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1 **HOW IMPORTANT ARE THE INFLUENCING FACTORS TO THE DECISION ON**  
2 **WHETHER TO PROVIDE SEAFOOD IN INFANT AND YOUNG CHILD FEEDING?**

3

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**Abstract**

Seafood is recommended as part of a healthy, balanced introductory diet however, consumption rates are low in young children. Research has previously investigated the influences to seafood consumption in consumers and non-consumers however the importance of these factors in mothers' decisions on whether to provide seafood for their child during the early years is unknown. This study aimed to measure the importance of factors that influence mothers' decisions on providing seafood for their child during infant and young child feeding (six months to four years). A mixed method Q methodology and cognitive interview approach was used with 32 mothers in Scotland. Despite a large consensus of opinion between mothers (n=20) on the importance of factors on their decision-making, two viewpoints emerged highlighting an importance placed on food attributes and the infant, and convenience and family-centred. This study is the first to quantify the influences on the decision to provide seafood during early years' feeding and could be used to inform and tailor seafood-based dietary promotions and interventions for parents.

**Keywords:** seafood, infant feeding, weaning, complementary feeding, influences

## 1 Introduction

2 Providing a nutritiously balanced and varied diet during the early years is recommended in  
3 global infant feeding guidelines (World Health Organization, 2005). Within this healthful diet  
4 seafood (edible fish, shellfish, and crustaceans from wild and farmed sources) plays a role,  
5 together with meat and alternatives, in providing energy, protein and iron, amongst other  
6 nutrients which are required to meet the growing needs of the infant. The most recent UK  
7 Diet and Nutrition Survey in Infant and Young Children (DNSIYC) indicates that 34% of  
8 seven to nine month old children consumed fish over the recorded period compared to 40%  
9 having consumed meat (red e.g. beef and white e.g. poultry) and 12% consuming meat  
10 products (Department of Health, 2011), trends which mirror those of older children and  
11 adults (Public Health England and Food Standards Agency, 2014). Evidence indicates that  
12 taste preferences can be developed during the early years (Birch, 1999; Harris, 2008; Kajiura,  
13 Cowart, & Beauchamp, 1992) and there is a suggestion that healthy eating patterns are  
14 established during this period (Schwartz, Scholtens, Lalanne, Weenen, & Nicklaus, 2011).  
15 The dietary trends evident in UK children are thus of great concern. Failure of the population  
16 to meet dietary recommendations to limit red and processed meat consumption (Scientific  
17 Advisory Committee on Nutrition, 2010), maintain current levels of white fish consumption  
18 and increase consumption of oil-rich fish to one portion per week (Scientific Advisory  
19 Committee on Nutrition, 2004) may continue in our youngest population and subsequently  
20 into their later life.

21  
22 The consumption of seafood has been suggested to be driven more by perceived healthfulness  
23 and a moral obligation to provide this food than taste and food preferences (Olsen, 2004).  
24 However, a perception that seafood is expensive often acts as a barrier to consumption and to  
25 frequent consumption (Bloomingdale et al., 2010; Neale, Nolan-Clark, Probst, Batterhan, &  
26 Tapsell, 2012; Olsen, 2004; Verbeke & Vackier, 2005). Furthermore, a lack of confidence  
27 and knowledge in preparing and cooking seafood (Leek, Maddock, & Foxall, 2000; Olsen,  
28 2004; Verbeke & Vackier, 2005), and the presence of bones and other physical attributes of  
29 seafood (Neale et al., 2012; Verbeke & Vackier, 2005) are often perceived as barriers to  
30 consumption. Previous research has also revealed that availability and confidence to cook  
31 seafood in addition to the preferences of the partner and children, influences provision of  
32 seafood to the family (McManus, Burns, Howat, Cooper, & Fielder, 2007). During infant and  
33 young child feeding (IYCF) parents commonly receive advice and information on feeding  
34 practices (Alder, et al, 2004; Bryant, 1982; Carruth & Skinner, 2001; Hoddinott, Craig,

35 Britten, & McInnes, 2010; Horodynski, et al, 2007; Pridham, 1990). There is a lack of  
36 published work investigating the advice parents are provided on the inclusion of seafood for  
37 infant feeding, however a study with pregnant women has shown that messages on  
38 consuming seafood are often confusing and contradictory (Bloomingdale et al., 2010).

39

40 A large bank of literature has previously investigated the influences on seafood consumption  
41 in adult populations (Birch & Lawley, 2012; Birch, Lawley, & Hamblin, 2012; Birch &  
42 Lawley, 2014; Bloomingdale et al., 2010; Foxall, Leek, & Maddock, 1998; Leek et al., 2000;  
43 McManus et al., 2007; Myrland, Trondsen, Johnston, & Lund, 2000; Neale et al., 2012;  
44 Olsen, 2001; Olsen, 2003; Olsen, 2004; Pieniak, Verbeke, & Scholderer, 2010; Pieniak,  
45 Verbeke, Scholderer, Brunsø, & Olsen, 2007; Trondsen, Braaten, Lund, & Eggen,  
46 2004a; Trondsen, Braaten, Lund, & Eggen, 2004b; Trondsen, Scholderer, Lund, & Eggen,  
47 2003; Vardeman & Aldoory, 2008; Verbeke, Sioen, Pieniak, Van Camp, & De Henauw,  
48 2005; Verbeke & Vackier, 2005; Verbeke, et al, 2008). An investigation of the influences on  
49 mothers' decision to provide seafood to their pre-school age child has additionally been  
50 conducted (McManus et al., 2007). However, this study was conducted only in one urban  
51 area of Australia using focus group discussions to explore influences to seafood consumption  
52 but did not explore the importance mothers give to these differing factors, particularly during  
53 the introduction of solid foods (from 6 months of age) and the early years when taste  
54 preferences and food acceptance occurs. The findings of this study are, to our knowledge, the  
55 first to measure the influences on mothers in providing seafood during early years' feeding  
56 and could be used to inform and tailor seafood-based dietary promotions and interventions.

57

58

## 59 **Methods**

60 This study employed a mixed method of Q methodology with an accompanying cognitive  
61 'think aloud' interview to quantify and put into context the influencing factors viewed by  
62 mothers' in the decision on whether to provide seafood into the diet of their young child. This  
63 methodology incorporates a Q sort technique which involves rank-ordering of a set of  
64 statements, providing participants with a decision-making task whilst allowing the researcher  
65 to observe and examine the decision-making process (Brown, 1980b). This mixed method  
66 incorporates a practical decision-making task providing a means to explore how each  
67 different influencing factor compares within context to others, an aspect lacking from the use  
68 of single aspect scales and questionnaires, such as Likert Scales.



69

70 ***Participants/Sample***

71 Mothers were recruited from pre-existing mother and baby/toddler groups identified from  
72 internet searches, and from work-place intranet advertisements and further snowballing in the  
73 North East of Scotland. Thirty two participant interview sessions were conducted with a  
74 sample of mothers with a range of demographics including; - deprivation (measured using the  
75 Scottish Index of Multiple Deprivation (SIMD) postcode look-up (Scottish Government,  
76 2012c)), urban/rural classification (measured by The Scottish Urban/Rural Classification  
77 (Scottish Government, 2012a)), fishing/non-fishing communities (indicated from coastal  
78 locations and Scottish Sea Fisheries Statistics (Scottish Government, 2015)), and child age.

79

80 It was deemed ethically correct to recruit only mothers who were over the age of 16 years due  
81 to classification of any person under this age as a child. Primi- and multiparous mothers of  
82 children aged six months (or younger if weaning had already started) and up to and including  
83 four years of age were included to incorporate the weaning and early years' period. This age  
84 range incorporates the key period when solid foods are introduced to infants, taste  
85 preferences and acceptance and neophobia of different foods occurs. Multiparous mothers  
86 were asked to think and refer to the feeding of their youngest child during the interview and  
87 sorting task. This study recruited mothers only due to the suggestion of significant differences  
88 between genders for views on food and health (Beardsworth, Bryman, Keil, Goode, Haslam,  
89 & Lancashire, 2002). Furthermore, evidence indicates that despite shared roles in meal  
90 planning and preparation, women are more likely to take the primary responsibility for these  
91 tasks and are also less likely than fathers to have no responsibility at all (Flagg, Sen, Kilgore,  
92 & Locher, 2014).

93

94 **Q set Development**

95 The statements for the sorting task were taken from themes identified through thematic  
96 analysis of parenting internet discussion forums (popular parenting websites identified as  
97 being used from previous studies (Hoddinott et al., 2010; Skea, Entwistle, Watt, & Russell,  
98 2008)) and focus group discussions carried out with mothers (n=29) of young children across  
99 six different parent and infant/toddler groups in the North East of Scotland (themes published  
100 in Carstairs, Marais, Craig, & Kiezebrink, 2017). Statements were developed from each of  
101 the themes identified and piloted to ensure clarity and saturation of themes. Development of

102 the Q set is an extremely important step in Q Methodology and can be achieved through a  
103 thorough review of the literature to identify themes however, information gathered during  
104 pilot studies, interviews and focus group discussions is often used (Watts & Stenner, 2005).  
105 Thirty five statements were originally piloted, the final Q set comprised 33 statements (Table  
106 2) which were assigned a code number and typed onto separate cards.

107

### 108 **Data Collection**

109 The Q sort and interview session (approximately 60 minutes) took place at the home of each  
110 participant and was conducted by one researcher (SC) between May and September 2015. A  
111 brief demographic questionnaire and informed consent form was obtained for each  
112 participating mother prior to the interview session. Instructions on how to complete the task  
113 were given by the researcher. Mothers were asked to sort the cards into three categories; -  
114 least important to me when choosing to give/not give my child seafood, neutral, and most  
115 important to me when choosing to give/not give my child seafood. Mothers were then asked  
116 to rank each statement card using a fixed quasi-normal distribution response grid on a scale  
117 of -4 (least important) to +4 (most important) (Figure 1). Throughout the sorting and ranking  
118 tasks mothers were asked to ‘think aloud’ to verbalise their decision-making and provide  
119 context for the placement of each statement card. Each interview session was audio recorded  
120 with the consent of the mother. On completion of the sorting task the researcher recorded the  
121 positioning of each statement on a template response grid. The study received ethical  
122 approval from the University of Aberdeen College Ethics Review Board (Project no:  
123 CERB/2014/9/1094).

124

125

126 **Figure 1:** The response grid.

127 The three coloured areas were used to get participants to group the statements in the first  
128 instance into three; “what is important to me”; “what is not important to me”; “not  
129 sure/neutral”. Following this, participants placed the statements into the response grid  
130 squares.

131

132

### 133 **Data Analysis**

134 Demographic data for the participant sample were analysed using descriptive statistics. The  
135 order in which each participant ranked each statement in the Q set was entered into the

136 PQMethod software 2.35 (Schmolck, 2014) for analysis. This analysis includes a by-person  
137 factor analysis technique to distinguish a correlation between participants' Q sort rankings  
138 (Watts & Stenner, 2005) thus identifying commonality in emergent factors (viewpoints).  
139 Viewpoints are then subjected to varimax rotation which maximises the amount of variance  
140 explained by the factors. To identify the number of viewpoints to undergo rotation two  
141 checks were employed - resultant viewpoints must have an eigenvalue (EV) (a measure of  
142 communality) greater than 1.00 to be interpretable (Watts & Stenner, 2005). Secondly, the  
143 viewpoint must have a minimum of two Q sorts that load significantly upon it (for this  
144 analysis a significant loading at  $P < 0.01$  was calculated as 0.449 (details of calculation in  
145 (Brown, 1980a)). Q sorts that significantly load on a given viewpoint therefore share a similar  
146 sorting pattern and thus it can be assumed, share a distinct opinion of the influences to  
147 seafood provision. Distinguishing statements (those significantly different at  $P < 0.01$ ) will be  
148 used to determine key statements which differ between viewpoints.

149 The audio recordings for a selection of participants were transcribed verbatim for qualitative  
150 analysis. The participants' data selected for transcription was determined by the participants  
151 who significantly loaded onto a single viewpoint. Particular focus was placed on the  
152 transcripts from the participants who best represented the ideal for each viewpoint i.e. had  
153 loadings closest to 1.0. Quotes were selected from discussions on specific statements to  
154 illustrate the points made by mothers. The immersion in the qualitative text was conducted by  
155 the researcher (SC) to examine the context and reasons behind participants' choices.

156

157 Fischer's exact test was conducted using SPSS software (IBM Corp, 2015) to investigate  
158 possible associations between viewpoints and socio-demographic variables. A P-value of  
159  $< 0.05$  was considered statistically significant.

160

161

## 162 **Results**

### 163 *Participant Demographics*

164 Of the 32 mothers who participated in this study, the mean age of the mothers was 33.7 years  
165 (SD = 4.39, range = 26 to 44 years) at the time of interview (Table 1). The mean age of the  
166 child was 18.6 months (SD = 11.43, range = 5 to 42 months) and the mean number of  
167 children in the household was 1.6 (SD = 0.75, range = 1 to 3). The sample had equal numbers  
168 of mothers residing in the least deprived and most deprived areas. Mothers were

169 predominantly seafood eaters (91%; n=29) and also had given seafood to their youngest child  
170 (91%; n=29).

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171 **Table 1:** Descriptive statistics of parent and child characteristics

Characteristic	Mean	Standard Deviation
Mother's age (years) (n=32)	33.7	4.39
Child's age (months) (n=33 <sup>a</sup> )	18.6	11.43
Children in household	1.6	0.75
	<b>N</b>	<b>%</b>
Child's gender <sup>a</sup>		
Male	19	58
Female	14	42
Married/Co-habiting	29	91
Working (part or full-time)	17	53
Area of Residence		
Most deprived (SIMD quintiles 1-3)	16	50
Least deprived (SIMD quintiles 4-5)	16	50
Urban	18	56
Rural	14	44
Fishing/coastal	14	44
Non-fishing/coastal	18	56
Consume seafood		
Mother	29	91
Child	29	91

172 <sup>a</sup>One pair of twins in study

173

174

175 ***Q Methodology Factor Analysis***

176 The results of the Q methodology factor analysis identified two significant factors  
 177 (viewpoints) (eigenvalues greater than 1.0 and two mothers' Q sorts significantly loaded onto  
 178 viewpoint). Factor 1 explained 25% of the study variance with eleven participants  
 179 significantly associated with this viewpoint. Factor 2 explained 19% of the study variance

180 and nine participants were significantly associated with this viewpoint. Six participants  
181 significantly loaded on both factors and a further six did not significantly load on either factor  
182 thus were excluded from further analysis. A high correlation score (0.563 which is greater  
183 than the 0.449 significance calculated for this analysis) was evident between the two  
184 viewpoints and with six participant's significantly loading on both factors it was evident that  
185 the two viewpoints were alternative manifestations of the same view (Watts & Stenner,  
186 2012). This is further evidenced by the number of consensus statements between the two  
187 viewpoints (described later in Table 2).

188

189 Factor arrays are presented in Table 2 showing the ranking of each statement in 'ideal'  
190 viewpoints. In the following sections descriptions of each viewpoint use the ranking position  
191 of distinguishing statements (statements which are significantly different ( $P < 0.01$ ) between  
192 the viewpoints calculated using z-scores) i.e. +3.

193 **Table 2:** Factor arrays for viewpoints identify significantly distinguishing statements  
 194 between viewpoints and consensus statements.

Statement	Viewpoint 1	Viewpoint 2
	Rank	
I believe my child doesn't like it	-1	-2
<b>Consensus Statement*</b>		
It's healthy good for them	4	4
The quality of it	3	3
I want them to try it	3	3
I know how to cook it	2	2
The taste	2	2
I cook it within a day or two of buying it	1	1
I know what to but for my kid(s)	1	0
It's what I like	0	1
It's habit, I normally give them it	0	0
The time of the day	0	-1
Eating out of special occasion	-1	-1
I bulk cook it and reheat it later	-2	-1
The day of the week	-3	-2
It's traditional	-2	-3
Media tells me to give them it	-3	-2
<b>Distinguishing statements †</b>		
<b>Viewpoint 1</b>		
It's safe to give them it	3	1
The cost	2	-3
It's filling	2	-2
It's available	1	0
The texture	1	0
Health professionals tell me to give them it	0	-1
I had it as a child	0	-1
<b>Viewpoint 2</b>		
I want to have just one family meal	-1	3
It is quick to make	0	2
It takes little effort/easy to make	1	2
It's what my partner likes	-3	1
It's what my other children like	-4	0
The environment	0	1
The smell	-1	0
The look of it	-1	0
My family tell me to give them it	-2	-3
My friends give their kid(s) it	-2	-4

195 \* denotes statements with no significant difference between factors at  $P > 0.05$  † denotes a  
 196 significant difference between factors at  $P < 0.01$

197

198 **Shared viewpoints**

199

200 Although it has been shown that the two viewpoints have key distinctions from each other,  
201 there was a consensus with mothers from both viewpoints for some statements (Table 3). The  
202 importance of taste (+2) was important in their decision on whether to give seafood to their  
203 child however, this was not the most important aspect for mothers in this study.

204

205 **Health**

206 The majority of mothers placed a high importance on the health aspects of giving seafood to  
207 their young child (+4) often relating it to the nutrients that seafood provides:

208 *“it's healthy or good for them' would probably be at the top for the white fish and the*  
209 *prawns. I think of it as a source of protein really and I know that there are some omega 3*  
210 *fatty acids in it that they don't necessarily get from anything else but to be honest I'm not sure*  
211 *that the fish that I give them has actually got very much of that in it because it is usually just*  
212 *white fish and prawns. I think it is more the fact that it is a source of protein really, that I*  
213 *think of” [P06, age 33, urban, fishing, 30 months]*

214

215 For the majority of mothers, the importance of health outweighed other practicalities of  
216 providing seafood to their child:

217 *“It's a battle between that you know, you want them to have a balanced diet, it's got to be*  
218 *good for them, but then it's easy and effortless to make. So it's a balance of being, knowing*  
219 *what you should be giving them versus in real life how you fit it in and get things done. So I*  
220 *think for me it's got... healthy has got to be the first one because it's good for them and I*  
221 *want them to have a bit of everything, so making sure they have some seafood at least a*  
222 *couple of times a week is very important”.* [P09, age 36, rural, fishing, 16 months]

223

224 In addition, mothers shared the consensus that they wanted their child to try seafood (+3),  
225 highlighting a desire to avoid fussiness:

226 *“Just so they're not restricted as they get older and so that when they go out with friends or*  
227 *they go to school or whatever, they're not, “Oh, I don't eat that and I don't eat this” and it*  
228 *doesn't become a big problem. I'd like them to have just tried everything or as much as they*  
229 *can”.* [P15, age 34, rural, non-fishing, 7 months]

230

231



232 **Quality**

233 The quality of seafood was an important aspect (+3) for the mothers and this was often  
234 considered in respect to the transparency of what they are eating:

235 *“I don’t really want to be giving her stuff that I don’t know what’s in it, so yeah. [talking*  
236 *about fish fingers] you don’t know quite what’s going on there, a bit like a chicken nugget.*  
237 *Whereas if you get a frozen fish that looks like a fish, then it is a fish and there’s not much*  
238 *else in there”*. [P12, age 31, rural, non-fishing, 12 months]

239

240

241 **Media Advice**

242 The unimportance of the media (-3 and -2) as a source of information on the inclusion of  
243 seafood during infant and young child feeding (Table 3) was apparent, with mothers often  
244 indicating distrust of the media:

245 *“with media you never know where the source of information is coming from, you never know*  
246 *if it's been [pause] even if they say it's research, you never know what the point of it is. Are*  
247 *they trying to sell a product or have they got an ulterior motive, so I don’t tend to listen to the*  
248 *media in terms of that”*. [P04, age 33, rural, non-fishing, 36 months]

249

250 **Knowledge and skills**

251 Mothers ranked the knowledge of how to cook seafood (+2) as important, with some  
252 indicating a lack of confidence resulting in avoiding cooking seafood for safety concerns and  
253 others limiting the type of seafood they provide to their child:

254 *“I'm thinking food poisoning if I don't know how to cook it and so I wouldn't try and give*  
255 *them it just in case”* [P28, age 34, urban, non-fishing, 12 months]

256

257 *“I give him like fish fingers, like, fish bites and fish goujons we eat but it’s always*  
258 *frozen...just cos I don't know how to cook it. I mean tuna steak looks so tasty but I just*  
259 *wouldn’t have a clue about how to cook it. I get nervous, I'm intimidated by cooking it”*.

260 [P24, age33, urban, non-fishing, 36 months]

261

262 **Viewpoint 1: Food attributes & infant-centred**

263 Of the eleven participants sharing viewpoint one, the mothers median age was 33 years (IQR  
264 31-35 years). The median age of the child was 17 months (IQR 9-24 months). Mothers

265 predominantly had only one child (82%) and 82% cohabited. This first viewpoint is depicted  
266 by food attributes and their impact on the young child and also an unimportance of other  
267 members of the household compared with viewpoint 2. Food attributes including the texture  
268 of seafood (+1) and also the availability of seafood (+1) were significantly distinguishing  
269 (Table 2) aspects impacting on the provision of seafood:

270 *"It's less chewy. She can break it down better with six teeth. So yeah, I'd say it was easier*  
271 *for her to eat and gum to death than trying to chew on a bit of actual red meat or chicken."*  
272 [P12, age 31, rural, non-fishing, 12 months]

273  
274 *"Like, well, it's not the supermarket, he's not getting it! So yes, I guess that that is*  
275 *important. It has to be available in my supermarket."* [P13, age 26, rural, non-fishing, 24  
276 months]

277

### 278 **Safety**

279 Mothers who shared this viewpoint placed greatest significance on the importance of the  
280 safety of seafood in giving this food to their young child (+3). The issues raised by the  
281 mothers often included the risk of food poisoning and choking due to bones but also due to  
282 the mercury and contaminant levels derived in seafood:

283 *"I suppose it is a wee bit important to me at the moment yeah, I'm more...it's the choking*  
284 *hazard...I don't know what fish has bones in it and what doesn't"* [P27, age 34, urban,  
285 fishing, 5 months]

286

287 *"That's funny, because before I would definitely give it to them without a doubt, but since I*  
288 *found out about the restrictions that really worried me. But the worrying one is to do with the*  
289 *girl's fertility that would be the one [pause] I wouldn't want to affect their fertility by giving*  
290 *them a lot of fish."* [P16, age 25, rural, non-fishing, 22 months]

291

### 292 **Value for money**

293 An additional attribute of seafood that mothers with this viewpoint shared was the cost of  
294 providing seafood (+2):

295 *"Well, because we will give him fish fingers because that's one of the easier options if you*  
296 *have less time, those are cheap so we keep those in the freezer, but that's not something*  
297 *(partner) and I would have, so in that respect yes, but when we're trying to give him some of*  
298 *the similar stuff to what we have, like salmon fillets and whatever, yes, he probably doesn't*

299 *get it as much because we don't eat it a much because it is expensive. I think actually fish is a*  
 300 *bit more expensive than the other meats” [P13, age 26, rural, non-fishing, 24 months]*

301

302 A need for the meal to be filling (+2) was also considered and combined with cost these  
 303 aspects were interrelated for some mothers where the value for money was considered:

304 *“I do think about it. And I maybe should spend more on food and that is one thing that*  
 305 *slightly puts me off fish as well because it is more expensive, or it seems to be more expensive*  
 306 *anyway. Whether it's just, if you spend £4 on chicken you get maybe one and a half or two*  
 307 *meals out of it whereas if you spend £4 on salmon you'd eat them in one meal and it would be*  
 308 *a light meal and you're hungry again later on in the evening. So for the same price you seem*  
 309 *to get less food for it with regards to fish” [P02, age 30, rural, non-fishing, 18 months]*

310

### 311 **Family Preferences**

312 However, it was the unimportance of family members' preferences, such as older siblings (-  
 313 4) that also exemplified this viewpoint, more so than the partner's preference (-3). Many  
 314 mothers discussed the fact that they often provided separate meals for weaning their youngest  
 315 child:

316 *“I think I probably did her [infant] on quite an individual basis when I was weaning her so I*  
 317 *don't, I suppose I didn't really take account of what [other child's name] was liking or not*  
 318 *liking if it meant making a separate meal then that's kind of what I did” [P04, age 33, rural,*  
 319 *non-fishing, 36 months]*

320

### 321 **Health Professionals Advice**

322 Despite ranking the advice from health professionals as neutral, mothers of this first  
 323 viewpoint felt advice from this source was more important to their decision-making than  
 324 those sharing viewpoint 2, comparing this advice to that from other sources:

325 *“Yes, I'm more influenced by health professionals than the media, definitely so he's got a 27-*  
 326 *month check at the end of the month so if they've got an opinion on me giving him seafood,*  
 327 *then it's something I would take on board” [P13, age 26, rural, non-fishing, 24 months]*

328

329 Some mothers even referred to the written material provided by their health visitor, citing  
 330 information:

331 *“I look at my books and things from them [reading from her booklet] yeah I mean like here it*  
 332 *says "are there any foods I shouldn't give?" and it's like "foods before they're one" and*

333 *they've got shark, marling, swordfish, who gives their babies that anyway?"* [P27, age 34,  
334 urban, fishing, 5 months]

335

### 336 **Viewpoint 2: Convenience & family-centred**

337 Nine mothers shared this second, alternative viewpoint. The median age of the mothers was  
338 33 years (IQR 31-39 years) whilst the youngest child was aged 16 months (IQR 8.5-24  
339 months). More than half the mothers of this viewpoint (55%) had more than one child and all  
340 co-habited (100%).

341

#### 342 ***Shared family meal***

343 Of importance to mothers of this viewpoint, was having one family meal (+3) (Table 2) with  
344 some highlighting an importance to cook only one meal:

345 *"If you don't like it then it's a bit tough in this house, if you don't like it you just move on and*  
346 *miss that bit, I'm not making anything else and they just get pudding or whatever."* [P09, age  
347 36, rural, fishing, 16 months]

348

349 and others referring to a learning experience and the social aspect of eating together:

350 *"I think a lot of it was kind of, not wanting to encourage fussiness, in my mind I think of*  
351 *servicing one meal as teaching children sometimes that they just have to be grateful for what*  
352 *they get. I quite like the idea that it maybe makes it more of a family occasion if you're all*  
353 *eating the same food rather than all doing separate things. There's just something about*  
354 *that. I think it is more important to me because we don't spend the day together, you know*  
355 *that when we do it is something that we all do."* [P06, age 33, urban, fishing, 30 months]

356

#### 357 ***Family Preferences***

358 Although the mother's own preference (+1) was not a significantly distinguishing aspect,  
359 mothers of this viewpoint ranked their husband/partner's preferences towards seafood (+1) as  
360 fairly important, often resulting in the infrequent consumption and offering of seafood to their  
361 child:

362 *"fish is something we eat very rarely in this house because my husband and I don't, it's not*  
363 *that we don't like it, it's just not our favourite and we don't eat it that much so if we ate it a lot*  
364 *the kids would eat it more."* [P05, 34, urban, fishing, 36 months]

365

366 But for others, some importance was placed on providing foods which conformed to their  
367 own intakes:

368 “So yes, that’s, I guess, a reason that we do give it to him because then his diet’s in line with  
369 ours.” [P10, aged 32, urban, fishing, 9 months]

370

### 371 **Convenience**

372 The importance of the ease (+2) and quickness (+2) of providing seafood was apparent in  
373 these mothers who chose to give both fresh and frozen seafood options:

374 “Yes, that’s important when, I have the two of them. Yes, so I don’t really spend that much  
375 time in the kitchen. I just put it in the steamer, two minutes and it’s ready, it’s just steaming  
376 there and I can do something in the meantime, it’s ready in half an hour and we can all have  
377 it so it’s really quick compared to the meats which you have to either fry or grill or something  
378 and it does take more time so I think fish is actually quite quick to make” [P11, age 30, urban,  
379 fishing, 12 months]

380

### 381 **Environment**

382 These mothers additionally placed some importance on the environmental aspects of eating  
383 seafood (+1) on their decision-making compared to mothers with the first viewpoint:

384 “Yes, so I do try and buy fish that’s been sustainably farmed and I do look at those things on  
385 the packets. I do look at the fish and we try and buy dolphin-friendly tuna and things like that,  
386 so yes, that kind of thing does influence me more than my husband.” [P15, age 34, rural, non-  
387 fishing, 7 months]

388

### 389 **Sensory Attributes**

390 Despite low scores and neutral ranking for the importance of the smell (0) and look of  
391 seafood (0), these physical, sensory characteristics were significantly more important for  
392 mothers of this viewpoint compared to viewpoint one. However, mothers differed in whether  
393 these attributes were important to themselves or to their child:

394 “the look of it is probably neutral really because I know that my children have looked at it  
395 and thought that it looked like other meats that they like, like chicken, so I suppose it  
396 certainly wouldn’t put me off but I’m not sure it positively encourages either.” [P06 age 33,  
397 urban, fishing, 30 months]

398 “it’s off putting to me [smell] but he likes it so I put up with it” [P31, age 26, urban, fishing, 8  
399 months]

**400 Others views and opinions**

401 This viewpoint additionally showed that mothers placed the views of other people, such as  
402 their friends (-4) and family (-3) as the least important aspects in choosing to give their young  
403 child seafood, which was lower than mothers sharing the first viewpoint:

404 *“I think that’s least important. I don’t care that much about really what they say.”* [P11, age  
405 30, urban, fishing, 12 months]

**408 Demographic analysis**

409 Possibly due to the small sample of mothers who significantly loaded onto the viewpoints  
410 identified in this study (n=20), there were no significant relationships between the mothers’  
411 viewpoint and demographic characteristics (Table 3). The majority of mothers sharing the  
412 first viewpoint (73%) resided in non-fishing, inland communities (p=0.175) and 60%  
413 residents in the areas of greatest deprivation (measured as those living in SIMD quintiles 1 to  
414 3) (p=1.000). The prevalence of single-child mothers who shared the view food attributes and  
415 infant-centred (82%) was also not significantly different to those sharing the view of  
416 convenience and family-centred (p=0.160). There was no relationship between the mothers  
417 age (p=1.000) or the age of their child (p=1.000) and their viewpoint. Mothers who shared  
418 the convenience and family-centred equally came from the least and most deprived areas  
419 (p=1.000) with 56% residents in urban locations (p=1.000) whilst 67% came from fishing or  
420 coastal communities (p=0.175). There was no significant relationship between mothers  
421 viewpoint and whether they consume seafood (p=1.000) or give it to their young child  
422 (p=1.000). Despite a lower percentage of mothers (55%) and children (46%) of viewpoint  
423 one consuming or giving oil-rich seafood, this relationship was not significant (p≥0.157).

424

425

426 **Table 3:** The relationship between demographic characteristics and viewpoint.

Characteristic		% of Viewpoint		P-Value <sup>c</sup>
		Viewpoint 1 (n=11)	Viewpoint 2 (n=9)	
Mother's Age	26-33yr	54.5	55.6	1.000
	34-44yr	45.5	44.4	
Child's Age	5-12mths	45.5	55.6	1.000
	13-42mths	54.5	44.4	
Child Sex	Female	36.4	37.5	1.000
	Male	63.6	62.5	
Other children in household	Yes	18.2	55.6	0.160
	No	81.8	44.4	
Co-habiting	Yes	81.8	100.0	0.479
	No	18.2	0.0	
Working	Yes	63.6	44.4	0.653
	No	36.4	55.6	
Area of residence	Highest Deprivation <sup>a</sup>	60.0	50.0	1.000
	Lowest Deprivation <sup>b</sup>	40.0	50.0	
	Urban	54.5	55.6	1.000
	Rural	45.5	44.4	
	Fishing/Coastal	27.3	66.7	0.175
	Non-fishing	72.7	33.3	
Mother consumed <sup>d</sup>	Seafood	90.9	100.0	1.000
	Oil-rich seafood	54.5	88.9	
Child given <sup>d</sup>	Seafood	90.9	88.9	1.000
	Oil-rich seafood	45.5	77.8	

427 <sup>a</sup> defined as SIMD quintiles 1-3 <sup>b</sup> defined as SIMD quintiles 4-5 <sup>c</sup> Fischer's Exact Test <sup>d</sup>  
 428 consumed seafood from weekly up to monthly basis  
 429

430

431

### 431 Discussion

432 This study aimed to investigate the importance of differing influencing factors on mothers'  
 433 decisions to provide seafood into the diet of their child during early years' feeding using Q  
 434 methodology. The sorting task and 'think aloud' interview revealed that there was an  
 435 agreement between mothers on the importance and unimportance of many aspects in driving  
 436 their decision on whether to include seafood during early years' feeding. However, two



437 viewpoints emerged in this group of mothers, namely; - food attributes and infant-centred,  
438 and convenience and family-centred.

439

#### 440 *Shared Views*

441 The importance of providing a healthy, balanced diet was paramount in mothers of both  
442 viewpoints with a desire to try to provide a variety of different foods for their child that were  
443 of good quality. The mothers in this study may have felt a moral obligation to provide good,  
444 nutritious foods for their young child to give them a healthy start in life in agreement with  
445 previous studies (Nielsen, Michaelsen, & Holm, 2014). By providing different foods to try,  
446 mothers wished to socialise their child into family mealtimes and hoped to have social eating  
447 outside the home without fuss or difficulty, an aspect also found in a study of Danish mothers  
448 (Nielsen et al., 2014). This moral obligation evident in our study compliments previous  
449 conclusions that seafood consumption is driven more by moral obligation than taste and  
450 preferences compared with other foods (Olsen, 2004). However, it is important to consider  
451 that mothers of this current study were predominantly seafood consumers who had offered  
452 seafood to their child and thus have an acceptance of this food. They may have felt happy in  
453 disclosing that they perceived seafood provision to be a moral obligation to be viewed as a  
454 “good parent”. Non-seafood consuming parents however may not hold this aspect as  
455 important in their decision-making compared to other factors, or wish to disclose feeling a  
456 moral obligation that they may be seen to not achieve. Some of our mothers also believed that  
457 providing seafood for their young child will encourage them to eat more healthily as a family,  
458 an aspect shared by mothers of a previous UK-based study (Hoddinott et al., 2010), thus  
459 providing an opportunity for seafood to appear more regularly on the household menu.

460

461 Mothers additionally shared the view that advice from media sources was the least important  
462 influence to their decision on providing seafood. Many mothers felt a lack of trust towards  
463 media as a source of information and mentioned ulterior motives by industry and food  
464 manufacturers, mirroring previous accounts by mothers on healthy eating information  
465 (O’Key & Hugh-Jones, 2010). The unimportance mothers placed on information and advice  
466 gained was partly explained by a perception of mixed messages on when and what seafood  
467 you can give your child that mothers received between different sources; findings which  
468 support those of a previous study with pregnant women (Bloomingdale et al., 2010). Our  
469 sample of mothers stated they relied on their own instincts when deciding to give seafood  
470 which may be a result of mothers’ decision to ignore these confusing mixed messages. The



471 confidence in their own choices apparent in this group of mothers may be indicative of their  
472 familiarity with eating seafood (Birch & Lawley, 2014) but may also be due to educational  
473 biases, a measure not recorded in this study. However, we should consider that mothers who  
474 do not consume seafood may not feel as confident with filtering the information and advice  
475 they receive on seafood and place a greater importance of this factor in their decision-  
476 making. The unimportance of advice from others on seafood provision held by these mothers  
477 opposes findings from infant feeding studies where advice from the maternal grandmother  
478 and encouragement from friends on the timing of weaning are sought (Alder, Williams,  
479 Anderson, Forsyth, du ve Florey, & van der Velde, 2004). This insignificance of external  
480 information sources on seafood inclusion could be suggested to be due to previous weaning  
481 experiences of older children (Hoddinott et al., 2010) or possibly due to mothers choosing to  
482 ignore these perceived mixed messages. Furthermore, the mother's education and socio-  
483 economic status may also play a role however, no statistical relationship was found in this  
484 study between multiparous mothers, level of deprivation and this second viewpoint, possibly  
485 due to the small sample size. The preferences of the partner were deemed important for  
486 mothers sharing the convenience and family-centred viewpoint indicating that the influence  
487 of the significant other may play a role more than advice from other family members out-with  
488 the household (Hoddinott et al., 2010).

489

#### 490 *Convenience and family-centred*

491 The idealism of providing a healthy diet for the child often competes with everyday  
492 practicalities of feeding (Hoddinott, Craig, Britten, & McInnes, 2012) and mothers of the  
493 second viewpoint held a great importance on providing one family meal. These mothers may  
494 in part wish to prepare and cook just one meal which the infant can share to incorporate them  
495 into the family (Hoddinott et al., 2010) and a shared eating experience however, family  
496 preferences and time constraints may play an interrelated role. Interestingly mothers  
497 expressing this view did not perceive the cost of seafood as central to their decision-making  
498 unlike their counterparts who deemed this as important. Previous findings have shown that  
499 seafood is often perceived as expensive and may act as a barrier to consumption  
500 (Bloomingdale et al., 2010; McManus et al., 2007; Neale et al., 2012; Verbeke & Vackier,  
501 2005) however, mothers sharing the second viewpoint did not perceive cost as a barrier as  
502 many had found affordable seafood options and others did not perceive this as any more  
503 expensive than other protein-rich types. Furthermore, the majority of mothers were seafood-  
504 eaters and described providing a taste of seafood for their child from their own plate, limiting

505 individually prepared meals for the young child. The greater importance of family food  
506 preferences evident in the convenience and family-centred viewpoint compliments the  
507 importance and desire to have a family meal and can often impact on the frequency of  
508 seafood meals appearing on the household menu (McManus et al., 2007; Myrland et al.,  
509 2000; Verbeke & Vackier, 2005).

510

### 511 *Food attributes and infant-centred*

512 The importance of safety for mothers who shared the food-attributes and infant-centred  
513 viewpoint shows a concern by these mothers of aspects such as texture, risk of choking, the  
514 risk of food poisoning, allergic reactions, and toxicological contamination. Balancing the  
515 benefits of seafood with these risks has been an area of debate (Nesheim & Yaktine, 2007).  
516 The framing of seafood messages may play an important role in mothers' decision-making  
517 and a prominence of the associated risks of harm may overshadow health benefits (Rothman  
518 & Salovey, 1997). It was expected that mothers who shared the viewpoint of food attributes  
519 and infant-centred would be primiparous, providing an individual meal for the weaning child  
520 compared to convenience and family-centred mothers who may be impacted more by  
521 competing priorities and preferences of older children (Robinson et al., 2007). A greater  
522 percentage of mothers sharing the food attribute and infant-centred view had only one child  
523 however, no statistical difference was found between mothers of each viewpoint, again  
524 possibly due to the final sample size being too small to detect any differences rather than no  
525 differences being found. It was expected that mothers of children within the weaning  
526 developmental stage (6-12mths) would hold the viewpoint of food attributes and infant-  
527 centred as this is the stage of introducing solid foods and when parents may be more hesitant  
528 and conscious towards the safety of food and how their child responds to foods. However  
529 possibly due to the small sample size, the trend towards mothers of this viewpoint having  
530 children within this younger age group was not statistically significant. The buying and  
531 preparation of separate foods for the weaning infant may provide an opportunity for non-  
532 seafood eating mothers to provide a food which does not suit their own preferences and it was  
533 often mentioned by mothers that they wished to offer foods that they themselves did not  
534 enjoy to widen the child's acceptance of foods, possibly explaining the lesser importance of  
535 the mothers preference on the decision on whether to include seafood in our sample.

536

### 537 *Limitations*

538 The provision of a practical decision-making tool and accompanying ‘think aloud’ interview  
539 utilised in this study permitted the researcher to view the decision-making process by mothers  
540 and listen to their reasoning. The presence of the researcher could however have influenced  
541 the mother to rank and discuss key factors in a manner that they believed was to be expected  
542 to be perceived as a ‘good mother’. Nonetheless, completing the Q sorting task in the  
543 presence of the researcher was necessary to explain the process of the Q sort and record and  
544 probe mothers during the ‘think aloud’ interview.

545

546 Our sample of 32 mothers was deemed sufficient to the design of Q methodology, which  
547 requires only a limited number of respondents (Watts & Stenner, 2005), and took into  
548 consideration a range of mothers from different areas of residence (urban/rural, fishing/non-  
549 fishing), deprivation levels, and with a range of child’s ages. However, the twelve mothers  
550 whose views were excluded from the analysis due to insignificant or confounded loading  
551 reduced the sample size which may have influenced the lack of relationships found between  
552 viewpoints and mothers demographic information. It is a generally held view that those with  
553 an interest in the research topic are more likely to volunteer for participation and it was  
554 evident that there was a bias to our sample, where mothers were primarily seafood consumers  
555 who had given seafood to their child. Future research should be conducted in non-seafood  
556 consuming parents to fully understand the decision to provide seafood during the early years.  
557 Despite recruiting mothers from a selection of deprivation levels, it must be considered that  
558 SIMD scores represent deprivation on an area level and not an individual basis (Scottish  
559 Government, 2012b). Thus the range of mothers from socio-economically divergent  
560 backgrounds may not have been achieved and results may not be generalizable to other  
561 populations. A further limitation of this study was the inclusion of one mother who had a  
562 child aged five months of age. This age is below the recommended six months for the  
563 introduction of solid foods and thus inclusion of seafood in the diet, on this occasion the  
564 mother had begun introducing solid foods and discussed their intentions and plans on  
565 providing seafood in their child’s diet. Our sample included a broad range of child age; from  
566 weaning to pre-school, however the sample size in this study did not permit the investigation  
567 of differences in mothers’ opinions according to the child’s developmental stage therefore,  
568 future studies are required to determine any key differences in the importance mothers place  
569 on the influences to their decision-making.

570

571 It is important to consider that fathers who hold the primary food provider role in the  
572 household may have a different opinion on the importance of the influences. This study was  
573 limited to mothers due to possible gender differences in opinions however, future research  
574 should consider the role and views of fathers in the decision to provide seafood and should  
575 additionally consider the implications of shared custody of children and the impact on food  
576 choices. The findings from this research study provides an insight into the importance  
577 mothers place on the influences to their decisions on providing seafood during infant and  
578 young child feeding. Furthermore, these findings can be used to inform and tailor  
579 interventions aimed at increasing and promoting the provision of seafood by parents to meet  
580 recommendations based on their views on whether food attributes and the infant are of focus  
581 or whether convenience and family-centred focus is more important.

582

### 583 **Transparency Declaration**

584 The lead author (SC) affirms that this manuscript is an honest, accurate, and transparent  
585 account of the study being reported; that no important aspects of the study have been omitted;  
586 and that any discrepancies from the study as planned have been explained.

587

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605

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607 Substantial contributions to the conception or design of the work; data collection, analysis,  
608 and interpretation of data for the work were conducted by Sharon Carstairs (SC) under the  
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611 approval of the version to be published given by KK, LC and DM. There is agreement  
612 between the authors that SC is accountable for all aspects of the work in ensuring that  
613 questions related to the accuracy or integrity of any part of the work are appropriately  
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615

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ACCEPTED MANUSCRIPT

Least important  
to me in choosing  
to give/not give  
my child seafood



Most important to  
me in choosing to  
give/not give my  
child seafood

-4	-3	-2	-1	0	+1	+2	+3	+4
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