



Australia's National
Science Agency

Gut health symptoms, concerns, and strategies: Australian parents

Key results from a community gut
health survey

8 June, 2022

Executive Summary

The project was a collaboration between CSIRO and Bakers Delight and was funded through the Innovation Connect Grant Scheme. The aim of the project was to investigate the current gut health issues, concerns, and management strategies of Australian parents and to use these insights to develop targeted evidence-based education content to accompany a gut health nutrition challenge.

The challenge, delivered by Bakers Delight, will take the form of a two-week program with specifically designed meal recipes that follow the CSIRO Healthy Gut Diet' fibre principals. The topics covered by the accompanying education content will be informed by data collected through a tailored CSIRO Community Gut Health Survey with evidence-based content provided by CSIRO's leading gut health scientists.

The survey targeted parents of primary school aged children *currently experiencing gut health issues*; a consumer group identified by Bakers Delight as a priority. The survey contained seven modules covering the nature, frequency and impact of gut health symptoms, the impact of the COVID-19 global pandemic, and psychological and lifestyle factors on these, top gut health concerns as well as the strategies currently used by this cohort to manage or optimise their gut health.

This final project report is based on survey responses collected between February 2nd and February 16th, 2022. In this period 661 individuals engaged with the survey of which 355 (53.7%) eligible participants went on to answer all of the questions. The inclusion criteria were parents aged 25-55 years, with at least one primary school aged child (5 -12 years of age), who were currently experiencing some form of gut distress. The sample is not representative of the general Australian population.

Key findings

Snapshot of the gut health of Australian parents: Questionnaire Modules 1, 2 & 3

- The age of participants ranged from 28 – 55 years, the average age was 42.1 years ($SD=5.0$). Most participants were female (95%). The sample is not representative of the general population.
- 3-in-4 (77%) of Australian parents who took part in the survey rate their gut health as poor or only fair; reporting on average 5 markers of GI distress (out of a possible 10 investigated). Note that the questionnaire specifically targeted parents who were experiencing some level of gut distress.
- The most reported symptoms were abdominal bloating (86%), followed by abdominal pain (64%). Over half reported abnormal bowel movements; diarrhoea (57%) or constipation (50%)
- 9-in-10 participants with gut health symptoms also reported experiencing other non-GI symptoms or conditions: with fatigue (70.6%), anxiety (55.4%), difficulties concentrating (50.4%), and food intolerances or sensitivities (41.7%) the most common.

How are Australian parents managing their gut health? Questionnaire Module 4

- Only 58.3% of parents surveyed reported that they were currently active in managing their gut health.

- For those who did report they were using strategies to manage their symptoms:
 - Removing perceived problematic foods or food components was a common gut health management strategy
 - 66% of all parents experiencing gut health symptoms were restricting or eliminating foods from at least one of the five key FODMAP categories presented
 - 20% were avoiding foods containing gluten or restricting alcohol content.
- Adding perceived beneficial foods, drinks or supplements, particularly probiotic products, for gut health was reported by 58% of parents surveyed.
- One third of participants indicated that they had made some changes to the amount or type of their physical activity in response to gut health concerns.
- Six-out-of-ten participants indicated disappointment with the outcomes of their current gut health strategies.

Lifestyle factors (smoking, sleep, weight, exercise, stress and diet): Questionnaire Module 5

- The prevalence of daily smoking in this cohort at 2.7% is much less than the report national average of 10.7%.
- 66% of participants were overweight or obese.
- 1-in-6 participants do not meet the NH&MRC guidelines of less than 10 standard alcoholic drinks per week,
- Only 1-in-5 participants in this cohort indicated that they would regularly meet (15%) or exceed (9.8%) national guidelines for physical activity,
- While 7-out-of-10 (68.8%) participants reported getting adequate amounts of sleep [sleeping between 7 and 9 hours per day], only 19.3% rated their quality of sleep as good or excellent.
- When asked about their current stress levels (where 1 = not at all stressed and 5 = extremely stressed); 50% of participants reported a score of either 4 or 5.

Personal attributes, attributions, attitudes and gut health: Questionnaire Module 6

- According to participants in this cohort the key contributors (rated as very or extremely influential) in their poor gut health were:
 - Gut microbiome imbalance (77%),
 - Lifestyle factors (79%),
 - Emotional health (73%) and
 - Food intolerances or sensitivities (68%).
- The perceived cause of gut health issues is reflected in the nature of the key strategies employed by participants in Module 4 of the questionnaire (i.e., dietary restrictions of problematic foods and consumption of probiotics). Results from Module 5 of the questionnaire reveal the high levels of stress experienced by this cohort as well as the lack of sleep quality, and changes needed in terms of physical activity and diet quality.

Covid-19 global pandemic and the impact on gut health and parenting: Questionnaire Module 7

- Nearly half of all participants (45%) reported that COVID-19 had a negative impact on their gut health, or the experience of their gut health symptoms had worsened.
- A small but significant proportion of participants indicated that COVID-19 had no negative impact on diet quality (25.5%), sleep patterns (32.9%), physical activity routine (26.4%), stress levels (5.8%), job security (51.7%) and relationships with family and friends (26.4%).
- COVID-19 presented unique challenges for parents of young children. According to responses the most challenging- in order of combined very or extremely challenging responses- were:
 - Managing children's screen time **65.2%**
 - Balancing work/working from home and caring responsibilities **54.5%**
 - Assisting with on-line learning or education **46.5%**
 - Keeping children occupied **43.7%**
 - Maintaining a healthy routine for their child **40.2%**
 - Managing their child's COVID-19 related stress **18.4%**

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1 Introduction

1.1 Background

Bakers Delight expressed interest in the development of a nutrition-based gut health challenge for their customers. Identifying parents of primary school aged children as the primary focus, Bakers Delight approached the CSIRO to collaborate on the development of scientific backed education content that reflects the specific experiences with gut health symptoms and the information needs in this specific consumer group. The developed content would accompany a 14-day consumer gut health challenge focusing on increasing dietary fibre diversity of diets, for improved gut health and well-being. The challenge, using recipes and meal plans featuring Bakers Delight products, would align with the CSIRO's Healthy Gut Diet' fibre principals. The topics covered by the accompanying education content will be informed by data collected through a tailored CSIRO Community Gut Health Survey with evidence-based content provided by CSIRO's leading gut health scientists. This report outlines the key findings from the questionnaire only.

1.2 Aims and Objectives

The key aim of this activity was to explore the gut health symptoms, management strategies used, and information needs of Australians parents, aged 22-55 years, with primary school aged children.

2 Method

The project employed an online, CSIRO delivered, community gut health survey targeting parents aged 22-55 years with primary school aged children (aged 5-12 years) who had gut health concerns or were experiencing some form of gut health distress. The aim of the survey was to identify common gut symptoms in this sub-group of the general population, the impact of these on quality of life and the gut health management strategies used. To do this, 7 of the 13 modules from the CSIRO community gut health survey were used.

1. Demographics including family composition
2. Gut and extra-intestinal symptoms: frequency and impact
3. Primary gut health concerns
4. Current gut health strategies being employed
5. Lifestyle factors (Sleep, Alcohol, Stress, intake of discretionary foods)
6. Psychological correlates of poor gut health
7. Impact of COVID-19 on symptoms of gut distress, health behaviour (diet and physical activity) and parenting practices

2.1 Ethics submission and approval

An ethics application was submitted to CSIRO's Low Risk Review Panel on 22nd December 2021, with ethics approval granted on the 1st February, 2022 (Application number: 2021_129_LR).

2.2 Recruitment



A paid national social media campaign began on February 2, 2022 and ran for two weeks. In this period 661 individuals engaged with the survey of which 355 (53.7%) eligible participants went on to answer all of the questions. Figure 1 shows the images and text used to recruit participants via social media. Participants who completed the questionnaire were eligible to go into a draw to receive one of 50 available e-gift vouchers valued at \$50.

Key study inclusion criteria:

- Currently experiencing some form of gut discomfort
- Aged between 22 – 55 years
- Have at least one primary-school aged child (aged 5-12 years)

Figure 1 Social media ad recruiting participants

2.3 Data analysis

This study was exploratory, not hypothesis driven, so participant responses are predominantly reported at the descriptive level. Where relationships between variables are explored or comparisons were needed between groups correlational analyses or independent t-tests were used and reported using APA formatting guidelines.

3 Results and Discussion (Phase 1)

3.1 Sample description: Demographics (Questionnaire Module 1)

A total of 613 individuals who met the inclusion criteria engaged with the survey. Just over half (58%; N=355) completed all questions and were eligible to register to go into a draw for the study incentive (50 x \$50 e-gift voucher). The project was particularly interested in the experiences of parents of young children and the demographic split reflects a strong bias towards female participants, with only 4% of respondents identifying as male. The age of participants ranged from 28 – 55 years, the average age was 42.1 years (SD=5.0). The sample is not representative of the general Australian population.

Table 1 Sample demographics

| | N | (%) |
|--------------------------------------|-----|------|
| Gender | | |
| Female | 498 | 95.2 |
| Male | 24 | 4.6 |
| Non-binary | 1 | 0.2 |
| Age | | |
| 28 – 35 years | 40 | 7.6 |
| 36 – 45 years | 351 | 67.1 |
| 46 – 55 years | 132 | 25.2 |
| Australian State of Residence | | |
| New South Wales | 140 | 26.8 |
| Victoria | 114 | 21.8 |
| Queensland | 91 | 17.4 |
| South Australia | 56 | 10.7 |
| Western Australia | 53 | 10.1 |
| Australian Capital Territory | 31 | 5.9 |
| Tasmania | 26 | 5.0 |
| Northern Territory | 9 | 1.7 |

3.1.1 Family composition

Most participants (88%) described their family as a ‘couple with dependent primary school aged children’ the remainder (12%) identified as a ‘one-parent family’ with dependent young children’.

Most participants reported having one (38%) or two (44%) dependent children. See Figure 2 below. The average number of children in this cohort was 1.8.

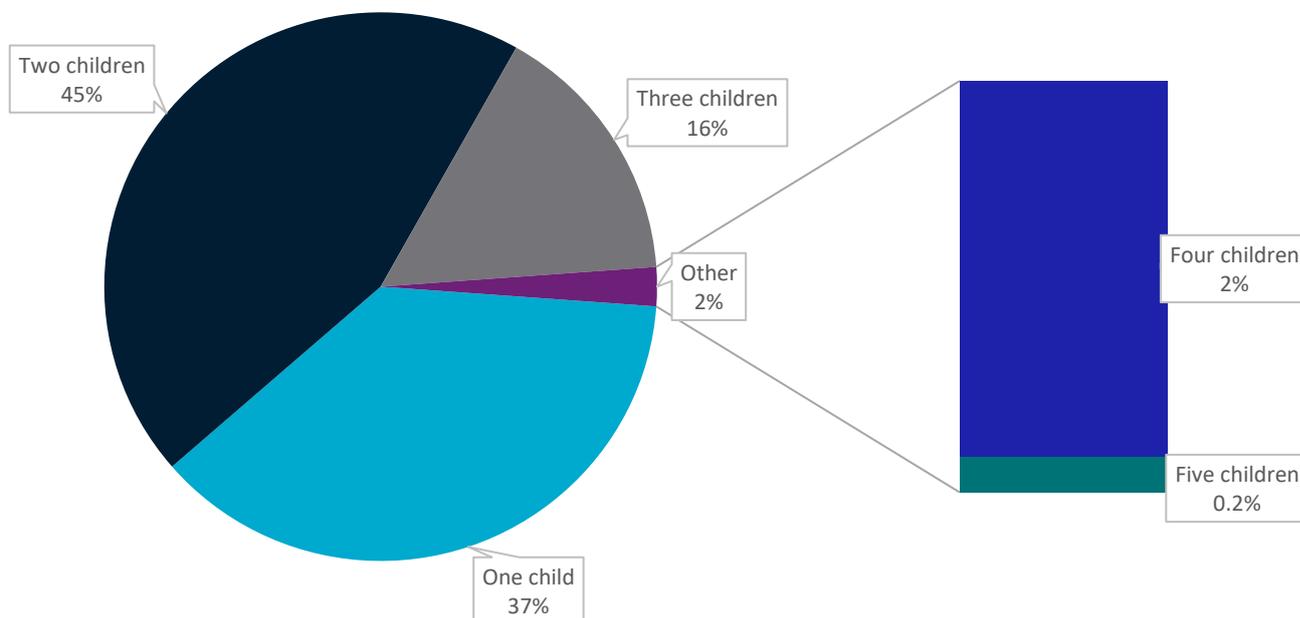


Figure 2 Family composition, number of children

Parents were asked to report the ages of their dependent children. In total participants (N=523) reported the ages of 1098 dependent children, ages ranged from 0 – 18 years. See Figure 3.

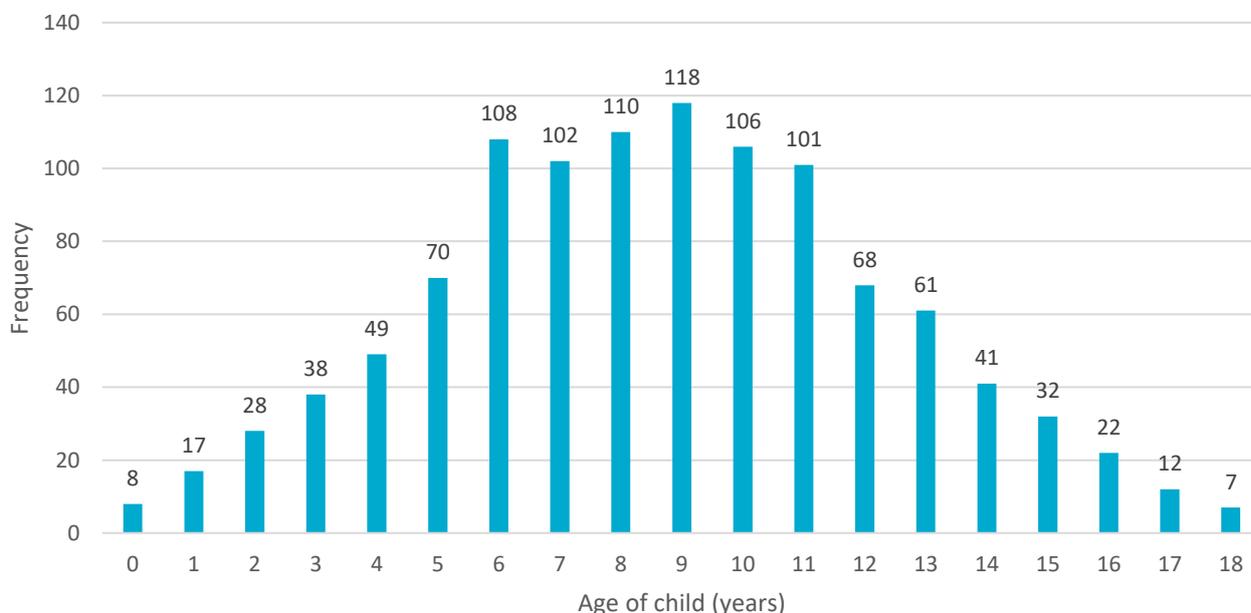


Figure 3 Age distribution of dependent children

3.2 Gut Health (Questionnaire Module 2)

In this module of the questionnaire participants were asked several questions regarding perceptions and ratings of their current gut health. This included the nature of the symptoms they experience, including the impact of these symptoms on their quality of life. Also investigated was the prevalence of 10 common gastrointestinal (GI) symptoms. The symptoms chosen are closely aligned to those included in the Gastrointestinal Symptom Rating Scale (GSRs)[1]. In the current scale the symptoms were modified slightly to capture gut discomfort or distress associated with upper, middle, and lower areas of the gastrointestinal tract. The included symptoms were heartburn, feelings of excessive fullness, excessive burping or belching, rumbling or growling gut noises, abdominal bloating, abdominal pain or cramping, excessive flatulence or wind, difficulty and/or pain when moving bowels, diarrhoea and, lastly, constipation. If participants indicated experiencing any of these symptoms, they were asked to indicate the frequency of occurrence as well as the impact on their quality of life or lifestyle.

3.2.1 Self-rating of current gut health quality, importance, and impact of quality of life (response distribution to single-item gut health questions)

Self-rating of current gut health

Before participants were presented with the symptom section of the questionnaire, they were asked to rate their current gut health, with options presented on a 5-point rating scale from poor to excellent. Distribution of ratings can be found in Figure 4. Most participants, who self-selected to participate in the study due to existing gut health concerns, rated their gut as either fair (46.5%) or poor (30.2%).

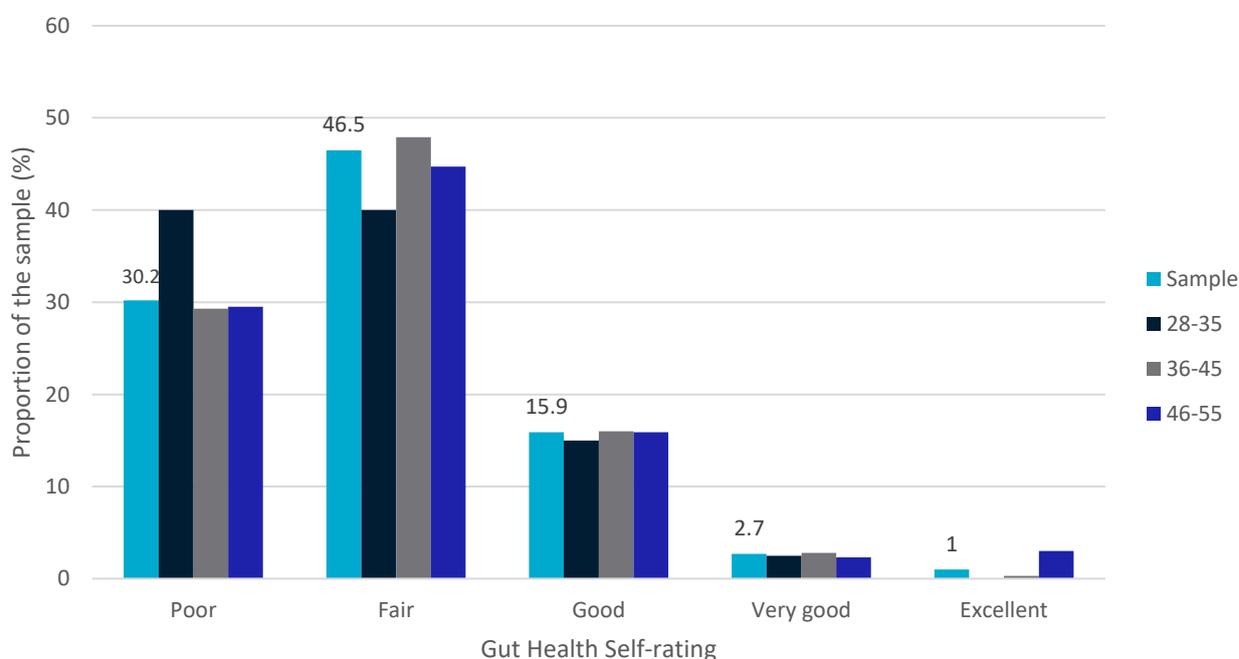


Figure 4 Self-ratings of gut health

How important is your gut health to your overall well-being and quality of life?

Measured on a 4-point scale (1=not at all, 2=somewhat important, 3=very important, 4=extremely important), the majority (85%) of participants rated gut health as either very or extremely important to their overall well-being, with over half (53%) indicating that gut health has a high or very high impact on their quality of life.

3.2.2 Number of gut health symptoms reported

Ninety-seven percent of participants report experiencing more than one of the ten symptoms presented, the average was 5 ($M=4.99$, $SD=2.39$). See Figure 5 below for the sample distribution of number of symptoms reported.

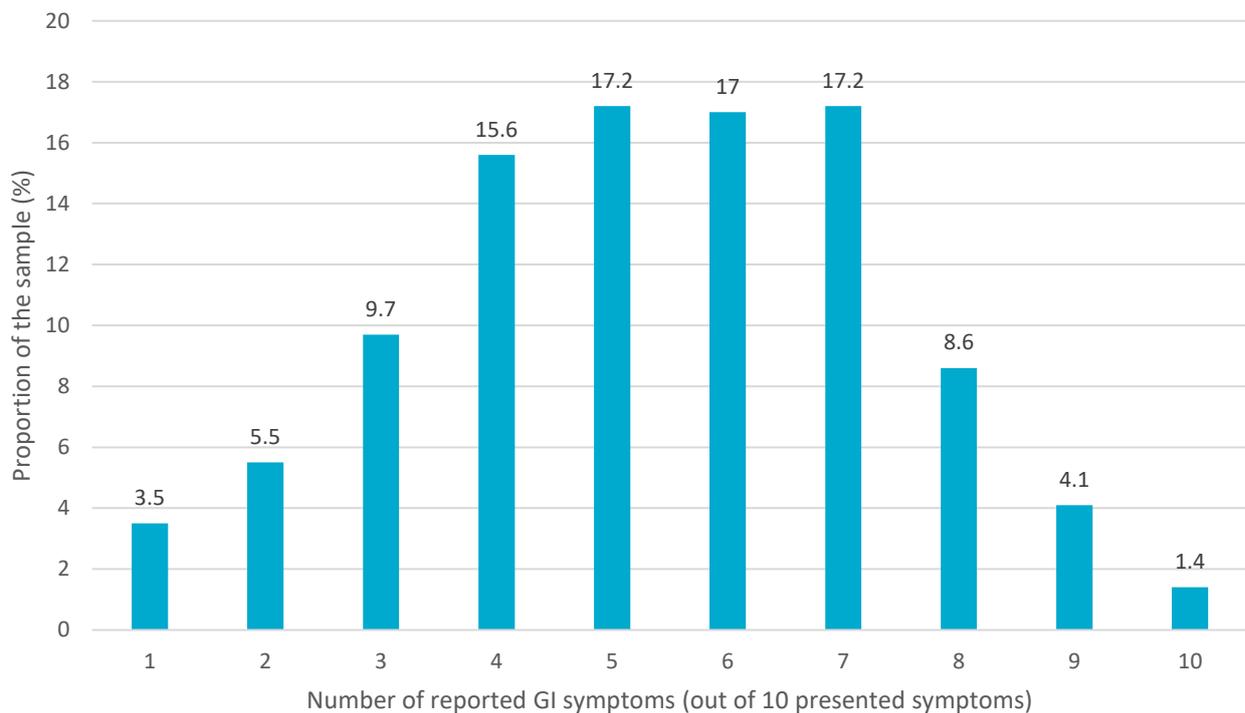


Figure 5 Number of reported GI symptoms (out of 10 listed)

There was a strong negative correlation between self-rating of gut health and number of symptoms reported by participants; $r(503) = -.48$, $p < .001$. The more symptoms that were reported by participants the lower they tended to rate their gut health.

Some symptoms like rumbling or flatulence, while quite common (63% and 56% respectively), were infrequently reported as having a severe or moderate impact on quality of life. However, other symptoms such as bloating, abdominal pain, and heartburn (86%, 65% and 44% respectively) were reported quite frequently but also were rated as having a significant impact on quality of life by those that experience them. See Figure 6 overleaf.

3.2.3 Prevalence and impact (severity) of gut distress symptoms amongst parents of young children

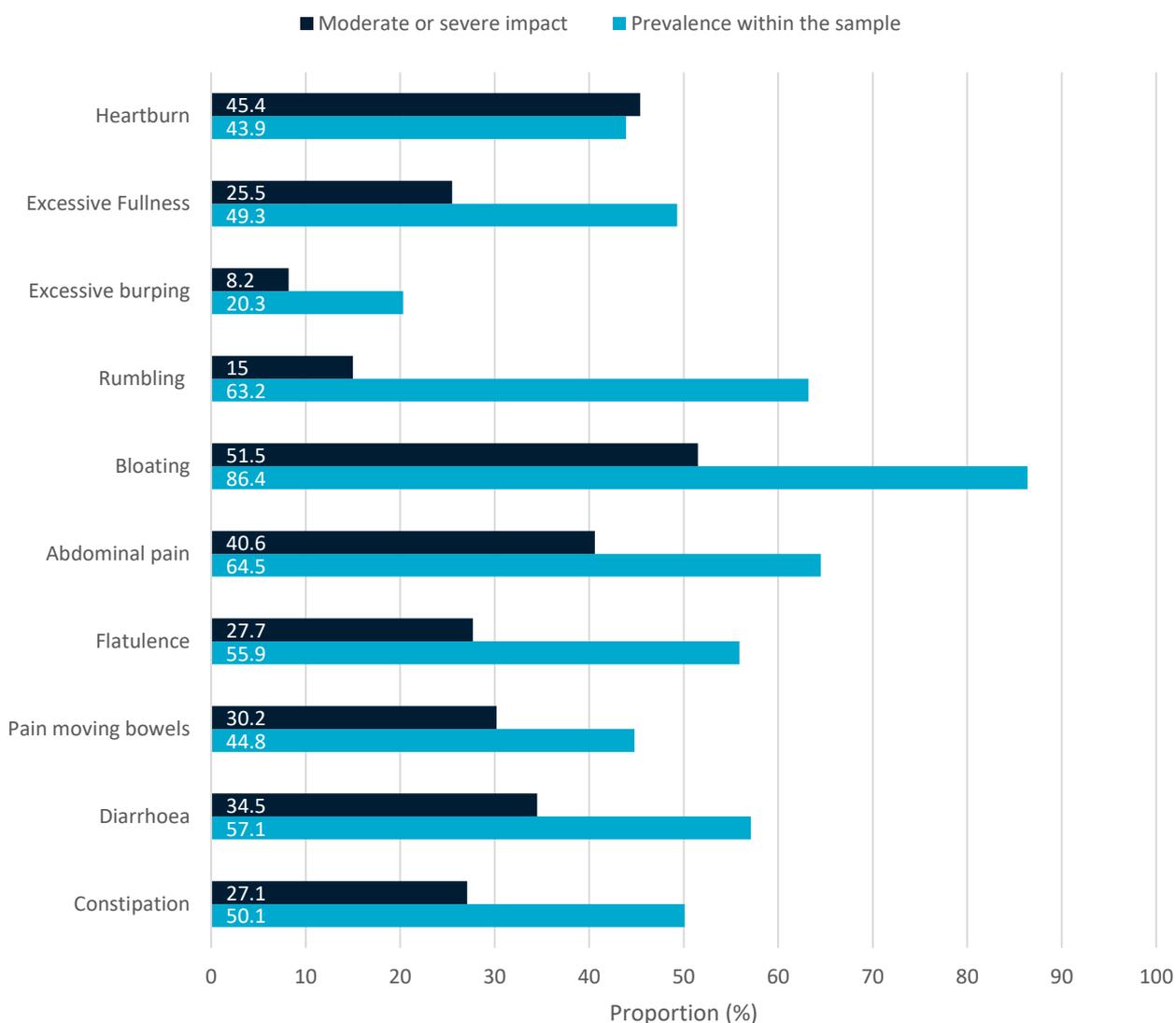


Figure 6 Prevalence and impact of GI symptoms

Key findings from Gut Symptom Section of Module 2

- Australian parents with gut health concerns report on average 5 markers of GI distress.
- The most reported symptoms were abdominal bloating (86%), followed by abdominal pain (64%).
- Over half of participants reported abnormal bowel movements; diarrhoea (57%) or constipation (50%)
- Symptoms had different levels of impact on lifestyle. The symptoms most often rated as moderate or severe by those experiencing them were abdominal bloating (51.5%), heartburn (45.4%), and abdominal pain (40.6%).

3.2.4 Prevalence and nature of extra-intestinal symptoms co-occurring with GI distress

In this module of the questionnaire all participants were presented with a list of non-gastrointestinal symptoms or issues to map what type of other symptoms individuals with gut distress may also be experiencing and attempting to manage. The nine issues included, based on previous research conducted by CSIRO, were: food allergies, food sensitivities or intolerances, chemical sensitivities, anxiety, migraines/severe headaches, poor memory, difficulties concentrating, recurrent skin rashes, and fatigue or sluggishness. The vast majority of participants (93%) indicated they experienced at least one of these additional conditions, symptoms or issues.

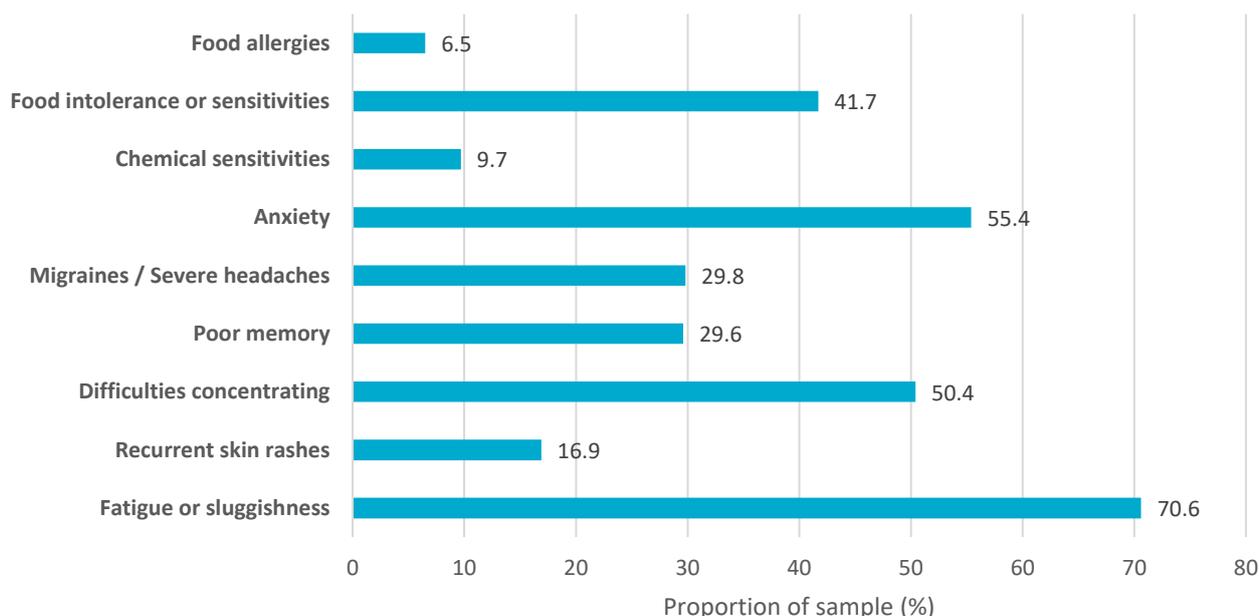


Figure 7 Prevalence and nature of non-GI symptoms or issues

As can be seen in the data presented in Figure 7, a significant number of participants in this cohort report experiencing fatigue (70.6%), difficulties concentrating (50.4%), anxiety (55.4%) and food intolerances or sensitivities (41.7%) alongside their symptoms of gut distress. These key issues are consistent with those reported previously (CSIRO Community Gut Health Questionnaire 2021).

Looking at the rates reported of each by age reveals some differences. Proportionally, older participants are more likely to report food intolerances, sensitivities or allergies as well as difficulties concentrating than younger participants. Skin rashes and severe headaches are more likely to be reported by younger participants, see Figure 8.

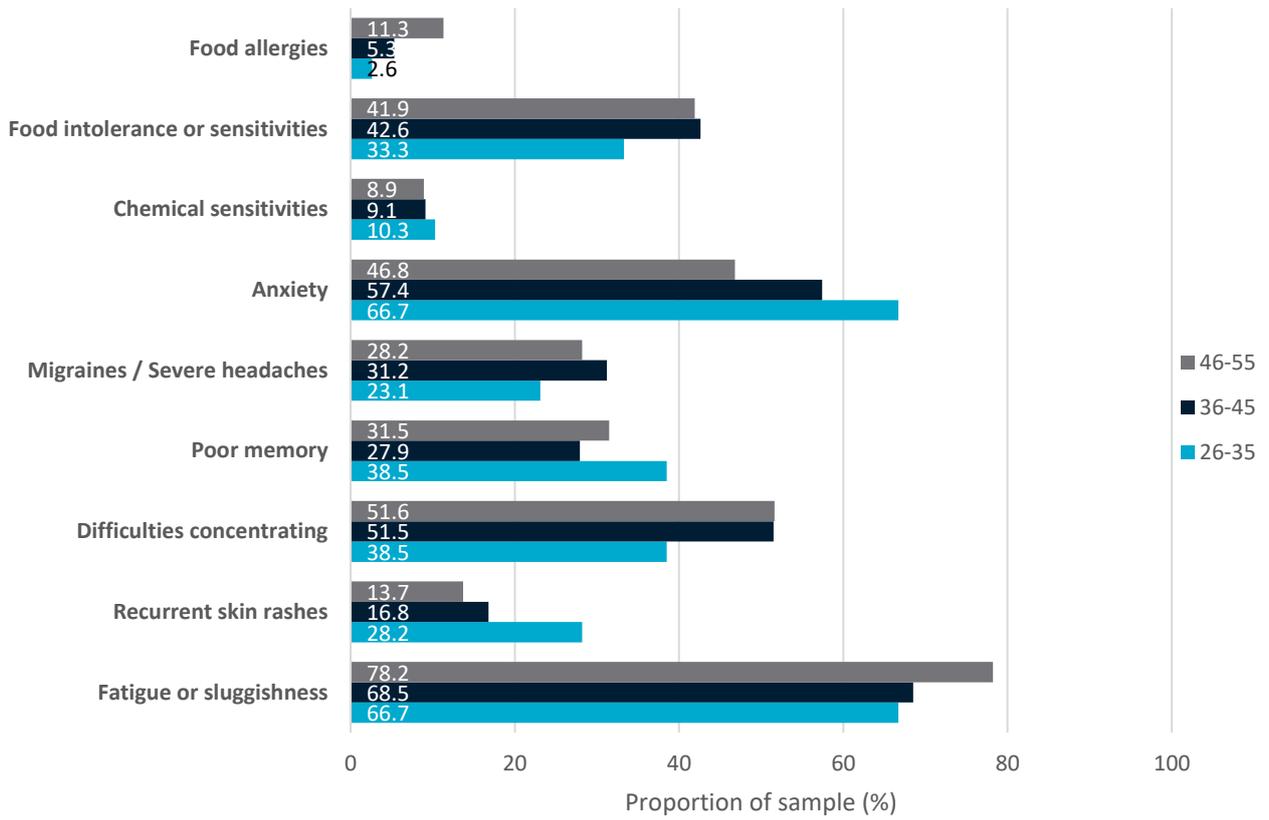


Figure 8 Prevalence of non-GI conditions or symptoms by age-group

3.3 What gut health issues are a concern for Australian parents? (Questionnaire Module 3)

In this section of the questionnaire participants were provided with a list of 13 common GI issues (see Figure 9 below for the 13 GI-related issues that were listed) and were asked to pick the 2 which were of most concern to them. Nearly half of all participants nominated bloating (47.6%), the next most common choices were abdominal pain (21.8%) followed by constipation (21.1%). GI-related issues such as bowel incontinence and excessive burping were not chosen by many of this cohort. This may be due to the lack of salience of these GI issues in this age-bracket (28-55 years), particularly bowel incontinence, or how serious the symptom is perceived to be.

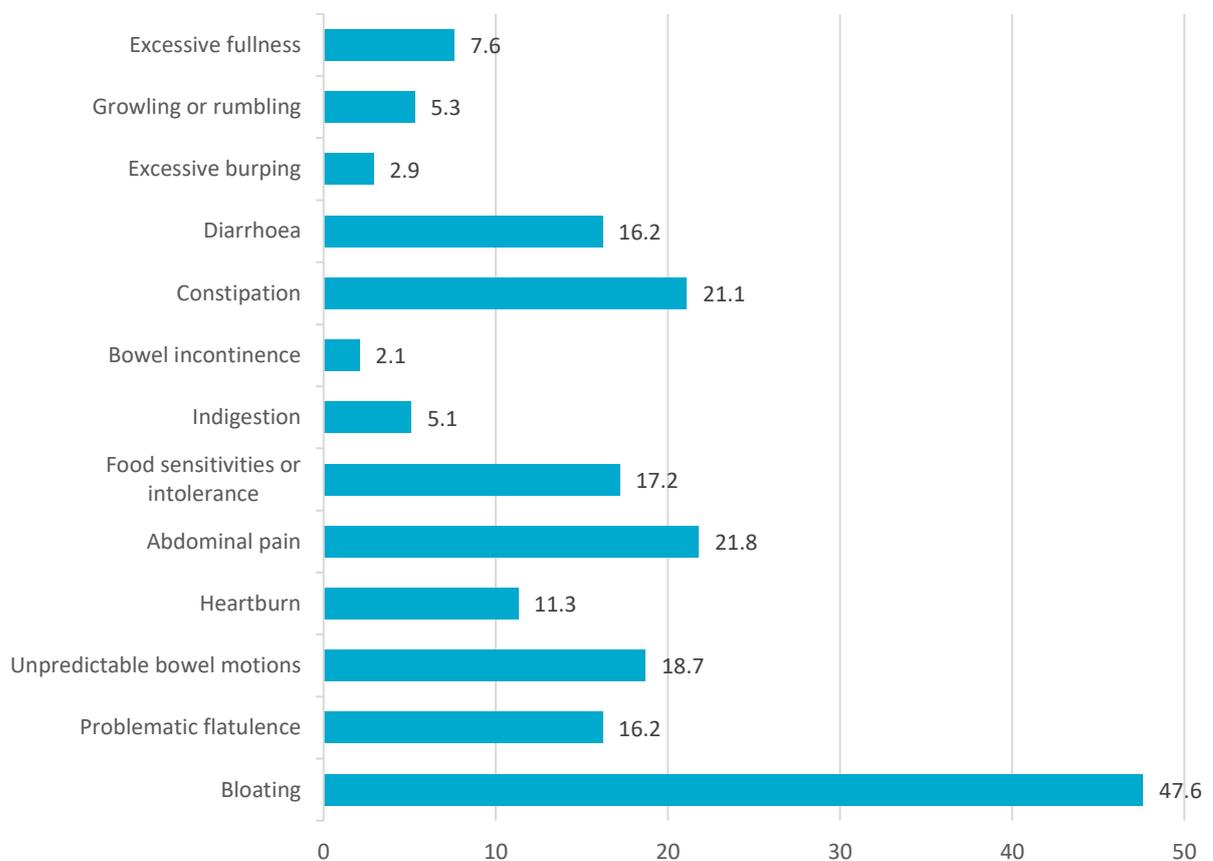


Figure 9 Gut health issues concerning parents with young children

Gut health concerns were found to differ with age, see Figure 10.

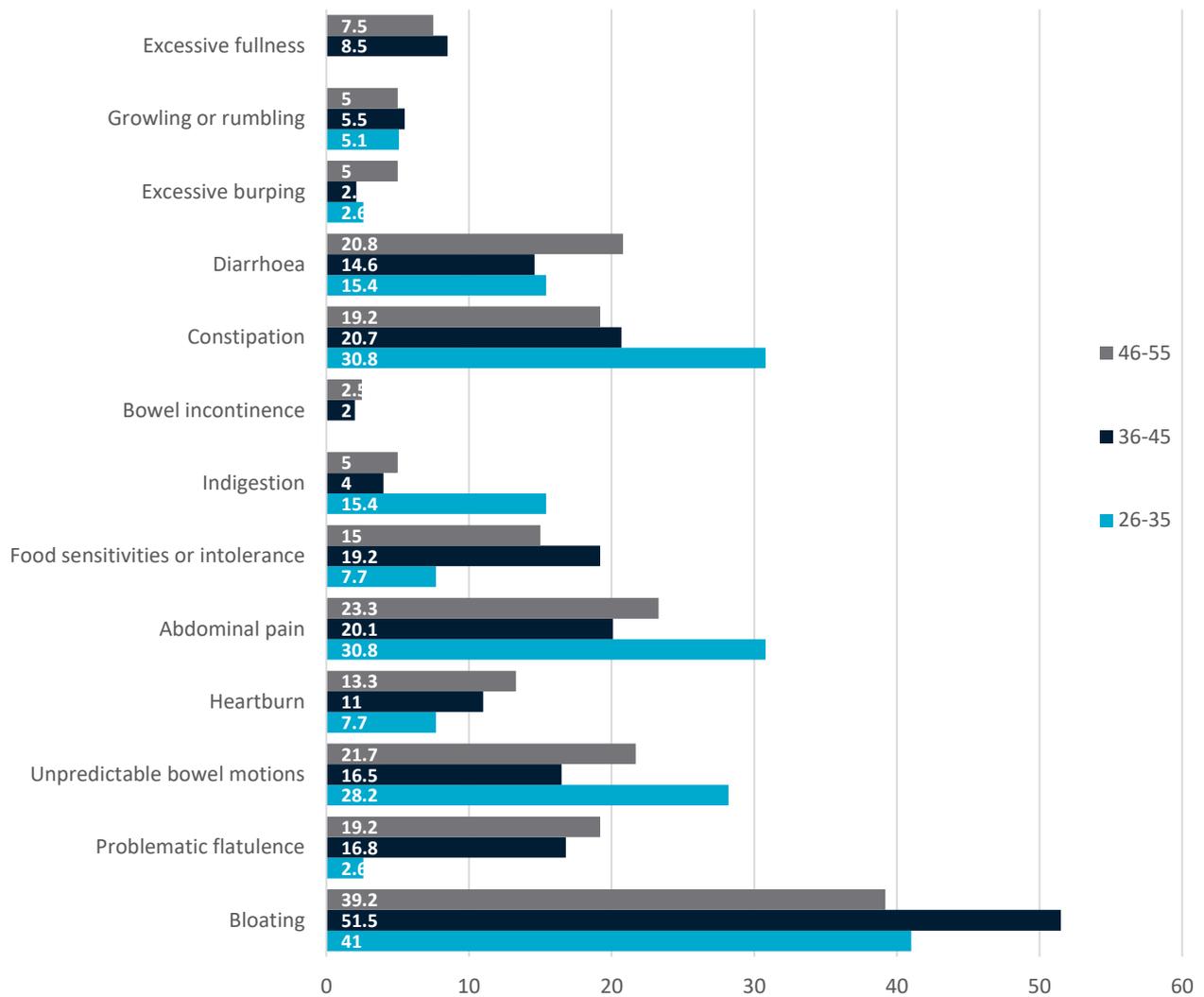


Figure 10 Age differences in GI health priorities

Key Findings from Module 3

Gut health concerns differ with age.

- ~ 1 in 5 of all those aged **46-55**years (oldest age group) nominated diarrhoea, constipation, unpredictable bowel motions, and problematic flatulence.
- ~ 1 in 5 of all those aged **36-45**years nominated food sensitivities, flatulence, and abdominal pain as issues of most concern.
- ~ 1 in 3 of all those aged **26-35**years (youngest age group) nominated constipation, abdominal pain, and unpredictable bowel motions
- Bloating was a salient issue regardless of age-group.

3.4 Current gut health strategies (Questionnaire Module 4)

The parents who participated in the questionnaire were asked to indicate their current level of engagement in terms of management of their gut health via the question ‘which of the following statements best describes how you think about and manage your gut health?’.

Of those participants who answered this question (N=492), all of whom experience at least one symptom of gut distress, only 58.3% reported that they were currently active in managing their gut health. See Figure 11 below.

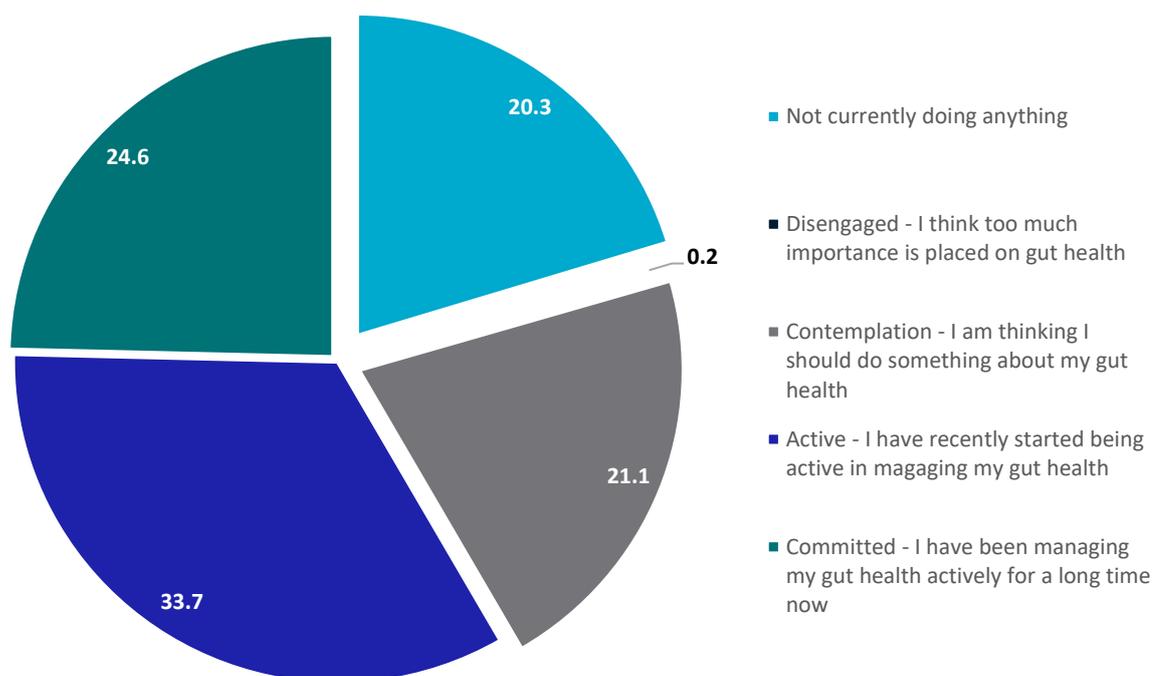


Figure 11 Engagement with personal gut health management

The remaining questions from this module of the survey asked participants about the nature of the strategies they currently employed and their levels of satisfaction with these strategies.

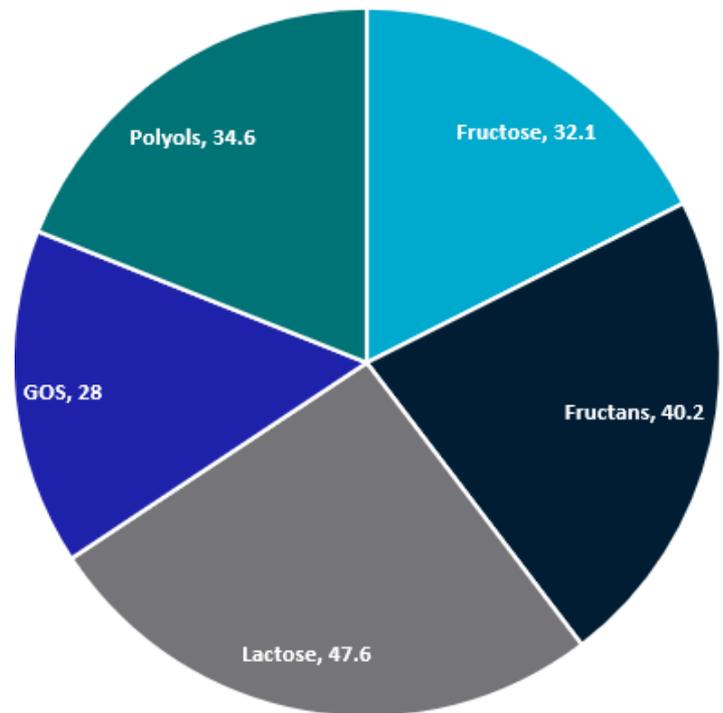
3.4.1 Gut health management strategies – Removing or reducing intake of specific foods or food components

Dietary restriction is a common method people employ to manage symptoms of gut distress [2]. Consumption of specific foods or food components have become linked with poor gut health. For many people the elimination of these foods relates to the alleviation of gut discomfort or distress [2, 3]. In this section of the survey, we asked participants to indicate which commonly targeted food or food components they were avoiding specifically to manage their gut health as opposed to not consuming based on other parameters such as taste, price or personal preference.

The first series of questions asked participants whether they were currently avoiding foods containing FODMAPS (Fermentable Oligosaccharides Disaccharides Monosaccharides and Polyols). This collection of sugars is found naturally in a wide variety of foods and food additives. They are not absorbed or digested properly in the gut and can produce symptoms of gut distress in sensitive individuals.

FODMAPS

Nearly half (47.8%) of all those who participated in this part of the questionnaire (N=464) reported avoiding at least one food containing lactose (a disaccharide) (e.g. milk, yoghurt) (see Figure 12). Fructans were the next most avoided FODMAP, with 40.5% of participants indicating they were cautious about eating foods such as garlic, onion, wheat, or rye. The least frequently avoided FODMAP in this cohort were galacto-oligosaccharides (GOS) containing foods, but these were still avoided by almost 1/3 of the cohort (28%).



In total, 2-in-3 participants (65.7%) avoided foods from at least one of the five FODMAP categories (see Figure 13 below).

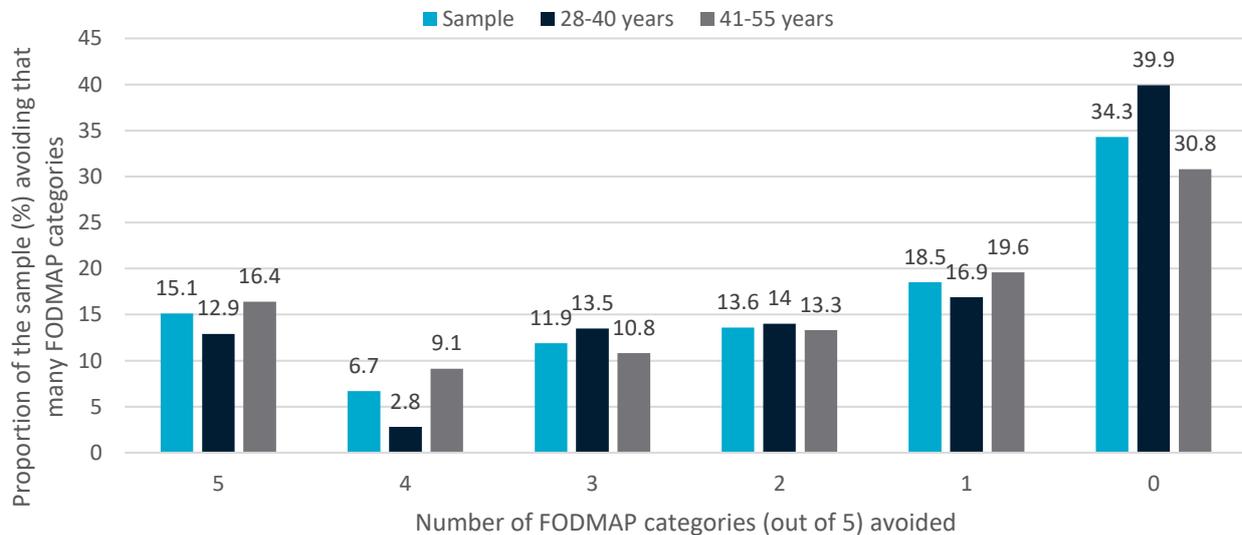


Figure 12 Number of FODMAP categories containing problematic foods for parents experiencing gut health issues

A breakdown of the specific foods avoided within each FODMAP category be found in Figure 14 to Figure 18.

Fructose 32.1% (N=149/464)

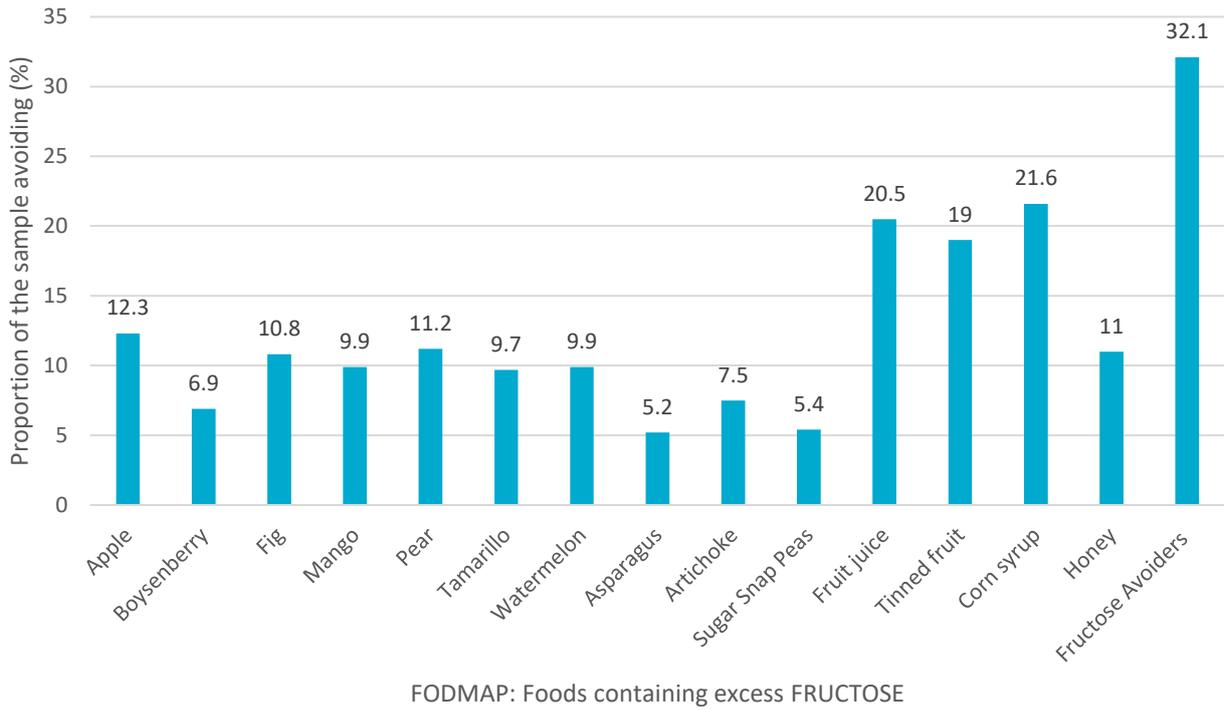


Figure 13 Avoidance of foods containing excess FRUCTOSE

Fructans: 40.2% (N=188/464)

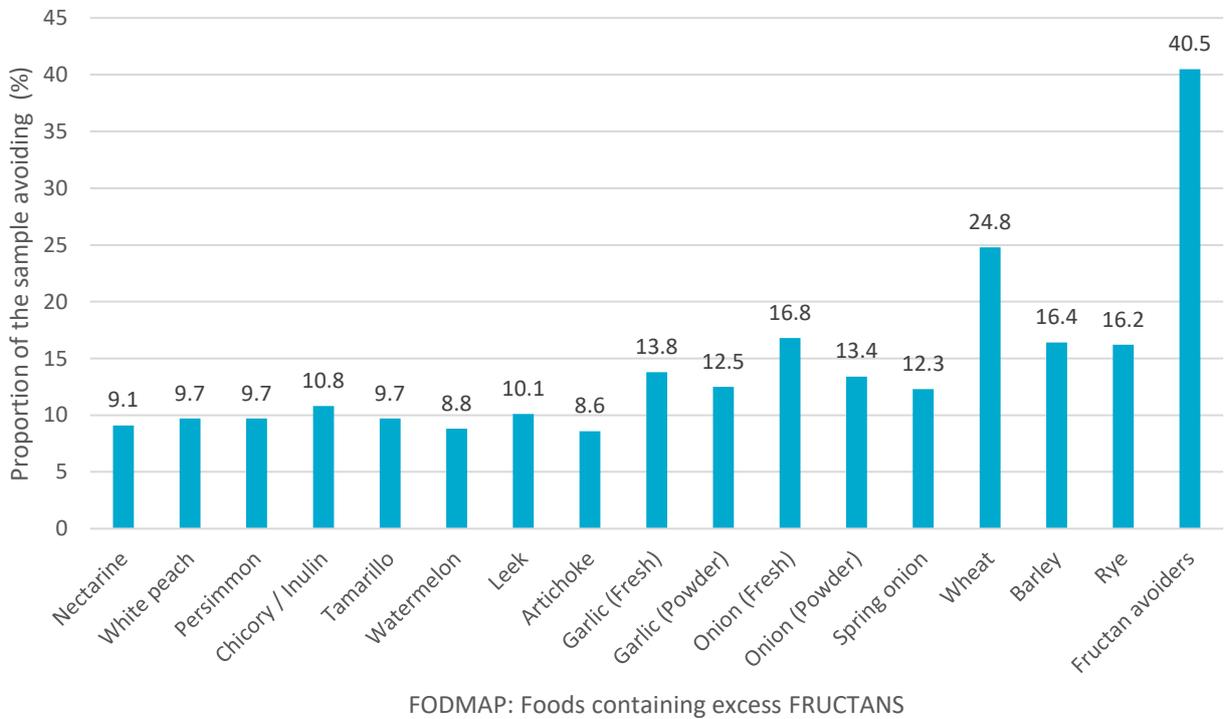


Figure 14 Avoidance of foods containing excess FRUCTANS

Lactose: 47.8% (N=222/464)

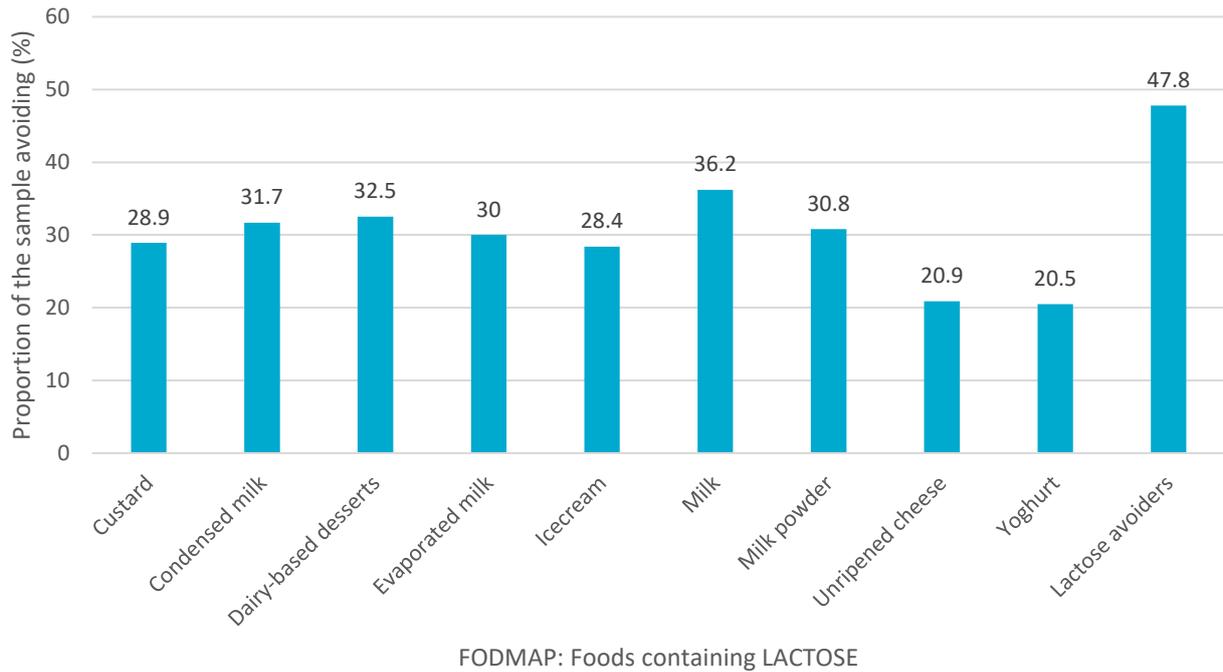


Figure 15 Avoidance of foods or beverages containing LACTOSE

GOS: 28.2% (N=131/464)

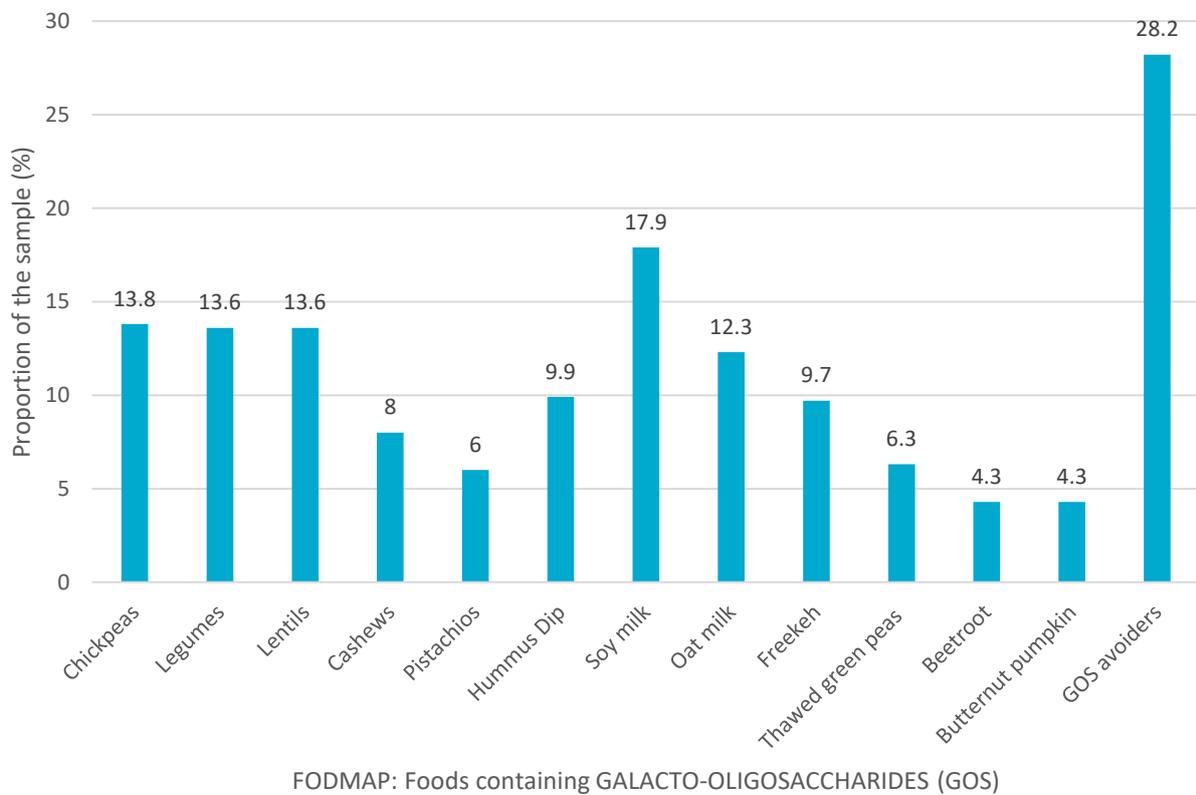


Figure 16 Avoidance of foods or beverages containing GOS

Polyols: 34.7% (N=161/464)

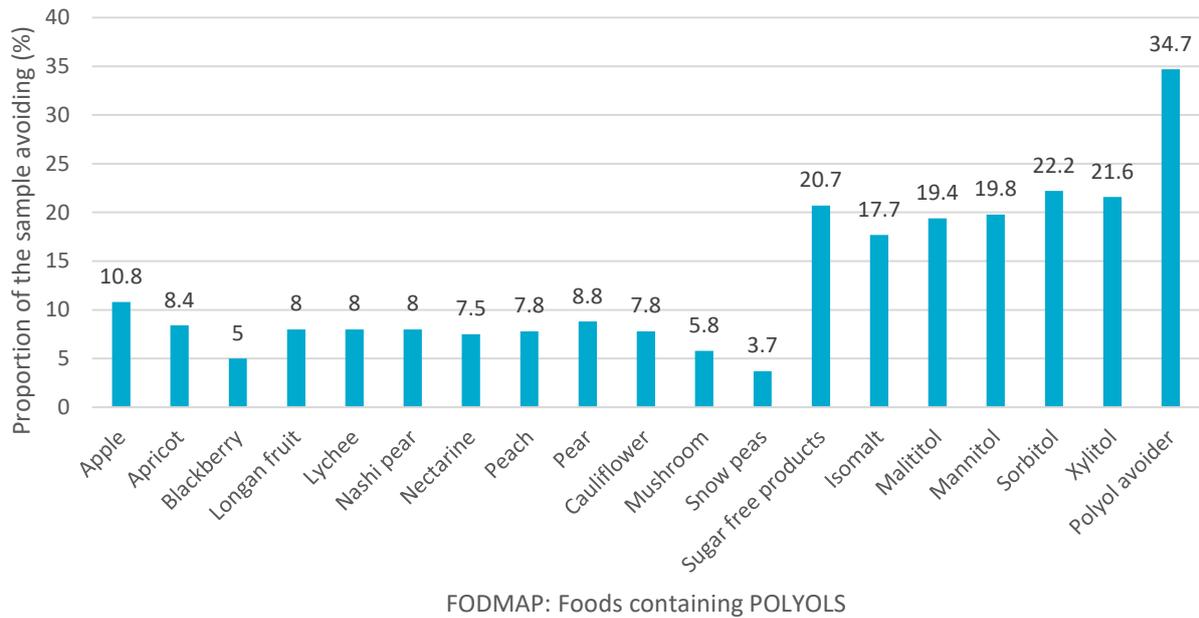


Figure 17 Avoidance of foods containing POLYOLS

Gut health related food avoidance strategies

Apart from avoiding problematic foods captured in the FODMAP categories above, participants were also provided with the opportunity to report other foods, food components, drinks, or supplements that they had removed from their diet or consciously reduced intake to manage their gut symptoms. Almost half of participants (49.8%) indicated they were making other dietary restrictions. Figure 19 below reports on the proportion of the whole sample who are consciously removing these dietary elements to manage their gut health symptoms.

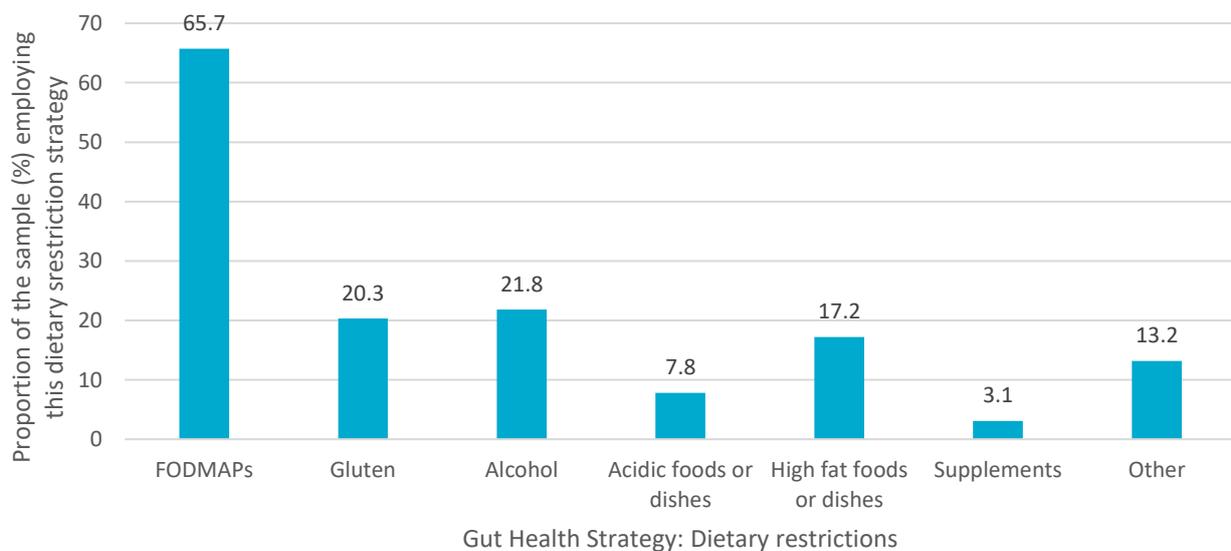


Figure 18 Type and prevalence of dietary restriction strategies

Figure 20 below outlines the dietary elements avoided according to age-group. Gluten avoidance was more commonly employed by older participants (41-55 year age group), while avoidance of high-fat foods was more common amongst younger participants (28-40 year age group).

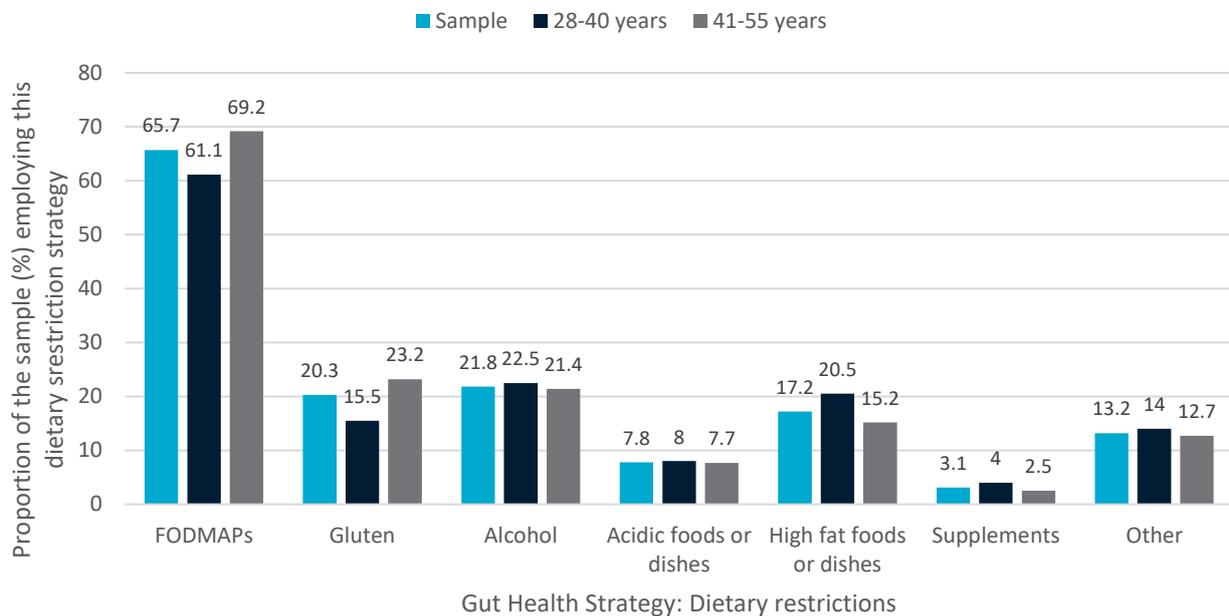


Figure 19 Nature and prevalence of dietary restriction strategies by age-group

Types of supplements avoided

Participants reported avoiding the following supplements, as listed in free-text sections of questionnaire.

Biokult; Fish oil tablets; Garlic, oregano oil, digestive enzymes; High dose vitamin C; Iberogast; K fibre; Prebiotics and probiotics, PHHG, intestamine, slippery elm; Magnesium; zinc, B vitamins, Chinese medicine herbs, Vitamin D; MSM.

Other foods or beverages avoided

Participants reported avoiding the following foods and beverages, as listed in the free-text section of the questionnaire.

Caffeine/coffee; Sugar; Additives; Colours; Processed foods; All grains / lectin, Sugar; High Carbs; Animal-based products; Chilli and stimulants; Banana; Coconut or related products; Carbonated beverages; Pizza; Corn; Creamy sauces; Dairy, meat, cheese, tomatoes; dried fruit; egg; excessive salt; garlic; Glutamate high foods; Grains and sugar; High histamine foods; Meat (vegetarian); Arsenic; Mushrooms; Nexium; Nuts, egg, milk; old avocado, aged cheese, orange; pickled vegetables; Processed meats; red meat, low fibre foods; Rice; Salicylates; Seafood; Soft drinks; Spicy food; Sulphur dioxide; Sweet potato, cauliflower, Sweet potatoes and soy; White bread; White rice, pasta and bread.

Note that some of these items fall within FODMAP categories.

3.4.2 Gut health management strategies – Adding or increasing intake of specific foods or food components

The majority of participants (58.5%; N=274) indicated they had made changes to their diet to include foods, beverages, supplements, tonics or remedies that they thought were beneficial in terms of optimising their gut health or managing their symptoms of gut discomfort. Figure 21 below reports on the use of each type of strategy in this cohort. Common strategies were listed for participants to choose from. The strategy reported by most participants (30.8%) was the inclusion of probiotic foods such as yoghurt containing strains of Bifidobacterium/Lactobacillus or pickled or fermented foods. Splitting the data by age did not reveal any preferences for specific solutions.

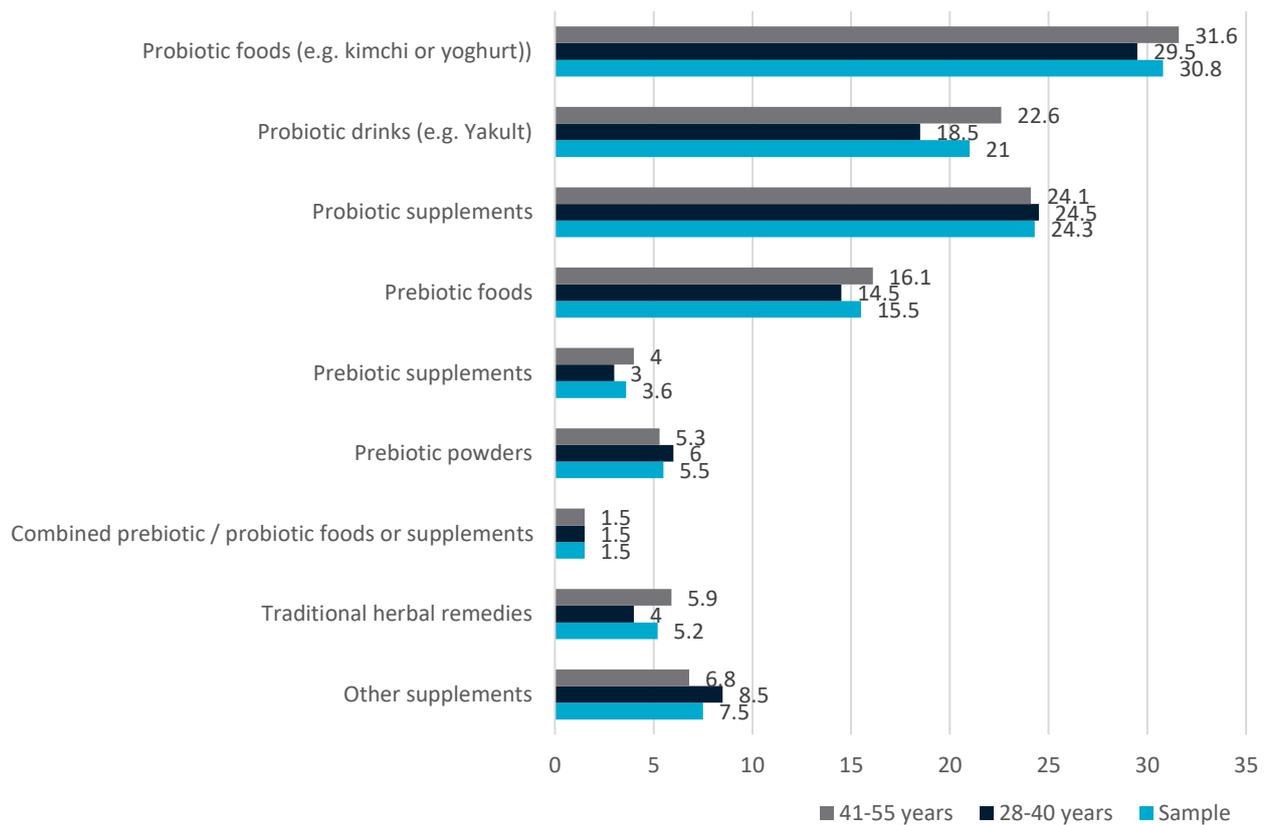


Figure 20 Dietary solutions for gut health management by age band

Participants were asked to share further details as to the type or name of the supplements, tonics or remedies they were using. Table 2 to Table 4 report the information provided directly by participants, sourced from the open-ended sections of the questionnaire.

Table 2 Combined prebiotic and probiotic foods or supplements used by participants to manage their gut health

| |
|--------------------------------------|
| Beauty chef Body and Glow |
| Blackmores Probiotics + daily health |

Fermented foods such as kimchi and sauerkraut

Happy Mammoth

Morning complete

Smoothie pre-mixes

Sprouted pea protein powder

The lady shake

Table 3 Traditional herbal remedies or tonics used by participants to manage their gut health

Ashwagandha

Chinese medicine

Chinese medicine pills - si jun zi tang

Chinese medicines (made by a practitioner)

Dandelion tea, ginger tea, turmeric tea, cinnamon tea

Diatomaceous dirt

Ginger and cold pressed honey tea

Happy mammoth gut cleanse

Herbal mix from naturopath (liquorice)

Herbal tea

Iberogast

Marshmallow root tea

Miso with shitake mushroom

Okra, bitter melon, arrowroot powder, ajwain seeds.

Peppermint tea

Peppermint tea, fennel seed tea

Seeing ayurvedic practitioner who has made up herbal tinctures

Slippery Elm capsules

Slippery Elm.

Tonic as supplied by naturopath to improve digestion

Topical essential oil digest zen by doTERRA

Turmeric

Table 4 Supplements used by participants to manage their gut health

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Amino acid blend |
| Apple cider vinegar |
| Apple cider vinegar, lemon juice |
| Benefibre |
| Bioceuticals intestamine- occasionally. SB restore very occasionaly |
| Bone broth |
| Broccoli sprout capsules |
| Celery juice |
| Chia seeds, benefibre, prune juice |
| Cold resistant starches - except cooked cold rice as it still raises my blood sugar too high. |
| Collagen Powder, diatomaceous shell powder |
| Collagen protein |
| Curcumin moringa cinnamon magnesium vit C |
| De gas |
| Digestive enzymes |
| Do terra digestizen |
| Dried fruit |
| Fast transit time and/or bad stomach bacteria so I take interlingual B12, sometimes ginko to reduce fatigue |
| Fibre capsules |
| Fish oil, hydrozyme, iron, s.boulardii, zinc |
| Gelatine |
| Gut repair, Actively Nourished Restore & Revitalise. Vit a, e and c as recommended by my clinical nutritionist. |
| Happy mammoth hormonal balance |
| Healthy Chef powders |
| High fibre foods |
| I have avoided mass produced wheat products such as bread and pasta. Making my own bread and buying handmade pasta doesn't give me the same issues. |
| Iberogast |
| Increasing fibre, eating vegetables for lunch not carbohydrates, magnesium |
| Intestamine Slippery Elm, PHGG, Iberogast |
| Inulin |
| Lactase enzyme tablets |
| Lacteeze |
| Licorice tea |

Lots of water, less alcohol

Magnesium

Masons Mushrooms

Metamucil

Metamucil fibre supplement

Mintec, digestive enzymes

Modere products used in goop gang

More whole grains in diet

Movicol

Mushroom powder for hormone balance

Osmolax, sunfiber

Pain killers - bind me up and stop the cramps

Pantoprazole for reflux. Also taking multi-vitamin

Quercitin and bromelian

Roogenic Tea

Sauerkraut

Soaked chia seeds

Sourdough products

To manage stress - multiB vitamins, zinc and magnesium

Vitamin B12 injections

Vitamin D3, fish oil and B complex

Dietary management strategies: Module 4 Summary

- 65.7% of participants in this study report removing a food containing FODMAPs; most commonly foods or beverages containing lactose.
- 49.8% of participants report removing other dietary components, including alcohol (22%), gluten (20%), or high fat foods or dishes (17%).
- The most common dietary inclusion strategy reported by participants was the addition of probiotic foods (31% of all participants), followed by probiotic supplements (24% of all participants)
- Participants employ a wide range of dietary inclusion strategies to manage their gut health from commercial over the counter products (e.g. Blackmores probiotic supplement) to traditional tonics or remedies (e.g. Slippery elm).

3.4.3 Changes to physical activity as a management strategy

One third (37.7%, N=175/464) of all participants indicated that they had made some changes to the amount or nature of their physical activity in response to gut health concerns or attempts to manage their symptoms. Of those who indicated making changes (N=175), it was most often an increase in the amount of activity that was reported (82.3%), with a much smaller proportion indicating they changed the type of activities they engaged in (12.0%). Changes to physical activity as a strategy was slightly more common in younger than older participants, but the difference was not significant. Older participants may be more likely to report decreasing their physical activity levels than younger participants.

3.4.4 Satisfaction with current symptom control and gut health optimisation strategies

Two single-item questions were presented to participants to investigate their level of satisfaction with their current gut health strategies.

Self-reported satisfaction with strategies to alleviate gut-related symptoms

Participants were asked to indicate how happy they were with the strategies they were currently using to manage their gut health symptoms. Six response options were provided. Figure 22 below reports the proportion of responses from participants in each response category.

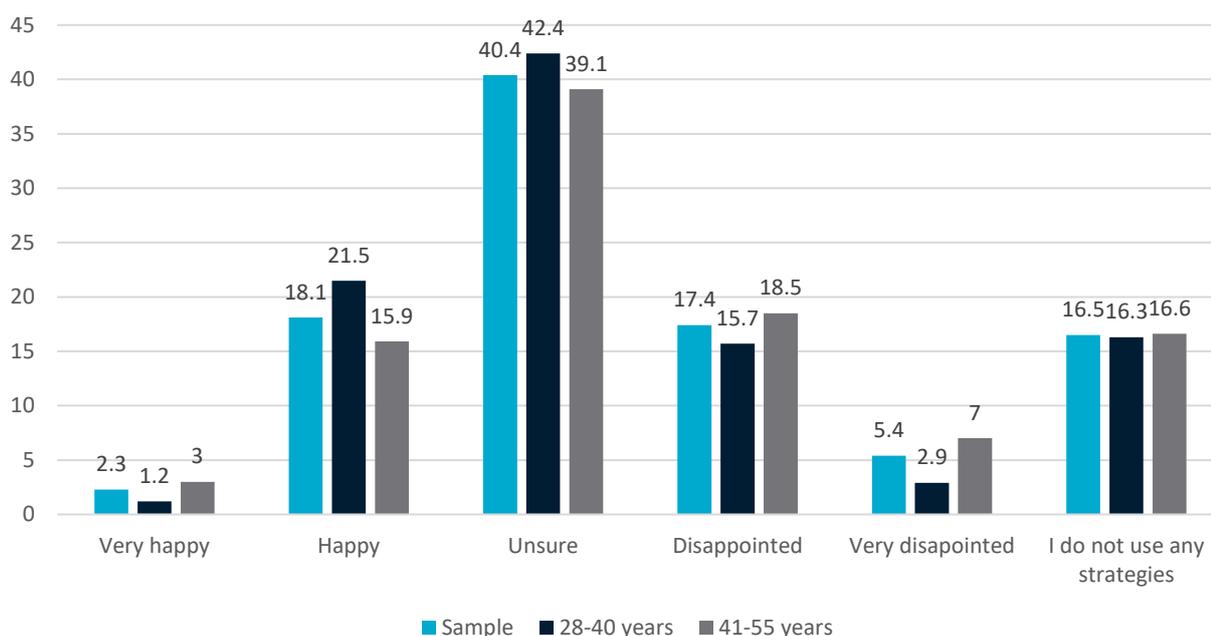


Figure 21 level of satisfaction with current employed gut health strategies

Six-out-of-ten participants indicated disappointment with the outcomes of their current gut health strategies (choosing wither 'unsure', 'disappointed' or 'very disappointed' from the options provided). The strategies either did not have the expected levels of improvement (57.7%) or had no impact at all on their symptom experience (5.4%).

Self-reported satisfaction with strategies expected to optimise gut health or well-being

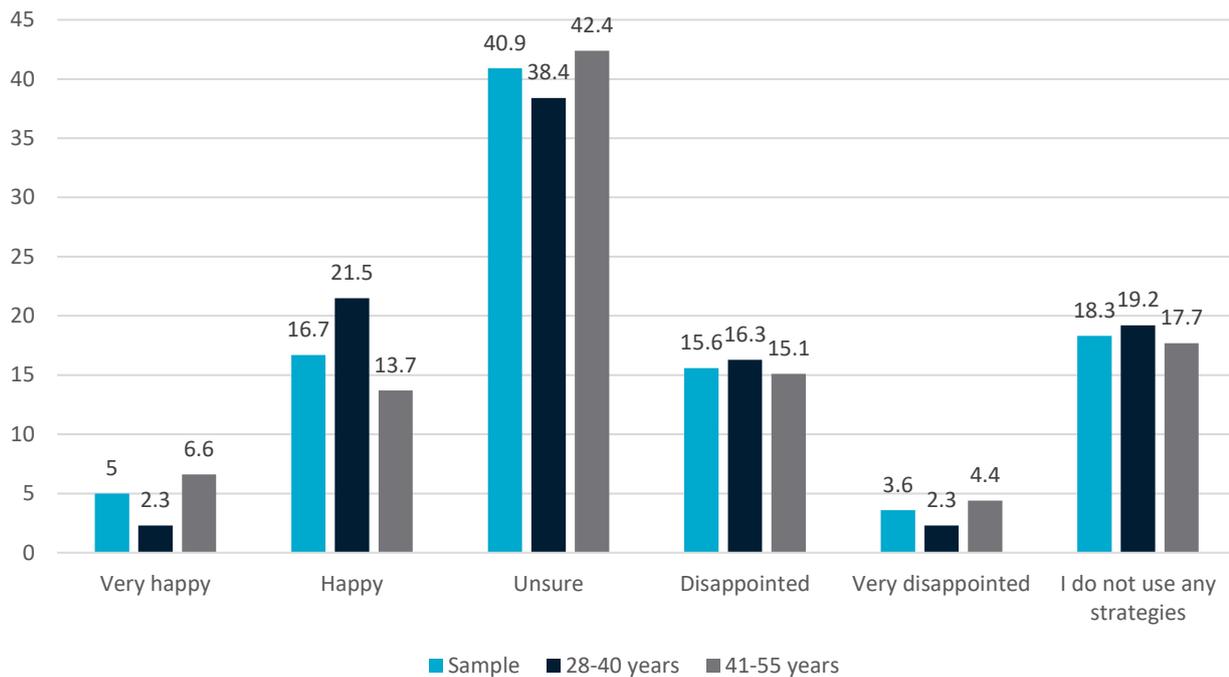


Figure 22 Self-reported satisfaction with strategies to improve gut health or well-being

A similar pattern was reported for strategies and products participants anticipated would make a positive impact on their well-being or optimise their gut health. As reported in Figure 23 above, while more participants indicated that they were happy with the improvements they associated with the use of the strategies (22%; combination of ‘very happy’, ‘happy’ responses categories), most still indicated that the strategies and products used did not match their expectations or needs.

3.4.5 Sources of gut health advice and guidance

In this section of the questionnaire participants reported from who and where they sourced their information and advice around gut health. Dietitians, scientific or peer reviewed articles, own research, and doctors/specialists, were reported as most influential source of information (see Table 5).

Table 5 Sources of gut health information and guidance

| | Not at all influential | Somewhat influential | Very influential | Extremely influential |
|----------------------------------------------------------|------------------------|----------------------|------------------|-----------------------|
| Doctor or specialist | 11.5 | 34.1 | 40.6 | 13.8 |
| Naturopath or other complementary health specialist | 28.9 | 39.9 | 23.2 | 8.1 |
| Traditional/Holistic or Integrated medical practitioner | 38.4 | 37.9 | 17.4 | 6.2 |
| Dietitian | 14.4 | 29.7 | 37.4 | 18.5 |
| Other allied health professional (e.g. psychologist, PT) | 20.4 | 48.0 | 25.7 | 6.0 |
| Internet | 18.1 | 60.9 | 17.7 | 3.3 |
| Friend or family networks | 20.9 | 64.7 | 11.5 | 2.9 |
| Media | 29.1 | 59.7 | 10.0 | 1.2 |
| Own research | 1.9 | 40.7 | 42.6 | 14.8 |
| Digital support apps (e.g. FODMAP app) | 34.2 | 42.6 | 17.7 | 5.5 |
| Popular gut health experts (e.g. Dr Michael Mosley) | 21.1 | 45.7 | 24.4 | 8.9 |
| Scientific or peer-reviewed journal article or books | 15.3 | 33.0 | 35.6 | 16.0 |

Satisfaction with current gut health management strategies: Module 4 Summary

- Six-out-of-ten participants indicated disappointment with their current gut health strategies to alleviate their gut distress.
- 22% of participants reported that they were happy with the strategies they were employing to optimise their gut health or well-being. Most still indicate that the strategies did not meet their expectations or needs.
- The most influential sources of advice amongst participants were dietitians, doctors/specialists, scientific or peer reviewed articles and books, and their own research.

3.5 Lifestyle factors: Smoking, alcohol consumption, sleep, physical activity, stress, weight status, and diet (Questionnaire Module 5)

There is growing recognition of the role played by diet and other modifiable lifestyle factors on the gut microbiome and general. In this section of the questionnaire participants were asked a range of questions designed to measure, amongst others, compliance with national alcohol consumption and physical activity guidelines, sleep quality, smoking, stress levels and dietary intake.

3.5.1 Smoking

The prevalence of daily smoking in this cohort at 2.7% is much less than the report national average of 10.7% [4].

3.5.2 Alcohol consumption – compliance with national guidelines

According to the NH&MRC's guidelines to reduce the risk of harm from alcohol-related disease or injury, healthy men and women should drink no more than 10 standard alcoholic drinks a week and no more than 4 standard alcoholic drinks on any one day [5].

In this cohort, 67% of individuals indicated that they consumed alcohol, with 1-in-6 not meeting the NH&MRC guidelines of less than 10 standard drinks per week. Participants were provided with a graphic to assist with understanding of what a standard alcoholic drink looks like.

3.5.3 Physical activity – compliance with national guidelines

Current Australian guidelines recommend that adults be active on most, preferably all days every week accumulating 150 to 300 minutes (2.5 to 5.0 hours of moderate physical activity per week) or 75 to 150 minutes (1.25 to 2.5 hours) of vigorous intensity activity [6].

We asked participants to indicate how often they meet these recommended amounts of physical activity per week. Only 1-in-5 participants in this cohort indicated that they would regularly meet (15%) or exceed (9.8%) national guidelines for physical activity. See Figure 24 below for more details.

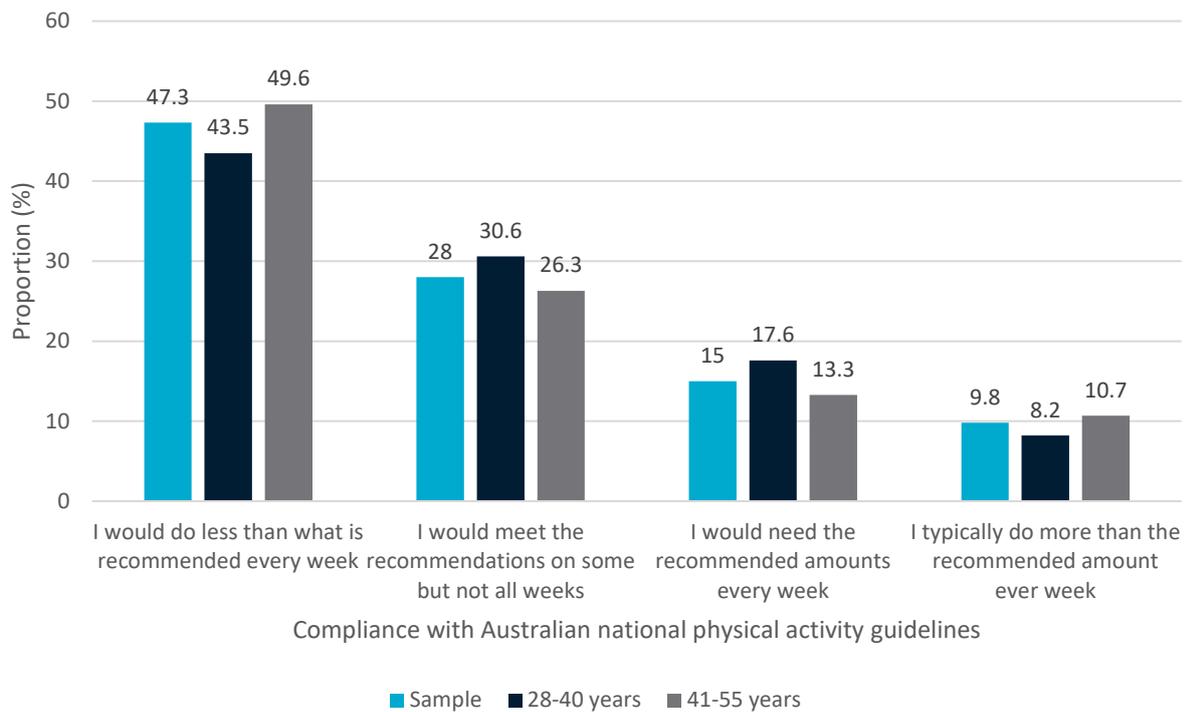


Figure 23 Proportion of the sample meeting Australian guidelines for physical activity by age group

3.5.4 Sleep amount and quality

On average adults need between 7 – 9 hours’ sleep each day. However, it is estimated that between 33%-45% of Australian adults do not get adequate amounts of sleep every day [7].

Consistent with these estimates, in the current cohort 7-out-of-10 (68.8%) participants reported getting adequate amounts of sleep [sleeping between 7 and 9 hours per day], but only 19.3% rated their quality of sleep as good or excellent. There were no noticeable differences between the age groups.

3.5.5 Stress

A single-item self-report measure of stress was included in this module of the questionnaire. Participants were asked to indicate their current feelings of stress using a scale ranging from 1 = not at all to 5 = extremely stressed. Fifty percent of participants report very high levels of stress (score of 4 or 5). A distribution of scores is reported in Figure 25 below.

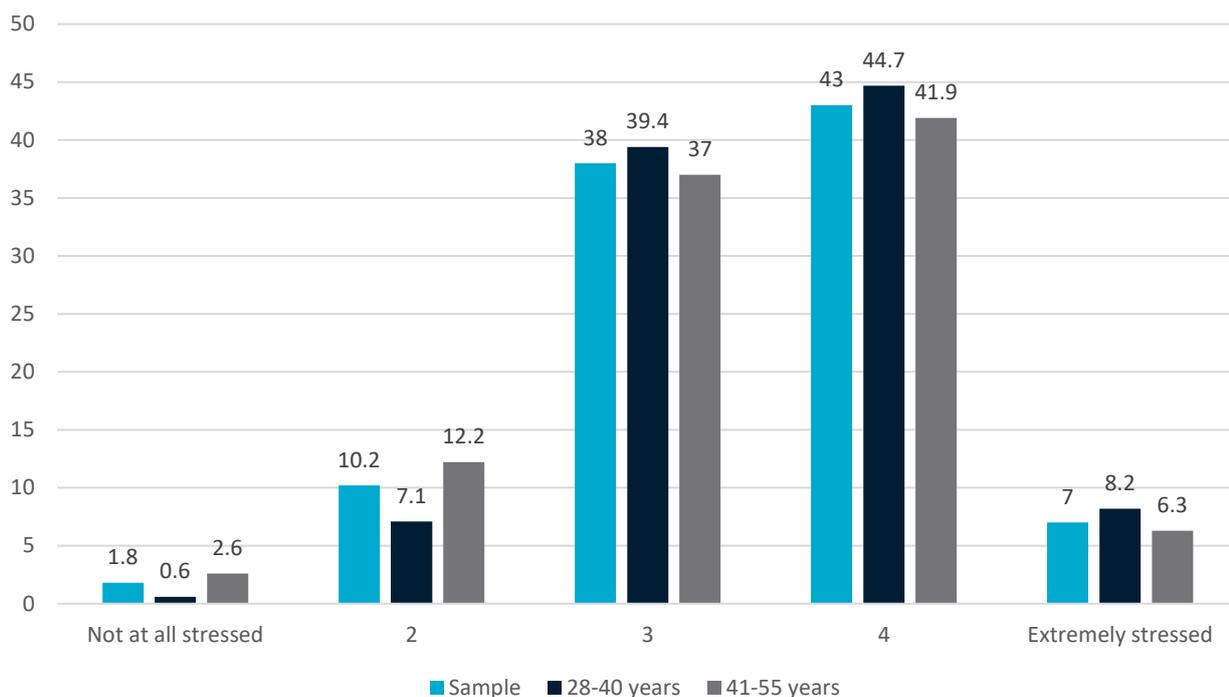


Figure 24 Self-reported stress levels

3.5.6 Weight status

Body mass index (BMI) was calculated based on self-reported height and weight. These BMI scores were then used to classify participants into one of 6 weight range categories. See Table 3 for meaning of categories.

Table 6 Meaning of BMI ranges [8]

| BMI (adults) | Classification |
|----------------|--------------------------|
| Less than 18.5 | Underweight |
| 18.5 to 24.9 | Healthy weight |
| 25 to 29.9 | Overweight but not obese |
| 30 to 34.9 | Obese Class I |
| 35 to 39.9 | Obese Class II |
| 40 or more | Obese Class III |

Figure 26 below reports the distribution of weight ranges in the current cohort. Consistent with national data, 66.1% of this cohort were overweight or obese [9].

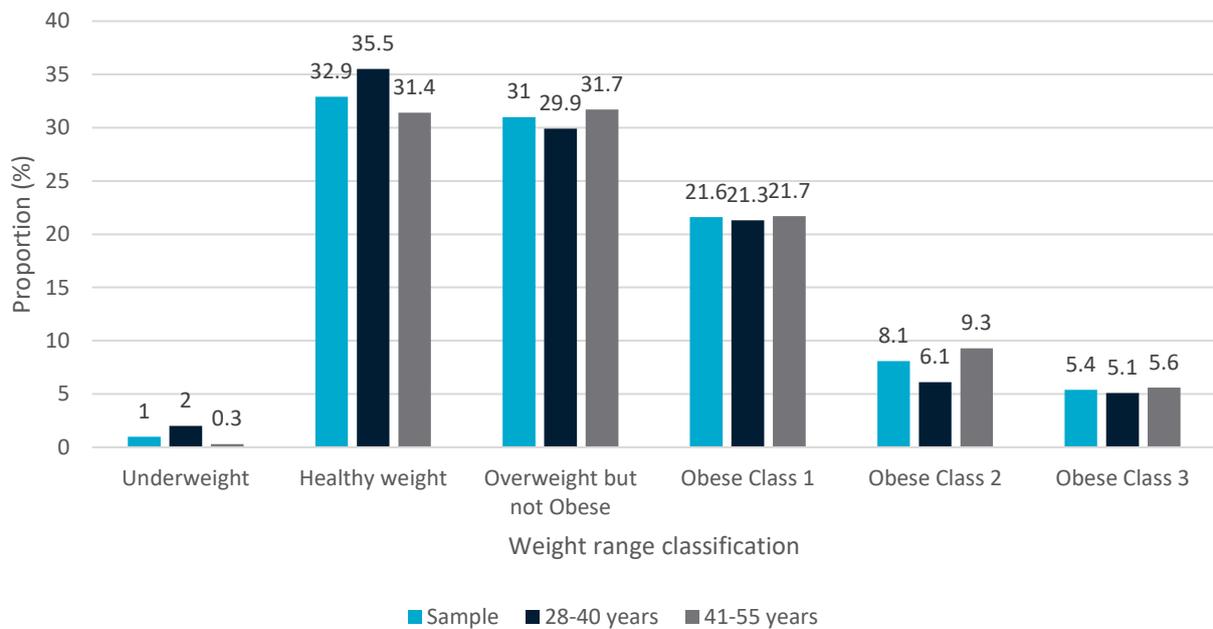


Figure 25 Distribution of weight range classifications

3.5.7 Dietary intake

The Australian Dietary Guidelines provide recommendations on suitable proportions of foods, from the 5 food groups, to guide healthy eating habits and promote overall health [10]. These food and beverages consumed, play a key role in maintaining but also optimising gut health through the provision of essential nutrients such as vitamins, minerals but also dietary fibre. Of core focus for maintaining a healthy gut are foods from the wholegrain products, vegetables, fruit and nut, beans, and legumes groups.

Discretionary foods, including most take away foods, sugar sweetened drinks, cakes, chocolate, pastries, crisps, deep fried foods, processed meat products and alcohol, that are not necessary for a healthy balanced diet do not fit in the 5 food groups, as these are often loaded with added sugar, saturated fats, and salt and exceptionally low in fibre.

In this cohort (Table 7), the proportion consuming vegetables was higher than fruit, with 79% of individuals indicated that they consumed at least vegetables at least once daily and 48% for fruit.

Whilst whole grain products and nuts, beans and legumes are known to be good sources of dietary fibre less than 20% of the cohort reported daily consumption of these foods.

For discretionary foods, the greatest contributor is processed meat products, consumed up to 2 times a week by 42.7% of this cohort. With overall discretionary intake being limited to 1-3 times a month for eating out and takeaways, (42.5%), and less than once a month for fruit juice (33%); deep fried foods (39.5%); sugar sweetened beverages (27.9%).

In contrast, this cohort fared better than the national average for these good groups. Australians Health, 2020 reported that most Australians did not consume the recommended intake for fruit and vegetables and intakes of discretionary foods were also higher, although had reduced from levels seen in 1995 national nutrition survey data [11].

Table 7 Dietary intake

| | Never | Less than 1 time a month | 1-3 times per month | 1-2 times per week | 3-4 times per week | 5-6 times per week | 1 time per day | 2 or more times per day |
|----------------------------------------------|-------|--------------------------|---------------------|--------------------|--------------------|--------------------|----------------|-------------------------|
| Vegetables | 0 | 0 | 0.5 | 2.3 | 6.7 | 11.3 | 30.7 | 48.5 |
| Fruit | 0.7 | 2.8 | 5.3 | 12.2 | 18.5 | 12.5 | 33.0 | 15.0 |
| Fruit juice | 33.7 | 33.0 | 17.3 | 8.1 | 4.2 | 0.7 | 2.8 | 0.2 |
| Dairy Products (milk type in separate table) | 6.5 | 4.8 | 4.8 | 10.9 | 10.4 | 8.1 | 27.3 | 27.3 |
| Chips, wedges etc | 2.5 | 16.2 | 37.4 | 33.7 | 7.4 | 1.8 | 0.9 | 0.0 |
| Deep fried food | 11.1 | 39.5 | 33.0 | 14.1 | 1.6 | 0.5 | 0.2 | 0.0 |
| Potatoes | 3.0 | 11.5 | 32.6 | 36.7 | 12.7 | 2.3 | 1.2 | 0.0 |
| Red meat | 7.6 | 4.4 | 10.6 | 44.3 | 25.6 | 6.2 | 0.7 | 0.5 |
| Processed meat products | 7.9 | 9.9 | 23.6 | 42.7 | 12.9 | 1.2 | 1.8 | 0.0 |
| Oily fish | 14.8 | 13.9 | 29.3 | 32.8 | 7.2 | 1.2 | 0.9 | 0.0 |
| White fish | 14.3 | 35.8 | 38.6 | 10.2 | 0.9 | 0.0 | 0.2 | 0.0 |
| Nuts, beans & legumes | 1.8 | 13.9 | 22.4 | 30.5 | 12.2 | 7.6 | 8.8 | 2.8 |
| Wholegrain products | 5.5 | 14.3 | 15.0 | 21.0 | 16.6 | 9.0 | 14.1 | 4.4 |
| Sugar-sweetened drinks | 34.4 | 27.9 | 15.5 | 9.5 | 3.0 | 1.2 | 6.0 | 2.5 |
| Eat out or takeaway | 1.4 | 14.5 | 42.5 | 35.0 | 4.4 | 1.2 | 0.9 | 0.0 |
| Frozen, chilled or ready-to-eat | 45.3 | 30.0 | 16.2 | 5.5 | 2.1 | 0.5 | 0.5 | 0.0 |

Snapshot of lifestyle factors: Module 5 Summary

- The prevalence of daily smoking in this cohort at 2.7% is much less than the report national average of 10.7% however,
- 66% of participants were overweight or obese,
- 1-in-6 participants do not meet the NH&MRC guidelines of less than 10 standard drinks per week,
- Only 1-in-5 participants in this cohort indicated that they would regularly meet (15%) or exceed (9.8%) national guidelines for physical activity,
- While 7-out-of-10 (68.8%) participants reported getting adequate amounts of sleep [sleeping between 7 and 9 hours per day], only 19.3% rated their quality of sleep as good or excellent.
- When asked about their current stress levels (where 1 = not at all stressed and 5 = extremely stressed); 50% of participants reported a score of either 4 or 5.
- Whilst whole grain products and nuts, beans and legumes are known to be good sources of dietary fibre less than 20% of the cohort reported daily consumption of these foods.

3.6 Personal attributes, attributions, and gut health (Questionnaire Module 6)

Two scales were included in the questionnaire to investigate attributes and attributions when it comes to the explanation and experience of gut symptoms. These scales appeared right at the end of the questionnaire.

3.6.1 What impacts gut health and experiences of symptoms: Attribution of cause and the relationship with gut health strategies

It is thought that the attribution of cause (internal, external or a combination) of gut health symptoms may be associated with the use of different types of numbers of self-management strategies. To investigate this proposed relationship, we included a symptom cause attribution measure to see what individuals see as having the most impact on their gut health. Response distributions are reported in Table 8 below.

Table 8 Attribution of cause of personal gut health symptoms

| | Not at all influential | Slightly influential | Somewhat influential | Very influential | Extremely influential |
|----------------------------------------------------------------------|------------------------|----------------------|----------------------|------------------|-----------------------|
| Illness, injury or health condition | 7.6 | 13.5 | 31.2 | 33.6 | 14.2 |
| Specific foods or dietary components (intolerances or sensitivities) | 5.0 | 9.2 | 17.7 | 42.8 | 25.3 |
| Family history | 6.6 | 12.1 | 35.9 | 32.9 | 12.5 |
| Modern life (pollution, household or agricultural chemicals) | 3.8 | 14.7 | 36.6 | 32.2 | 12.8 |
| Physiological or bodily changes with age | 4.0 | 11.6 | 38.6 | 36.7 | 9.0 |
| Gut microbiome or gut bacteria out of balance | 0.5 | 4.0 | 18.4 | 39.5 | 37.6 |
| Emotional well-being | 0.2 | 4.3 | 22.0 | 44.9 | 28.6 |
| Lifestyle factors (sleep, diet quality, alcohol consumption) | 0.7 | 3.1 | 17.0 | 49.2 | 30.0 |
| Hormone fluctuations | 3.5 | 7.3 | 31.7 | 36.2 | 21.3 |
| Medications | 9.0 | 5.0 | 23.5 | 35.8 | 26.8 |

The gut microbiome (77.1%), lifestyle factors (79.2%), emotional health (73.5%) and food intolerances (68.1%) are seen to be very or extremely influential in the cause and experience of symptoms in this cohort. This is reflected in the nature of the strategies reported in Module 4 of the questionnaire. There we saw high numbers of participants eliminating suspect dietary components from their diet, particularly lactose and gluten. We also saw a large proportion of participants report consuming probiotics, which are thought to assist in replenishing good bacteria in the gut. The final most influential perceived cause of personal gut health issues are lifestyle factors. Findings from Module 5 of the questionnaire reveal that the majority of participants are overweight or obese, not meeting physical activity guidelines, are experiencing high levels of stress, and are not consuming enough foods such as whole grain products and nuts, beans and legumes which are known to be good sources of dietary fibre.

3.6.2 Somatosensory amplification and GI symptoms

The Somatosensory Amplification Scale (SSAS) measures an individual's tendency to perceive body sensations as intense or disturbing. There was a significant positive correlation between number of symptoms reported and scores on the SSAS [$r(421) = .30, p < .001$]. Participants who scored higher on the SSAS tended to report more GI symptoms.

Personal attributes and attributions of cause: Module 6 Summary

- According to participants in this cohort the key contributors (rated as very or extremely influential) in their poor gut health were:
 - Gut microbiome imbalance (77%),
 - Lifestyle factors (79%),
 - Emotional health (73%) and
 - Food intolerances or sensitivities (68%).
- The perceived cause of gut health issues is reflected in the nature of the key strategies employed by participants as reported in Module 4 of the questionnaire (i.e., dietary restrictions of problematic foods and consumption of probiotics). Results from Module 5 of the questionnaire reveal the high levels of stress experienced by this cohort as well as the lack of sleep quality, and changes needed in terms of physical activity and diet quality.
- There was a significant positive correlation between number of symptoms reported and scores on the Somatosensory Amplification Scale (SSAS). The SSAS measures an individual's tendency to perceive body sensations as intense or disturbing. Participants who scored higher on the SSAS tended to report more GI symptoms.

3.7 Impact of COVID-19 on symptoms of gut distress, health behaviour (diet and physical activity) and parenting practices (Questionnaire Module 7)

In this final section of the questionnaire, participants were presented with a range of questions designed to provide insights into the impact of the COVID-19 pandemic on overall gut health but also on health behaviours such as physical activity, dietary choices, and sleep patterns which are associated with overall health and well-being. Also captured were responses around the challenges COVID-19 may have had specifically for parents of young children.

3.7.1 Impact of COVID-19 pandemic on gut health

Nearly half of all participants (45%) reported that COVID-19 had a negative impact on their gut health or the experience of their gut health symptoms had worsened.

3.7.2 Impact of COVID-19 on lifestyle factors and relationships

COVID-19 had a significant impact on all domains investigated: diet, sleep, physical activity, stress, finances and relationships. Most seriously impacted domains in this sample were physical activity routines and stress levels (Table 9).

Table 9 Impact of COVID-19 on lifestyle and relationships

| | Not applicable to me | No negative impact | Slightly negative | Moderately negative | Very negative | Extremely negative |
|--------------------------------------|----------------------|--------------------|-------------------|---------------------|---------------|--------------------|
| Diet or dietary choices | 1.9 | 25.5 | 26.7 | 23.3 | 13.0 | 9.6 |
| Sleep patterns | 2.6 | 32.9 | 21.9 | 20.0 | 15.9 | 6.7 |
| Physical activity routine | 1.7 | 26.4 | 21.2 | 17.8 | 19.5 | 13.5 |
| Stress levels | 0.2 | 5.8 | 17.5 | 29.8 | 26.9 | 19.7 |
| Financial or job security | 4.1 | 51.7 | 17.1 | 11.1 | 7.0 | 9.1 |
| Relationships with family or friends | 1.2 | 26.4 | 32.9 | 22.6 | 10.1 | 6.7 |

3.7.3 COVID-19 and challenges faced by parents of primary-school aged children

With school lockdowns and social distancing measures in place during the COVID-19 pandemic many parents were faced with specific challenges, for example needing to balance work commitments and on-line learning for their school-aged children. In this last question we asked

participants to rate additional challenges, specific to parents posed by the COVID-19 pandemic. See Table 10 below.

Table 10 Ratings of COVID-19 challenges facing parents

| | Not applicable to me | Not challenging at all | Slightly challenging | Moderately challenging | Very challenging | Extremely challenging |
|------------------------------------------------------------------|----------------------|------------------------|----------------------|------------------------|------------------|-----------------------|
| Managing your child's COVID-related stress | 1.0 | 22.5 | 35.5 | 22.7 | 11.4 | 7.0 |
| Assisting with on-line learning and education | 6.0 | 9.6 | 16.9 | 21.0 | 21.4 | 25.1 |
| Maintaining a healthy routine for your child | 0.5 | 9.6 | 22.2 | 27.5 | 23.6 | 16.6 |
| Balancing work or working from home with caring responsibilities | 6.5 | 6.5 | 13.7 | 18.8 | 21.0 | 33.5 |
| Keeping your child occupied | 0.7 | 10.4 | 19.1 | 26.1 | 24.4 | 19.3 |
| Managing your child's screen time | 0.7 | 6.3 | 11.1 | 16.7 | 25.1 | 40.1 |

Covid-19 global pandemic and the impact on gut health and parenting: Questionnaire Module 7 Summary

- Nearly half of all participants (45%) reported that COVID-19 had a negative impact on their gut health, or the experience of their gut health symptoms had worsened.
- A small but significant proportion of participants indicated that COVID-19 had no negative impact on diet quality (25.5%), sleep patterns (32.9%), physical activity routine (26.4%), stress levels (5.8%), job security (51.7%) and relationships with family and friends (26.4%).
- COVID-19 presented unique challenges for parents of young children. According to responses the most challenging- in order of combined very or extremely challenging responses were:

Managing children's screen time 65.2%

Balancing work/working from home and caring responsibilities 54.5%

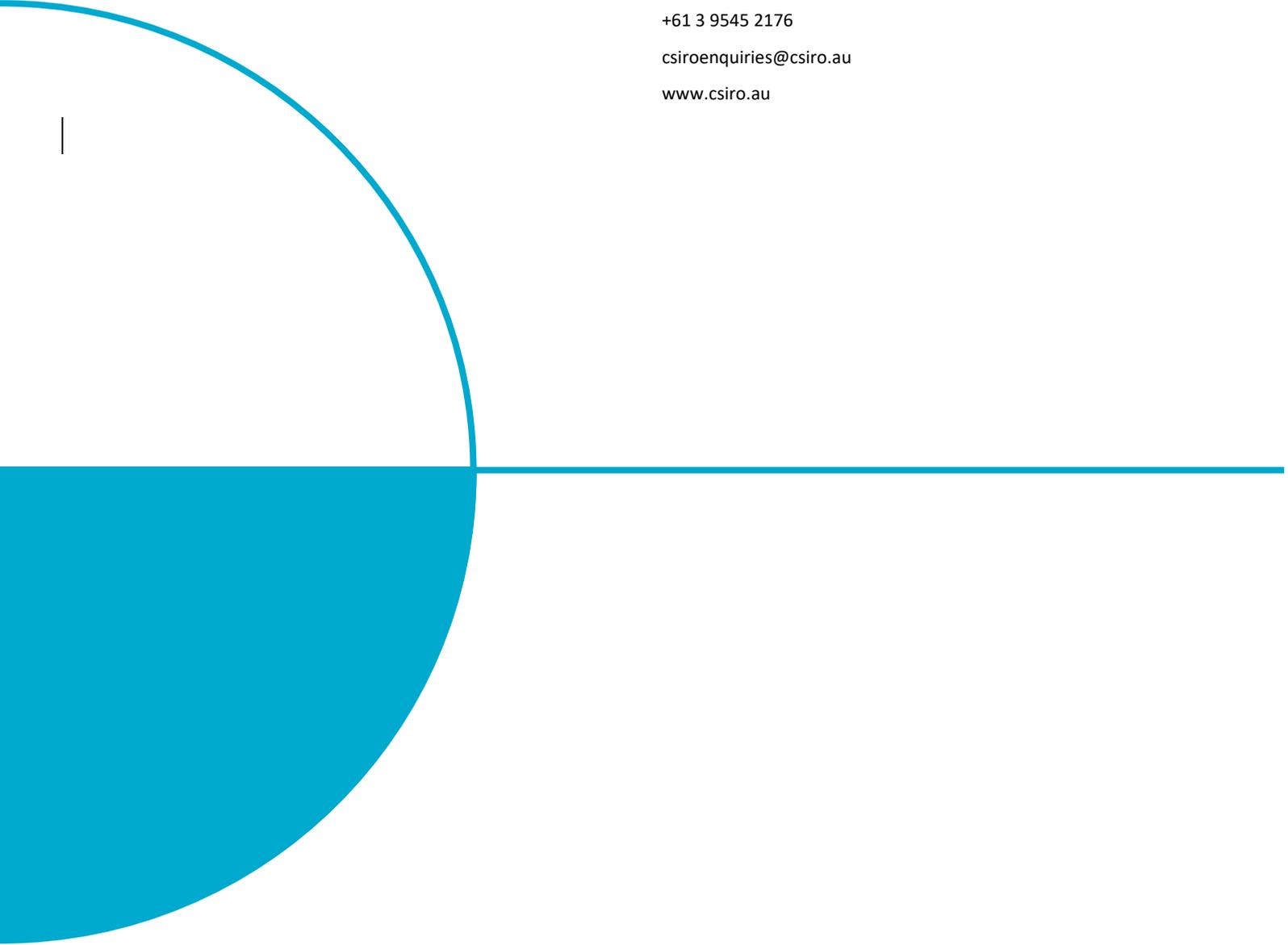
Assisting with on-line learning or education 46.5%

Keeping children occupied 43.7%

Maintaining a healthy routine for their child 40.2%

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