

# The Effects of Food Allergy and Food Intolerance on the Development of Concepts of Healthy Eating and Nutrition: Incidence Rates in an Australian Population.

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## ABSTRACT

A food intolerance is a pharmacological reaction to the chemicals contained in a food or a food substance. Surveys in Australia indicate that around 25% of the population perceive that they have some form of intolerance to a food or food additive, however, there is currently no data regarding incidence rates of diagnosed food intolerances in Australia. Studies have linked some food chemical intolerances to the severity of symptoms in psychological illnesses such as Autism and ADHD. Similarly, emerging research out of the UK provides evidence that the increased processing of food, and reliance on artificial food additives, could be having detrimental affects on the health and behaviour of children. Healthy eating and nutrition has been identified as one of the major components that requires addressing in response to the current obesity epidemic in Australia. This paper presents the results of a population study of the incidence of food intolerances for the state of Queensland, and discusses the implications of this for the ways in which healthy eating is conceptualised.

## INTRODUCTION

Food hypersensitivity is an umbrella term used to describe the range of adverse reactions that individuals can have to food, and include food allergies and food intolerances (Madsen, 2005). While included under the same term, there is an important distinction between the two. A true food allergy involves the body's immune system responding to a component of food seen as toxic by the body. It is a complex process in which the body produces antibodies to attempt to control a physical reaction to the ingested substance (Anaphylaxis Australia, 2008). Reactions can range from eczema, to wheezing, to anaphylaxis, which can ultimately result in death.

In contrast, a food intolerance is a reaction to some chemical component of a food (Dengate, 2008; Eggesbo et al., 1999; Swain, Soutter & Loblay, 2002). An intolerance is often likened to the experience of a side effect from a drug, as it involves a chemical reaction inside the body. Reactions from a food intolerance can range from behavioural disturbances, chronic skin disorders, asthma, gastrointestinal complaints and a range of other symptoms. Apart from the activation of the body's immune system, the main difference between a food allergy and a food intolerance is that an intolerance is extremely unlikely to result in anaphylaxis, and therefore the risk of death is negligible. Individuals can be intolerant to both natural and artificial components of foods (Swain et al, 2002) and the natural chemicals in some foods can be just as problematic for some individuals as the artificial ones. These individuals would be said to have a natural food chemical intolerance.

Swain et al (2002) provide an overview of the natural food chemicals that can cause adverse reactions and explain that such chemicals are found in many different foods. For an individual who suffers a natural chemical intolerance, the more of these chemicals that are consumed, the more likely it is for some reaction to occur (indeed the same process applies to someone intolerant to artificial food chemicals – e.g. colourings or preservatives). There are three classes of natural chemicals which can be problematic; salicylates, amines and

glutamates. Salicylates are a family of plant based chemicals found naturally occurring in many fruits and vegetables, herbs and spices, scented products (i.e. toiletries) and some medications (e.g. aspirin). Amines are a naturally occurring product of protein breakdown and fermentation. These chemicals are found in large quantities in cheese, chocolate (cocoa), wine, yeast extracts (e.g. vegemite) and fish products. They are also found in some fruits and vegetables, particularly those which are typically eaten after ripening (e.g. bananas, tomatoes, and avocados) as this process involves a form of fermentation. Glutamates are the naturally occurring form of what is known as MSG (monosodium glutamate), and is found naturally in most foods as it is the building block of all proteins. However, in its free form, not linked to a protein, it enhances the flavour of foods (Swain et al, 2002). Foods rich in natural glutamates include tomatoes, mushrooms, yeast extracts, stock cubes and cheeses. MSG exists in both natural and artificially derived forms, and is commonly added to snack foods as flavour enhancer 621. Swain et al, provide lists of foods which contain different concentrations of each combination of these natural food chemicals.

Australia has one of the highest prevalence rates for food allergy in the world (Allen, Hill & Heine, 2006), and some studies suggest that this prevalence is rising (Hill, Heine & Hosking, 2004). In addition, there are indications that the prevalence of food intolerance in Australia is also on the increase (Hadley, 2006). Some studies have linked natural and artificial food chemical intolerances to the severity of symptoms in psychological illnesses such as Autism and ADHD. Furthermore, emerging research from the UK provides evidence that the increased processing of food, and reliance on artificial food additives, could be having detrimental affects on the health and behaviour of children (Bateman et al, 2004; McCann et al, 2007). Given these observed effects on children, it is imperative that population based prevalence estimates are established in order to ascertain the number of individuals who are potentially affected. There are currently no such incidence estimates for the Australian population.

Healthy eating and nutrition has been identified as one of the major components that requires addressing in response to the obesity epidemic alongside levels of physical inactivity. Accordingly, a number of initiatives have been put into place that target the wider population, with the aim of promoting healthy eating, in particular, greater consumption of fruits and vegetables, and less consumption of fats, salt and sugar. Many of these programs have been around for a number of years and have gone through a number of iterations. In addition to these population based programs, schools across Australia are currently adopting and implementing a variety of food guidelines designed to minimise the amount of sugar, fat and salt offered through these services, and thereby to decrease the consumption of such foods amongst students. Both school canteens and school curriculum's are increasingly focussing attention on instilling concepts of healthy eating and nutrition amongst their students, through the provision of healthy food alternatives, and curriculum methods based on teaching children about healthy foods and how to make healthy food choices.

Current concepts of healthy eating targeted at the general public and school children alike are influenced heavily by the healthy food pyramid concept, and more recently by the 'Go for 2& 5' fruits and vegetables campaign. This can be clearly seen in the increasing reliance on mainstream conceptualisations of healthy food influencing school curriculum and tuckshop/canteen offerings. However, in focussing on the reduction of foods with a high fat, salt or sugar content, many alternative foods, even those endorsed by the canteens association of Australia, contain artificial additives such as colours, preservative and flavour enhancers. As a result these campaigns do not accommodate the often very different needs of children and families suffering food intolerance and allergy, and the differences in the ways in which these children, by necessity, conceptualise healthy food, eating and nutrition. Given the growing incidence of food allergy amongst children, and the perceived increase in children suffering food intolerances, it is important to re-examine the concepts that drive our understanding of healthy eating and nutrition.

The aim of this study was to gather information pertinent to establishing an estimate of the incidence of individuals with a diagnosed food intolerance in the Australian state of Queensland. While recent incidence rates are available for sufferers of food allergy, there is currently no data which outlines the rates at which individuals are affected by food intolerance in Australia, and none which indicates the types that appear to be more or less common. This study forms part of a larger project examining the ways in which food intolerances and allergies are conceptualised by children and adolescents, and the ways in which their immediate caregivers respond to these events in their children's lives. There are some indications to suggest that the incidence of food intolerance and food allergy is increasing, and this project represents a first step in examining the nature of these issues in an Australian context.

## METHOD

### Sampling Procedure.

This study was administered as part of the 4<sup>th</sup> Annual Queensland Social Survey (QSS) from within the Centre for Social Science Research, at CQ University. The final sampling report (Hanley & Mummery, 2008) can be obtained by contacting the Centre for Social Science Research. Data was collected in July and August 2008 as part of the QSS. The survey gathered data from a representative sample of the Queensland population by means of a computer assisted telephone interview (CATI) survey. The target population was all individuals 18 years or older who at the time of the survey were living in a dwelling in Queensland that could be contacted by a direct dialled land based telephone service. List assisted random digit dialling was utilised to draw the sample. Duplicate and mobile phone numbers were removed from the lists. The gender of the respondent in each household was pre-designated in order to ensure an equal representation of each gender in the random sample.

### Participants.

A pilot study of the whole QSS obtained data from 46 respondents in South East Queensland. No modifications of the food intolerance questions was considered necessary. The population study obtained data from 1243 respondents across the state of Queensland. Gender representation was even, with 50% ( $n=623$ ) being male. Sampling procedures split the state of Queensland into two specific sampling areas based on data obtained from the 2006 ABS census. Consistent with census findings, 66% ( $n=818$ ) of respondents resided in South East Queensland and the remaining 34% ( $n=425$ ) of the sample was sought from the rest of the state. The mean age of the total sample was 51.56 ( $SD=15.90$ ).

### Materials & Procedure.

The Queensland Social Survey is an annual omnibus survey that addresses a variety of topics of interest to the research community. The survey consists of a standardised introduction, a series of question sets reflecting the specific research interests of the university and community researchers participating in the study, and demographic questions. A set of questions relating to adverse food reactions were embedded within the survey. Respondents were first asked about their own reactions, and subsequently asked about the reactions of other individuals living in their households. Specifically, respondents were asked:

- Have you ever had an undesirable or adverse (negative) reaction to a food or food substance? (Yes, No)
- Have you been diagnosed by any medical or health professional, including a GP, paediatrician, dietician/nutritionist or nurse, with a food intolerance? (Yes, No).
- What food or food substance do/did you have a reaction to? (Verbatim responses were recorded for this question).

Respondents were also asked the above questions in relation to others who currently lived in their household (i.e. Has anyone else in your household ever had...) and asked to report the age of that person. Four response options were given regarding age: Child 0-4, Child 5-12, Adolescent 13-17, and Adult 18 plus.

## RESULTS

The frequencies of respondents indicating they, or someone else in their household, had had an adverse reaction to a food or food substance were examined first. Subsequent analyses were conducted examining respondents indicating an individual living within their household with a diagnosed food intolerance.

Frequency analysis indicated that 43% ( $n= 536$ ) of households surveyed had at least one individual who had had an adverse reaction to a food or food substance. Of those individuals, 42% ( $n= 227$ ) indicated that it was themselves who had had this reaction, 35% ( $n= 185$ ) indicated that someone else living in the household had had a reaction and the remaining 23% ( $n= 124$ ) indicated that both themselves and another person/s in the household had had an adverse reaction to a food. Subsequent analyses of the verbatim qualitative data indicated that approximately 2% ( $n= 11$ ) of these individuals had suffered a food poisoning experience.

Analysis of the data of respondents who indicated that someone in the household had a diagnosed food intolerance showed that 21% ( $n= 252$ ) of the total households surveyed had at least one person living in them with a diagnosed food intolerance, representing 47% of those who indicated an adverse food reaction. Of those with a food intolerance, 36% ( $n= 90$ ) reported that they had a diagnosed food intolerance, 50% ( $n= 126$ ) indicated that someone else living in the household had a diagnosed food intolerance, and the remaining 14% ( $n= 36$ ) indicated that they and at least one other individual living in their household had been diagnosed with a food intolerance. This equates to an incidence rate of at least 23% of individuals in the total sample (where 14% of households had at least 2 individuals with diagnosed food intolerance). Qualitative reports suggest that this estimate could be higher, and further analysis indicates that the household percentage comprised 323 individuals with a diagnosed food intolerance.

Examination of age data indicated that those individuals with a diagnosed food intolerance were overwhelmingly adults (81%,  $n= 262$ ). Figure 1 shows the differences in each age category for individuals under the age of 18, and indicates little difference in the frequency of diagnosed food intolerance for children and adolescents.

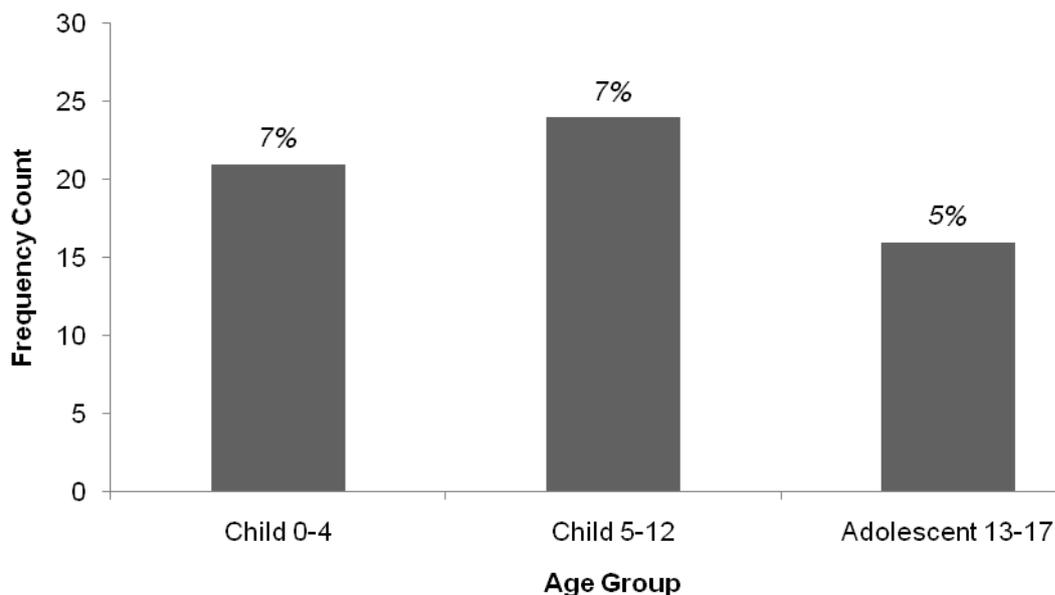


Figure 1. *Frequencies of diagnosed food intolerance in each age group under 18 years. Note percentages of total individual sample (N= 323) shown above data columns.*

Five food reaction categories were created from respondents qualitative reports of the foods they reacted to; additives; gluten & wheat; lactose and dairy; shellfish, nuts, eggs (indicating likely presence of an allergy); and natural chemical. Natural chemical reactions comprised individuals who specifically reported they reacted to salicylates, amines and/or glutamates or provided a list of foods that was consistent with the likelihood of a reaction to one or more of these natural food chemicals (i.e. a reaction to tomatoes, grapes and plums). Figure 2 shows the percentage of households which had an individual responding to each food category. It must be noted that the summing of percentages exceeds 100 as some households/individuals had co-occurring sensitivities (i.e. individuals responded to, for example, gluten and lactose). The figure indicates the highest reported percentage of adverse reaction was to natural food chemicals, followed by additives and potential allergy reactions.

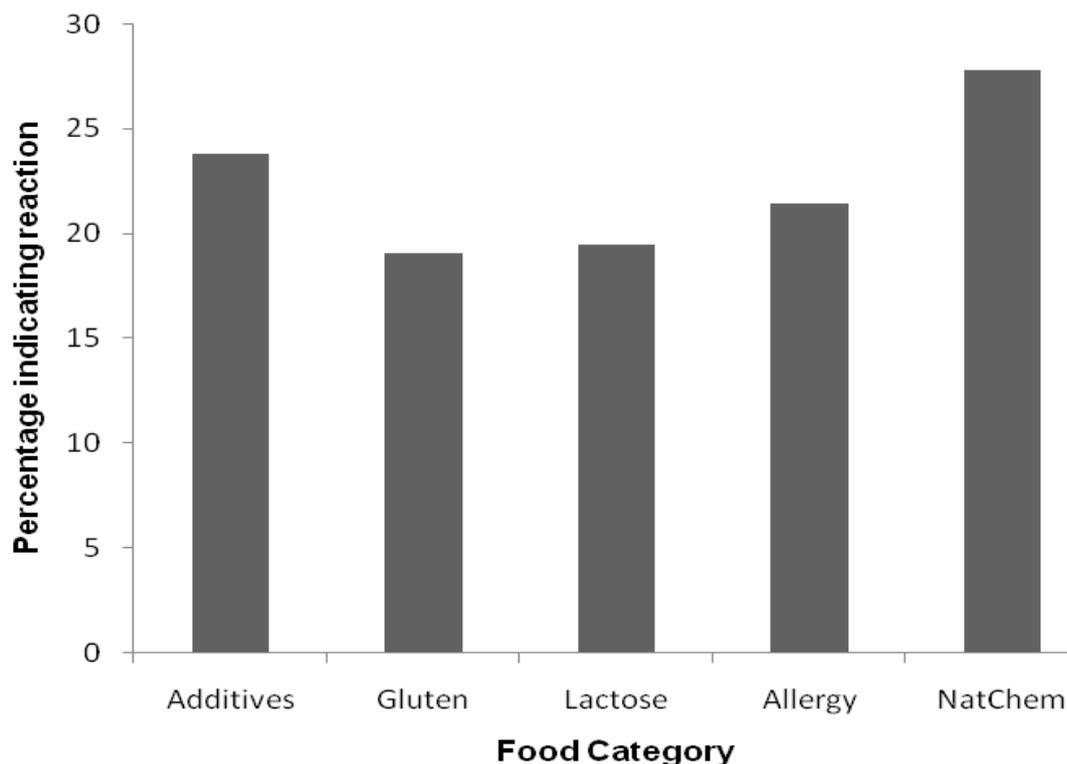


Figure 2. Percentages of household reaction within each food category.  
 Note. Percentages do not sum to 100 due to co-occurring sensitivities.

## DISCUSSION

The findings indicated an incidence rate for diagnosed food intolerance of 21% of households in the Queensland population, and a population incidence rate of at least 23% (where 14% of households indicated there was more than one person with diagnosed food intolerance). Based on 2006 ABS census data it is therefore probable that there are at least 822 853 individuals residing in Queensland who have been diagnosed with a food intolerance. Extrapolation to the Australian population sets this incidence rate at 19% (where Queensland represents 21% of the total Australian population). While it is possible, given the qualitative results, that this figure is compounded to some extent by those who have a food allergy, this contention requires further investigation. It is possible that some individuals who have been diagnosed with a food allergy equated this being diagnosed with a form of food intolerance. In the absence of the ability to recontact these people, the results need to be interpreted with caution. However, none of these individuals reported an anaphylactic reaction to the food/s they reported being intolerant to, adding strength to the argument these individuals had been diagnosed with an intolerance rather than an allergy.

Despite the potential confound of food allergies, the rate presented here only covers those households who reported an individual with a 'diagnosed' food intolerance. Given that over 40% of total respondents reported an adverse reaction to a food, but only 2% of this could be reliably attributed to a food poisoning experience, approximately 17% of households in Queensland reported an individual who had had some adverse reaction to a food that was not attributed to food poisoning or to a diagnosed food intolerance. There are a number of potential reasons for this disparity. Some of these individuals may understand the distinction between food allergy and food intolerance and thus may not have indicated a diagnosis. Secondly, some of these individuals may have recognised an adverse reaction, but did not consider it to be at chronic enough levels to warrant the process that a diagnostic

assessment of a food intolerance can take (e.g. rigorous controlled elimination diet). Finally, in examining the qualitative data, it appears some of these individuals were currently undergoing the diagnostic process with some reporting that they were still working out exactly what they reacted to – suggesting a future diagnosis was possible. Thus, while conclusive assertions cannot be made regarding diagnosed food intolerance, the results clearly suggest that there is a high proportion of the population suffering from some form of diagnosed food sensitivity.

Previous studies have indicated that survey research, and opinion based research tends to over-estimate the incidence of food allergy and intolerance, however, this study went to the lengths of asking individuals about diagnoses they had received, and specified the health professionals who could have made this diagnosis in order to attempt to counteract such a problem. Thus, the study did not examine simply those who perceived they had a food sensitivity but those who reported having been diagnosed with one. Accordingly there is potential for an element of self-report and desirability bias, however the question wording was chosen, and interviewers carefully briefed, to ensure this bias was minimal. Despite this, it will be necessary for future studies to specifically distinguish between individuals with an allergy and individuals with intolerance, and between those who self-diagnose versus seeking the diagnosis of a health professional in order to provide further understanding of these sensitivities in the Australian population.

Increasing numbers of studies are being conducted on the effects of artificial food additives on health and behaviour, primarily in children (e.g. Bateman et al., 2004; McCann et al., 2007; Obstlom et al., 2008). However, the results of the current study suggest that diagnoses of food intolerances may not be conclusively made until adulthood. This suggests that further research is needed in charting the development of intolerance/sensitivity diagnoses, and the point at which intolerance is actually confirmed for individuals. This finding highlights the importance of awareness campaigns which are currently being directed towards parents, schools and health professionals. If the current ratio is reflective of diagnosis rates in Queensland, this suggests many individuals may suffer the adverse effects of this chronic condition for years prior to diagnosis. The implication of such a finding is widespread and has the potential to influence both individual development and psychological well-being. Furthermore, it suggests a need to further examine the nature of food intolerances and food allergies within both child and adult populations.

Concepts of health, healthy eating and nutrition are determined by multiple sources, and current conceptualisations used in educational settings and for the general public rely heavily on the healthy food pyramid construct. However, with increased reliance on processed and pre-packaged items, food has become progressively more complex. For individuals who suffer food intolerances such a conceptualisation is no longer adequate. Fruits and vegetables which are rich in natural chemical concentrations, typically held to be healthy, everyday foods, cannot be seen as healthy for these individuals. Artificial additives are found in many foods, especially those targeted at children. Lactose and gluten are found in many products which are often seen as a staple part of a healthy diet. In short, individuals suffering a food intolerance, by necessity, approach food choices very differently. This study illustrates that in Queensland such choices play a role in the food decision making of at least 23% of the population, suggesting a need to reconsider the ways in which we conceptualise food and that ways in which teach such conceptualisations to our children. This paper offers the first examination of incidence rates of diagnosed food intolerance in an Australian context which can be used to guide future research examining the psychological, social and health effects of food sensitivities.

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