

Central Lancashire Online Knowledge (CLoK)

Title	Food allergies and perceptions towards food allergen labelling in Mauritius
Type	Article
URL	https://clock.uclan.ac.uk/23074/
DOI	https://doi.org/10.1016/j.foodcont.2018.06.012
Date	2018
Citation	Soogali, Bibi Madina amiina nabiilah and Soon, Jan Mei (2018) Food allergies and perceptions towards food allergen labelling in Mauritius. Food Control. ISSN 0956-7135
Creators	Soogali, Bibi Madina amiina nabiilah and Soon, Jan Mei

It is advisable to refer to the publisher's version if you intend to cite from the work.
<https://doi.org/10.1016/j.foodcont.2018.06.012>

For information about Research at UCLan please go to <http://www.uclan.ac.uk/research/>

All outputs in CLoK are protected by Intellectual Property Rights law, including Copyright law. Copyright, IPR and Moral Rights for the works on this site are retained by the individual authors and/or other copyright owners. Terms and conditions for use of this material are defined in the <http://clock.uclan.ac.uk/policies/>

Food allergies and perceptions towards food allergen labelling in Mauritius

Abstract

There remains a paucity of research in food allergies in Sub-saharan Africa. It is the aim of this study to determine the self-reported prevalence of food allergies and consumers' perceptions towards food allergen labelling in Mauritius. A survey was conducted in four supermarkets in the Municipalities of Vacoas-Phoenix, Quatre-Bornes and Moka during the period of September to November 2017. The questionnaire was designed based on previous studies and administered using a face-to-face interview approach to increase completion rate. Descriptive analysis and one-way ANOVA between subjects design were conducted. Shellfish was reported as the most common causative agent followed by fish, egg and peanut. Respondents were satisfied with the current font size and general information provided in food labels. Respondents agreed that it could be problematic to identify suitable foods for individuals suffering from food allergies or intolerances. Variations of PAL statements and generic terms provided in food labels, and location of allergy warnings were cause for concern. More than 80% of the respondents felt that allergens in ingredient list should be emphasised (e.g. bold font) and plain English or French language should be used to describe allergenic ingredients. The findings in this study provide practical insights on food allergen labelling issues for policy makers and stakeholders in the food supply chain. Determining the prevalence of food allergies in the country will inform policy makers to consider adding shellfish and other major allergenic ingredients to the list of ingredients requiring mandatory allergen warning label in Mauritius.

Keywords: food allergy; food regulations; precautionary allergen labelling; shellfish

Introduction

Food allergy is a specific immunological adverse reaction to a trigger food while food intolerance is a form of non-immunologically mediated reaction (Fraser, Sumar, & Sumar, 2000). Examples of food intolerance include lactose intolerance where the individual lacks the ability to produce sufficient lactase needed to digest lactose. Food allergies can cause life-threatening anaphylactic reactions and reduce the quality of life of individuals with food allergies (Franzese, 2017). Food allergy affects up to

30 10% of the global population (Sicherer, & Sampson, 2018) and is increasingly reported in developed
31 nations. For example, the prevalence of food allergy is estimated to be 5 – 10% in infants and 5% in
32 young children in Japan (Ebisawa *et al.*, 2017), 6% in Europe (Nwaru *et al.*, 2014) and 8% of
33 children in US (Gupta *et al.*, 2011). Codex stated that the eight common food allergens (cereals
34 containing gluten, egg, milk, soy, peanuts, tree nuts, fish and shellfish) shall be declared (Codex Stan
35 1-1985). There is still a paucity of research in less developing countries such as in the Africa region
36 (Prescott *et al.*, 2013). Africa is also burdened by infectious and non-communicable diseases and lack
37 of recognition of allergy as a clinical specialty due to limited health care infrastructure (El-Gamal,
38 Hossny, El-Sayed, & Reda, 2017; Potter *et al.*, 2010). To date there are some reports of surrogate
39 measures of food allergy such as self-reported reactions or sensitisation to food (Kung, Steenhoff, &
40 Gray, 2014) such as those reported in Mozambique (Lunet, Falcao, Sousa, Bay, & Barros, 2005) and
41 Tanzania (Justin-Temu, Risha, Abla, & Massawe, 2008). Gray *et al.* (2014) and Basera *et al.* (2015)
42 also assessed the prevalence of food allergy in South Africa using questionnaires, skin prick testing
43 and oral food challenge whilst Obeng *et al.* (2011) studied the prevalence of food sensitisation and
44 reported food allergy among schoolchildren in Ghana. There is one report of food hypersensitivity in
45 Mauritius which revealed that 20% of the participants reported symptoms of food allergies (Pugo-
46 Gunsam, Cahoolessur, & Subratty, 2008).

47

48 Mauritius is a small island nation in the Indian Ocean with a population of more than 1.2 million
49 (Naidoo, & Ramseook-Munhurrin, 2016). It is also a thriving international tourism hub since 1974
50 where the travel and leisure industry contributed more than 10% of the total Gross Domestic Product
51 (Ladkin, & Juwaheer, 2000; Statistics Mauritius, 2017). Protecting both local and international visitors
52 are key and the Mauritian government has reinforced and updated the Food and Drugs Act with Food
53 Act 1998 and Food Regulations (1999) since 1st January 2000 (Ministry of Health and Quality of Life,
54 n.d.). The current food labelling regulations establish the standard labelling requirements of pre-
55 packed food. There are currently no regulations requiring the mandatory labelling of food allergens in
56 food products containing such ingredients (Food Regulations, 1999). This is understandable as the
57 true prevalence of food allergy in Mauritius and a number of African countries are not known.
58 However, there has been a report stating high self-reported symptoms of food sensitivity especially

59 towards seafood (Pugo-Gunsam *et al.*, 2008). Other food safety associated studies such as food
60 additives (Koyratty, Aumjaud, & Neeliah, 2014), food hygiene practices (Subratty, Beeharry, & Chan
61 Sun, 2006) and food safety management in fish industry (Ramnauth, Driver, & Vial, 2008) had been
62 conducted in Mauritius. There is no cure for immunologically mediated food allergy and the main
63 treatment or preventative step is avoidance of the trigger food. One of the key strategies to avoid
64 food allergens is clear and accurate labelling. Studies on consumers' attitudes towards food allergen
65 labelling were conducted mostly in developed nations (Cornelisse-Vermaat, Voordouw, Yiakoumaki,
66 Theodoridis, & Frewer, 2007; Voordouw *et al.*, 2007). Food allergen labelling plays a crucial role in
67 preventing development of food allergies among allergic individuals. Mfueni *et al.* (2018) carried out a
68 study in Malawi and found that the country's food allergen labelling was the least demanding
69 compared to other international regulations. This study aims to determine the self-reported incidence
70 of food allergies and awareness of food allergen labelling in Mauritius.

71

72 **Methodology**

73 The questionnaire was constructed and divided into 3 sections: (i) demographics; (ii) self-reported
74 food allergies and (iii) food allergen labelling. Several questions on using food labels in managing
75 food allergies were included in Section III. Respondents were asked 'to what extent they agree or
76 disagree on how serious a problem it is to identify suitable foods for individuals with food allergies or
77 intolerances'. This was followed by a section on 'Improvements of food allergen labelling' and
78 respondents were asked how important the improvements or changes were. The questions were
79 developed based on Choi & Choi (2016), Cornelisse-Vermaat *et al.* (2007) and Pugo-Gunsam *et al.*
80 (2008). A pilot study was conducted among 20 participants who were not included in the actual study
81 to evaluate the language, clarity and suitability of wording. Four supermarkets in Municipalities of
82 Vacoas-Phoenix, Quatre-Bornes and Moka were visited during the period of September to November
83 2017. The supermarkets were visited on both weekdays and weekends as types of shoppers may
84 differ. Individuals visiting the supermarkets in were approached and the purpose of the study was
85 explained to them. The study targeted both males and females of different ages to represent a
86 snapshot of the demographic characteristics of the participants. Participants were invited to
87 participate in the study and interested participants were asked for their signed consent before

88 answering the survey questions. Young respondents (< 18 years old) could only participate in the
89 survey if their parents provided the consent. The questionnaire was administered using a face-to-face
90 interview approach as this helps to increase response and completion rate (Koyratty *et al.*, 2014).
91 One hundred and thirteen respondents completed the survey. This is similar to Pugo-Gunsam *et al.*
92 (2008) and Greiwe, Pazheri, & Schroer (2015).

93

94 Statistical analysis

95 Statistical analyses were carried out using SPSS 24.0 (IBM Corp., NY, USA). Differences between age,
96 gender and education levels were first analysed using one-way ANOVA between subjects design
97 followed by pairwise comparison with Bonferroni's correction. Results were expressed as mean \pm SD
98 and significance level was set at $p < 0.05$.

99

100 **Results and Discussion**

101 A total of 113 consumers participated in the study with more females (64.6%) responding to the
102 survey compared to males. This is similar to other studies and reflect the demographics of mostly
103 female adults conducting the shopping as they take more responsibility for shopping and preparing
104 meals (Helgesen & Nasset, 2010; Juwaheer, Pudaruth, & Ramdin, 2013; Liu, & Niyongira, 2017).
105 Participants mostly belong to the age bracket 25 – 54 years (62.83%), highly educated (53.98% held
106 at least a degree) and tend to report their knowledge on food allergen labelling as somewhat
107 knowledgeable (79.65%). Curtin, Presser, & Singer (2000) stated that more educated people are
108 more likely to respond to surveys and this could be largely attributable to the subject matter. All
109 respondents reported symptoms of food allergies (including those experienced by their family
110 members). Shellfish, egg, milk and peanuts were the most commonly reported trigger food (Table
111 1). Most allergic reactions to seafood are IgE-mediated and can cause rapid onset of symptoms
112 ranging from mild symptoms such as cutaneous reactions to severe anaphylactic reaction (Bahna,
113 2016). Shellfish was the most commonly reported causative agent in Mauritius (Pugo-Gunsam *et al.*,
114 2008) and Asia (Boye, 2012; Chiang *et al.*, 2007). Lunet *et al.* (2005) reported seafood allergy as the
115 most frequent in Mozambique whilst crab was one of the major allergenic food in Zimbabwe
116 (Westritschnig *et al.*, 2003). Based on Pugo-Gunsam *et al.* (2008) and this study, shellfish is reported

117 as one of the common allergenic food. Fish is an important component of Mauritian diet (Daby, &
118 Sigurlinnason, 2003) and the strategic location enable the expansion of the fish industry in Mauritius
119 (Ramnauth, Vial, & Driver, 2008). Due to the availability and frequency of consumption of seafood,
120 this may have led to a higher increase in prevalence of seafood allergy (Lopata, O’Hehir, & Lehrer,
121 2014; Sharp, & Lopata, 2014) as evident in regions such as Japan (Ebisawa *et al.*, 2017), Spain
122 (Pascual *et al.*, 2008) and Philippines (Connett *et al.*, 2012).

123

124 Insert Table 1 here

125

126 Other food products reported to cause allergies among the respondents of this study were eggplant,
127 food colourings, mushroom, chocolate, taro leaves and red and white beans. There are similar reports
128 of unique ethnic food allergens such as eggplant allergy among Indians residing in US (Dinakar,
129 Kamdar, Yarbrough, & Gupta, 2015) and India (Babu, Mahesh, & Venkatesh, 2008) and mushroom
130 allergy (Hegde, Das, & Venkatesh, 2002). Subjects experiencing adverse reactions to eggplants could
131 be due to pharmacologic action of histamine and other non-protein components (Babu *et al.*, 2008).
132 Kumar *et al.* (2011) demonstrated that red beans showed cross reactivity with other legumes such as
133 peanuts, soybean and chickpea and may induce allergic reactions in humans. Novel food allergens
134 reported elsewhere in Africa include pineapple in Ghana, okra in Nigeria and mopane worm in
135 Botswana (Kung *et al.*, 2014). Similarly, chocolate can trigger headache and migraine due to
136 consumption of increased level of tyramine, which is naturally present in cocoa products (Finocchi, &
137 Sivori, 2012). There is also a possibility of presence of milk and or nuts in chocolate that caused the
138 sensitivity (Bedford, Yu, Wang, Garber, & Jackson, 2017).

139

140 Respondents reported having experienced symptoms mostly affecting their cutaneous (e.g. hives,
141 eczema) and gastrointestinal (e.g. vomiting) systems followed by respiratory (e.g. shortness of
142 breath), and circulatory systems (e.g. low blood pressure). Although not determined from this survey,
143 anaphylactic reaction can cause hypotension or severe drop in blood pressure. Fourteen respondents
144 reported either themselves or their family members have had experience of hypotension as one of
145 the reactions to food. Food anaphylaxis can occur rapidly or within a few hours and is often

146 accompanied by angioedema in the lips, eye or tongue, followed by symptoms associated with other
147 organ systems (e.g. wheezing / bronchospasm, hypotension and vomiting) (Sarinho, & Lins, 2017). In
148 this case, epinephrine is the first line of treatment (Kemp *et al.*, 2008; Sarinho & Lins, 2017). About
149 16% of the respondents indicated that they bring some forms of medications (e.g. anti-histamines or
150 epi-pen) to treat a food allergic reaction. Forty percent of the respondents opted to see their general
151 practitioner if they suffer from food allergic reactions. However, on the other end of the spectrum,
152 37.2% of the respondents chose not to consult any healthcare professionals if they suffer from food
153 allergic reactions (Table 1). Similar to cases of foodborne illnesses, patrons who experienced food
154 poisoning often do not report the incident (Harrison *et al.*, 2014) or seek medical advice (Soon, Singh,
155 & Baines, 2011).

156

157

158 More than 60% of the respondents agreed that the information provided in the ingredient list are
159 easy to understand and the font size is sufficient for reading (Figure 1). This is in contrast to
160 Cornelisse-Vermaat *et al.* (2007) and Voordouw *et al.* (2007) where the food allergic consumers
161 reported that font sizes were too small and terminologies used in ingredients as difficult to
162 understand. Singla (2010) also reported difficult terminologies and small font sizes were some of the
163 major problems encountered by consumers. Fifty-nine percent of the respondents in this study felt
164 that the ingredient list could provide more information about food allergens in the label. However,
165 space limitation on the label limits how much information can be included (Verbeke, & Ward, 2006).
166 There is also the potential of information overload to consider as excessive information may create
167 confusion or even boredom among consumers (Salaun, & Flores, 2001).

168

169 Insert Figure 1

170

171 The consumers' responses were further evaluated in terms of their perceptions towards the food
172 labels. 56.6% of the respondents agreed that it will be difficult for respondents with food allergies or
173 intolerances if there are different variations of food labels among imported products. Males ($3.85 \pm$
174 0.86) were more concerned about the different labelling of imported food products ($F = 5.97$, $p =$

175 0.016, $p\eta^2 = 0.05$) compared to females (3.42 ± 0.89). Lack of harmonisation in food labelling
176 practices across imported countries can cause confusion among consumers and may even restrict
177 consumers' diet (Voordouw *et al.*, 2007). Gender also revealed significant difference in the
178 information provided in E-numbers. Females (3.74 ± 1.07) were more concerned about details of
179 food additives in the E-numbers ($F=6.21$, $p = 0.014$, $p\eta^2 = 0.05$) compared to males (3.20 ± 1.16).
180 There were strong agreement regarding the location of allergy warnings and usage of generic terms
181 in ingredient lists (e.g. spices, vegetable oil). Ambiguous labels or terms may compromise consumers'
182 ability to determine the safety of the food products (Joshi, Mofidi, & Sicherer, 2002). Consumers also
183 felt that there is currently lack of manufacturers' or packers' details in the food labelling and that E-
184 numbers should also provide an indication of types of ingredients. Interestingly, there were no
185 significant differences between education levels. This could be explained by the fact that all
186 respondents reported having experienced food allergies or intolerances themselves or by their family
187 members. This represents a motivated group of respondents who may be keen to see changes in the
188 current food labelling practices.

189

190 Insert Table 2

191

192 More than 80% felt that allergens in the ingredient list should be emphasised using bold or capitalised
193 font or highlighted with suitable background colour. Different styles of emphasis could be used to
194 emphasise the presence of allergens in the ingredient list or precautionary allergen labelling. Mfueni
195 *et al.* (2018) revealed that bold font was the most frequently used font when declaring allergens in
196 ingredient list. Other emphasis include contrasting colour, italics or enlarged font. Simple terms
197 should be used to inform customers of the presence of allergens in the ingredients and this could
198 either be in English or French terms. Complex ingredient terminology such as casein and whey for
199 milk may compromise consumers' safety especially if they do not understand the terminologies for
200 milk protein (Joshi *et al.*, 2002). In Joshi *et al.* (2002)'s study, only 4 of 60 parents correctly identified
201 all the labels that indicated milk. Simons, Weiss, Furlong, & Sicherer (2005) reported that allergic
202 reactions were attributed to misunderstanding of label terms or usage of generic terms (e.g. flavour
203 or spice). A large proportion of the respondents felt that symbols could be used to indicate the

204 presence of allergens (87.6%) while 73.5% indicated that allergy warning could be placed adjacent to
205 the ingredient list. Symbols such as asterisks (*) were used in food labels to indicate presence of
206 allergens. For example, an asterisk could be placed on vitamins* to inform consumers that the
207 vitamins *contain soybean oil or sulphur dioxide* to declare that the product *contains preservative
208 as sulphite in some fruits. Alternatively, internationally recognised symbol such as the Crossed Grain
209 Symbol is used across Europe to signify gluten-free products that conform to high and safe standards
210 of production (Association of European Coeliac Societies, 2015). Slightly more than 60% indicated
211 that contact details should be included in the labelling and similar number of respondents reported
212 that percentage of allergenic ingredients could be shown in the ingredient list. There were significant
213 difference between age groups regarding manufacturer's contact details ($F = 3.49$, $p = 0.003$, $\eta^2 =$
214 0.17). Consumers under 17 years old (3.50 ± 1.23) were significantly less concern about the details
215 compared to other age groups (more than 4.00 score). This is understandable as adults may be
216 contacting the manufacturer on behalf of their allergic children and are responsible for finding out
217 further information about usage of allergenic ingredients in the manufacturing environment. Contact
218 details will enable consumers to communicate with manufacturers as indicated by Simons *et al.*
219 (2005) where 86% consumers ($n=486$) in their study contacted the manufacturers for more
220 information. The Internet of Things (IoT) technologies could be utilised in future by integrating Quick-
221 Response (QR) codes and radio frequency identification tag to food products to enable information
222 sharing within the supply chain and consumers. QR codes that are a form of 2D barcodes will be
223 useful in providing detailed information for allergic consumers (Kerbach *et al.*, 2009).

224

225 Shellfish is considered a major (self-reported) cause of food allergies in Mauritius. In the current
226 Mauritian Food Regulations (1999), there is no specification requiring food manufacturers to declare
227 the listing of foods causing hypersensitivity. The Codex General Standard for the Labelling of Pre-
228 packaged Foods could be used as an international benchmark with reference to the foods and
229 ingredients known to cause hypersensitivity (Codex Stan 1-1985). The eight foods listed in Codex –
230 cereals containing gluten, eggs, milk, peanuts & soybeans (legumes), tree nuts & nuts, fish,
231 crustacean and sulphite (> 10 mg/kg) contribute to 90% of food allergic reactions (Bush, & Hefle,
232 1996). This study is also of value to the food industry and healthcare practitioners as the findings

233 represent a snapshot of the food allergy status in Mauritius. Limited countries in Africa had carried
234 out research in this area (Basra et al., 2015; Gray et al., 2014; Kung et al., 2014) and there remains
235 numerous research and development opportunities for Mauritius and other African countries.

236 Determining the prevalence of food allergies in the country will inform policy makers to consider
237 adding shellfish and other major allergenic ingredients to the list of ingredients requiring mandatory
238 allergen warning label in Mauritius. Studies on assessment of food allergen management in food
239 facilities such as those conducted by Dzwolak (2017) in Poland and Thailand (Waisarayutt et al.,
240 2014) and costs for implementation of food safety and allergen management systems (Cusato et al.,
241 2014) will be beneficial. Studies looking into the knowledge and practices of food handlers in food
242 services (Ajala et al., 2010; Dupuis et al., 2017; Soon, in press) can also be carried out.

243

244 **Conclusion**

245 The only current treatment for food allergies is to avoid the trigger food. This relies on accurate and
246 clear declaration of allergens in ingredient list and unambiguous precautionary allergen labelling to
247 inform consumers regarding the presence of allergens. Food allergy is a concern in Mauritius and
248 more resources need to be allocated to determine the prevalence of food allergies. Mauritian
249 consumers would like to see improvements in food allergen labelling such as using bold font to
250 emphasise allergens in the ingredient list, plain English or French terminologies, symbol to indicate
251 presence of allergen and the location of allergy warning adjacent to the ingredient list. Consumers
252 would also like manufacturers or packers to include contact details on the food labels as this would
253 allow consumers to enquire or to seek confirmation about the ingredients used and handling of food
254 allergens on their premises. At this time, there remains extensive work in determining the prevalence
255 of food allergies, investigating current food allergen labelling practices in pre-packaged food, and
256 benchmarking and re-aligning the list of food allergens requiring mandatory declaration in food labels.
257 Studies on consumers' attitudes and purchasing habits of food products with allergens will further
258 identify the needs of public.

259

260 **References**

261 Ajala, A. R., Cruz, A. G., Faria, J. A. F., Walter, E. H. M., Granato, D., & Sant' Ana, A. S. (2010). Food
262 allergens: Knowledge and practices of food handlers in restaurants. *Food Control*, *21*(10), 1318-1321.
263
264 Association of European Coeliac Societies (2015). The Crossed Grain Symbol. Available at:
265 <http://aoecs.org/licensing-crossed-grain-symbol> [Accessed 19 December 2017].
266
267 Babu, B. N. H., Mahesh, P. A., & Venkatesh, Y. P. (2008). A cross-sectional study on the prevalence
268 of food allergy to eggplant (*Solanum melongena* L.) reveals female predominance. *Clinical &*
269 *Experimental Allergy*, *38*(11), 1795-1802.
270
271 Bahna, S. (2016). Not every seafood "allergy" is allergy! *Annals of Allergy, Asthma and Immunology*,
272 *117*, 458-461.
273
274 Basera, W., Botha, M., Gray, C. L., Lunjani, N., Watkins, A. S. M., Venter, C., Allen, K. J., Hlela, C., &
275 Zar, H. J. (2015). The South African food sensitisation and food allergy population-based study of
276 IgE-mediated food allergy: validity, safety, and acceptability. *Annals of Allergy, Asthma &*
277 *Immunology*, *115*(2), 113-119.
278
279 Bedford, B., Yu, Y., Wang, X., Garber, E. A., & Jackson, L. S. (2017). A limited survey of dark
280 chocolate bars obtained in the United States for undeclared milk and peanut allergens. *Journal of*
281 *Food Protection*, *80*(4), 692-702.
282
283 Boye, J. I. (2012). Food allergies in developing and emerging economies: need for comprehensive
284 data on prevalence rates. *Clinical and Translational Allergy*, *2*(25), doi.org/10.1186/2045-7022-2-25
285
286 Bush, R. K., & Hefle, S. L. (1996). Food allergens. *Critical Reviews in Food Science and Nutrition*, *36*,
287 S119-S163.
288
289 Chiang, W. C., Kidon, M. I., Liew, W. K., Goh, A., Tang, J. P. L., & Chay, O. M. (2007). The changing
290 face of food hypersensitivity in an Asian community. *Clinical & Experimental Allergy*, *37*(7), 1055-
291 1061.
292
293 Codex Stan 1-1985 (2001). Codex General Standard for the Labelling of Prepackaged Foods. Joint
294 FAO/WHO Food Standards Programme Codex Alimentarius Commission. Available at:
295 <http://www.fao.org/tempref/docrep/fao/005/y2770E/y2770E00.pdf> [Accessed 19 December 2017].
296
297 Connett, G. J., Gerez, I., Cabrera-Morales, E. A., Yuenyongviwat, A., Ngamphaiboon, J., Chatchee, P.,
298 Sangsupawanich, P., Soh, S.-E., Yap, C.-C., Shek, L. P.-C., & Lee, B. W. (2012). A population-based
299 study of fish allergy in the Philippines, Singapore and Thailand. *International Archives of Allergy and*
300 *Immunology*, *159*, 384-390.
301
302 Cornelisse-Vermaat, J. R., Voordouw, J., Yiakoumaki, V., Theodoridis, G., & Frewer, L. J. (2007).
303 Food-allergic consumers' labelling preferences: a cross-cultural comparison. *European Journal of*
304 *Public Health*, *18*(2), 115-120.
305
306 Curtin, R., Presser, S., & Singer, E. (2000). The effects of response rate changes on the index of
307 consumer sentiment. *Public Opinion Quarterly*, *64*(4), 413-428.
308
309 Cusato, S., Gameiro, A. H., Sant'Ana, A. S., Corassin, C. H., Cruz, A. G., & de Oliveira, C. A. F. (2014).
310 Assessing the costs involved in the implementation of GMP and HACCP in a small dairy factory.
311 *Quality Assurance and Safety of Crops & Foods*, *6*(2), 135-139.
312
313 Daby, P., & Sigurlinnason, S. A. (2003). A critical view of the fish processing sector in Mauritius with
314 particular reference to seafood safety and quality assurance. Fisheries Training Programme. Available
315 at: <http://innri.unuftp.is/proj03/Daby03PRF.pdf> [Accessed 18 December 2017].

316
317 Dinakar, C., Kamdar, O., Yarbrough, M., & Gupta, R. (2015). Asian Indian food allergy survey: Unique
318 ethnic food allergens. *American College of Allergy, Asthma & Immunology 2015 Annual Scientific*
319 *Meeting*. Available at: [https://www.mdlinx.com/allergy-immunology/conference-](https://www.mdlinx.com/allergy-immunology/conference-abstract.cfm/55242/?conf_id=207968&searchstring=&coverage_day=0&nonus=0&page=1)
320 [abstract.cfm/55242/?conf_id=207968&searchstring=&coverage_day=0&nonus=0&page=1](https://www.mdlinx.com/allergy-immunology/conference-abstract.cfm/55242/?conf_id=207968&searchstring=&coverage_day=0&nonus=0&page=1) [Accessed
321 12 February 2018].
322
323 Dupuis, R., Meisei, Z., Grande, D., Strupp, E., Kounaves, S., Graves, A., Frasso, R., & Cannuscio, C. C.
324 (2016). Food allergy management among restaurant workers in a large U.S. city. *Food Control* 63,
325 147-157.
326 Dzwolak, W. (2017). Assessment of food allergen management in small food facilities. *Food Control*
327 73, 323-331.
328
329 Ebisawa, M., Ito, K., Fujisawa, T., Committee for Japanese Pediatric Guideline for Food Allergy, The
330 Japanese Society of Pediatric Allergy and Clinical Immunology, & The Japanese Society of Allergology.
331 (2017). Japanese guidelines for food allergy 2017. *Allergology International*, 66(2), 248-264.
332
333 El-Gamal, Y. M., Hossny, E. M., El-Sayed, Z. A., & Reda, S. M. (2017). Allergy and immunology in
334 Africa: Challenges and unmet needs. *Journal of Allergy and Clinical Immunology*, 4(5), 1240-1243.
335
336 Finocchi, C., & Sivori, G. (2012). Food as trigger and aggravating factor of migraine. *Neurological*
337 *Sciences*, 33(Suppl. 1), 77-80.
338
339 Food Regulations (1999). Government Notice No. 173 of 1999. The Food Act 1998: Regulations made
340 by the Minister under Section 18 of the Food Act 1998. Available at:
341 <http://health.govmu.org/English/Documents/reg-food.pdf> [Accessed 18 January 2018].
342
343 Franzese, C. B. (2017). Advances in food allergy. *Otolaryngologic Clinics of North America*, 50(6),
344 1167-1173.
345
346 Fraser, O., Sumar, S., & Sumar, N. (2000). Adverse reaction to foods. *Nutrition and Food Science*,
347 3(5), 236-242.
348
349 Gray, C. L., Levin, M. E., Zar, H. J., Potter, P. C., Khumalo, N. P., Volkwyn, L., Fenemore, B., & du
350 Toit, G. (2014). Food allergy in South African children with atopic dermatitis. *Pediatric Allergy and*
351 *Immunology*, 25(6), pp. 572-579.
352
353 Greiwe, J. C., Pazheri, F., & Schroer, B. (2015). Nannies knowledge, attitude and management of
354 food allergies in children: an online survey. *Journal of Allergy and Clinical Immunology: In Practice*,
355 3(1), 63-67.
356
357 Gupta, R. S., Springston, E. E., Warriar, M. R., Smith, B., Kumar, R., Pongracic, J. *et al.* (2011). The
358 prevalence, severity, and distribution of childhood food allergy in the United States. *Pediatrics*, 128,
359 e9-17.
360
361 Harrison, C., Jorder, M., Stern, H., Stavinsky, F., Reddy, V., Hanson, H., Waechter, H. Lowe, L.,
362 Gravano, L., & Balter, S. (2014). Using online reviews by restaurant patrons to identify unreported
363 cases of foodborne illness – New York City. *Morbidity and Mortality Weekly Reports*, 63(20), 441-445.
364
365 Hegde, V. L., Das, J. R., & Venkatesh, Y. P. (2002). Anaphylaxis caused by the ingestion of cultivated
366 mushroom (*Agaricus bisporus*): Identification of allergen as mannitol. *Allergology International*, 51(2),
367 121-129.
368
369 Helgesen, Ø., & Nettet, E. (2010). Gender, store satisfaction and antecedents: a case study of a
370 grocery store. *Journal of Consumer Marketing*, 27(2), 114-126.

371
372 Joshi, P., Mofidi, S., & Sicherer, S. H. (2002). Interpretation of commercial food ingredient labels by
373 parents of food-allergic children. *Journal of Allergy and Clinical Immunology*, *109*(6), 1019-1021.
374
375 Justin-Temu, M., Risha, P., Aba, O., & Massawe, A. (2008). Incidence, knowledge and health seeking
376 behaviour for perceived allergies at household level: a case study in Ilala district Dar es Salaam
377 Tanzania, *East African Journal of Public Health*, *5*, 90-93.
378
379 Juwaheer, T. D., Pudaruth, S., & Ramdin, P. (2013). Enhancing customer shopping experience in
380 malls of emerging countries – the “Mauritius” experience. *World Journal of Entrepreneurship,
381 Management and Sustainable Development*, *9*(2/3), 178-190.
382
383 Kemp, S. F., Lockey, R. F., Simons, F. E. R., & the World Allergy Organization ad hoc Committee on
384 Epinephrine in Anaphylaxis. (2008). Epinephrine: The drug of choice for anaphylaxis: A statement of
385 the World Allergy Organization. *World Allergy Organization*, *1*(Suppl. 2), pp. S18.
386
387 Kerbach, S., Alldrick, A. J., Crevel, R. W. R., Domotor, L., DunnGalvin, A., Mills, E. N. C., Pfaff, S.,
388 Poms, R. W., Popping, B., & Tomoskozi, S. (2009). Managing food allergens in the food supply chain
389 – viewed from different stakeholder perspectives. *Quality Assurance and Safety of Crops & Foods*,
390 *1*(1), 50-60.
391
392 Koyratty, B. N. S., Aumjaud, B., & Neeliah, S. A. (2014). Food additive control: a survey among
393 selected consumers and manufacturers. *British Food Journal*, *116*(2), 353-372.
394
395 Kumar, S., Verma, A. K., Misra, A., Tripathi, A., Chaudhari, B., Prasad, R., Jain, S. K., Das, M., &
396 Dwivedi, P. D. (2011). Allergenic responses of red kidney bean (*Phaseolus vulgaris cv chitra*)
397 polypeptides in BALB/c mice recognized by bronchial asthma and allergic rhinitis patients. *Food
398 Research International*, *44*(9), 2868-2879.
399
400 Kung, S.-J., Steenhoff, A. P., & Gray, C. (2014). Food allergy in Africa: Myth or reality? *Clinical
401 Reviews in Allergy & Immunology*, *44*(3), 241-249.
402
403 Ladkin, A., & Juwaheer, T. D. (2000). The career paths of hotel general managers in Mauritius.
404 *International Journal of Contemporary Hospitality Management*, *12*(2), 119-125.
405
406 Liu, A., & Niyongira, R. (2017). Chinese consumers food purchasing behaviors and awareness of food
407 safety. *Food Control*, *79*, 185-191.
408
409 Lopata, A. L., O’Hehir, R. E., & Lehrer, S. B. (2010). Shellfish allergy. *Clinical & Experimental Allergy*,
410 *40*(6), 850-858.
411
412 Lunet, N., Falcao, H., Sousa, M., Bay, N. & Barros, H. (2005). Self-reported food and drug allergy in
413 Maputo, Mozambique. *Public Health*, *119*, 587-589.
414
415 Mfueni, E., Gama, A. P., Kabambe, P., Chimbaza, M., Matita, G., & Matumba, L. (2018). Food allergen
416 labelling in developing countries: Insights based on current allergen labelling practices in Malawi.
417 *Food Control*, *84*, 263-267.
418
419 Ministry of Health and Quality of Life (n.d.). Food Act 1998, Republic of Mauritius. Available at:
420 <http://health.govmu.org/English/Legislations/Pages/Foodact1998.aspx> [Accessed 10 February 2018].
421
422 Naidoo, P., & Ramseook-Munhurrin, P. (2016). Enclave resorts in Mauritius. In, P. L. Pearce, M.-Y.
423 Wu (Eds.). *The World Meets Asian Tourists (Bridging Tourism Theory and Practice)*, Vol. 7, Emerald
424 Group Publishing, pp. 127-147.
425

426 Nwaru, B. I., Hickstein, L., Panesar, S. S., Roberts, G., Muraro, A., Sheikh, A. *et al.* (2014).
427 Prevalence of common food allergies in Europe: a systematic review and meta-analysis. *Allergy*, *69*,
428 992-1007.
429

430 Obeng, B. B., Amoah, A. S., Larbi, I. A., Yazdanbakhsh, M., van Ree, R., Boakye, D. A., & Hartgers, F.
431 C. (2011). Food allergy in Ghanaian schoolchildren: Data on sensitization and reported food allergy.
432 *International Archives Allergy Immunology*, *155*, 63-73.
433

434 Pascual, C. Y., Reche, M., Fiandor, A., Valbuena, T., Cuevas, T., & Esteban, M. M. (2008). Fish allergy
435 in childhood. *Pediatric Allergy and Immunology*, *19*(7), 573-579.
436

437 Potter, P. C., Warner, J. O., Pawankar, R., Kaliner, M. A., Del Giacco, S., Rosewasser, L., & WAO
438 Specialty and Training Council (2009). Recommendations for competency in allergy training for
439 undergraduates qualifying as medical practitioners: a position paper of the World Allergy
440 Organization. *World Allergy Organization*, *2*(8), 150-154.
441

442 Prescott, S. L., Pawankar, R., Allen, K. J., Campbell, D. E., Sinn, J. K. H., Fiocchi, A., Ebisawa, M.,
443 Sampson, H. A., Beyer, K., & Lee, B.-W. (2013). A global survey of changing patterns of food allergy
444 burden in children. *World Allergy Organization*, *6*, 21.
445

446 Pugo-Gunsam, P., Cahoolessur, N., & Subratty, A. H. (2008). A survey on reported symptoms of food
447 hypersensitivity in Mauritius. *Nutrition & Food Science*, *38*(5), pp. 446-450.
448

449 Ramnauth, M., Driver, F., & Vial, P. B. (2008). Food safety management in the fish industry in
450 Mauritius: knowledge, attitude and perception. *British Food Journal*, *110*(10), 989-1005.
451

452 Ramnauth, M., Vial, P. B., & Driver, B. M. F. (2008). Characterisation of the fish producing and fish
453 processing sectors in Mauritius. *University of Mauritius Research Journal*, *14*(1), 37-48.
454

455 Salaun, Y., & Flores, K. (2001). Information quality: meeting the needs of the consumer.
456 *International Journal of Information Management*, *21*, 21-37.
457

458 Sarinho, S., & Lins, M. d. G. M. (2017). Severe forms of food allergy. *Jornal de Pediatria*, *93*(Suppl.
459 1), 53-59.
460

461 Sharp, M., F., & Lopata, A. L. (2014). Fish allergy: In review. *Clinical Reviews in Allergy &*
462 *Immunology*, *46*(3), 258-271.
463

464 Sicherer, S. H., & Sampson, H. A. (2018). Food allergy: A review and update on epidemiology,
465 pathogenesis, diagnosis, prevention and management. *Journal of Allergy and Clinical Immunology*,
466 *141*(1), 41-58.
467

468 Simons, E., Weiss, C. C., Furlong, T. J., & Sicherer, S. H. (2005). Impact of ingredient labelling
469 practices on food allergic consumers. *Annals of Allergy, Asthma and Immunology*, *95*(5), 426-428.
470

471 Singla, M. (2010). Usage and understanding of food and nutritional labels among Indian consumers.
472 *British Food Journal*, *112*(1), 83-92.
473

474 Soon, J. M., Singh, H., & Baines, R. (2011). Foodborne diseases in Malaysia: A review. *Food Control*,
475 *22*(6), 823-830.
476

477 Soon, J. M. (In press). 'No nuts please': Food allergen management in takeaways. *Food Control*. DOI:
478 doi.org/10.1016/j.foodcont.2018.04.024
479

480 Statistics Mauritius (2017). International travel and tourism. Available at:
481 http://statsmauritius.govmu.org/English/Publications/Pages/Tourism_Jan-Sep17.aspx [Accessed 3
482 March 2018].

483
484 Subratty, A. H., Beeharry, P., & Chan Sun, M. (2006). A survey of hygiene practices among food
485 vendors in rural areas in Mauritius. *Nutrition & Food Science*, 34(5), 203-205.
486
487 Verbeke, W., & Ward, R. W. (2006). Consumer interest in information cues denoting quality,
488 traceability and origin: An application of ordered probit models to beef labels. *Food Quality and*
489 *Preference*, 17(6), 453-467.
490
491 Voordouw, J., Cornelisse-Vermaat, J. R., Yiakoumaki, V., Theodoridis, G., Chryssochoidis, G., &
492 Frewer, L. J. (2009). Food allergic consumers' preferences for labelling practices: a qualitative study
493 in a real shopping environment. *International Journal of Consumer Studies*, 33(1), 94-102.
494
495 Waisarayutt, C., Surojanametakul, V., Kaewpradub, S., Shoji, M., Ito, T., & Tamura, H. (2014).
496 Investigation on the understanding and implementation of food allergen management among Thai
497 food manufacturers. *Food Control*, 46, 182-188.
498
499 Westritschnig, K., Sibanda, E., Thomas, W., Auer, H., Aspöck, H., Pittner, G., Vrtala, S., Spitzauer, S.,
500 Kraft, D., & Valenta, R. (2003). Analysis of the sensitization profile towards allergens in central Africa.
501 *Clinical & Experimental Allergy*, 33(1), pp. 22-27.