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The burden of food allergy on children and teens: A systematic review

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Abstract

Background: Over the last two decades, researchers have placed increasing attention on understanding how food allergy affects the health-related quality of life (HRQL) and psychosocial well-being of children and teens. In response, a number of reviews have been published that aim at synthesizing the literature. However, many of these papers focus narrowly on HRQL or suffer from methodological limitations.

Method: The current review aims to fill this gap by providing a comprehensive overview of the burden of pediatric food allergy by synthesizing the quantitative and qualitative literature.

Results: Findings from the present review provide evidence of reduced HRQL among children and teens with food allergy, particularly older children and those with more severe manifestations of the condition. In comparison to HRQL, the link between food allergy and psychosocial functioning is less clear; however, some evidence can be cited linking food allergy to greater levels of psychological distress. Qualitative evidence suggests that the burden of pediatric food allergy largely stems from worries surrounding exposures outside of the home and the social consequences of the condition. The current review also highlights several gaps in the literature, including a paucity of longitudinal research, research focused on predictors of psychological distress among children and teens with food allergy as well as a dearth of studies comparing rates of bullying in food-allergic and non-food-allergic samples.

Conclusion: More emphasis should be placed on not only alleviating the social and psychological consequences of food allergy, but also on identifying and assisting those most acutely burdened by the condition.

KEYWORDS

bullying, burden, food allergy, food hypersensitivity, mixed methods, psychosocial functioning, quality of life

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1 | BACKGROUND

With the prevalence of food allergy believed to be at an all-time high, researchers have placed increasing attention on understanding both the sources and types of burden experienced by children with the condition and their families.¹ In response, several reviews have been published over the last decade that aim at synthesizing the literature.²⁻¹⁰ Results from this body of work suggest, perhaps not surprisingly, that food allergy has a negative impact on the health-related quality of life (HRQL) of both children and caregivers. While the impact of food allergy on HRQL has been described in a number of review papers, few have traced the impact of food allergy on other areas of psychosocial functioning. However, a recent review paper by our group attempted to partially fill this gap in the literature by examining the impact of food allergy on the HRQL, psychosocial functioning, and finances of *parents of children with food allergy*.¹¹ In it, we found parents not only reported lower levels of HRQL, but also greater stress, anxiety, and financial costs, relative to those without a child with food allergy.¹¹ Surprisingly, few of the existing reviews of the burden of food allergy on *children and teens* have adopted a similarly broad approach and have focused largely on HRQL.^{3,4,7,10} Given these gaps in the literature, many questions regarding the psychosocial burden of food allergy on children and teens remain unanswered, including whether the condition leaves children vulnerable to mental health issues, like anxiety and depression, or bullying. Despite this paucity of research, it is plausible that children and teens with food allergy experience greater psychological distress and rates of bullying given that the condition can not only be life-threatening, but also stigmatizing.¹²

Consequently, the current study aims to provide a comprehensive overview of the burden of food allergy on children and teens through a thorough review of the quantitative and qualitative literature. While a number of the previously published reviews have omitted the qualitative literature, either in full or in part, its inclusion is arguably critical to fully understanding the consequences of the condition as it is particularly well-suited to describing the complex social processes that affect the HRQL and psychosocial functioning of people with food allergy.^{3,6,7,8,10} We hope that by adopting a comprehensive approach, the current review will not only enhance our understanding of how food allergy affects the lives of children and teens, but also identify remaining gaps in the literature.

2 | METHODS

2.1 | Design

The current study used a segregated, mixed research synthesis design, in accordance with Heyvaert and colleagues' definition.¹³ In this approach, the quantitative and qualitative articles are analyzed and synthesized separately. Once synthesized, the findings from the quantitative and qualitative analyses are integrated.

Key Message

Results from the current review suggest that children and teens with food allergy not only report lower HRQL, but also, in some instances, greater symptoms of anxiety and depression. However, the findings appeared to be at least partially dependent on the age of the child, the severity of the condition, and whether functioning is assessed by the child themselves or their parents. Qualitative evidence suggests that the burden experienced by food-allergic children and teens largely stems from social consequences of the condition and worries surrounding exposures outside of the home. In light of these findings, it is apparent that greater emphasis should be placed on not only identifying those disproportionately affected by the social and psychological consequences of food allergy but also on how to best alleviate the burden experienced by those most affected.

2.2 | Search strategy

Our initial search was conducted on the PubMed, Scopus, and CINAHL databases between November 26 and December 2, 2019. We repeated our search of PubMed, Scopus, and CINAHL on March 23rd 2021 and limited the retrieved articles to 2020–2021 in order to identify papers published over the previous year. At this time, we expanded our search to include PsycInfo to ensure no relevant articles were omitted (see Table 1 for a complete list of the search terms). Articles were screened by two authors (MG and JP) and any disagreements regarding the inclusion of specific articles were resolved through discussion and subsequent consensus. However, a third author (AB) was available to settle any disagreements that could not be resolved through discussion.

2.3 | Eligibility criteria

Articles written in English focused on quality of life (QoL), HRQL, psychological health, or the social well-being of children (0–12 years) and teens (13–19 years) with food allergy were eligible for review. In the current study, food allergy was defined as both immunoglobulin E (IgE)-mediated food allergies and non-IgE-mediated allergies (ie, food protein-induced enterocolitis, proctocolitis, enteropathy). There were no restrictions based on the article's year of publication; however, only original research articles were eligible for review. Research published in conference proceedings was also deemed ineligible given that it is typically not peer-reviewed. While studies centering on QoL were eligible for review, our search and screening process revealed no QoL articles that met our inclusion criteria. Our final sample did, however, include a number of studies focused on

TABLE 1 Search strings

Bibliographic databases	Search string
PubMed	(psychological health[tw] OR "cost of illness"[MeSH Terms] OR "quality of life"[MeSH Terms] OR "socioeconomic factors"[MeSH Terms] OR "stress, psychological"[MeSH Terms] OR "mental disorders"[MeSH Terms] OR "social adjustment"[MeSH Terms] OR burden[tw] OR community[tw] OR economic[tw] OR HRQL[tw] OR mental[tw] OR psychologic[tw] OR social[tw]) AND (allergen avoidance[tw] OR ige sensitization[tw] OR ige sensitization[tw] OR food hypersensitivity[tw] OR "food hypersensitivity"[MeSH Terms] OR food protein induced enterocolitis[tw] OR "lactose intolerance"[MeSH Terms] OR "food intolerance"[MeSH Terms] OR food allergy[tw] OR peanut allergy[tw] OR dairy allergy[tw] OR immunoglobulin e-mediated[tw]) AND "humans"[MeSH Terms] AND English[lang] NOT ("systematic review"[Publication Type] OR "systematic reviews as topic"[MeSH Terms] OR "systematic review"[All Fields]) NOT ("review"[Publication Type] OR "review literature as topic"[MeSH Terms] OR "review"[All Fields]) NOT ("meta-analysis"[Publication Type] OR "meta-analysis as topic"[MeSH Terms])
Scopus	TITLE-ABS-KEY (("stigma" OR "psychological health" OR "cost of illness" OR "quality of life" OR "socioeconomic factors" OR stress OR "mental disorders" OR "mental disease" OR "social adjustment" OR burden OR community OR economic OR hrql OR mental OR psychologic OR social OR "psychological wellbeing" OR anxiety OR depression) AND ("allergen avoidance" OR "ige sensitization" OR "ige sensitisation" OR "food hypersensitivity" OR "food protein induced enterocolitis" OR "lactose intolerance" OR "food intolerance" OR "food allergy" OR "peanut allergy" OR "dairy allergy" OR "milk allergy" OR "immunoglobulin e-mediated")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (EXCLUDE (SRCTYPE, "k") OR EXCLUDE (SRCTYPE, "d") OR EXCLUDE (SRCTYPE, "b"))
CINAHL	MH stigma OR MH psychological wellbeing OR MH quality of life OR MH stress, psychological OR food allergy/economics OR food hypersensitivity/economics OR MH socioeconomic factors OR MH caregiver burden OR "psychological health" OR burden OR community OR economic OR HRQL OR mental OR psychologic OR social) AND (MH food hypersensitivity OR MH food intolerance OR MH milk hypersensitivity OR "allergen avoidance" OR "ige sensitization" OR "ige sensitisation" OR "food protein induced enterocolitis" OR "lactose intolerance" OR "food allergy" OR "peanut allergy" OR "peanut hypersensitivity" OR "dairy allergy" OR "dairy hypersensitivity" OR "immunoglobulin e-mediated") ^a
PsycInfo	((("stigma" or "psychological health" or "cost of illness" or "quality of life" or "socioeconomic factors" or stress or "mental disorders" or "mental disease" or "social adjustment" or burden or community or economic or hrql or mental or psychologic* or social or "psychological wellbeing" or anxiety or depression) and ("allergen avoidance" or "ige sensitization" or "ige sensitisation" or "food hypersensitivity" or "food protein induced enterocolitis" or "lactose intolerance" or "food intolerance" or "food allergy" or "peanut allergy" or "dairy allergy" or "milk allergy" or "immunoglobulin e-mediated")) ^a

Note: Initial searches were conducted on PubMed, Scopus, and CINAHL between November 26 and December 2, 2019. We repeated our search of PubMed, Scopus, and CINAHL on March 23rd 2021 and limited the retrieved articles to 2020–2021 to identify papers published over the previous year. At this time, we expanded our search to include PsycInfo. Although intolerance was included as a search term, articles pertaining to intolerances were ultimately excluded.

^aSearch limited to peer-reviewed and English language articles.

the related, but narrower concept of HRQL. Unlike QoL, which describes an individual's satisfaction with their position in life across all domains, HRQL is embedded within QoL and focuses more closely on an individual's physical functioning and psychosocial well-being as it relates specifically to health.¹⁴

2.4 | Quantitative data extracted

Data extracted from the reviewed articles included the publication year, title, country of the participants, study objectives, sample size, participant age, study design, comparator group/s, outcome measures, the allergy type, allergens studied, diagnosis type (eg, physician-diagnosed or self-reported), burden type, key findings, and the names of the authors. We also assessed the methodological quality of the quantitative studies using the National Heart, Lung, and Blood Institute's Quality Assessment Tools.¹⁵ These tools are comprised of a series of checklists, tailored to the study's design, that are used to assess a study's risk of bias. In completing these measures, the researcher is asked to indicate whether the

study meets a number of criteria related to its internal validity (eg, adequate participation rate, valid and reliable measures, and control for confounds). Based on the degree to which these criteria are met, studies are assigned a rating of good, fair, or poor. Good studies are described as having a low risk of bias, whereas a fair study is described as having some bias, but not enough to invalidate the results. Studies given a poor rating, on the other hand, are considered to have a significant risk of bias. Given the widely varying designs, measures, and quality of the reviewed studies, the quantitative literature was synthesized using a narrative synthesis rather than a meta-analysis.

2.5 | Qualitative analyses

The findings from the qualitative literature were summarized using the thematic synthesis approach. This is a qualitative methodology used to summarize and integrate findings from multiple qualitative studies.¹³ As part of this approach, the results sections from each of the qualitative studies were coded with short descriptive codes.

Conceptually similar codes were then organized to form descriptive themes that captured the underlying meaning of a particular collection of codes. Lastly, the descriptive themes were grouped to form higher order analytical themes. For instance, the descriptive themes: isolation, exclusion from activities, food allergy as a marker of difference, and a lack of validation from others were combined to form the analytical theme: "The subtle alienation of food allergy." Each of the analytical themes went beyond the content of the primary articles and were directly aimed at describing the burden of pediatric food allergy. The thematic synthesis and the review of each step in the process was conducted by two different authors (MG and JP). Conflicting interpretations of the data were discussed by the authors until consensus was reached.

2.6 | Selection of eligible studies

A PRISMA-style flowchart detailing the search results and selection process can be found in Figure 1. Of the 3789 unique publications screened, 154 advanced to full-text review. Upon review, 93 of these articles were excluded from the final sample as they were not focused on the topic of interest, six articles were excluded as they failed to include primary data, and 1 article was excluded as it was a published conference abstract. After removing all the ineligible articles, 45 studies were included in the quantitative synthesis and nine in the qualitative synthesis (see Tables S1–S3 in the online supplement for a summary of each of the included studies). In total, these studies included over 8000 participants with food allergy (Quantitative = 8202; Qualitative = 186).

3 | RESULTS

3.1 | Impairments in HRQL

Review of the included studies suggests that pediatric food allergy has a negative impact on the HRQL of children and teens. In eleven of the fourteen studies (78%) that employed the use of a comparison group, children and teens with food allergy were found to have significantly lower levels of HRQL in at least one domain.^{16–29} Statistically significant differences emerged most frequently in the domains related to total HRQL (66%), followed by social functioning (58%), emotional functioning (54%), and physical functioning (54%). It is important to note that these differences were also found to be clinically meaningful in the majority of the studies that utilized measures with published minimal clinically important difference (ie, MCID) cut-points.^{18,20,21,22,25,28,29}

Evidence from the sample of within-group studies (ie, limited to those with food allergy) suggests that the burden of food allergy worsens as children age.^{30–35} However, the majority of this research has not examined the trajectory of HRQL beyond childhood. In fact, only one of the reviewed studies examined differences in HRQL between children and adolescents with food

allergy.³⁶ In this paper, Miller and colleagues provided evidence that HRQL continues to decline beyond childhood as adolescents (13–17 years) were found to have lower HRQL relative to children (0–12 years).³⁶ However, determining whether this difference is wholly attributed to age-related changes is made difficult by the fact that the adolescent participants reported on their own HRQL, while parents provided proxy reports for the children.³⁶ Given this limitation and the general paucity of research, it is not yet clear whether HRQL continues to decline into adolescence, a time in which children often begin to take greater responsibility for managing their food allergy independently.

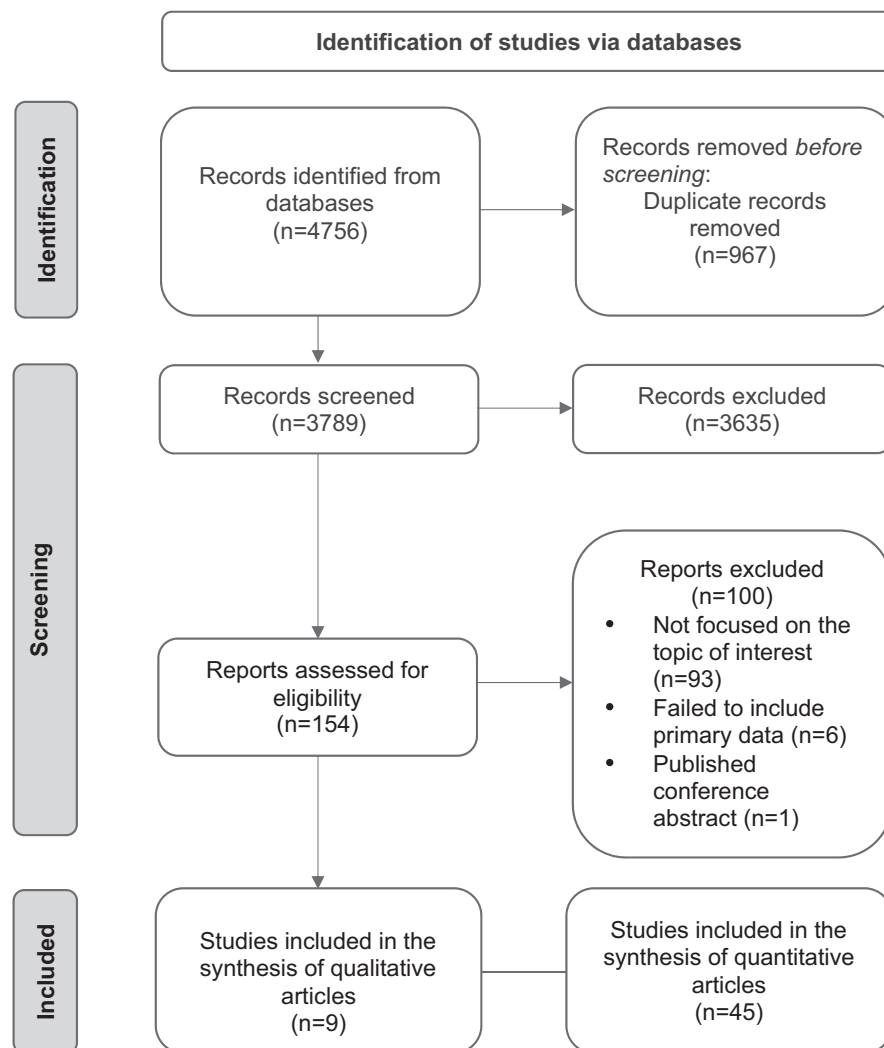
Results from the current review also revealed a paucity of studies that examined the relationship between food allergy type and HRQL. Furthermore, what scant research has been done has failed to consistently identify particular food allergens that predict greater levels of burden.^{25,33,35,37,38} In contrast, far more research has investigated the relationship between a child's number of food allergies and their HRQL. Findings from this body of work suggest, that children who avoid greater numbers of foods, tend to report lower HRQL relative to those avoiding fewer foods.^{23,25,26,33,35,38} Similarly, evidence suggests children and teens with more severe food allergy often report lower HRQL in comparison to those with less severe allergy.^{20,23,25,31,32,33,34,36,37,39,40,41} It should be noted, however, that the majority of these studies did not control for allergic comorbidities.^{20,25,26,32,35,37,39} Given that asthma has been associated with severe reactions to food and has been found to be more common among children with multiple food allergies, it is difficult to determine whether these factors are truly linked to HRQL or whether the relationship is predicated, in full or in part, on their relationship with asthma.^{42–44}

3.2 | Psychosocial challenges

Our review of the literature revealed a number of papers focused on the impact of pediatric food allergy on psychosocial functioning ($n = 18$). While the majority of these studies limited their focus to symptoms of anxiety and depression, a small number of the reviewed articles included measures aimed at assessing a wider range of psychological symptoms and disorders. Results from this body of work revealed children and teens with food allergy had lower levels of psychosocial functioning in nine of the 14 (64%) studies that included a comparison group.^{20,45,46,47,48,49,50,51,52} However, the current findings did not provide conclusive evidence of condition-specific associations as children and teens with food allergy reported greater symptoms of anxiety and depression in a similar proportion of the reviewed studies (50% and 42%, respectively).^{18,20,22,45,46,47,48,49,51,52,53,54,55}

Across the within-group sample of studies, few individual factors consistently predicted higher levels of psychological symptoms. However, some evidence can be cited that suggests individuals with a history of anaphylaxis may experience greater psychological distress relative to those without such a history.^{50,56}

FIGURE 1 Flowchart of the study selection process



3.3 | Differences in child vs. parent-reported outcomes

While the majority of the reviewed studies employed the use of either self-reported or parent proxy-reported outcome measures, a number included both types of questionnaires. Interestingly, results from this body of work suggest that parents often perceive their child's food allergy as causing greater impairment than the child themselves.^{16,20,22,47,49,57} This tendency appeared not only in studies investigating the impact of food allergy on HRQL^{16,20,22,57} but also on mental health^{47,49} and was manifested in both significant differences between parent and child scores as well as differences in the patterns of findings between parents and children. For example, Ferro and colleagues found that while mothers rated their children as having higher levels of anxiety, depression, and ADHD, relative to controls, these differences did not reach statistical significance when mental health outcomes were reported by the children themselves.⁴⁷ While only seven of the reviewed studies included both self- and proxy-reported measures, five provided some evidence that parents perceive their children as experiencing greater burden than the children themselves.^{16,20,47,49,57} In

contrast, one of the seven studies provided mixed findings²² and one reported wholly consistent findings between the two sets of questionnaires.⁵⁵

3.4 | Bullying of children with food allergy

Findings from the current review revealed a sizeable minority of children reported experiencing food allergy-related bullying (20%–32%).^{58–63} However, determining whether bullying is more likely, occurs more frequently, or is more severe among children with food allergy is made difficult by a paucity of studies employing the use of a comparison group. In fact, only one of the reviewed studies compared rates of bullying between children with and without food allergy.⁵⁸ Given this gap in the literature, it remains to be seen whether food allergy truly increases a child's likelihood of being bullied. Moreover, the largely descriptive nature of the current literature makes it difficult to determine whether individual or food allergy-related characteristics increase one's likelihood of experiencing bullying. Consequently, more research is needed to better understand how bullying affects children and teens with food allergy.

3.5 | Qualitative synthesis

3.5.1 | The subtle alienation of food allergy

The first theme we identified in the qualitative analysis, *the subtle alienation of food allergy*, describes both the real and perceived consequences of food allergy on the social lives of children and adolescents. While children described their food allergy as having a range of negative consequences, many reported that they were sometimes isolated from their classmates as a result of their allergy.^{12,64,65,66} Specifically, several participants explained that because they were reliant on the allergen-friendly food from the school cafeteria, they could be forced to eat alone if their food was prepared at a different time or if their friends chose to eat elsewhere^{64,65}: "My friends they don't have to eat the school lunch if they don't like what's on the menu, but I have to go there because they have fixed it just for me, so for this reason sometimes I have to sit by myself."⁶⁴ However, children did not just experience social limitations at school, as many indicated that they were unable to participate in certain activities outside of school as well. For some, this meant being unable to attend group activities where food was served, like birthday parties and summer camps^{65,67,68}; whereas, other children and teens reported that they did attend social events involving food, but doing so required them to take added precautions that were sometimes perceived as a source of embarrassment^{65,68,69}: "It's a bit embarrassing going to your friend's barbeque...and then bringing your own buns".⁶⁹ To avoid these feelings of separation and embarrassment, some participants reported taking steps to conceal their food allergy by inconsistently carrying their epinephrine auto-injector (EAI) and failing to disclose their food allergy when eating outside their home.^{68,70}

3.5.2 | The desire for control in uncontrolled environments

The second theme we identified, *the desire for control in uncontrolled environments*, describes the worries that stem from the inherent unpredictability of food allergy. While children largely described feeling comfortable in the controlled environment of their own home, many participants reported experiencing greater worry in areas where their control over potential sources of exposure was diminished (eg, school, restaurants, and when travelling)^{64,65,67,68}: "I felt anxious occasionally in restaurants, because the allergic reaction I had in the restaurant had a lasting impact on me...I had a reaction in a place where I was supposed to be safe, but it happened anyway."⁶⁸ In response to the heightened risks encountered outside of the home, some children/teens tried to regain a sense of control by adopting a vigilant coping style characterized by sustained attention to potential sources of exposure, excessive handwashing, and avoidance of social events involving food^{64,67,71}: "well, like I am constantly washing my hands before like I have any food product, so it is kind of like annoying, because I am kind of like afraid to not wash my hands for once..."⁶⁷

3.5.3 | "It's not that bad": The minimization of burden

The third theme we identified, "It's not that bad": the minimization of burden, describes the tendency for children and teens with food allergy to downplay the negative consequences of their condition. Both younger and older children minimized their limitations, but they tended to do so in different ways. Younger children reported that their caregivers were responsible for the bulk of the allergy management, which helped to lighten their load.^{64,67} In contrast, older children appear to adopt one of two perspectives depending on whether they were diagnosed earlier or later in life. Older children who were diagnosed early in life often did not remember a time when they were not food-allergic and as a consequence, managing their food allergy was perceived simply as a way of life.^{69,70} Children who were diagnosed later in life, on the other hand, described a period of adaptation and acceptance in which they had to not only grieve the loss of certain foods and experiences, but also learn how to manage their food allergy^{65,67,69}: "It used to bother me a lot more than it does now because, if you think of it, like one day you're eating whatever, you go to the supermarket and think I fancy that or I fancy cereal or I fancy a sandwich, and then the next day it was that you can't have a sandwich, you can't have biscuits and it's like Aaargh!"⁶⁹ Although participants described adapting to their food allergy over time, many children appeared to cope with the residual burdens of the condition by reframing and contextualizing their limitations.^{65,69} In particular, several participants not only emphasized the unexpected benefits of food allergy (eg, character building and special meals) but also the ways in which their limitations paled in comparison to those with more severe food allergies^{65,69}: "There's some that have to be really aware because they can just smell it and have a reaction. I'm kind of grateful for that."⁶⁹ Taken at face value, statements that minimize the burden of food allergy would seem to suggest that children and teens experience relatively minor challenges as a result of their condition. However, downward comparisons and positive reframing can also be seen as emotion-focused coping techniques that aim to mitigate the negative emotions associated with the burdens that fail to improve with time and experience.

4 | DISCUSSION

Findings from the quantitative literature suggest that food allergy negatively affects the HRQL of children and teens.¹⁶⁻²⁶ While participants most frequently reported lower levels of social functioning, evidence of deficits in other facets of HRQL can be cited as well. Within-group research suggests that the severity of the food allergy and the child's age are important factors in determining the condition's impact on HRQL as older children and those with more severe food allergy were found to report lower functioning.^{20,23,25,31,32,33,34,36,37,39,40} By comparison, evidence of psychological distress among children and teens with food allergy emerged less consistently across the reviewed literature. Nevertheless, children

were found to report greater symptoms of anxiety, depression, and other mental health issues in a slight majority of the reviewed studies.^{20,45,46,47,48,49,50,51,52} Evidence from the qualitative literature suggests that food allergy's negative impact on the psychosocial functioning and HRQL of children and teens is related to the negative social repercussions of the condition as well as worries stemming from potential exposures.^{12,64,65,66,67,68,69,70,71} Despite these burdens, many children and teens with food allergy downplayed the significance of the condition through downward comparisons and reframing their limitations.^{64,65,67,69,70}

Findings from the present study are broadly consistent with the work of previous review articles, which have noted a negative impact of food allergy on the HRQL of children and teens.^{3,4,6,7,8} However, the present study extends previous work by synthesizing a decade of novel quantitative and qualitative research focused on the relationship between pediatric food allergy and psychosocial functioning.^{46,47,48,50,51,52,53,54,55,56,64,65,67} As a whole, this body of work provides some evidence of a negative relationship between pediatric food allergy and psychosocial functioning, assessed in the majority of the reviewed studies in terms of anxiety and depression.

5 | IMPLICATIONS

By highlighting the sometimes subtle and sometimes acute feelings of alienation experienced by children and teens with food allergy, findings from the current study underscore the need for greater consideration of the social consequences of the condition. Given that many of the negative social consequences reported by children and teens appear tied to school and extracurricular activities, individuals and organizations responsible for the care of children would be well-advised to mindfully consider students' food allergies when crafting policies and planning activities. However, efforts aimed at promoting the social inclusion of children with food allergy are predicated on both staff and organizations having the confidence that children with food allergy can be included safely. Not surprisingly, research suggests that greater food allergy management confidence can be earned, in part, through food allergy-related training and education.^{72,73} Consistent with recent guidelines, organizations are encouraged to adopt greater use of expert-designed training to not only improve the confidence of staff and encourage greater inclusion of children with food allergy, but to also reduce the frequency of reactions.⁷⁴

Furthermore, while institutions can play a role in limiting the social impact of food allergy, parents and clinicians should also help children and teens find an appropriate balance between their safety and social well-being. Findings from the current review suggest that some children and teens with food allergy impose considerable restrictions on their social lives in order to avoid the threat of potential exposures.^{64,67,71} Others, however, report taking what could be seen as excessive risks (ie, failing to carry an EAI and/or neglecting to disclose their food allergy) in order to avoid embarrassment.^{68,70} Arguably, children and families who adopt either of these extreme

approaches should be encouraged to carefully weigh the pros and cons of their orientation.⁷⁵

Lastly, results from the current review suggest that researchers investigating the psychosocial burden of food allergy on children should carefully consider their choice of informant. Consistent with research focused on other pediatric conditions, several studies in the current review provided evidence that parents of children with food allergy tend to rate their child's condition as causing more impairment than the child themselves.^{16,20,22,47,49,57,76,77} While parent proxy measures may provide an important complementary perspective on the HRQL of children with food allergy, findings from the current study suggest that parent reports may not provide a wholly comparable stand-in for self-reported measures. As such, researchers should carefully consider the aims of their research when deciding on their choice of informant as the information they receive from children and teens may in fact differ from that of their parents.

6 | LIMITATIONS

It should be noted that the current review was limited, to some degree, by the methodological quality of the included studies. Few of the reviewed papers received a poor quality rating, but a number of the studies failed to control for the effect of allergic comorbidities.^{17,18,19,20,21,22,29,52,55} Consequently, it is possible that the current review may have exaggerated the burden of food allergy given that asthma, allergic rhinitis, and atopic dermatitis have been found to have a negative impact on HRQL.⁷⁸⁻⁸⁰ The current review was also limited in that it was restricted to English language papers. As a consequence, the majority of the included studies were from developed, Western nations. In addition to an oversampling of papers from the Western world, it appeared as though peanut was the commonly reported type of allergy across the reviewed studies. As such, it is not clear how well the findings generalize beyond the Western world and peanut allergy. It should also be noted that the studies included in the current review employed a wide range of measures and inclusion criterion, which may, to some degree, confuse the interpretation of outcomes across studies. Naturally, the variability in the included studies also prevented us from performing a meta-analysis of the relationship between food allergy, HRQL, and psychosocial outcomes. Without the objective standard of significance afforded by a meta-analysis, it could be argued that the conclusions derived from the current review are at greater risk of bias.

7 | FUTURE DIRECTIONS

Not surprisingly, given its resource intensive nature, the current review revealed a paucity of longitudinal research investigating the relationships between food allergy, HRQL, and psychosocial outcomes. Given this gap in the literature, questions remain regarding the degree of causality underlying the relationship between food allergy and burden as well as the degree to which the burden changes

over time. In addition, while the present study did identify several factors associated with diminished HRQL, it is not yet clear whether one's particular type of food allergy moderates their degree of burden. Similarly, the literature unfortunately provides few clear indications of whether individual or food allergy-related factors increases one's vulnerability toward psychological health issues. Given these gaps in the literature, future research should not only determine whether particular children and teens are more susceptible to the psychological health consequences of food allergy, but also whether particular types of food allergy exert a disproportionate impact on HRQL or mental health. Naturally, identifying individuals most vulnerable to the psychosocial consequences of food allergy could help inform interventions and direct resources to the most needy. Lastly, the review of the literature revealed a paucity of studies comparing rates of bullying among children and teens with and without food allergy. Arguably, researchers should strive to fill this gap in the literature, by determining not only whether children and teens with food allergy are more likely to experience bullying, but also whether individual factors moderate one's vulnerability.

8 | CONCLUSIONS

Consistent with previous work, findings from the current review suggest that food allergy has a negative impact on the HRQL of children and teens, particularly older children and those with severe food allergy. By comparison, the link between food allergy and psychosocial functioning is less clear; however, some evidence can be cited linking food allergy to greater levels of depression and anxiety. Evidence from the qualitative literature suggests that the burden of childhood food allergy largely stems from worries surrounding exposures outside of the home and the social consequences of the condition. While much progress has been made in tracing the impact of food allergy on the HRQL and psychosocial health of children and teens, findings from the current review revealed several gaps in the literature including, a dearth of longitudinal research, a lack of comparative research focused on the relationship between food allergy and bullying, and a paucity of studies centering on the predictors of psychological distress among children and teens with food allergy.

CONFLICT OF INTEREST

JP sits on the steering committee for Canada's National Food Allergy Action Plan and is the section head of Allied Health at the Canadian Society of Allergy and Clinical Immunology and has accepted consulting fees from Novartis. The remaining authors have no conflict of interests to report.

AUTHOR CONTRIBUTIONS

Michael A. Golding: Data curation (lead); formal analysis (lead); investigation (lead); project administration (supporting); Visualization (supporting); writing – original draft (lead). **Ayel L. R. Batac:** Data curation (supporting); formal analysis (supporting); visualization

(lead); writing – original draft (supporting); writing – review and editing (equal). **Nina V. Gunnarsson:** Conceptualization (equal); methodology (equal); supervision (supporting); writing – review and editing (equal). **Staffan Ahlstedt:** Conceptualization (equal); methodology (equal); supervision (supporting); writing – review and editing (equal). **Roelinde Middelveld:** Conceptualization (equal); methodology (equal); supervision (supporting); writing – review and editing (equal). **Jennifer L. P. Protudjer:** Conceptualization (equal); funding acquisition (lead); methodology (equal); project administration (lead); supervision (lead); validation (lead); writing – review and editing (equal).

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