Gluten-free Food Insecurity in Pediatric Celiac Disease

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Introduction

Increase in prevalence of food insecurity (FI) among households with children from

12.5% in 2021 ➡ 17.3% in 2022

Food Insecurity ≠ Nutritional Insecurity

Nutritional insecurity exists when there is inconsistent and/or unequal access to "healthy, safe, and affordable foods that promote optimal health and well-being"

Celiac Disease (CeD) requires lifelong adherence to a gluten-free diet (GFD)

Gluten-free (GF) foods in the US cost **183%** more compared to wheat-based alternatives

Methods

- Patients <18yo with CeD diagnosis and seen by a Cincinnati Children's Hospital Medical Center gastroenterologist between 11/1/2018 and 11/1/2024 were invited to participate
- Electronic survey was to sent to all mobile phone numbers and emails listed in the patient's electronic health record (EHR) four times
- Sociodemographic and clinical data extracted from EHR

Survey Instrument

- US Household Six-Item Short Form Food Security Survey Module
- Adapted Hunger Vital Sign™ to assess GF FI
- Gluten-Free Eating Assessment Tool short to assess for GFD adherence
- Questions assessing social determinants of health as barriers to GFD adherence
- Demographic information

Classified by food security status

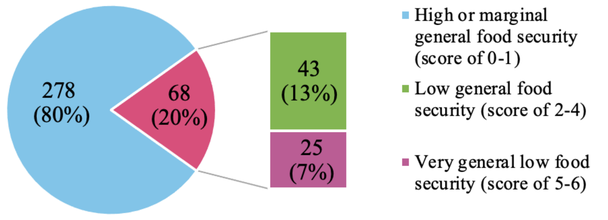
	Gluten-free Food Insecure	Gluten-Free Food Secure
General Food Insecure	GF FI/FI	GF FS/FI
General Food Secure	GF FI/FS	GF FS/FS

Results

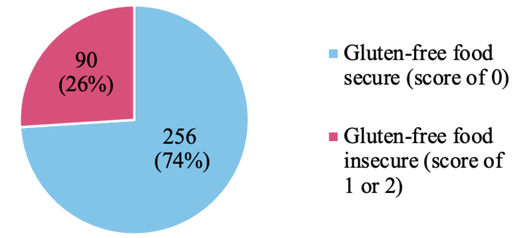
1039 patients from 994 unique households (43 households with multiple CeD patients) received survey invitations

34.8% (346/994) response rate

General Food Insecurity Prevalence



Gluten-free Food Insecurity Prevalence



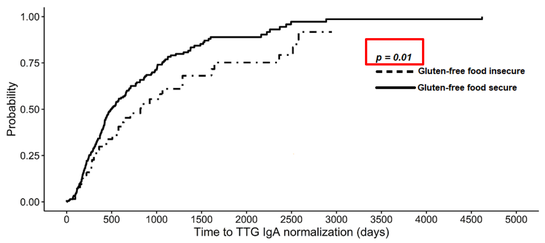
Results of group comparisons to examine associations between food security status and sociodemographic characteristics

	GF FI	GF FS	p-value	GF FI/FI	GF FI/FS	p-value	GF FI/FS	GF FS/FS	p-value
Deprivation Index Score									
Mean ± Standard Deviation	0.28 ± 0.1	0.24 ± 0.08	**0.0006**	0.29 ± 0.1	0.27 ± 0.09	0.35	0.27 ± 0.09	0.24 ± 0.08	0.13
Health Insurance Type (n, %)									
Public	21 (24.1)	17 (6.7)	**<.0001**	18 (32.1)	3 (9.7)	**0.019**	3 (9.7)	17 (7)	0.59
Private	64 (73.6)	234 (92.5)		36 (64.3)	28 (90.3)		28 (90.3)	225 (92.2)	
Self-pay	2 (2.3)	2 (0.8)		2 (3.6)	0 (0)		0 (0)	2 (0.8)	
Total Household Income (n, %)									
Less than $60,000	29 (34.5)	10 (4.2)	**<.0001**	26 (46.4)	3 (10.7)	**0.0092**	3 (10.7)	8 (3.5)	**<.0001**
$60,000 - $105,000	27 (32.1)	40 (16.7)		13 (23.2)	14 (50)		14 (50)	39 (17)	
$105,000 - $150,000	20 (23.8)	53 (22.1)		12 (21.4)	8 (28.6)		8 (28.6)	49 (21.3)	
Greater than $150,000	8 (9.5)	137 (57.1)		5 (8.9)	3 (10.7)		3 (10.7)	134 (58.3)	

Results of group comparisons to examine associations between food security status and gluten-free dietary adherence and barriers

	GF FI	GF FS	p-value	GF FI/FI	GF FI/FS	p-value	GF FI/FS	GF FS/FS	p-value
Gluten-free dietary adherence (n, %)									
Frequent gluten (>1x/week)	8 (8.9)	5 (2.1)	**0.0004**	6 (10.5)	2 (6.1)	0.091	2 (6.1)	3 (1.3)	0.29
Occasional gluten (1-4x/month)	10 (11.1)	5 (2.1)		8 (14)	2 (6.1)		2 (6.1)	5 (2.1)	
Rare intentional gluten (<1x/month)	7 (7.8)	7 (2.9)		5 (8.8)	2 (6.1)		2 (6.1)	7 (3)	
Rare accidental gluten (<1x/month)	30 (33.3)	97 (40.1)		19 (33.3)	11 (33.3)		11 (33.3)	95 (40.4)	
No known gluten	35 (38.9)	128 (52.9)		19 (33.3)	16 (48.5)		16 (48.5)	125 (53.2)	
Reported gluten-consumption due to increased cost of gluten-free foods at grocery (n,%)									
Yes	17 (19.3)	1 (0.4)	**<.0001**	14 (25.5)	3 (9.1)	0.060	3 (9.1)	1 (0.4)	**0.0064**
No	71 (80.7)	240 (99.6)		41 (74.6)	30 (90.9)		30 (90.9)	233 (99.6)	
Reported gluten-consumption due to increased cost of gluten-free foods while eating outside of the home (n,%)									
Yes	22 (24.7)	1 (0.4)	**<.0001**	18 (32.1)	4 (12.1)	**0.034**	4 (12.1)	1 (0.4)	**0.0009**
No	67 (75.3)	240 (99.6)		38 (67.9)	29 (87.9)		29 (87.9)	233 (99.6)	
Reported gluten-consumption due to transportation barriers (n,%)									
Yes	7 (7.9)	5 (2.1)	**0.019**	4 (7.1)	3 (9.1)	0.71	3 (9.1)	4 (1.7)	**0.042**
No	82 (92.1)	237 (97.9)		52 (92.9)	30 (90.9)		30 (90.9)	231 (98.3)	
Reported gluten-consumption due to lack of accessibility of gluten-free food at nearby locations (n,%)									
Yes	22 (25)	20 (8.3)	**<.0001**	17 (30.4)	5 (15.6)	0.12	5 (15.6)	19 (8.1)	0.18
No	66 (75)	221 (91.7)		39 (69.6)	27 (84.4)		27 (84.4)	215 (91.9)	
Reported gluten-consumption due to personal choice and/or preference (n,%)									
Yes	28 (31.5)	28 (11.6)	**<.0001**	19 (33.9)	9 (27.3)	0.51	9 (27.3)	25 (10.6)	**0.021**
No	61 (68.5)	214 (88.4)		37 (66.1)	24 (72.7)		24 (72.7)	210 (89.4)	
Reported gluten-consumption by accident (n,%)									
Yes	61 (67.8)	128 (52.9)	**0.015**	39 (68.4)	22 (66.7)	0.86	22 (66.7)	124 (52.8)	0.13
No	29 (32.2)	114 (47.1)		18 (31.6)	11 (33.3)		11 (33.3)	111 (47.2)	

Serologic Findings with Tissue Transglutaminase Immunoglobulin A (TTG IgA)



Number at risk

Gluten-free food secure	222	87	41	16	9	2	1	1	1	1	0
Gluten-free food insecure	73	32	17	9	7	5	0	0	0	0	0

Based on Kaplan-Meier survival curves, gluten-free food insecure respondents took significantly longer for TTG IgA to normalize

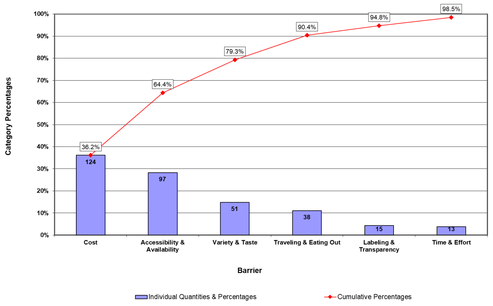
- No significant difference in comparing time to normalization of TTG IgA for
  - GF FI/FI vs GF FI/FS
  - GF FI/FS vs GF FS/FS

No significant difference among the three group comparisons in:

- Highest ever TTG IgA
- Proportion of respondents who ever had TTG IgA normalization
- The highest TTG IgA expressed as multiples of the upper limit of normal as a continuous variable

Results

Reasons for gluten-free food insecurity provided by respondents



Conclusions

- One-fourth of survey respondents classified as gluten-free food insecure, higher than general FI rates
- Respondents who identified as gluten-free food insecure had worse adherence to a gluten-free diet
- Patients with gluten-free food insecurity were slower to normalize TTG IgA, but ultimately normalize proportional to those who are gluten-free food secure

Next Steps

Gluten-Free Food Insecurity Recognition and SupporT (GF FIRST)

- Enhance approaches to clinic-based screening to effectively identify CeD patients with GF FI
- Implement a standardized and sustainable response pathway to address GF FI
- Assess GF FI prevalence and characteristics of GF FI families as identified through in-clinic screening