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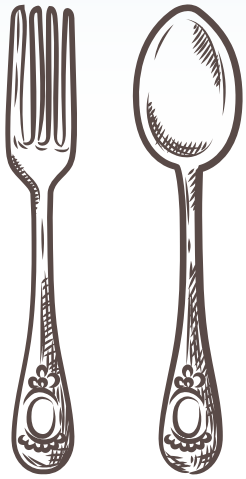
CAPSTONE RESERCH REPORT

SAFE MEAL

FOR PEOPLE WITH FOOD ALLERGIES



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3817 WORDS

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Date : 08 /09/2024

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Abstract

This report focuses on the importance of improving the safety of eating out for people with food allergies. It is believed that they face dietary restrictions when eating out and often feel anxious about meals outside of their homes. This report explores the challenges and solutions through background research on food allergies, benchmarking, survey analysis, and interviews with end users.
The background research clarifies the scale of food allergies, symptoms, and risks associated with eating out, demonstrating the necessity of this study. Benchmarking of existing products identified opportunities and gaps in current solutions, highlighting the requirements that the new design should meet. As part of design research, qualitative and quantitative data were collected through surveys and interviews, and these were compared with the benchmarking results to reveal the specific challenges and needs faced by people with food allergies.
Interviews with end users indicated that conventional allergen detection devices are difficult to use and can only test a portion of the meal. As a result, key elements of the new design, such as "ease of use," "portability," and "non-contact functionality," have been proposed.
Finally, the key findings of this study are summarised, emphasising the potential of a new allergen detection device to make the dining experience safer and more comfortable for people with food allergies. These insights will serve as valuable guidelines not only for people with food allergies but also for the food service and medical industries.

Contents

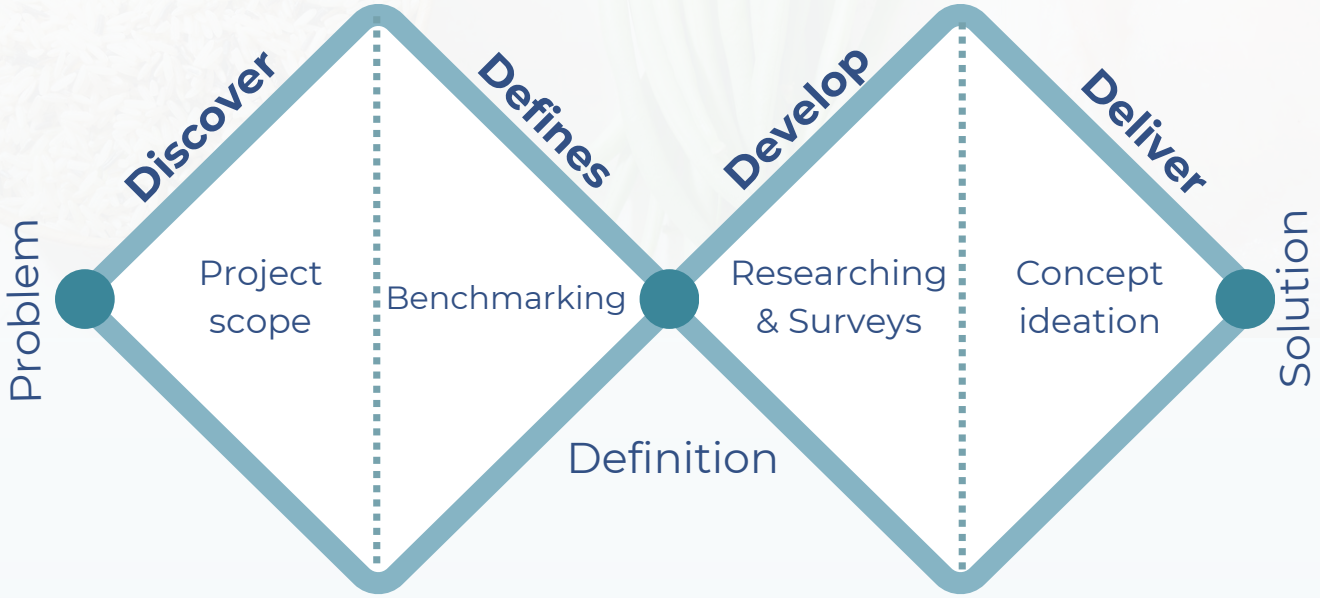
1.1 Introduction

Food is an essential part of our lives and an important factor in offering us a more fulfilling life and good health. The food and beverage industry continues to grow year after year, with new restaurants opening as well which means ensuring food safety to customers is becoming increasingly important.

The health problem of food allergies is a growing global problem, affecting **more than 10%** of the general population. It is also estimated that approximately **1 in 10 adults** and **1 in 12 children** have a food allergy. (Tanno & Demoly, 2022). Accidents due to food allergies in restaurants are not uncommon, and in Australia one man passed away in 2017 due to an anaphylactic shock from sesame seeds. (A &AA, 2021). To prevent similar incidents, restaurants have a responsibility to familiarise themselves with the allergens contained in the food they serve and customers also have a responsibility to clearly inform the restaurant with allergies of the ingredients they cannot consume. However, the current situation is that 53.9% of those who developed allergic symptoms occurred despite having informed restaurant staff of their food allergy, and 26.6% occurred when the allergen was indicated on the menu. (Roxanne et al., 2021). Thus, it is difficult to determine whether the dishes contain allergens when eating out, and people with food allergies have limited access to food when eating out, a problem that makes them anxious about eating outside of their home.

The aim of this research report is to explore innovative solution devices that solve food allergy-related dietary issues and allow people with allergies to **enjoy eating in restaurants with less anxiety and with a sense of comfort and reassurance.**

Graphic structure of the project



Stage 1

Investigate the current situation and problems of food allergy sufferers in food service and the implications for solving this problem.

Stage 2

Conduct benchmarking in the food allergy market and provide a comparative analysis of existing products and therapies. Furthermore, the aim is to refine own ideas by highlighting new innovations with potential application to these challenges.

Stage 3

The research is conducted through surveys and interviews with the general public in relevant fields, academic articles. The research data obtained is used to identify value and meaning, and to understand the needs of users.

Stage 4

From research findings and interviews, several concepts for end-users are created. Once the concepts are defined, prototypes are produced and refined based on user feedback. Finally, the design journey is presented in a presentation.

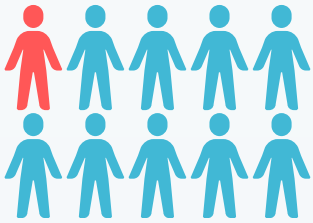
1.2 Background

This section defines food allergy, explains its causes, presents the risks when food allergy patients eat out and, finally, the innovations that are needed.

Food allergies

A food allergy is an immune system response, almost always to a food protein, that the body mistakenly believes is harmful. When a person eats food containing the allergen, the immune system releases a large amount of chemicals, including histamine, that can lead to signs and symptoms of an allergic reaction (A&AA, 2024).

Size of food allergy sufferers



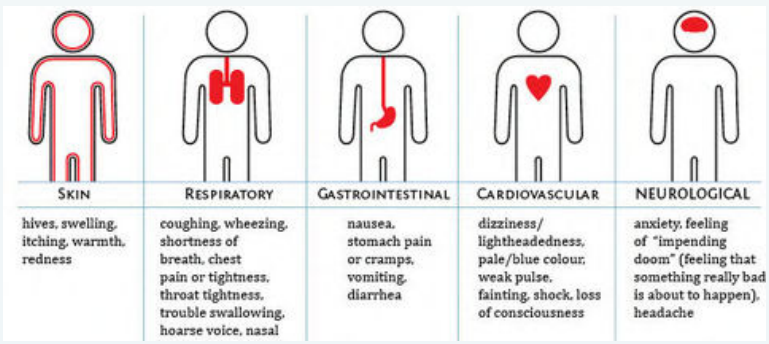
Food allergies are a global health concern, affecting more than **10%** of the general population. It is estimated that about **1 in 10 adults** and **1 in 12 children** have food allergies which is equivalent to 2 students per class (Tanno & Demoly, 2022).

According NSW authorities report, while deaths from anaphylaxis in australia have increased by **7 %** per yer from 1997 to 2013 (NSW Food Authority, n.d.).

Symptoms of an allergic reaction

Figure 1 illustrates common food allergy symptoms. The signs and symptoms of allergic reactions vary from person to person and are not always the same each time (ACCAI,2023). Because it is impossible to predict how severe the next reaction will be, and because it can sometimes be life-threatening, allergic patients should always avoid foods containing allergens.

Figure 1
Sign & Symptoms (Allergy home, n.d.)



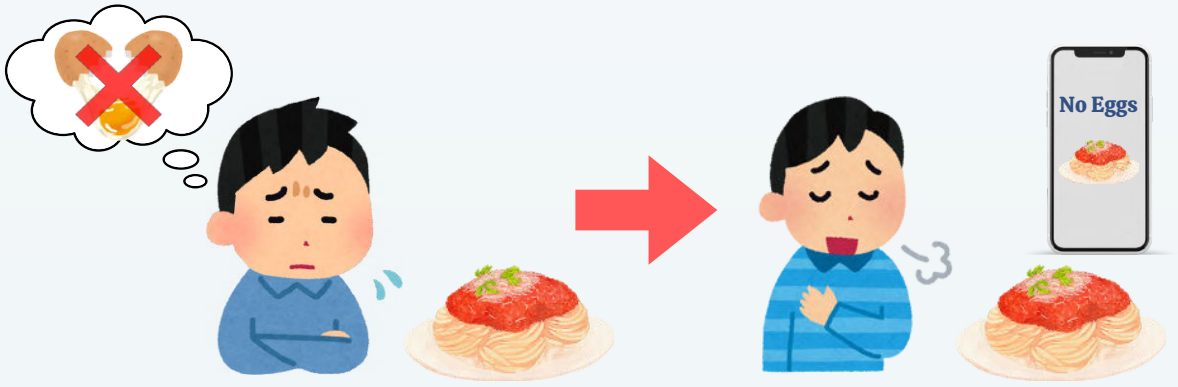
The risk of eating outside

According to multiple studies, most anaphylactic reactions occur outside of the home, with **25% occurring while dining at restaurants**. Some estimate that 74% of all allergy-related food reactions involve non-pre-packaged food (Gabriel et al., 2021).
In Australia, it is mandatory for restaurants to provide ingredient lists (A&AA), and customers are required to check whether their allergens are present in the food and inform the cook. However, even if an allergen is not listed on the ingredient list, there is a possibility of **cross-contamination** if the same cutting board or knife is used during food preparation(Queensland Gov, 2023).
Thus, it is a very risky situation for food allergic patients to eat out, with problems that can make them anxious about eating out and limit the range of food they can eat.

Innovation

In order to alleviate this situation as much as possible, a new product will be proposed that will help people such as judging before eating out whether the food they are allergic to contains ingredients that cause allergies and whether the allergens contained in the food are at a level where they can eat it. The aim is to create an environment where people with food allergies can **enjoy eating out with peace of mind.**

Innovation Image



1.3 Benchmarking

This section presents and compares the market of the existing products for food allergies (and in development). It also explores the occasions and opportunities in which these products are used and presents some insights using visual comparative representations.

Existing products for food allergies

Products for food allergies fall into two main categories. One is those that test for allergens in food and prevent allergic ingestion in advance. The other is to deal with allergic reactions after they have occurred. This section is some of the products that currently exist and how they work.

For before allergic reaction

Figure 2 Allergy amulet

(Bloom, 2020)

This (figure 2) is the Allergy amulet, a product that allows food samples to be tested for the presence of allergens. The product is unique in that it can be worn as a **necklace** or **key holder**, making it **very portable**.

Figure 3 The steps of Allergy amulet

(Yale school of management , 2016)

To use the product, simply insert a single-use test trip into the food as shown in figure 3, **place the strip in the sheath** and mix the food with the buffer solution. A tip emerges from the end of the sheath and is inserted into the Allergy Amulet Reader and they display allergy information.

Figure 4 Nima sensor

(Matheson, 2016)

Nima (figure 4)was created by the MIT in 2013. It is a **portable food sensor** designed to allow people with food allergies and sensitivities to test foods containing **gluten** and **peanut**. Usage method is similar to the Allergy amulet, where a food sample is placed in a capsule and inserted into the Nima, which is analysed within **5** minutes.

For after allergic reaction

Whereas Allergy amulet and Nima sensors are designed to test for allergens in dishes and prevent the ingestion of allergens in advance, figure 5 product is designed to deal with allergic reactions when they develop.

In memory of a young girl who tragically died from an anaphylactic reaction to a food allergen, Project Abbie is focused on creating a wearable, non-invasive device that can detect anaphylaxis, alert the patient, notify caregivers through their phones, and automatically inject life-saving adrenaline for those unable to do it themselves (The check up,2019).

Figure 5 Project abbie

(Wyss institute, 2017, 3:10)

Medical supplies

Figure 6 is an effective over-the-counter medicine for food allergy symptoms. Patients are required to take appropriate action depending on the level of allergy symptoms.

Figure 6(a)

(Benadry, n.d.)

Figure 6(b)

(LFA First Response, n.d.)

Mild symptoms, such as itchy skin, can be relieved by antihistamines (figure 6a). However, severe symptoms such as breathing difficulties or anaphylactic shock cannot be treated. In such cases, an epipen (figure 6b) may be necessary for severe allergic reactions. Epipens have effects such as relaxing the airway muscles, making breathing easier. (Mayo clinic, n.d.)

Comparison

The graph in figure 7 below compares the existing food allergy products in the market today on a five-point scale in different areas. The graph reveals the following opportunities and gaps in the existing product market

Figure 7 Benchmarking table

	Allergy amulet	Nima sensor	Epipen	Project abbie	Antihistamine
When	Before	Before	After	After	After
Cost	3	3	4	3	5
Portable	5	4	4	5	3
Convenience	3	3	4	5	5
Reaction time	5	4	3	3	3
Number of Allergens supported	4	2	5	5	4

Excellent Good Average Poor Very poor

Opportunities

- The ability to check allergens in food in restaurants and on the go provides peace of mind, especially when eating out.
- Many products are highly portable, which is due to the fact that they are designed to be used by users eating out and in a variety of situations.
- Social costs of food allergies are reduced by these products.

Gaps

- Current detectors are only compatible with specific allergens and do not cover all major allergens. In addition, there is still a lack of devices capable of detecting multiple allergens simultaneously.
- Allergen testing devices are time-consuming as a portion of the foodstuff needs to be taken into the device, and in many cases it takes a long time to get a diagnostic result. In contrast, pharmaceuticals are simple to use and quick to respond.
- Current portable allergen detectors are costly and not widely accessible, so keeping prices low is essential for broader consumer reach.

2.1 Research

Design research is an important step in understanding user needs and turning them into more actionable insights to improve design and create a better user experience (Esposito, 2018).
This section aims to investigate the challenges faced by people with food allergies when eating out and to identify specific needs for enhancing safety in dining environments. The research methods include **surveys** and **interviews** to understand the current state and perceptions of dining out, as well as to gather user opinions on the potential benefits of new portable allergen detection devices, with the goal of improving design.

Surveys

Figure 8 Survey structure

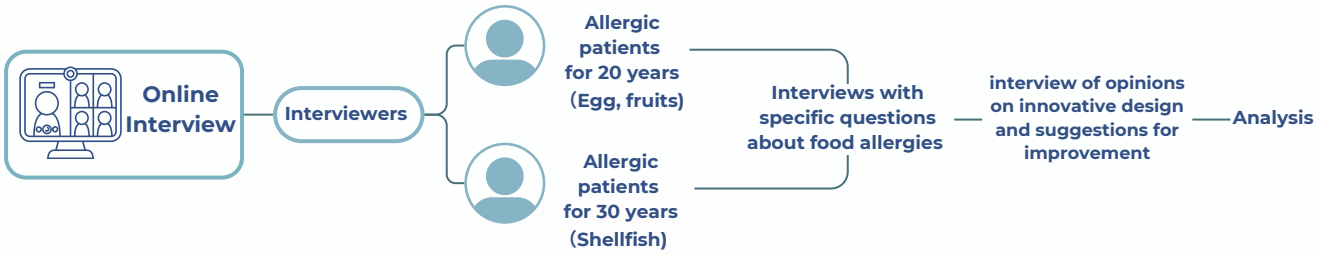
The first research method was to invite participants to complete a questionnaire about their awareness of food allergies and how they respond when eating out using Google form. Participants were divided into three main groups, structured to allow analysis of the views of **people with food allergy**, **those in a position to support them** and **third parties with no food allergy** connection. The questionnaire consisted of **22 questions** and took an average of **6 minutes** to answer. The first part of the questionnaire is mainly questions related to common food allergies, with the aim of collecting quantitative data. The response format is mainly Yes/No two-choice or multiple-choice. In the later stages, the questions became more specific and incorporated Likert scales and descriptive response formats with the aim of collecting qualitative data.

The research questions that the survey aims to address include:

- What is the level/ severity of you food allergy?
- What challenges do people with food allergies face when eating out?
- How well restaurants understand, take into consideration and deal with food allergies?
- Would they find portable allergy testing devices an innovative approach or unnecessary?

Interviews

Figure 9 Interviews structure



The second data collection method was interviews with **two long-standing food allergy patients.** The interviews were conducted in an online format using Zoom and lasted approximately **30** minutes. The first part of the interview was a detailed interview about their allergy status, while the second part of the interview focused on specific research topics through questions about problems when eating out and how restaurants dealt with them.

This interviews provided the qualitative data obtained and aimed to fill research gaps. Insights from end-users help us to understand their problems and improve the user experience.

The interview questions that the survey aims to address include:

- What are the places and situations where allergies may be triggered?
- What is eating out like for people with food allergies?
- How do they feel about the response to food allergies in the restaurant industry?
- Do they think portable allergy testing devices are an innovative approach for them or unnecessary?
- If the product were to be made, how would they like it to be designed?

2.2 Analysis & Findings

This section focuses on the analysis of the quantitative and qualitative data collected in the study.The following section will interpret the insights drawn from the surveys and interviews, aiming to validate the secondary research. Details of the survey findings and interview transcripts are presented in Appendix 1 and 2.

Survey Analysis & Findings

A Survey on food allergy conducted using Google forms received responses from **65** people. The all survey result is shown in Appendix 1.

The market size of food allergies

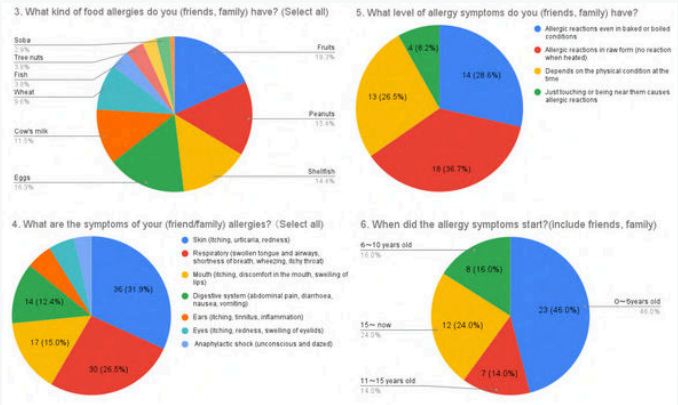
According to the my survey results, **23.4%** of people have a food allergy and **75%** of people said they have a family member or friends with a food allergy close to them. This reveals that the impact and prevalence of food allergies in our day to day lives, even if one does not direct have an allergy.

1 in 4 people have a food allergy

The market of food allergies

As figure 10 shows, food allergies vary widely from each person in terms of the type of allergen, severity, how the reaction manifests itself and age of onset. Therefore, it found that avoiding allergenic dishes in advance is very important in order to effective way to accommodate all allergic patients.

Figure 10 Diversity of food allergies



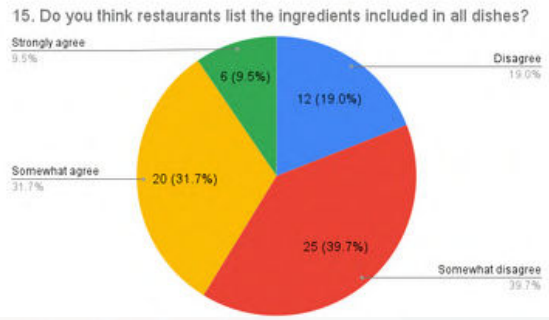
Challenges for eating out

Eating out is one of the biggest challenges for allergic patients. The survey found that despite taking precautions against allergies, **27.6%** of people **have experienced allergic reactions in restaurants** and **25.4%** of people **feel anxious about eating out**. This is a particularly important reason for the fact that 'I don't know the ingredients used in the dish' and **91.8%** of people have eaten without knowing what their food contained in the restaurants . Another cause for concern is that only **12.7%** of respondents have allergy-friendly products such as Epipen, making it **difficult to deal with allergic reactions** when eat out.

Response of food allergies in restaurants

Food providers are responsible for food allergies, as well as the person with food allergies. In Australia, it is required by law to provide accurate information when questioned by customers about allergens in the food it provides (NSW Food authority, n,d.).

Figure 11 Response to food allergies in restaurants

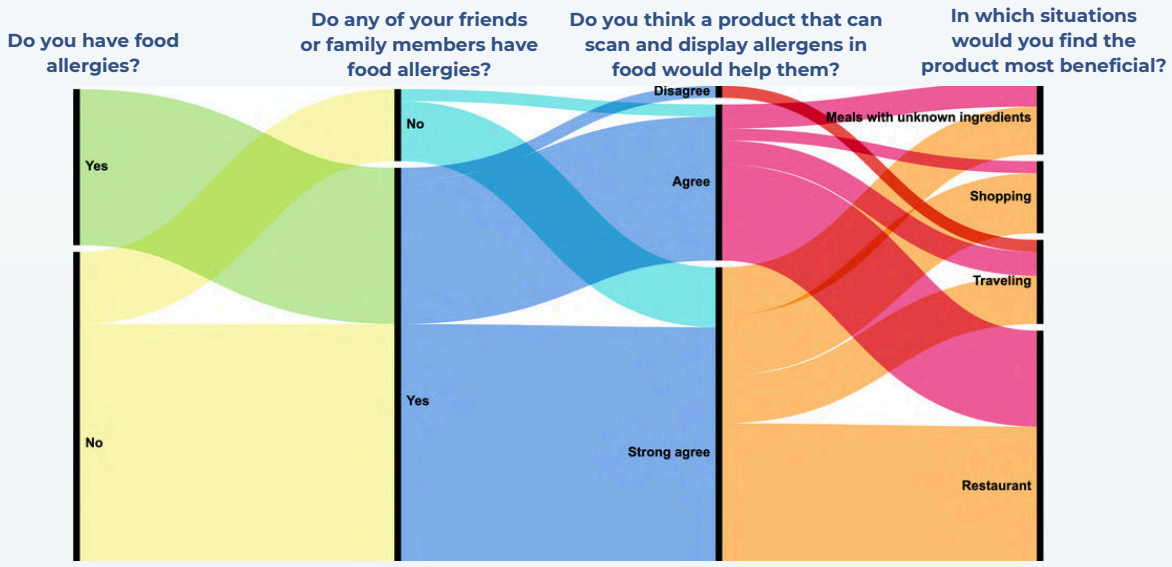


However, in response to the question about the list of ingredients in restaurant dishes (see figure 11), the most common response was somewhat disagree at 39.7%, and when combined with disagree **58%** of respondents felt that the ingredients were not sufficiently listed.

When asked about their understanding of allergens in the dishes they serve, 51.1% of people with experience working in restaurants responded that they understand only about 70% of the allergens. Additionally, it was found that 62.5% of them have experienced **cross-contamination** by using the same cutting boards or knives in the restaurant. These results indicate that restaurant staff have **inadequate awareness** and handling of food allergies.

Requirement for people with food allergies

These research results indicate that people with food allergies need to make their own food decisions and avoid foods containing allergens and to meet this need, it was proposed that a product that scans food and displays allergens to help people decide whether they can eat it or not would make their food choices safer. A survey conducted on this idea showed that 98.4% of respondents supported it. The graph below is a Fineo diagram summarising the results of a bivariate analysis on whether people with food allergies and their associates believe this product would support them and where it would be most useful.



Interview Analysis & Findings

Two interviews were conducted to gain a more concrete understanding of users' current eating out situation and needs, which could then be reflected in the design. The two interviewees, Haruto and Shino, have both lived with food allergies for over 20 years. The interviews were recorded, and the transcriptions are included in Appendix 2. The interview content was also coded for analysis.

Findings from interviews

Two interview participants pointed out that food allergies pose a significant **disadvantage** when eating out. Although their allergies and reactions differ, Shino noted that while she can have a reaction just by coming into contact with an allergen, there are cases where she can consume the food if it has been cooked. This suggests that cooking methods can alter the impact of allergens. As a result, it is difficult for her to determine what is safe to eat when eating out, and she mentioned having experienced allergic reactions in the past due to inadequate cooking at restaurants.

On the other hand, Haruto expressed frustration with the **limited food options** available when eating out. He pointed out that even if eggs are not used directly, they are often present in processed products like mayonnaise, making the number of dishes he can safely eat very limited.
Both participants noted that the way restaurants handle food allergies **varies greatly**, with fast food and lower-priced restaurants often having inadequate measures in place. As a result, they often have to inform the staff about their allergies each time or **take the risk of deciding what to order.**

They recognise that allergen testing devices are highly beneficial for their lives, but it has been pointed out that traditional products are **contact-based** and have limitations, such as the **require a lot of work to use** and the ability to test **only the contact surfaces**. They state non-contact allergen detection devices could not only expand dining options but also can be extremely useful for unknown meals in situations where emergency response is difficult, such as when **traveling abroad**.

Their insights point in an important direction in improving the eating out experience for people with food allergies.

In the next page the figures show the interview transcripts categorised into Themes, Codes and Sub-Codes respectively.

Themes	Code	Sub-Code	Examples
Types of allergies & Allergy level	Types of Allergies	Egg, Fruits (apple, cherry, kiwi)	(Haruto) "I am currently allergic to fruits such as eggs, apples, cherries, and kiwi"
		Shellfish (prawns, crabs)	(Shino) "I have shellfish allergies like prawn or crabs. But I can eat them if I boil or bake them. Just cannot eat raw shellfish."
	Severity	Mild reaction	(Shino) "Eating them only causes itchy skin and throat." (Haruto) "Swollen lips, itchy throat, itchy ears, sometimes diarrhea."
		Contact Sensitivity	(Shino) "Itching at the point of contact."
		Reaction Changes Over Time	"When I was little I couldn't eat eggs completely, (Haruto) but now I can eat them if they're cooked."
Experience with Eating Out	Challenges in Restaurants	Limited Food Choices	"Many dishes were likely to contain eggs so my dishes (Haruto) are limited to those which do not include eggs."
		Allergic reactions in restaurant	"I ordered Fried prawn because it's fried so I figured I could eat it. But actually, only the outside was fried and (Shino) the inside was raw, causing allergic reactions"
	Actions Taken	Reporting Allergies	(Shino) "Occasionally, I have to report allergies to the restaurant staff." (Haruto) "I used to tell restaurant staff that I was allergic to eggs and ask them to make me an egg-free dish."
		Self-Assessment	(Shino) "If there is a picture on the menu, that is the best way to judge." (Haruto) "I would judge for myself what dishes I could eat."
	Response to allergies in restaurants	Varied Awareness by Restaurant Type	(Shino) "There is a large gap between where it is done and where it is not." (Haruto) "While upscale restaurants will check for allergies, fast food restaurants often omit that they do check or display what ingredients are included."
		Lack of knowledge of allergies by restaurants workers	(Shino) "My son was allergic to eggs and they sometimes served him with mayonnaise, even though I told them he was allergic to eggs."
Allergy Detection Products	Perception of Current Products	Potential Limitations	(Shino) "If the decision is based solely on whether an allergen is present or not, it might be judged as inedible even if it could be eaten after being boiled." (Haruto) "If it's just part of the food, it reacts differently in different places."
		Concerns About Usability	(Haruto) "Preparing a new capsule for every inspection is likely to cause problems, such as forgetting to refill the next one after one use."
Key features to consider	Design innovation	Usability	(Haruto) It would be nice to be able to inspect them easily and quickly, without needing to go through various steps before using them.
		Portability	(Shino) "I want something compact and lightweight because I want to carry it with me." (Haruto) "It should have a compact design that can be worn at all times. Ready for immediate inspection at any time. "
		Non contact type	(Shino) "The method should also allow testing without direct contact with the food. In order to come into direct contact with the foods, that would have to be purchased, so a non-contact testing method would allow the allergen to be confirmed before purchasing the foods."
Views on new non-contact allergen testing devices.	Potential benefits	Travelling	(Haruto) It could be very useful in situations where I don't know what is included, such as overseas traveling
		Eating out	(Shino) They will be able to eat food I have avoided in the past and more choices when choosing a shop. It would also reduce stress in eating out.

3.1 Discussion

A range of insights and findings were drawn from the information obtained from the benchmarking and the research conducted. This section identifies those relationships and examines how the research findings impact on the gaps that exist. Linking the benchmarking to the research findings makes the importance of addressing the issues faced by people with food allergies when eating out and improving the safety of their eating out more clear.

The results of the survey revealed that one in four people have a food allergy, and that the type, severity and age of onset of the allergy varies from person to person. It was therefore found that the most effective response for all food allergy sufferers is to avoid allergenic foods in advance.

However, in a survey of people who had worked in restaurants, 62.5% said they had cross-contaminated by using cutting boards and knives. This showed that even if allergy sufferers avoided allergens in advance, the likelihood of triggering an allergic reaction was still high. Furthermore, the Roxanne survey reports that 53.9% of people had an allergic reaction in the shop, despite having given allergy information to the staff.

These factors also created the need for allergen testing equipment in order to make their own decisions without having to rely on shopkeepers.

Benchmarking has revealed a research gap in conventional allergen testing devices. They are limited in the types of allergens they can detect, and because a portion of the food must be inserted into the device, the process is time-consuming and labor-intensive. Additionally, the results can vary significantly depending on which part of the food is tested.

Interviews with long-standing food allergy sufferers explored the problems they face when eating out and, based on these experiences, a review of conventional allergen testing equipment and suggested improvements were presented.

Therefore, by combining a benchmaking review and primary research, this study highlights the need to address the problems faced by food allergy sufferers when eating out and to improve the safety of eating out to provide a freer and more comfortable eating out experience.

3.2 Design implications

From previous research, it has become clear that there is a growing demand for devices that can detect allergens when eating out for people with food allergies, and that existing allergen detection devices require redesigning. The challenge for this new design is to ensure that allergy patients can enjoy their meals with peace of mind by determining whether the food is safe to eat and broadening their dining options. The new design needs to focus on three key features: **portability**, **usability**, and **non-contact functionality**.

Portability

Portability is crucial when eating out. If users can easily carry the device, they will be able to use it in any situation, ensuring safe dining experiences. Therefore, the design must emphasise **compactness** and **lightness**, prioritising ease of transport.

Usability

As allergic reactions can be life-threatening, it is essential to minimise the risk of **misuse or confusion** when using the device. Since allergen detection devices may be used by individuals of various age groups and technical skills, the design must be **simple** and **intuitive** so that anyone can use it correctly. This ensures accurate usage regardless of the user's age or technical proficiency.

Non-contact functionality

A non-contact design not only enhances convenience but also improves hygiene. By using a non-contact approach, it is possible to measure the entire dish rather than just a part of it, reducing the risk of **cross-contamination** and allergen exposure. Technologically, utilising **NIR** (Near-Infrared) sensors allows for the rapid analysis of allergenic **proteins** and their quantities. (Ingle et al., 2016).These sensors can even test food through its packaging, providing quick results.

These insights aim to significantly reduce the anxiety and risk that food allergy patients face when eating out, allowing them to enjoy meals safely and with confidence. As a result, the quality of their dining experience is expected to improve greatly.

3.3 Conclusion

This report focuses on the importance of improving the safety of eating out for people with food allergies and identifies challenges and solutions through background on food allergies, benchmarking of existing products, survey analysis and end-user interviews. Background research identified the scale of food allergy, its symptoms and risks when eating out, indicating the need for research.

Benchmarking of existing products identified opportunities and gaps facing current allergen testing devices and identified requirements for new designs. Qualitative and quantitative data from questionnaires and interviews highlighted the specific challenges and needs faced by people with food allergies. The interviewees pointed out the problems with conventional allergen testing devices being difficult to use and only measuring part of the food, and emphasised the importance of “usability”, “portability” and “non-contact functionality” in the new design.

As a result of this research, it is hoped that incorporating these elements into the development of new allergen testing devices will make the experience of eating out safer and more comfortable for people with food allergies. These innovative design concepts will provide useful guidance not only for food allergy patients, but also for the catering and medical industries.

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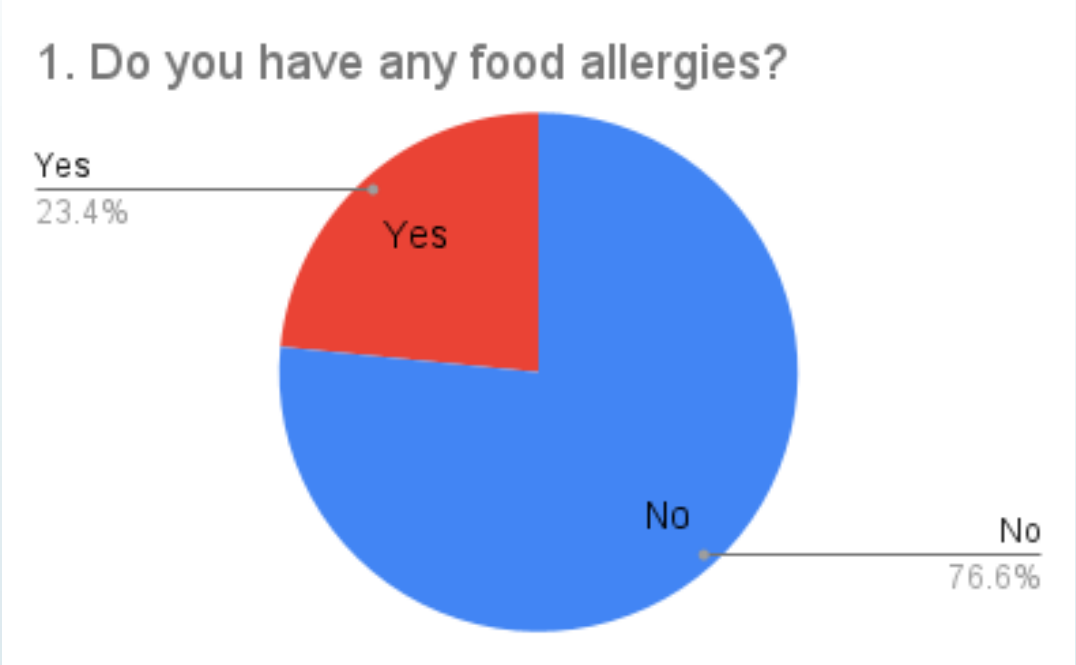
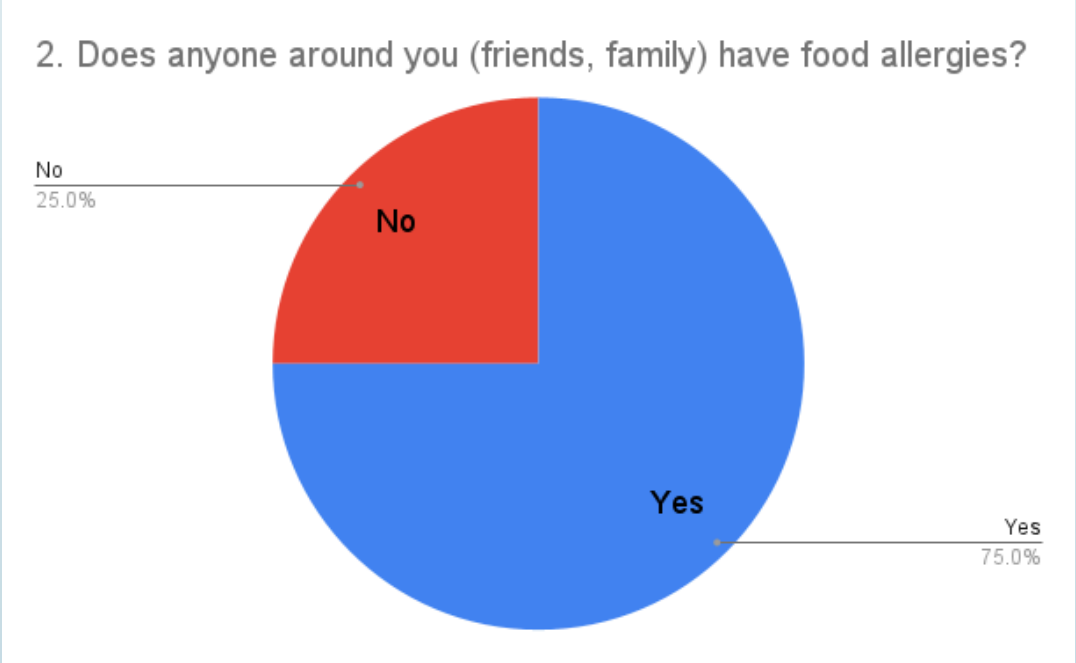
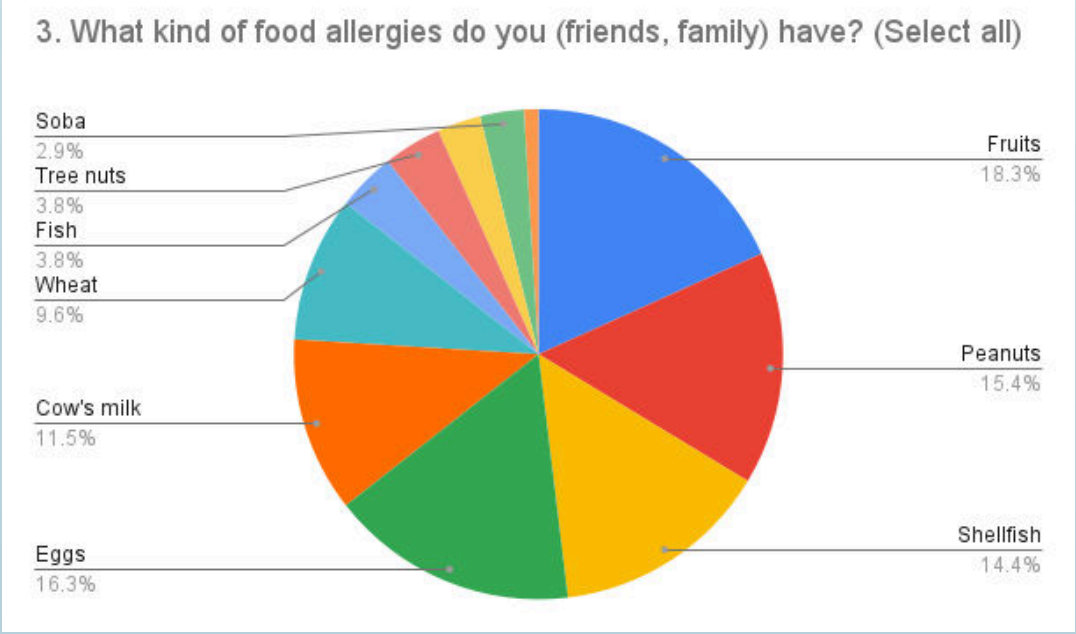
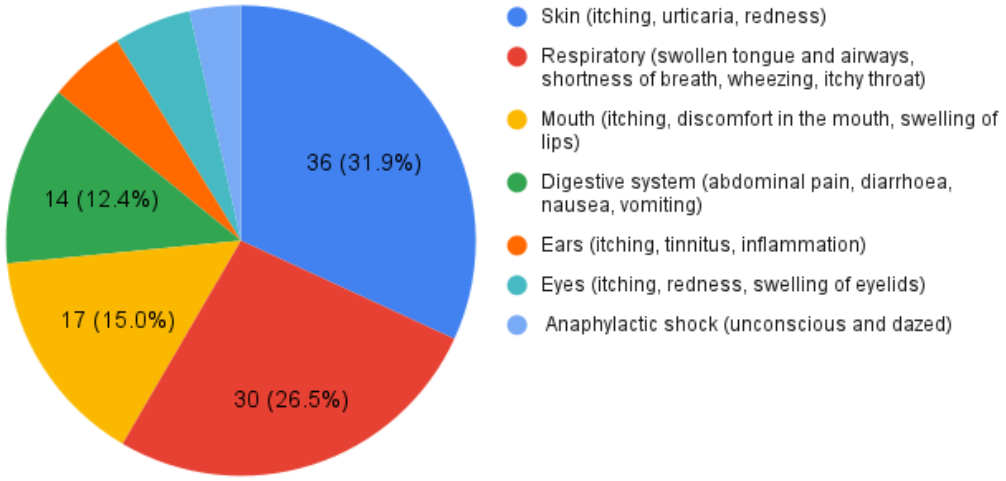
Appendix 1: Survey results



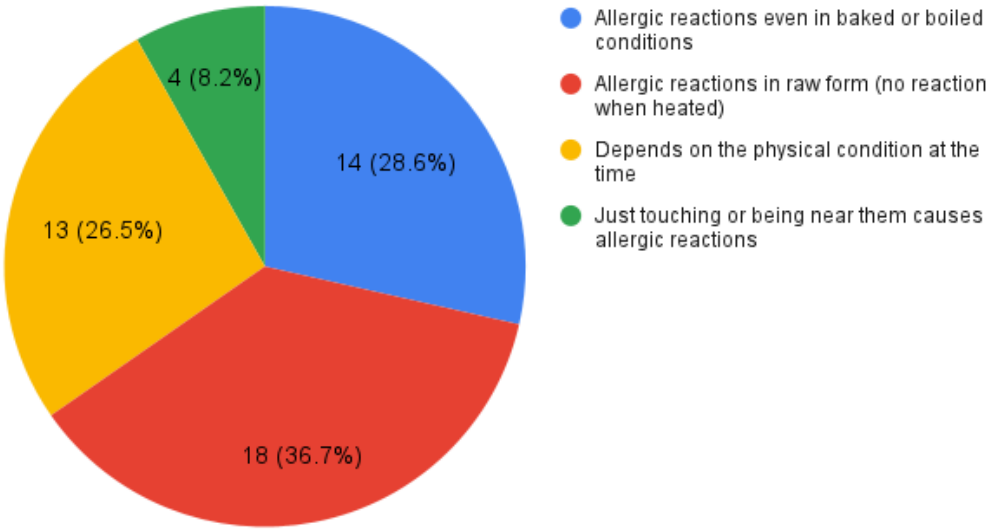




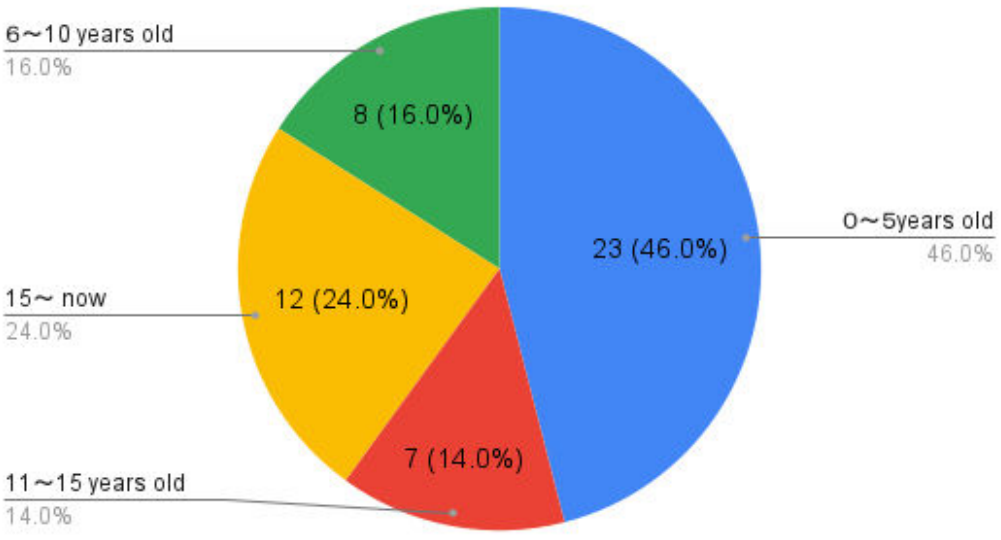
4. What are the symptoms of your (friend/family) allergies?（Select all)



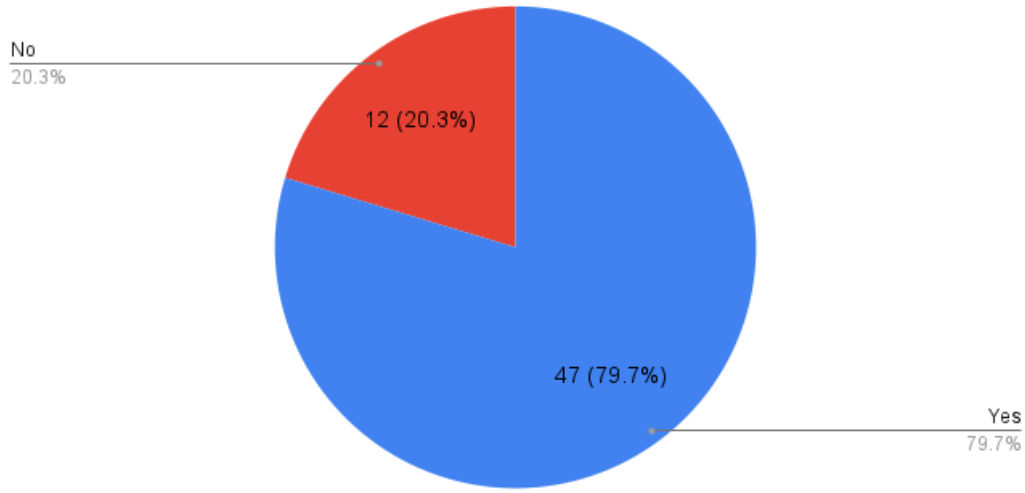
5. What level of allergy symptoms do you (friends, family) have?



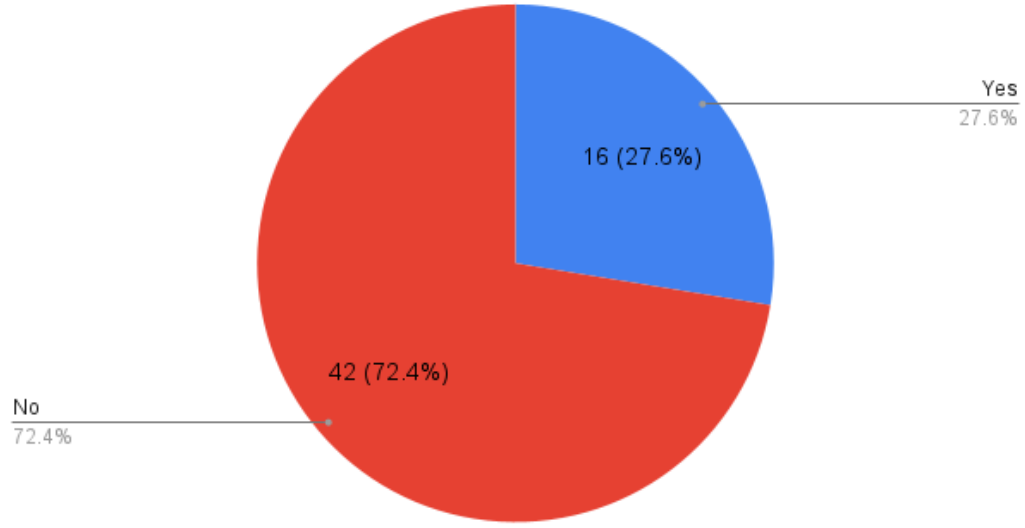
6. When did the allergy symptoms start?(include friends, family)



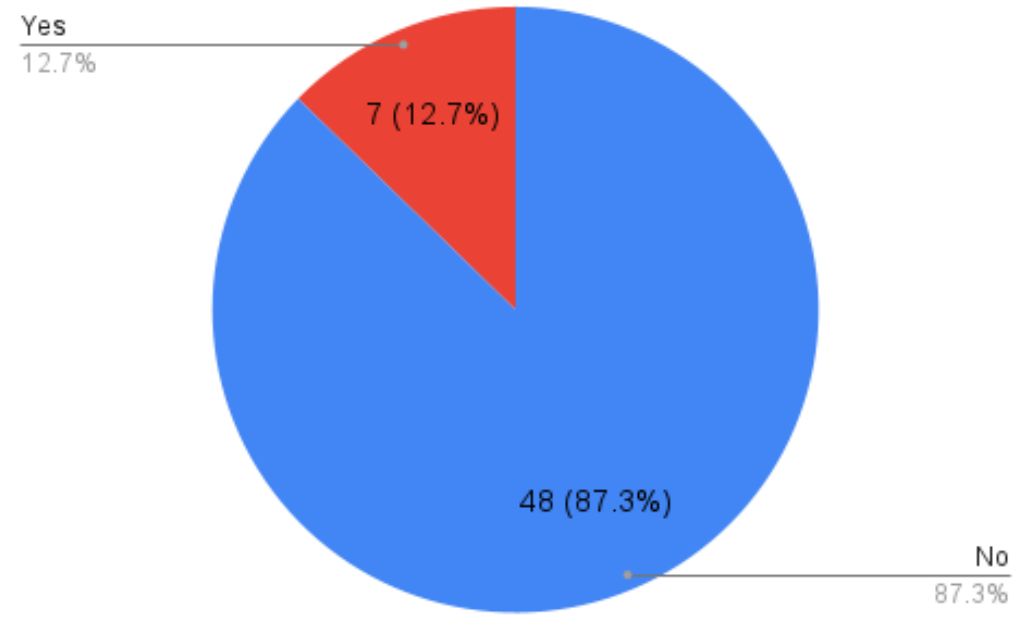
7. Have you eaten outside with people with food allergies?

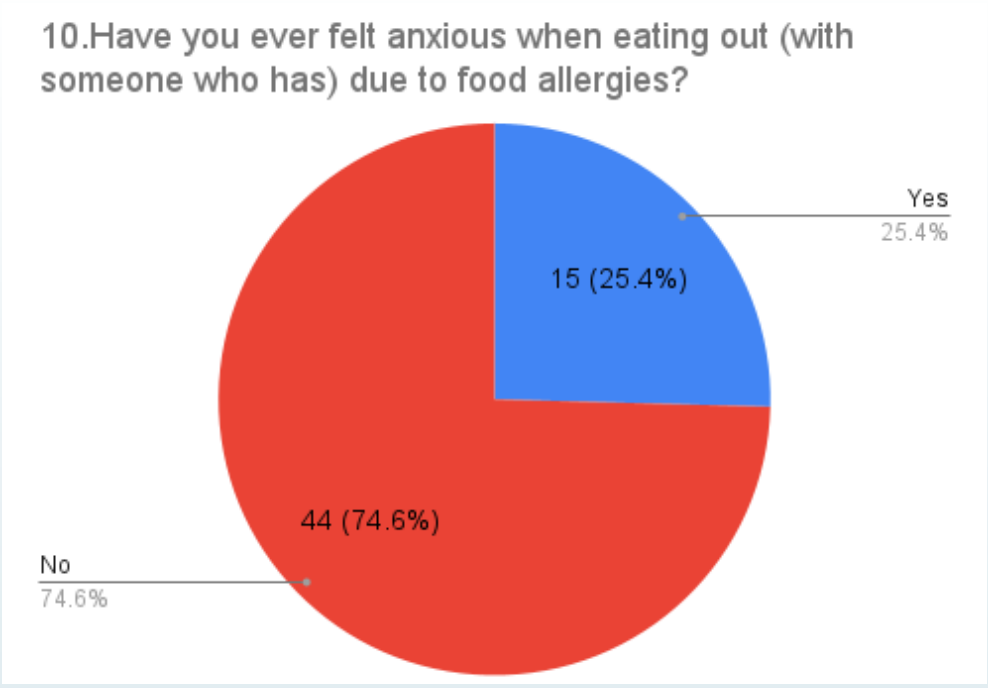


8. Have you (friends/family) ever had an allergic reaction at a restaurant?

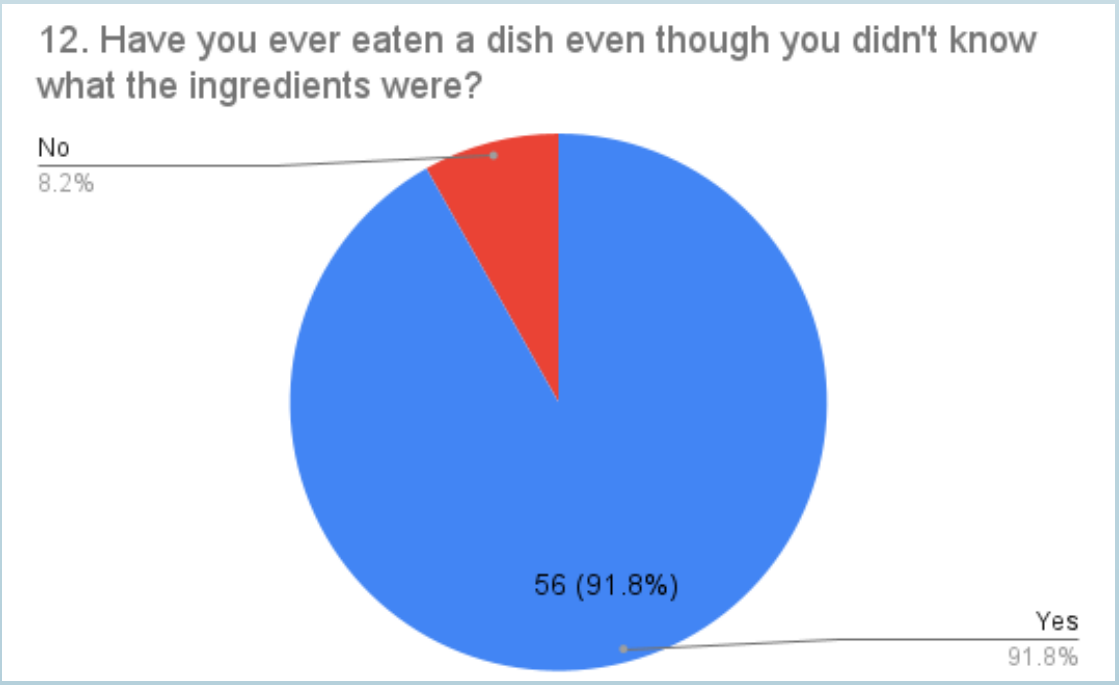


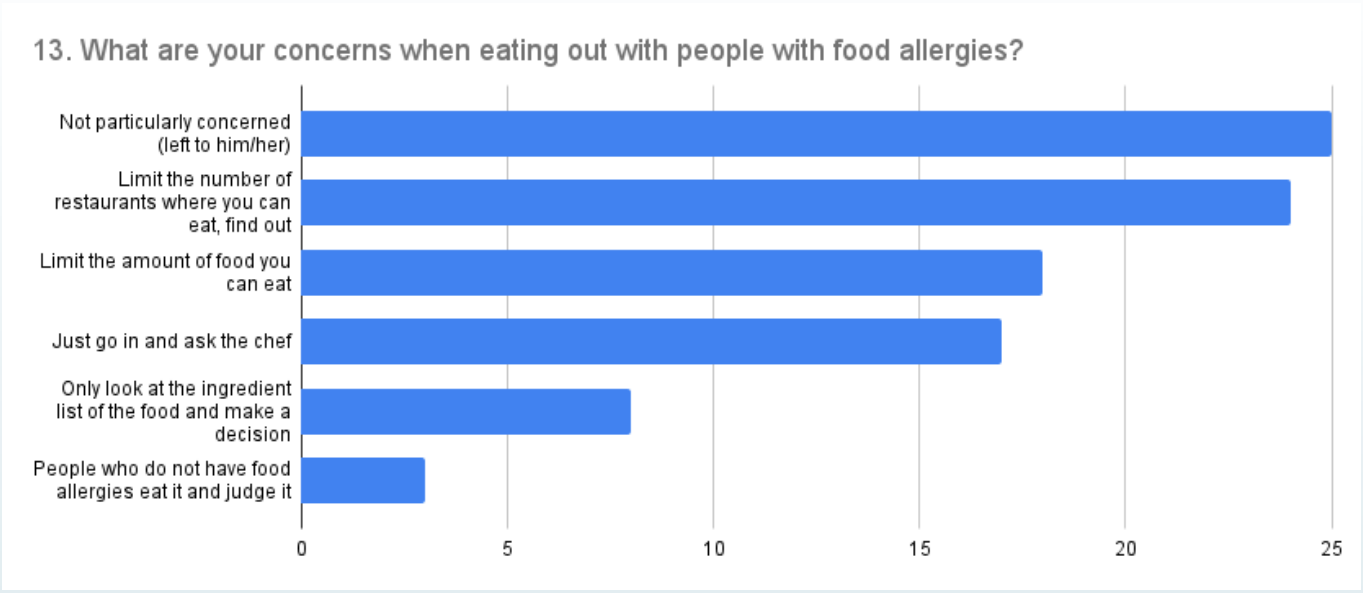
9. Does the person with food allergies (friends, family) have an EpiPen when eating out?

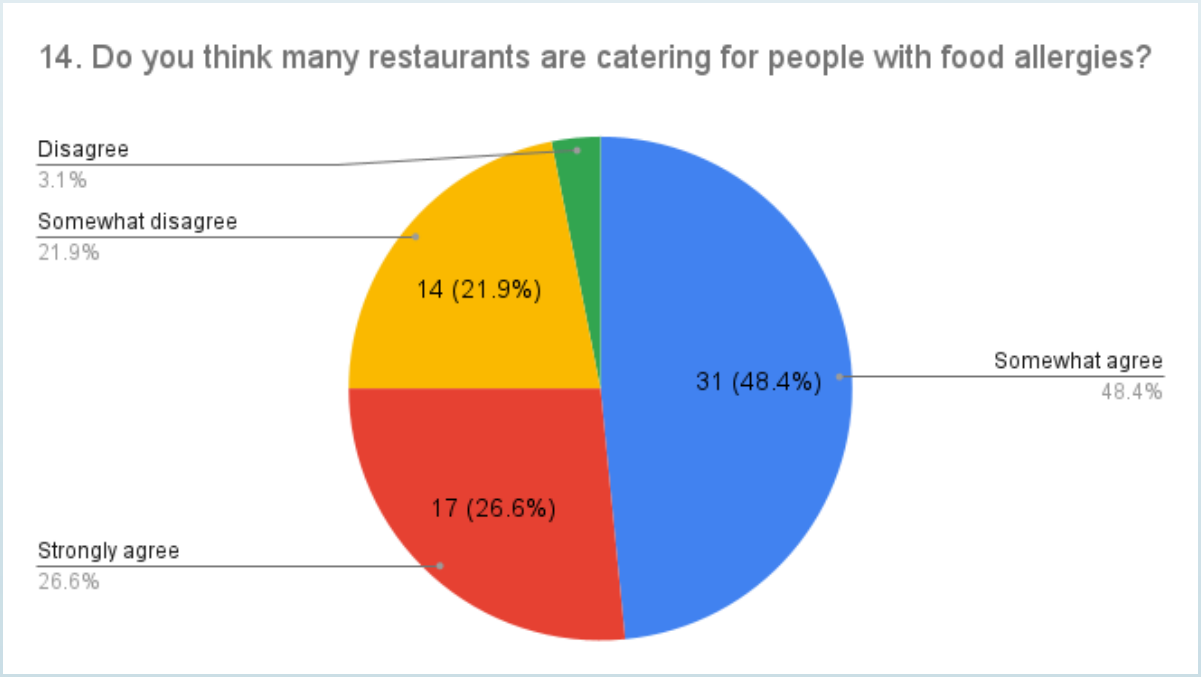


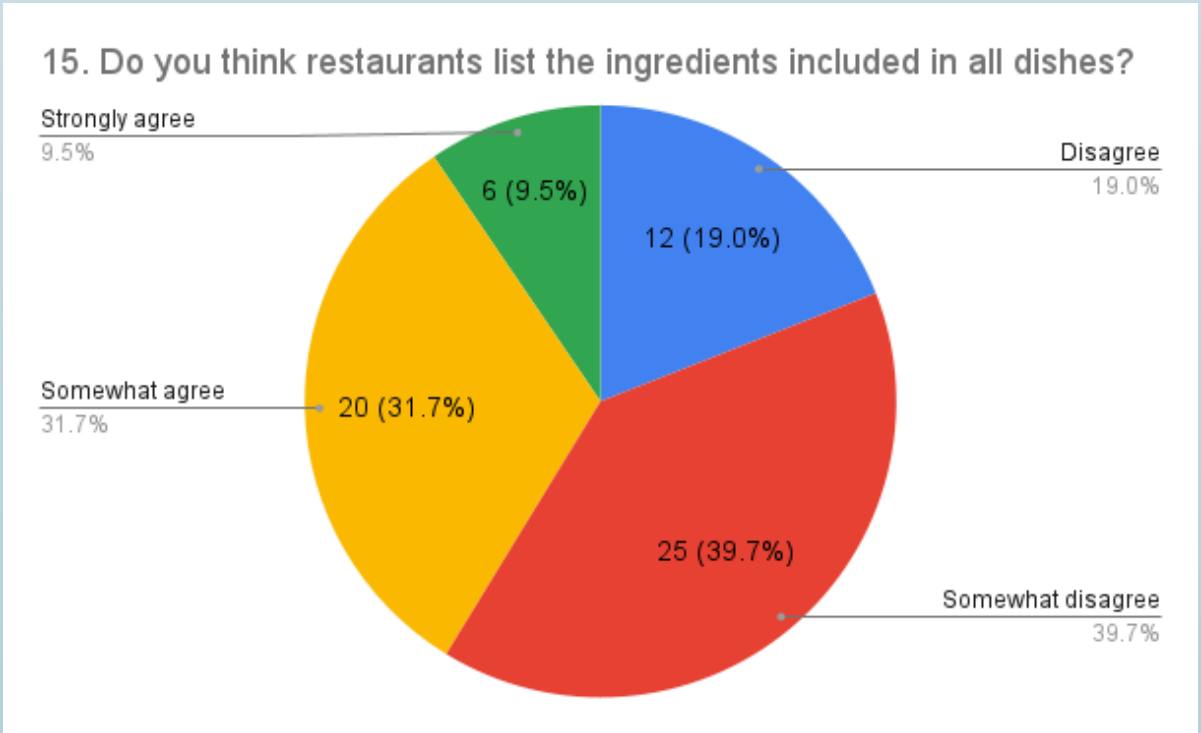


11. If you answered Yes, why do you feel anxious?
I don't know the level of allergy symptoms, so I'm worried if it's safe when it's offered.
Because sometimes I don't know what's in the food
Because I don't know what's in the food.
Concerned I'm going to be contaminated with the allergen.
coz you need to pick a menu that works for someone with allergies
Even if they are careful, I am worried about how to respond and help when symptoms arise
It hard to ask for the food to which the person is allergic, even if I want to eat it myself.
Worried about what I need to do to help them
If they have a reaction, im not sure what to do/ the proper procedure
Because the ingredients are not well labelled and you are on your own.
I am worried about the possibility of extreme allergic symptoms that could be life-threatening.
Concerns about allergy sources on crockery, etc., cutting boards and plates.
Whether there are any allergenic items in the food

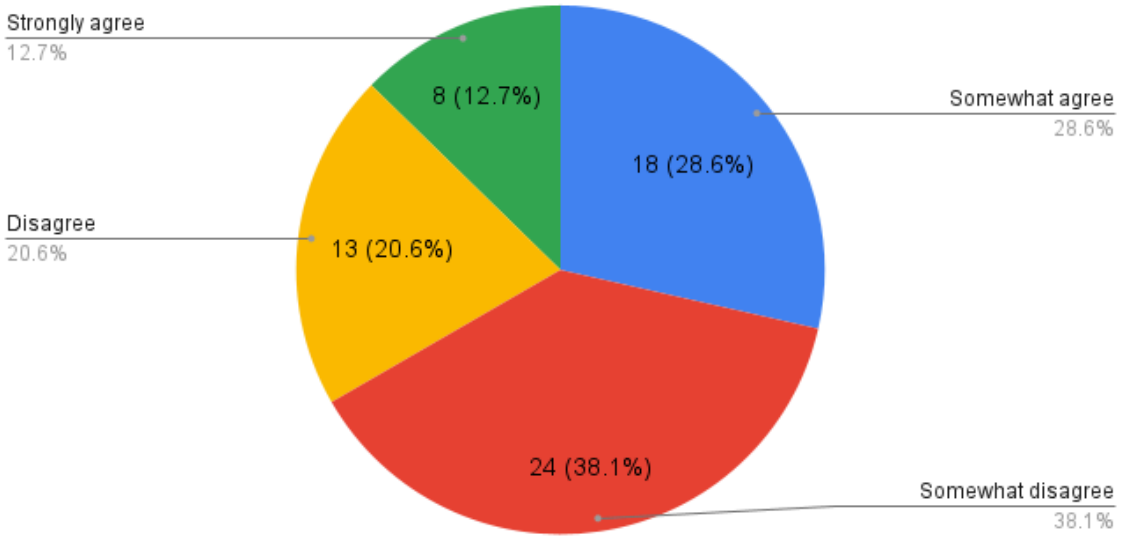



13. What are your concerns when eating out with people with food allergies?
Not particularly concerned (left to him/her)
Limit the number of restaurants where you can eat, find out
Limit the amount of food you can eat
Just go in and ask the chef
Only look at the ingredient list of the food and make a decision
People who do not have food allergies eat it and judge it
0
5
10
15
20
25

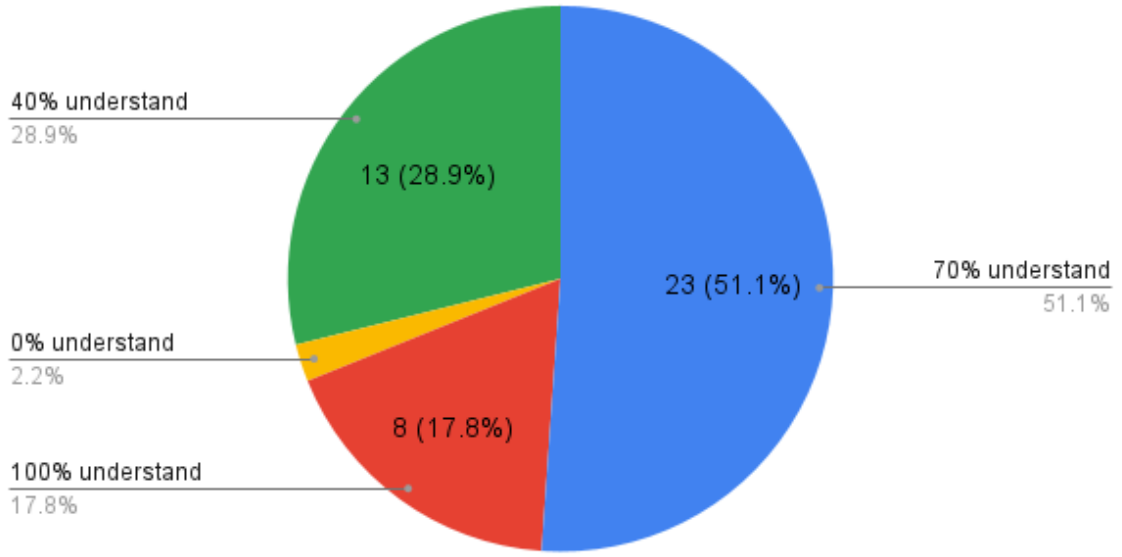

14. Do you think many restaurants are catering for people with food allergies?
Disagree
3.1%
Somewhat disagree
21.9%
14 (21.9%)
31 (48.4%)
Somewhat agree
48.4%
17 (26.6%)
Strongly agree
26.6%


15. Do you think restaurants list the ingredients included in all dishes?
Strongly agree
9.5%
6 (9.5%)
Disagree
19.0%
12 (19.0%)
Somewhat agree
31.7%
20 (31.7%)
25 (39.7%)
Somewhat disagree
39.7%

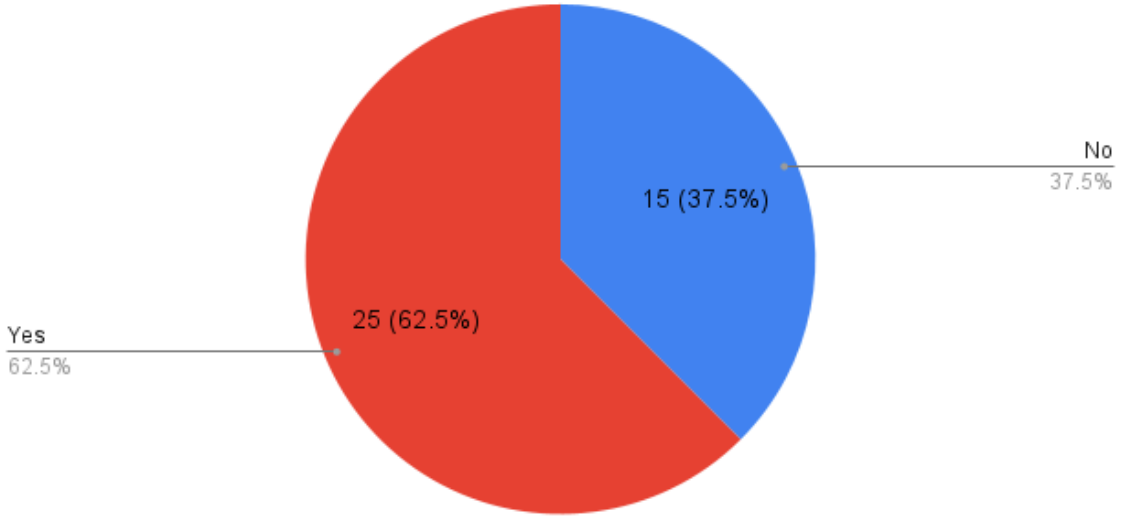
16. Do you think the list of ingredients is also displayed when ordering online?

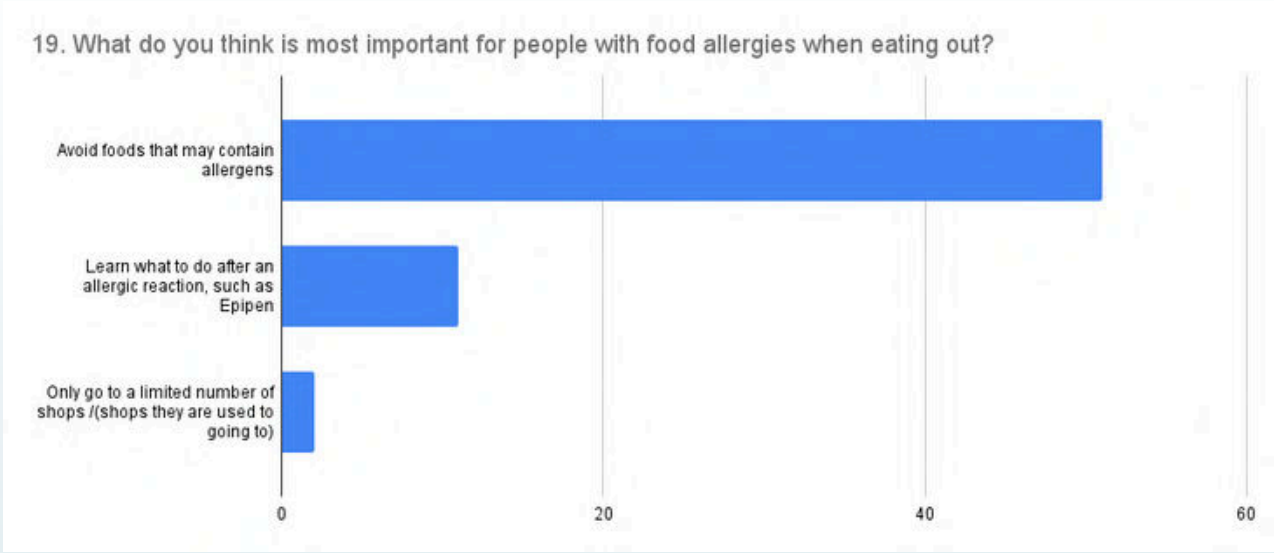


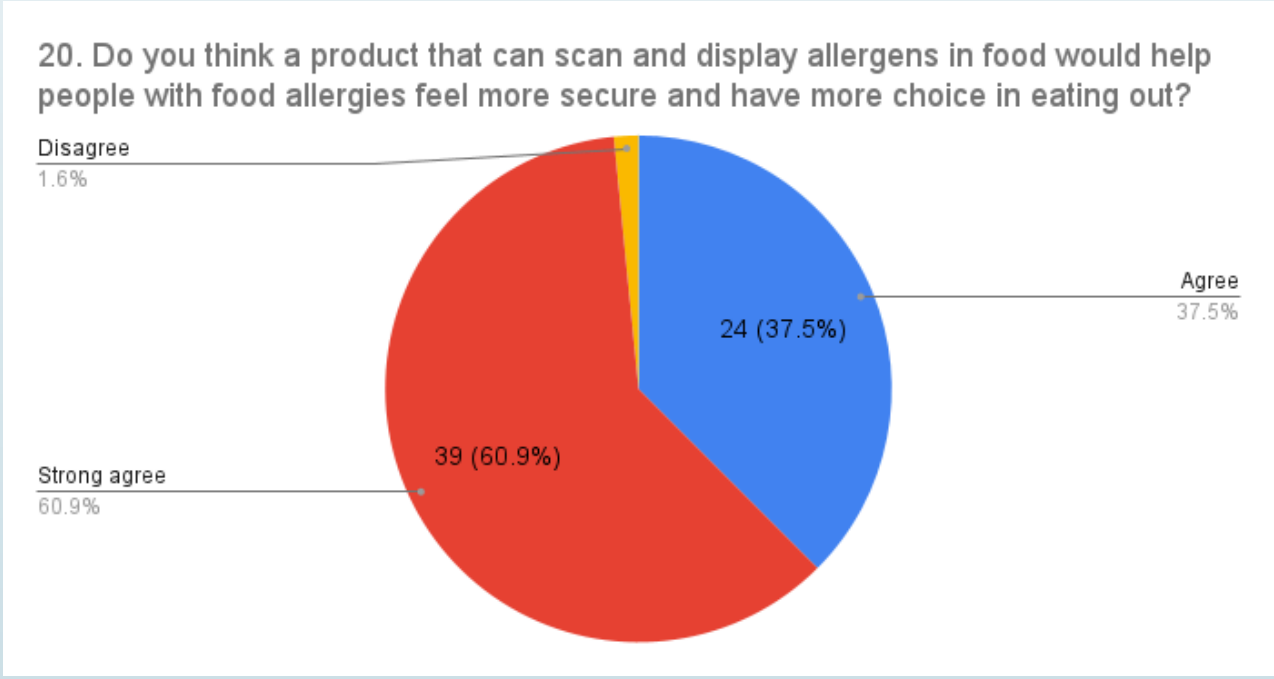
17. For those who have worked in restaurants, do you know everything about what is included in what you make in the restaurant?

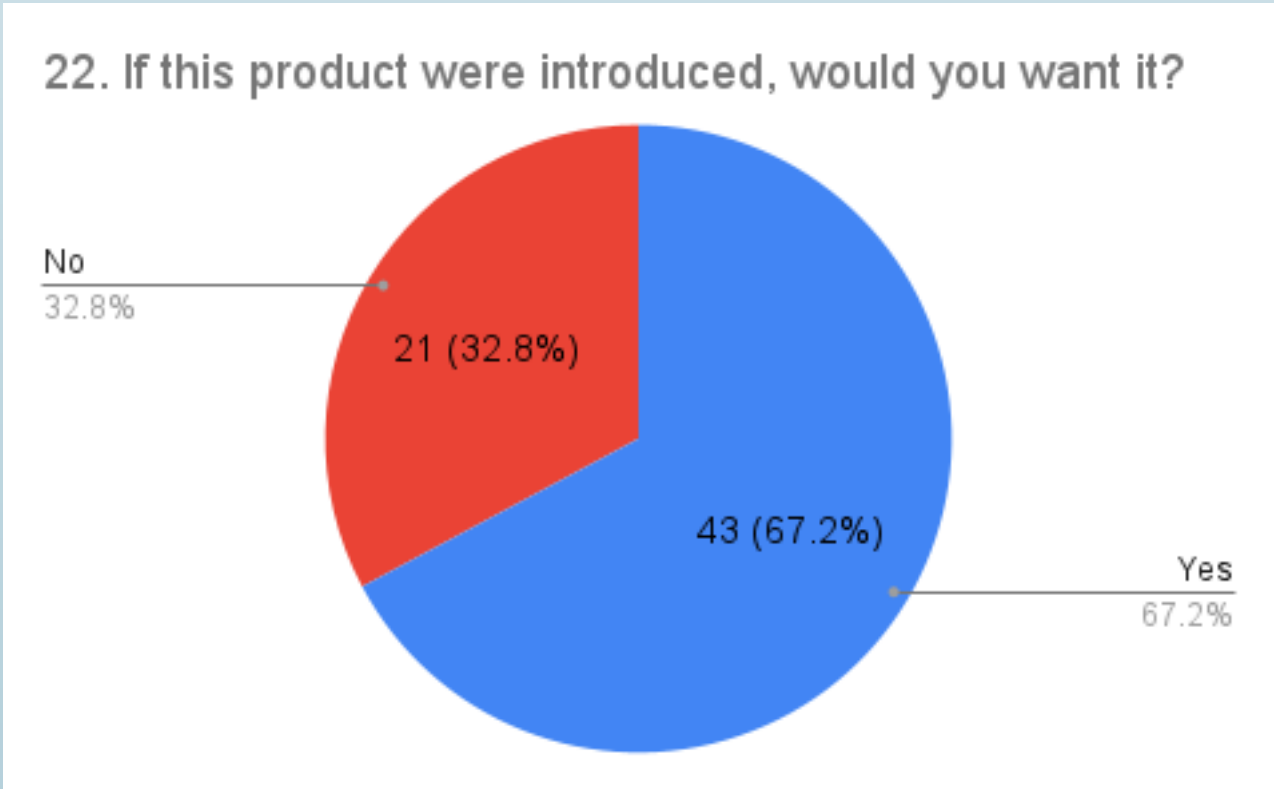


18. For those who have worked in restaurants, have you ever used the same chopping board or knife to cut different vegetables or ingredients?




19. What do you think is most important for people with food allergies when eating out?
Avoid foods that may contain allergens
Learn what to do after an allergic reaction, such as Epipen
Only go to a limited number of shops /(shops they are used to going to)
0
20
40
60


20. Do you think a product that can scan and display allergens in food would help people with food allergies feel more secure and have more choice in eating out?
Disagree
1.6%
Agree
37.5%
24 (37.5%)
39 (60.9%)
Strong agree
60.9%


22. If this product were introduced, would you want it?
No
32.8%
21 (32.8%)
43 (67.2%)
Yes
67.2%

21. In which situations would you find a product that can scan and display allergens in food would most beneficial?
in restaurants
dining out
While scanning the product before buying it
When you come across a restaurant that does not have an ingredient label, but you want to try it, and you decide if you can eat it.
When traveling, or to small restaurants
When transitioning from weaning to regular food
When the allergens are not listed on the menu.
When someone with allergies wants to know what ingredients are in a dish.
When shopping or eating out, it would be nice to save the hassle of having to look things up yourself or ask people.
When shopping and dining
When looking at menu to prevent ordering food that contains allegies, before eating
When eating outside without knowing what specific ingredients are used for the dish.
When eating out with a large group
When eating out or grocery shopping
When eating out or eating food given as a gift
When eating out in a country where I do not speak in the language.
When eating out at restaurants
When eating out
When eating
When checking for allergens such as sauces, which are difficult to detect if they have been contaminated during the cooking or production process.
When buying food from stalls, e.g. at festivals
When I cannot identify the ingredients used in a dish at a quick glance
Supermarket
Restaurants where food is brought directly from the raw, such as seafood markets and barbecue gardens.
Restaurant
Places where treatment cannot be given immediately, such as by plane or ship.
Overseas trip, restaurant
Overseas trip
Meals with unknown ingredients
It is also ideal for use in supermarkets and restaurants
If the language is not understood or raw materials cannot be identified in a foreign country
Going out
Go restaurant with friends and don't wanting to bothered
Eating out/ new restaurants
Eating out, sweets received
Eating out or eating food that you didnt make
Eating out
Dining out at restaurant and Grocery shopping

Appendix 2: Interview transcripts

Interviewee 1: Haruto, 22 years with egg allergies

Interviewer : Hi, Haruto. Thank you for cooperating with my interview today.
Haruto: No worries! I'm happy to talk to you.

Interviewer : I am currently conducting research at a university aimed at creating an environment where people with food allergies can enjoy eating out in peace. And I was chosen as an interviewee for this interview because you have been living with food allergies for a long time.
Haruto: Sounds great! How can I help you?

Interviewer :So, the first question is what types of food allergies do you have?
Haruto: I am currently allergic to fruits such as eggs, apples, cherries and kiwi.

Interviewer : Wow, that's a lot. What is their allergic level? Is it a very severe allergic reaction or a minor allergic reaction?
Haruto: I think it is minor now. Eating them only causes itchy skin and throat. Also, if eggs and fruit are heated, allergic reactions are less likely to occur.

Interviewer :I see. In the past, you couldn't eat them even it's cooked?
Haruto: Yeah, so my parents were careful to check the ingredients list when they bought something in the supermarket.

Interviewer : How long have you had the allergy?
Haruto: I have had egg allergies since I was borned, so it's almost 22 years. Fruit allergies started appearing when I was around 12 years old and I still have an ever-increasing variety of fruit allergies.

Interviewer : Wow, that's quite a long time. Do you have any kind of plan to deal with an allergic reaction if you have one? Like you will take medicine or bring an Epipen anywhere.
Haruto: Actually no I don't. I've never used an Epipen and medicine. I understand my allergy symptoms so I have never taken that much action.

Interviewer : Okay Thank you. Now I'd like to ask you about the eating outside situation.
Haruto: Okay.

Interviewer : Do you experience any difficulties from having food allergies when eating out?
Haruto: Not particularly now, but it used to be. Many dishes were likely to contain eggs so my dishes are limited to those which do not include eggs.

Interviewer : That's sad. Are there any actions you took when you went to restaurants?
Haruto: I used to tell restaurant staff that I was allergic to eggs and ask them to make me an egg-free dish, or I would judge for myself what dishes I could eat.

Interviewer : Do you think many restaurants cater for allergy sufferers?
Haruto: I think it depends on the restaurant. While upscale restaurants will check for allergies, fast food restaurants often omit that they do check or display what ingredients are included.

Interviewer : I agree with you. What do you think are the major problems for allergy sufferers when eating out?
Haruto: The main problem I think is allergic reactions caused by cross-contamination, which the patient cannot identify. Feel that by using the same chopping boards and knives, allergens on them may be on their food.

Interviewer :Yeah that's scary. There are now products for food allergies that put pieces of food into disposable capsules and detect the allergens contained in them. What do you think about that?
Haruto: I think it's very helpful for me. but I think if it's just part of the food, it reacts differently in different places. And I guess preparing a new capsule for every inspection is likely to cause problems, such as forgetting to refill the next one after one use and not being able to use it at the next restaurant outing.

Interviewer: Okay, If a new portable allergy testing device were to be designed, what design would you prefer?
Haruto: It should have a compact design that can be worn at all times. Ready for immediate inspection at any time. For example, watches, necklaces, rings, key holders?
It would be nice to be able to inspect them easily and quickly, without needing to go through various steps before using them.

Interviewer:Nice! Okay final question! Do you think a product that can scan and display allergens in food would help people with food allergies feel more secure and have more choice in eating out?
Haruto: I definitely think so. It could be very useful in situations where I don't know what is included, such as overseas traveling. I want it !

Interviewer: Okay, This concludes the interview. Thank you very much for your cooperation in this interview. If you have any new ideas for the design, please contact me at any time.
Haruto: Okay! Thank you too. Good luck with your assignment!

Interviewee 2: Shino, 43 years with raw shellfish allergies

(Her son has also allergies of eggs)

Interviewer : Hi, Shino. Thank you for cooperating with my interview today.
Shino: It's alright. How can I help you?

Interviewer : I am currently conducting research at a university aimed at creating an environment where people with food allergies can enjoy eating out in peace.
And I choose you as an interviewee for this interview because you have been living with food allergies for a long time.
Shino: I see. I'll answer anything as long as I can answer it.

Interviewer : Thank you very much! So, firstly, I'd like to ask you what types of food allergies you have?
Shino: I have shellfish allergies like prawn or crabs. But I can eat them if I boil or bake them.
Just cannot eat raw shellfish.

Interviewer : I see. If you eat raw shellfish, is the allergic reaction very severe? or minor?
Shino: I think it's a minor reaction like swollen lips, itchy throat, itchy ears. sometimes diarrhea.

Interviewer : Do you have allergic reactions even to the touch of raw shellfish?
Shino:Yes. Itching at the point of contact.

Interviewer : Wow, it's quite sensitive. When did you develop those symptoms?
Shino:It might be from 10 years old. I could eat before that, but suddenly i couldn't.

Interviewer : Have used any treatment for allergies such as Epipen, antihistamin?
Shino:No, I'Ve never used it. Because my symptoms are not too severe and stay safe it goes away.
If my symptoms are anything like anaphylactic shock, I think it's essential.

Interviewer : Okay Thank you. Now I'd like to ask you about the eating outside situation.
Shino: Okay!

Interviewer : Do you experience any difficulties from having food allergies when eating out?
Shino: I think it's that I don't know how cooked the food is because I didn't cook it myself.

Interviewer : Have you ever had an allergic reaction at a restaurant?
Shino: Yes I have. I ordered Fried prawn because it's fried so I figured I could eat it.
But actually, only the outside was fried and the inside was raw, causing allergic reactions.

Interviewer : Certainly that can only be judged by actually eating it.
Shino: Yes, so after that, I don't order shellfish even it's cooked. So food available in the restaurant was slightly restricted.

Interviewer : That's sad. Are there any actions you took when you went to restaurants?
Shino: Basically, if there is a picture on the menu, that is the best way to judge. Occasionally, I have to report allergies to the restaurant staff.

Interviewer : Do you think many restaurants cater for allergy sufferers?
Shino: No, I don't think so. There is a large gap between where it is done and where it is not. There are many shops that do not list the allergies they contain.

Interviewer :Do you think many restaurant staff understand what might contain that allergen when you report an allergy?
Shino: My allergy is easy to understand, but my son was allergic to eggs and they sometimes served him with mayonnaise, even though I told them he was allergic to eggs.
So,I think many employees do not understand the allergies contained with regard to processed products.

Interviewer: :That's interesting. So You do not trust that the food served by the restaurant does not contain 100% allergens?
Shino: Yes. The ultimate responsibility lies with us, so we don't eat anything that might have even the slightest chance of being in it.

Interviewer: :There are now products for food allergies that put pieces of food into disposable capsules and detect the allergens contained in them. What do you think about that?
Shino: If the decision is based solely on whether an allergen is present or not, it might be judged as inedible even if it could be eaten after being boiled, like in my case. I hope decisions can be made based on the severity of the allergen.

Interviewer: :If a new portable allergy testing device were to be designed, what design would you prefer?
Shino:Well... I want something compact and lightweight because I want to carry it with me.
And ideally, the method should also allow testing without direct contact with the food. In order to come into direct contact with the foodstuff, the foodstuff would have to be purchased, so a non-contact testing method would allow the allergen to be confirmed before purchasing the foods.

Interviewer: :Okay final question! Do you think a product that can scan and display allergens in food would help people with food allergies feel more secure and have more choice in eating out?
Shino:Yes I think so. They will be able to eat food I have avoided in the past and more choices when choosing a shop. It would also reduce stress in eating out.

Interviewer: Okay, This concludes the interview. Thank you very much for your cooperation in this interview. If you have any new ideas for the design, please contact me at any time.
Shino: No worries!! Thank you !

Appendix 3: Participants concent form

Interview information concent form

PARTICIPANT INFORMATION FOR CAPSTONE RESEARCH PROJECT
– Interview / Focus Group / Observations–

Ensuring people with food allergies can eat food safely when eating outside

Research team

Principal Researcher:	Yuki Maeda	Undergraduate
Unit Coordinators:	Rafael Gomez	Unit Coordinator
	Tim Williams	Unit Co-Coordinator

School of Design/Faculty of Creative Industries, Education and Social Justice
Queensland University of Technology (QUT)

Why is the study being conducted?
This interview project is being undertaken as part of Industrial Design Capstone project for Yuki Maeda.

The purpose of this project is to ensure people with food allergies can eat food safely when eating outside. You are invited to participate in this interview project because you have been living with food allergies for a long time.

What does participation involve?
Your participation will involve an audio record interview at voice recording or other agreed location that will take approximately 30 minutes of your time.

Questions will include:
- How long have you had the allergy?
- Do you experience any difficulties from having food allergies when eating out?
- Are there any actions you took when you went to restaurants?
- If a new portable allergy testing device were to be designed, what design would you prefer?

Your participation in this research project is entirely voluntary. If you do agree to participate you can withdraw from the research project without comment or penalty. You can withdraw anytime during the interview. If you withdraw with 2 weeks after your interview, on request any information already obtained that can be linked to you will be destroyed. Your decision to participate or not participate will in no way impact upon your current or future relationship with QUT (for example my grades)
You will be able to review a transcript of your responses after the interview.

What are the possible benefits for me if I take part?
It is expected that this research project will not benefit you directly. The outcomes of the research, however, may benefit the end user. You can request a summary of the outcomes of the study by providing an email address or contact address.

What are the possible risks for me if I take part?
There are no risks beyond normal day-to-day living associated with your participation in this research project.

QUT provides for limited free psychology, family therapy or counselling services for research participants of QUT research projects who may experience discomfort or distress as a result of their participation in the research. Should you wish to access this service please call the Clinic Receptionist on **07 3138 0999** (Monday–Friday only 9am–5pm), QUT Psychology and Counselling Clinic, 44 Musk Avenue, Kelvin Grove, and indicate that you are a research participant. Alternatively, Lifeline provides access to online, phone or face-to-face support, call **13 11 14** for 24 hour telephone crisis support. If you are aged up to 25, you can also call the Kids Helpline on **1800 551 800**.

What about privacy and confidentiality?
All comments and responses are coded i.e. it be possible to re-identify you. A re-identifying code stored separately to personal information (e.g. name, address), will only be accessible to the research team, and the code plus identifying information will be destroyed the end of the semester.

Any data collected as part of this research project will be stored securely on personal computers or password protected cloud storage systems (not on public storage systems). Data will be deleted once the project is complete at the end of the semester.

As the research project involves an audio recording:
- You will have the opportunity to verify your comments and responses prior to final inclusion.
- The recording will not be used for any other purpose.
- Only the named researchers will have access to the recording.
- It is possible to participate in the research project without being recorded.

Every effort will be made to ensure that the data you provide cannot be traced back to you in reports, publications and other forms of presentation. For example, we will only include the relevant part of a quote, we will not use any names, or names will be changed, and/or details such as dates and specific circumstances will be excluded. Nevertheless, while unlikely, it is possible that if you are quoted directly your identity may become known.

How do I give my consent to participate?
We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate.

Name: Haruto Yamamoto
Signature: 山本 陽士
Date: 20.08.2024

PARTICIPANT INFORMATION FOR CAPSTONE RESEARCH PROJECT
– Interview / Focus Group / Observations–

Ensuring people with food allergies can eat food safely when eating outside

Research team

Principal Researcher:	Yuki Maeda	Undergraduate
Unit Coordinators:	Rafael Gomez	Unit Coordinator
	Tim Williams	Unit Co-Coordinator

School of Design/Faculty of Creative Industries, Education and Social Justice
Queensland University of Technology (QUT)

Why is the study being conducted?
This interview project is being undertaken as part of Industrial Design Capstone project for Yuki Maeda.

The purpose of this project is to ensure people with food allergies can eat food safely when eating outside. You are invited to participate in this interview project because you have been living with food allergies for a long time.

What does participation involve?
Your participation will involve an audio record interview at voice recording or other agreed location that will take approximately 30 minutes of your time.

Questions will include:
- How long have you had the allergy?
- Do you experience any difficulties from having food allergies when eating out?
- Are there any actions you took when you went to restaurants?
- If a new portable allergy testing device were to be designed, what design would you prefer?

Your participation in this research project is entirely voluntary. If you do agree to participate you can withdraw from the research project without comment or penalty. You can withdraw anytime during the interview. If you withdraw with 2 weeks after your interview, on request any information already obtained that can be linked to you will be destroyed. Your decision to participate or not participate will in no way impact upon your current or future relationship with QUT (for example my grades)
You will be able to review a transcript of your responses after the interview.

What are the possible benefits for me if I take part?
It is expected that this research project will not benefit you directly. The outcomes of the research, however, may benefit the end user. You can request a summary of the outcomes of the study by providing an email address or contact address.

/users/nekonosuke/downloads/dnb311_interview_focus group_observation_participant_information_sheet.docx
Version x Page 1 of 3

What are the possible risks for me if I take part?
There are no risks beyond normal day-to-day living associated with your participation in this research project.

QUT provides for limited free psychology, family therapy or counselling services for research participants of QUT research projects who may experience discomfort or distress as a result of their participation in the research. Should you wish to access this service please call the Clinic Receptionist on **07 3138 0999** (Monday–Friday only 9am–5pm), QUT Psychology and Counselling Clinic, 44 Musk Avenue, Kelvin Grove, and indicate that you are a research participant. Alternatively, Lifeline provides access to online, phone or face-to-face support, call **13 11 14** for 24 hour telephone crisis support. If you are aged up to 25, you can also call the Kids Helpline on **1800 551 800**.

What about privacy and confidentiality?
All comments and responses are coded i.e. it be possible to re-identify you. A re-identifying code stored separately to personal information (e.g. name, address), will only be accessible to the research team, and the code plus identifying information will be destroyed the end of the semester.

Any data collected as part of this research project will be stored securely on personal computers or password protected cloud storage systems (not on public storage systems). Data will be deleted once the project is complete at the end of the semester.

As the research project involves an audio recording:
- You will have the opportunity to verify your comments and responses prior to final inclusion.
- The recording will not be used for any other purpose.
- Only the named researchers will have access to the recording.
- It is possible to participate in the research project without being recorded.

Every effort will be made to ensure that the data you provide cannot be traced back to you in reports, publications and other forms of presentation. For example, we will only include the relevant part of a quote, we will not use any names, or names will be changed, and/or details such as dates and specific circumstances will be excluded. Nevertheless, while unlikely, it is possible that if you are quoted directly your identity may become known.

How do I give my consent to participate?
We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate.

Name: SHINO MAEDA
Signature: Shino Maeda
Date: 20. 08. 2024

Survey information concent form

PARTICIPANT INFORMATION FOR CAPSTONE RESEARCH PROJECT
– Survey –

Ensuring people with food allergies can eat food safely when eating outside

Research team

Principal Researcher:	Yuki Maeda	Undergraduate
Unit Coordinators:	Rafael Gomez	Unit Coordinator
	Tim Williams	Unit Co-Coordinator

School of Design/Faculty of Creative Industries, Education and Social Justice
Queensland University of Technology (QUT)

Why is the study being conducted?
This research project is being undertaken as part of an Industrial Design Capstone project for Yuki Maeda.

The purpose of this project is to ensure people with food allergies can eat food safely when eating outside.

You are invited to participate in this research project because you have food allergies yourself and meet the end-user requirements.

What does participation involve?
Participation will involve completing a google forms questionnaire with Likert scale answers, yes or no, multiple choice and short answer that will take approximately 10 minutes of your time.

Questions will include:

Do you have any food allergies?
What kind of food allergies do you have?
In which situations would you find product that analyses and tells you the allergens in your food most beneficial?

Your participation in this research project is entirely voluntary. If you agree to participate you do not have to complete any question(s) you are uncomfortable answering. Your decision to participate or not participate will in no way impact upon your current or future relationship with QUT my grades. If you do agree to participate you can withdraw from the research project during your participation without comment or penalty. Any information already obtained that can be linked to you will be destroyed. However, as the survey does not request any personal identifying information, once it has been submitted it will not be possible to withdraw.

You will be able to review your responses before submitting and save a copy of your responses after submitting the survey.

What are the possible benefits for me if I take part?
It is expected that this research project will not benefit you directly. The outcomes of the research, however, may benefit the end user in the food allergies industry. You can request a brief summary of the outcomes of the study by providing an email address or contact address.

What are the possible risks for me if I take part?
There are no risks beyond normal day-to-day living associated with your participation in this research project.

QUT provides for limited free psychology, family therapy or counselling services for research participants of QUT research projects who may experience discomfort or distress as a result of their participation in the research. Should you wish to access this service please call the Clinic Receptionist on **07 3138 0999** (Monday–Friday only 9am–5pm), QUT Psychology and Counselling Clinic, 44 Musk Avenue, Kelvin Grove, and indicate that you are a research participant. Alternatively, Lifeline provides access to online, phone or face-to-face support, call **13 11 14** for 24 hour telephone crisis support. If you are aged up to 25, you can also call the Kids Helpline on **1800 551 800**.

What about privacy and confidentiality?
All comments and responses are anonymous i.e. it will not be possible to identify you at any stage of the research, because personal identifying information is not sought in any of the responses and no traceable information is collected via the server or survey tool.

Any data collected as part of this research project will be stored securely on personal computers or password protected cloud storage systems (not on public storage systems). Data will be deleted once the project is complete at the end of the semester.

How do I give my consent to participate?
The submission or return of the completed survey is accepted as an indication of your consent to participate in this research project.

What if I have questions about the research project?
If you have any questions or require further information please contact the researcher:

Yuki Maeda n11020318@qut.edua.u 0405948625

What if I have a concern or complaint regarding the conduct of the research project?
The researcher is committed to research integrity and the ethical conduct of research projects. If you wish to discuss the study with someone not directly involved, particularly in relation to matters concerning policies, information or complaints about the conduct of the study or your rights as a participant, you may contact the Unit Coordinator on email (Rafael Gomez) r.gomez@qut.edu.au or (Tim Williams) tim.williams@qut.edu.au

Thank you for helping with this research project. Please keep this sheet for your information.