nutr Diet* **29**, 593–606.
33. Ojetti V, Nucera G, Migneco A, *et al.* (2005) High prevalence of coeliac disease in patients with lactose intolerance. *Digestion* **71**, 106–110.
34. Health Canada (2008) *Nutrient Value of Some Common Foods*. Ottawa, ON: Health Canada.
35. Shakur YA, Lou W & L'Abbe MR (2014) Examining the effects of increased vitamin D fortification on dietary inadequacy in Canada. *Can J Public Health* **105**, e127–e132.
36. Chen GC, Wang Y, Tong X, *et al.* (2017) Cheese consumption and risk of cardiovascular disease: a meta-analysis of prospective studies. *Eur J Nutr* **56**, 2565–2575.
37. Munasinghe LL, Willows N, Yuan Y, *et al.* (2015) The prevalence and determinants of use of vitamin D supplements among children in Alberta, Canada: a cross-sectional study. *BMC Public Health* **15**, 1063.
38. Hoffmann MR, Alzaben AS, Enns SE, *et al.* (2016) Parental health beliefs, socio-demographics, and healthcare recommendations influence micronutrient supplementation in youth with coeliac disease. *Can J Diet Pract Res* **77**, 47–53.
39. Woodruff SJ, Coyne P, Fulcher J, *et al.* (2021) Reaction on social media to online news headlines following the release of Canada's food guide. *Can J Dietetic Pract Res* **82**, 16–20.
40. Health Canada (2019) *Minister of Health to Unveil Canada's New Food Guide*. Ottawa, ON: Health Canada.
41. Schipper K, Bakker M, De Wit M, *et al.* (2016) Strategies for disseminating recommendations or guidelines to patients: a systematic review. *Implement Sci* **11**, 82.
42. Garza C, Stover PJ, Ohlhorst SD, *et al.* (2019) Best practices in nutrition science to earn and keep the public's trust. *Am J Clin Nutr* **109**, 225–243.
43. Slater JJ & Mudryj AN (2018) Are we really 'eating well with Canada's food guide'? *BMC Public Health* **18**, 652.
44. Garriguet D (2006) *Overview of Canadian's Eating Habits. Nutrition: Findings from the Canadian Community Health Survey*. Ottawa, ON: Statistics Canada.
45. Rasmussen M, Krolner R, Klepp KI, *et al.* (2006) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies. *Int J Behav Nutr Phys Act* **3**, 22.





46. Chu YL, Farmer A, Fung C, *et al.* (2013) Fruit and vegetable preferences and intake among children in Alberta. *Can J Diet Pract Res* **74**, 21–27.
47. Zampollo F, Kniffin KM, Wansink B, *et al.* (2012) Food plating preferences of children: the importance of presentation on desire for diversity. *Acta Paediatr* **101**, 61–66.
48. Krolner R, Rasmussen M, Brug J, *et al.* (2011) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part II: qualitative studies. *Int J Behav Nutr Phys Act* **8**, 112.
49. Reed J, Frazão E & Itskowitz R (2004) *How much do Americans pay for fruits and vegetables?* *Agriculture Information Bulletin: no 792–4*. Washington, D.C: United States Department of Agriculture, Economic Research Service.
50. Miller SR & Knudson WA (2014) Nutrition and cost comparisons of select canned, frozen, and fresh fruits and vegetables. *Am J Lifestyle Med* **8**, 430–437.
51. Vaitkeviciute R, Ball LE & Harris N (2015) The relationship between food literacy and dietary intake in adolescents: a systematic review. *Public Health Nutr* **18**, 649–658.
52. Vanderlee L, Hobin EP, White CM, *et al.* (2018) Grocery shopping, dinner preparation, and dietary habits among adolescents and young adults in Canada. *Can J Diet Pract Res* **79**, 157–163.
53. Talati Z, Pettigrew S, Moore S, *et al.* (2017) Adults and children prefer a plate food guide relative to a pyramid. *Asia Pac J Clin Nutr* **26**, 169–174.
54. Truman E (2018) Exploring the visual appeal of food guide graphics: a compositional analysis of dinner plate models. *Br Food J* **120**, 1682–1695.
55. Kulai T & Rashid M (2014) Assessment of nutritional adequacy of packaged gluten-free food products. *Can J Diet Pract Res* **75**, 186–190.
56. Vereecken C, Haerens L, De Bourdeaudhuij I, *et al.* (2010) The relationship between children's home food environment and dietary patterns in childhood and adolescence. *Public Health Nutr* **13**, 1729–1735.
57. McKinley MC, Lewis C, Robson PJ, *et al.* (2005) It's good to talk: children's views on food and nutrition. *Eur J Clin Nutr* **59**, 542–551.