

Protection Motivation Theory and consumers' food safety behaviour in response to COVID-19

Abstract

The threat of COVID-19 has altered consumers shopping behaviour and increased consumers' willingness to purchase food using online food delivery services. Consumers were more likely to practice strict hand hygiene measures and were concerned with food safety. Such behaviours were likely driven by the fear and threat of contracting COVID-19. This study aims to use Protective Motivation Theory (PMT) to investigate how COVID-19 affects food shopping and food safety behaviour. An online, cross-sectional study was conducted in Indonesia and Malaysia to determine the protective motivation to engage in three food shopping and hygiene practices such as i) Safe food shopping behaviour; ii) Hand hygiene and avoiding cross contamination; and iii) Use of online food delivery services. Data were analysed using descriptive statistics, Spearman rho's correlation and binary logistic regression. A total of 1,180 responses were received of which 1,129 were valid. Gender was identified as a significant predictor across all food safety behaviours during COVID-19. Response efficacy and self-efficacy were significant predictors for food shopping behaviour while perceived severity significantly predicted hand hygiene practices after shopping. Age, frequency of food preparation and shopping, perceived severity, perceived vulnerability, response efficacy and self-efficacy were significant predictors for use of online food delivery services. Our findings suggest that women were more likely to engage in protective measures during food shopping, carry out hand hygiene practices after shopping and use online food delivery services during COVID-19. Participants with higher response and self-efficacy scores were more likely to shop from markets or shops with high hygiene standards while participants who perceived COVID-19 as a serious threat were more likely to clean and sanitise their hands after shopping. Participants also believed that the use of online food delivery services helps to reduce the risk of COVID-19 infection. However, foods should be purchased from trusted restaurants or takeaways. This is the first study to use Protection Motivation Theory to explore consumers' food shopping, hand hygiene and online food delivery practices during COVID-19.

Keywords: food safety practices; hand hygiene; online delivery; perceived severity; perceived vulnerability; self-efficacy; shopping; response efficacy

Highlights:

- Gender was a significant predictor across all food safety behaviours during COVID-19.
- Women were more likely to engage in protective measures.
- Response efficacy and self-efficacy were significant predictors for food shopping behaviour.
- Perceived severity significantly predicted hand hygiene practices after shopping.
- Threat and coping appraisals significantly predicted intention to use online food delivery services.

Introduction

The supply and demand for food were significantly affected by COVID-19. Outbreaks of COVID-19 have closed multiple food production sites and disrupted food supply chains (Middleton, 2020; Saitone et al., 2021). To prevent the spread of COVID-19, individuals have changed their work, dietary and shopping behaviours. The change in consumer behaviour during shopping and food handling practices during the COVID-19 pandemic were largely driven by fear for health (Eger et al., 2021), stress and anxiety (Haas et al., 2020; Soon et al., 2021). This has increased precautions in grocery shopping, handwashing and sanitation behaviours. For example, the fear of COVID-19

46 increased consumers' willingness to use online food delivery services (Gavilan et al., 2021).
47 Consumers were less willing to shop indoors (Grashuis et al., 2020) and exhibited unusual retail
48 consumer behaviour such as hoarding toilet paper, disinfectant and cleaning products, water and food
49 (Kirk & Rifkin, 2020; Laato et al., 2020). A study by Rodrigues et al. (2021) revealed that Brazilians
50 were buying a greater amount of food and more than half of the respondents reduced their shopping
51 trips to markets. Consumers were also more concerned with food safety and hygienic practices, as
52 40% of the respondents do not trust the food safety of packaged food sold in markets (Rodrigues et
53 al., 2021). More than 70% of respondents in Malaysia would sanitise the surfaces such as shopping
54 trolleys or basket handles prior to using them and shop as quickly as possible to minimise contact
55 with others (Soon et al., 2021).

56
57 The pandemic has altered consumers' food safety practices, some to the extent of using disinfectants
58 to clean fresh fruits and vegetables. A large number of consumers in Lebanon and Jordan used
59 vinegar and soap whilst a high proportion of Tunisians used chlorine bleach solution to clean fresh
60 fruits and vegetables. There was also a significant increase in reported handwashing practices,
61 especially after returning home and after touching food packages and shopping bag (Faour-Klingbeil
62 et al. 2021a). There is no evidence suggesting that SARS-CoV-2 is transmitted through food or food
63 packaging (EFSA, 2020; WHO, 2020a). Although FAO and WHO (2020a) proposed that touching food
64 packages or containers contaminated with SARS-CoV-2 could transmit the virus to the mouth, eyes,
65 or nostril, but this is not the main route for transmission. Studies had evaluated the survival of SARS-
66 CoV-2 on different surfaces and found that the virus could remain for hours or days depending on the
67 physical characteristics of the surfaces. The virus was found to remain viable up to 72 hours on
68 plastic or stainless-steel surfaces, up to 24 hours on cardboard and four hours on copper (Kampf et
69 al., 2020; van Doremalen et al., 2020).

70
71 Studies also revealed that consumers in the U.S. used online food deliveries (OFD) more frequently
72 during the COVID-19 pandemic. The number of consumers who used OFD more than once a week
73 has increased while those who used OFD services once a month or less has decreased (Hong et al.,
74 2021). Features of online food delivery services such as non-cash transactions and less physical visits
75 to brick and mortar stores are highly important. Researchers reported that during the COVID-19
76 pandemic, OFD has been widely utilised in Brazil (Rodrigues et al., 2021; Zanetta et al., 2021),
77 Indonesia (Prasetyo et al., 2021), Pakistan (Ali et al., 2021) and Malaysia (Kamel, 2021). For
78 example, GrabFood which is one of the main OFD in Malaysia recorded a 25% increase in revenue
79 and more than 8,000 restaurants signed up to the platform (Kamel, 2021). This contradicts the
80 findings from Faour-Klingbeil et al. (2021a) who revealed that reliance on home delivery for food and
81 groceries were uncommon despite reduced shopping frequency in physical stores.

82

83 Protection motivation theory (PMT) originally describes the effects of fear appeals on health threats
84 and how it motivates individuals to react in a self-protective way (Rogers, 1975). PMT was further
85 expanded to provide general persuasive messages and cognitive mediating processes (Norman et al.,
86 2015; Rogers, 1983). Broadly, PMT is divided into threat and coping appraisal. Threat appraisal
87 focuses on the severity and vulnerability to risk while coping appraisal refers to the individual's
88 consideration of the recommended behaviour in response to threat (response efficacy) and their
89 ability to implement the recommendations (self-efficacy) (Norman et al., 2015). PMT has been
90 applied in multiple areas especially to study the effects of health and safety risks (Bui et al., 2013; Lin
91 & Chang, 2021; Ong et al., 2021) and more recently motivation for COVID-19 vaccination and
92 protective behaviour against COVID-19 (Eberhardt & Ling, 2021; Kim et al., 2021). PMT has been
93 used to investigate food safety-related topics in several studies, such as how employees in food
94 services react to food safety threats (Harris et al., 2021), reaction of diners towards a food safety
95 violation in a restaurant (Harris et al., 2020), safe food handling behaviour (Choi et al., 2019; Mullan
96 et al., 2016) and the public's behavioural intentions for safe food choices (Chen, 2016). To date there
97 is no study that explores PMT on how COVID-19 affects food shopping and food safety behaviour.
98 This study aims to use the PMT model to determine consumers' food shopping, food safety and online
99 food delivery practices during COVID-19.

100

101 **Methodology**

102 Study design

103 A cross-sectional study was employed in Indonesia and Malaysia to determine the protection
104 motivation to engage in three food shopping and hygiene practices such as i) Safe food shopping
105 behaviour; ii) Hand hygiene and avoiding cross contamination; and iii) Use of online food delivery
106 services.

107

108 Questionnaire Development

109 The questionnaire was divided into six sections i.e. demographics and food preparation & shopping
110 practices (6 questions); perceived severity (5 questions); perceived vulnerability (5 questions);
111 response efficacy (5 questions); self-efficacy (5 questions) and protection motivation (3 questions).
112 Demographics information included age, gender, frequency of food shopping & preparation and use
113 of online food delivery services. The measurement scales were developed based on the constructs of
114 the PMT model (Rogers, 1983) and related food safety topics such as hand hygiene (Dwipayanti et
115 al., 2021; Olaimat et al., 2020), safe food handling behaviour (Mullan et al., 2016), food shopping
116 (Faour-Klingbeil et al., 2021a; Soon et al., 2021) and use of online food delivery services during
117 COVID-19 (Hong et al., 2021; Olaimat et al., 2020). Our study adapted the constructs and
118 measurement scales developed by Mullan et al. (2016). We define perceived severity as how seriously
119 an individual believes that COVID-19 will be a threat during food shopping and food handling.
120 Perceived vulnerability is how susceptible an individual feels to the threat of COVID-19 during food

121 shopping and food handling. Self-efficacy refers to the perceptions of respondents' own abilities to
122 carry out recommended protective actions. Response efficacy refers to the perceptions or beliefs in
123 the efficacy of the recommended practices. Respondents were asked to indicate the extent to which
124 they agree with each statement for each construct (i.e., perceived severity, perceived vulnerability,
125 self-efficacy and response efficacy) on a seven-point Likert scale, where 1=strongly disagree;
126 7=strongly agree. The questionnaire was translated into Bahasa Indonesia (Indonesian language)
127 and Bahasa Malaysia (Malay language) by the second and third authors and back translated into
128 English. We sent the questionnaire to four food safety experts for content validity. The questionnaire
129 was pilot tested among 50 undergraduate students from Indonesia and Malaysia to ensure clarity and
130 if revision was required. The Cronbach's alpha for each construct was as follow: perceived severity
131 (0.793), perceived vulnerability (0.832), response efficacy (0.818) and self-efficacy (0.809), all of
132 which are above the 0.60 threshold and indicates high reliability (Hair et al., 2009).

133

134 Perceived severity

135 To measure the perceived severity of three food shopping and hygiene practices, participants were
136 asked to what extent they agreed with the statements. Perceived severity for food shopping practices
137 were measured using two items: i) 'Risks of COVID-19 infection seriously influence my choice of
138 shopping in market or shops' and ii) 'The risk from shopping in person makes me anxious'. Hand
139 hygiene and handling practices were measured using two items: i) 'Not washing my hands after
140 returning home from shopping makes me anxious' and ii) 'Not wiping or disposing food packaging
141 after shopping makes me feel at risk'. While measurement of using OFD was based on one item i.e.
142 'Using OFD makes me less anxious'.

143

144 Perceived vulnerability

145 Perceived vulnerability of food shopping was measured using two items i) 'If I shop in person at
146 markets or shops, I feel my health is at risk'; and ii) 'If I see other people who don't follow hygiene
147 measures while shopping, I feel vulnerable to COVID-19'. Two items such as i) 'I wipe food packaging
148 as I feel my health is at risk if the packaging has been contaminated with coronavirus' and ii) 'I wash
149 my hands before preparing food as I feel my health is at risk if cross contamination happens'. OFD
150 was measured using the statement: 'I choose trusted restaurants if I order online delivery, as it's less
151 risky'.

152

153 Response efficacy

154 Response efficacy on food shopping was based on two items i.e. i) 'Shopping from clean markets or
155 shops helps to reduce the risk of COVID-19 infection' and ii) 'Avoiding shops at busy times helps to
156 reduce the risk of COVID-19 infection'. Hygienic practices were based on i) 'Cross contamination of
157 raw and cooked food should be avoided to reduce health risk' and ii) 'Cleaning and sanitising hands

158 helps to reduce risk of COVID-19 infection'. OFD was measured using the statement: 'Buying take-
159 outs online helps to reduce the risk of COVID-19 infection'.

160

161 Self-efficacy

162 i) 'I know which markets or shops that maintain high hygiene standard' and ii) 'I know the best time
163 to shop to avoid crowds' were used to measure self-efficacy of food shopping. To measure self-
164 efficacy of hygiene practices, the following items were used: i) 'I feel confident cooking fresh food
165 bought from clean markets or shops' and ii) 'I am confident my cleaning and sanitising practices at
166 home helps to reduce the risk of COVID-19 infection'. Self-efficacy of OFD was measured using 'I feel
167 confident eating take-outs ordered online.'

168

169 Protection Motivation

170 Protection motivation were measured using three questions i.e. 'Due to the pandemic.... i) I intend to
171 shop from markets or shops with high hygiene standards'; ii) 'I intend to clean and sanitise my hands
172 after shopping'; and iii) 'I intend to order food using online food delivery services more frequently'.

173

174 Online Survey

175 An online survey (<https://admin.onlinesurveys.ac.uk/>) was conducted among consumers who
176 currently reside in Indonesia or Malaysia and were involved in food shopping and preparation of food.
177 Convenience and snowball sampling were used. Online consent was obtained prior to completing the
178 survey. All responses were anonymised.

179

180 Statistical Analysis

181 Descriptive statistics, Spearman rho's correlation and three binary logistic regression analyses were
182 conducted using IBM SPSS 28.0 to determine the protection motivation on food shopping practices,
183 hand hygiene & cross contamination and online food delivery services during COVID-19. P value <
184 0.05 was considered statistically significant.

185

186 **Results**

187 A total of 1,180 responses were received of which 1,129 were valid. Table 1 shows the demographics
188 characteristics of the participants from both countries. More than 55% of the participants prepared
189 food at home daily and 37.6% carried out food shopping 2–3 times/week during the pandemic.
190 GrabFood (available in Indonesia and Malaysia), GoFood or Golek (available in Indonesia) and
191 FoodPanda (available in Malaysia) were the most common food delivery apps used by the
192 respondents (Table 1). Such delivery apps are often used to purchase takeaway cooked food or
193 meals.

194

195 Insert Table 1

196

197 Tables 2–4 show the correlation between perceived severity, perceived vulnerability, response
198 efficacy and self-efficacy when shopping for food or groceries, carrying out hygienic practices and
199 using online food delivery services. Significant and positive correlations were found across all
200 constructs for each activity.

201

202 Insert Tables 2 – 4

203

204 Food shopping practices

205 The logistic regression model was statistically significant χ^2 (9, N=1129) = 51.072, $p < 0.001$)
206 indicating that the model was able to distinguish between participants who due to the pandemic
207 intend or did not intend to shop from markets or shops with high hygiene standards. The model
208 explains between 4.4% (Cox and Snell R square) and 10.2% (Nagelkerke R square) of the variance in
209 food shopping practices, with 99.4% cases correctly classified in the model. Gender (OR = 0.545,
210 $p < 0.05$), response efficacy (OR=0.766, $p < 0.01$) and self-efficacy (OR=0.765, $p < 0.05$) were
211 significant predictors in the model (Table 5). Women were 0.5 times more likely to shop from markets
212 or shops with high hygiene standards. Participants with higher response and self-efficacy scores
213 were more likely to shop from markets or shops with high hygiene standards.

214

215 Insert Table 5

216

217 Hand hygiene practices during COVID-19

218 The model was able to distinguish between participants who due to the pandemic intend to clean and
219 sanitise their hands after shopping, χ^2 (9, N=1129) = 46.923, $p < 0.001$). Hosmer and Lemeshow Test
220 shows the model was a good fit for the data χ^2 (8, N=1129) = 6.718, $p = 0.567$) and explains between
221 4.1% (Cox and Snell R square) and 13.7% (Nagelkerke R square) of the variance in handwashing and
222 sanitising practices after shopping with 99.9% cases correctly classified in the model. Gender
223 (OR=0.377, $p < 0.01$) and perceived severity (OR=0.665, $p < 0.05$) were significant predictors in the
224 model (Table 6). Women and participants who perceived that COVID-19 is a serious threat were more
225 likely to clean and sanitise their hands after shopping.

226

227 Insert Table 6

228

229 Using online food delivery services during COVID-19

230 The logistic regression model was statistically significant χ^2 (9, N=1129) = 225.851, $p < 0.001$)
231 indicating that the model was able to distinguish between participants who due to the pandemic were
232 more likely to use food delivery services. Hosmer and Lemeshow Test shows the model was a good fit
233 for the data χ^2 (8, N=1129) = 8.590, $p = 0.378$) and explains between 18.1% (Cox and Snell R

234 square) and 24.2% (Nagelkerke R square) of the variance in using food delivery services. Gender
235 (OR=1.452, $p<0.01$), age (OR=1.291, $p<0.001$), frequency of food shopping (OR=0.873, $p<0.05$),
236 frequency of food preparation (OR=1.261, $p<0.001$), perceived severity (OR=0.899, $p<0.05$),
237 perceived vulnerability (OR=1.149, $p<0.01$), response efficacy (OR=0.636, $p<0.001$) and self-efficacy
238 (OR=0.771, $p<0.001$) were significant predictors (Table 7). Women were 1.452 times more likely to
239 use online food delivery services than men. Increasing perceived severity, perceived vulnerability,
240 response efficacy and self-efficacy scores were associated with increased likelihood of using OFD.

241

242 Insert Table 7

243

244 **Discussion**

245 Gender was identified as a significant predictor across all food safety behaviours during COVID-19.
246 Previous studies had shown that a higher percentage of women reported avoiding public spaces and
247 being more supportive of social distancing (Czeisler et al., 2020), avoid 3Cs such as closed spaces,
248 crowded spaces and close-contact (Muto et al., 2020), engage in frequent hand hygiene practices and
249 were more likely to rate the seriousness of COVID-19 threat as high (Wolf et al., 2020). Women in
250 Indonesia also reported more handwashing frequencies when arriving home and before eating or
251 preparing food (Dwipayanti et al., 2021). Our findings are aligned with previous studies including a
252 multi-country study by Galasso et al. (2020) who found women were more likely to perceive the
253 pandemic as a very serious health threat and tend to adhere to safe preventive measures. This could
254 be due to women being more risk averse than men and women tend to believe they are more likely
255 to be infected (Galasso et al., 2020; Lewis & Duch, 2021).

256

257 Food shopping practices

258 Response efficacy and self-efficacy were identified as significant predictors for food shopping
259 practices. Consumers were confident in the efficacy of shopping from markets or shops that
260 maintained high hygiene level and were less congested. They were also confident in their abilities to
261 identify shops that carried out cleaning and hygiene procedures and best time to shop for groceries to
262 avoid queues and minimise contact with other customers. This is in line with the recommendations by
263 WHO (2020b) and WHO (2021) advice for the public in South East Asia while shopping for food
264 during the COVID-19 pandemic. There is a clear need to shop from supermarkets with high hygiene
265 standard. Shops with higher number of staff and the probability of staff being infected is much higher
266 for supermarkets. Li and Tang (2022) found that the average infection probability for a customer
267 visiting a supermarket was 6.22×10^{-6} compared to 1.40×10^{-6} for visiting one small shop. Wet
268 markets are also common in Indonesia and Malaysia and one could often find a variety of fresh
269 produce, meat, seafood, and poultry sold in semi open-air environments (Nadimpalli & Pickering,
270 2020). Wet markets are often humid, have poor ventilation in enclosed areas, insufficient hygiene
271 facilities and this may contribute to viral transmission. Toilets and handwashing facilities were found

272 to be inadequate in wet markets in Malaysia (Soon & Abdul Wahab, 2021); and consumers would
273 need to select markets with adequate hygiene facilities and cleaning procedures and avoid crowds.
274

275 Hand hygiene practices during COVID-19

276 Perceived severity significantly predicted intention to carry out hand hygiene practices. Our study
277 revealed that consumers in Indonesia and Malaysia who perceived COVID-19 as a serious threat were
278 more likely to wash their hands after arriving home from shopping and cleaning food packaging to
279 avoid cross contamination. Similar findings were reported in Indonesia where respondents who
280 perceived COVID-19 as a serious threat were more likely to wash their hands frequently (Dwipayanti
281 et al. 2021). Consumers from Arab countries also reported a significantly higher frequencies of
282 handwashing when returning home, after touching food packages and before food handling (Faour-
283 Klingbeil et al., 2021a) and were extremely concerned about touching contaminated food packaging
284 (Faour-Klingbeil et al., 2021b). Since the pandemic, Ministry of Health (MOH) Malaysia had provided
285 multiple programmes on handwashing techniques and use of hand sanitisers on the Official Portal of
286 MOH and social media and had been instrumental in urging all individuals to practice personal
287 hygiene (Md Shah et al., 2020; Tang, 2020), while the Government of Indonesia recommended the '3
288 Ms' including '*memakai masker*' (wearing mask), '*menjaga jarak*' (social distancing) and '*mencuci*
289 *tangan pakai sabun*' (handwashing with soap) (Dwipayanti et al., 2021). Hand hygiene is identified as
290 one of the most effective interventions to stop the spread of pathogens including SARS-CoV-2 virus
291 (CDC, 2020a; WHO, 2020c). Kwok et al. (2015) found that participants involuntarily touched their
292 faces over 20 times per hour, with higher frequencies on the mouth, nose, and eyes. Contact
293 transmission of COVID-19, i.e. touching contaminated surfaces followed by hand to facial mucosa has
294 been identified as a potential infection route (Przekwas & Chen, 2020). Hence, the threat of
295 contracting COVID-19 most likely drove the participants in our study to wash their hands after
296 shopping. Participants may also be concerned about the possibility of being infected after touching
297 contaminated surfaces such as food packaging. WHO recommended that it is not necessary to
298 disinfect food packaging materials, but hands should be properly washed after handling food
299 packages and before eating (WHO, 2020c). Although there is no evidence that SARS-CoV-2 is
300 transmitted via food and food packaging (EFSA, 2020; WHO, 2020d), however, consumers are likely
301 to be highly concerned and preferred to wipe down the food packaging as an additional measure. For
302 example, an outbreak of COVID-19 in Singapore was linked to physical contact and sharing of food
303 among participants at a conference (Pung et al., 2020). Thus, the increased perception of risk
304 associated with touching contaminated surfaces and being infected with COVID-19 motivated
305 participants to clean their hands and food packaging after shopping.

306

307 Using online food delivery services during COVID-19

308 In OFD usage intention, all predictors except country significantly affected intention to use online
309 food delivery services. Younger adults were more likely to use OFD. Globally, young people (18-34)

310 are the main users of OFD platforms (Statista, 2022). OFD services are commonly used by young,
311 working adults with higher disposable incomes in Australia (Bates et al., 2020), Malaysia (Yusra &
312 Agus, 2019) and Indonesia (Ilham, 2018). Our findings also showed an inverse relationship between
313 frequency of food preparation and shopping. Those who infrequently prepared food at home (e.g.,
314 once or less than once a week) and those who relied solely on delivery services or shopped for food 4
315 – 6 times / week were more likely to use OFD. Perceived severity and vulnerability were found to
316 significantly affect use of OFD during COVID-19 and corroborate with Gavilan et al. (2021) where fear
317 of COVID-19 increased consumers preference for OFD. People with higher perceived severity and
318 vulnerability to an adverse health condition (i.e. COVID-19) were more likely to take protective
319 measures purchasing food online (Carpenter, 2010). But our study contradicts findings from Hong et
320 al. (2021) and Mehrolia et al. (2020) where perceived severity and vulnerability were not associated
321 with use of OFD during COVID-19. In fact, Mehrolia et al. (2020) found that high perception of risk
322 leads to negative purchase intentions via OFDs; linked to uncertainty involved in the purchase and
323 perception of being infected through delivery partners. Consumers in Malaysia and Indonesia who
324 showed high response efficacy and self-efficacy were more confident in their abilities to use OFD.
325 Food delivery and curb-side pickup were recommended as measures to maintain social distancing
326 practices and minimise spread of COVID-19 (CDC, 2020b; FDA, 2020). The risk of using OFD is
327 lessened compared to visiting physical restaurants, as the probability of contracting COVID-19 is
328 reduced due to social distancing, hence improving consumers' beliefs in their response and self-
329 efficacy. Although there is risk of transmission from delivery employees who are often highly mobile
330 with access to a wide range of clients (Ortiz-Prado et al., 2021), consumers' practices of wiping and
331 disposing off food packaging and adhering to hand hygiene practices potentially helped to mitigate
332 the risk. The participants in our study tend to use online food delivery from trusted restaurants and
333 reflects the study by Soon and Xin (2020) who found that Chinese consumers prefer to purchase food
334 from 'time-honoured' (reputable) or familiar restaurants. They tend to check online reviews and
335 prefer recommendations through word of mouth. Strict lockdown measures imposed during the
336 pandemic and travel or mobility restrictions had further affected consumers' willingness to dine out in
337 Malaysia (Rodzi, 2021) and Indonesia (The Jakarta Post, 2020). A large number of restaurants that
338 transitioned to online catering in both countries supported the use of OFD and consumers understood
339 the use of OFDs as a protective measure. The use of OFD services is potentially one of the long-term
340 behavioural shifts impacted by the pandemic.

341

342 **Conclusion**

343 Protection Motivation Theory was used to explore how COVID-19 affects consumers' food shopping,
344 hand hygiene and use of online food delivery services. The logistic regression models explained
345 between 4.1% (Cox and Snell R square) and 24.2% (Nagelkerke R square) of the variance in all three
346 behaviours. Our findings revealed that gender was a significant predictor across all food safety
347 behaviours during COVID-19. Women were more likely to shop from markets or shops with high

348 hygiene standards, clean and sanitise their hands after shopping, and use online food delivery
349 services. Response efficacy and self-efficacy were significant predictors for food shopping behaviour.
350 Participants believed in the efficacy of recommended practices such as 'Avoid 3Cs' in Malaysia and '3
351 Ms' in Indonesia while shopping. Similarly, participants were confident in their ability in identifying
352 shops that practiced high hygiene standards and were aware of 'quiet periods' to minimise contact
353 with other customers. Perceived severity significantly predicted hand hygiene practices after
354 shopping. Participants from both countries were concerned about the risk of being infected with
355 COVID-19 after touching contaminated surfaces and were more likely to wash their hands after
356 arriving home from shopping and cleaning food packaging to avoid cross contamination. Threat and
357 coping appraisals were associated with increased likelihood of using OFD services. Consumers in
358 Indonesia and Malaysia with higher perceived severity and vulnerability to COVID-19 were more likely
359 to use OFD. Similarly, participants with high response and efficacy scores believed in the efficacy and
360 their abilities to use OFD in reducing the risk of COVID-19 infection.

361

362 This study has several limitations including the use of convenience and snowball sampling to recruit
363 participants from both countries. It is likely that participants who were interested and motivated by
364 COVID-19 and food safety topics were more likely to participate in the study, hence introducing
365 selection bias among our respondents. The survey was conducted online, and the findings would
366 have excluded potential participants with limited internet access.

367

368 This study has successfully used PMT to determine how threat and coping strategies motivate
369 consumers to react in a self-protective manner. Our findings suggest focusing on interventions that
370 seek to affect consumer food safety behaviour i.e., by improving self and response efficacies. These
371 two constructs were significant predictors in food shopping and use of online delivery services. One
372 way in which self and response efficacies could be improved is through visual and verbal
373 recommendations of hand hygiene and food safety practices by local governments and regional /
374 international health organisations. Improving awareness and understanding of the threat of COVID-19
375 can be used to encourage hand hygiene practices. It is recommended that qualitative studies such as
376 in-depth interviews or focus group discussion be conducted to enable greater understanding of
377 consumers' threat and coping appraisals. Similarly, future studies to investigate if consumers retained
378 the protective measures post-pandemic is recommended.

379

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