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**Perception and understanding of health claims on milk powder for children: A
focus group study among mothers in Indonesia, Singapore and Thailand.**

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Abstract

Health claim regulations and guidelines on food products have been established in some Southeast Asia (SEA) countries. Health claims on food products aim to help consumers make informed food choices to achieve a healthy diet. This study aimed to investigate the perception and understanding of health claims and the associated regulatory frameworks of SEA mothers using semi-structured focus groups conducted in Indonesia, Singapore and Thailand. Milk powder for children for three years and above was used as product focus. The mothers recognised and recalled some specific nutrients and food constituents by name but lacked full understanding of their function. The findings indicated that the mothers in all three countries trusted health claims made on the products which was, in part, explained by their trust in their governments and the international brand manufacturers. Their understanding of health claims was influenced by several factors such as their familiarity of the nutrient, the previous knowledge of the nutrients, the perceived relevance of the nutrient, the use of scientific terms, the choice of words, and also the phrasing and length of the claims. Consumer education efforts via Public, Private Partnerships could be an approach to educate SEA consumers and help them to better understand health claims. The findings of this study may be relevant to different stakeholders such as local regulatory bodies, policy makers, food industry, academia and non-profit organisations that aim to effectively communicate health claims.

Keywords: Health claims, Southeast Asia, consumers, perception, understanding, regulatory affairs

Introduction

Health claims communicate a relationship between a food and health via i) nutrient function claims, ii) other function claims, and iii) reduction of disease risk claims (Codex Alimentarius, 1997 (last amended in 2013)). Research has suggested that health claims have an educational impact by informing consumers of previously unknown health benefits and diet-disease relations, with the potential to support healthy food choices (Richardson & Eggersdorfer, 2014; Wills, Schmidt, Pillo-Blocka, & Cairns, 2009; Wills, et al., 2012). Health claims can also create more favourable attitudes to products (Kozup, Creyer, & Burton, 2003) through potential positive framing effects (van Kleef, van Trijp, & Luning, 2005) as a heuristic to indicate perceived product healthiness (Roe, Levy, & Derby, 1999) and via a ‘halo effect’ when a food is conferred with additional health benefits that were not mentioned in the claim (Roe, et al., 1999). Given the potential commercial benefits of products with health claims, health claims legislation typically aims to provide a regulatory framework in which consumers can confidently use health claims to make informed food choices via clear, accurate and scientifically grounded evidence to protect consumers, promote innovation and a fair, competitive environment (European Food Safety Authority, 2006).

Since 2014, the Association of South East Asian Nations (ASEAN) Economic Community (which includes the ten nations of Brunei Darussalam, Cambodia, Indonesia, Lao People’s Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam) has represented the third largest trading block globally, with a combined population of 622 million. The strategic forward plans for the region outlined in the ‘*ASEAN Economic Community Blueprint 2025*’ (ASEAN, 2015) have espoused the need for consumer protection, including the provision of adequate information to support consumers’ informed product choices. At present, due to differences in cultures, languages and stages in economic development (ASEAN, 2015), health claim regulations and guidelines which would support

this consumer protection remit have only been established in five countries, namely Indonesia, Malaysia, the Philippines, Singapore and Thailand (Tan, van der Beek, Chan, Zhao, & Stevenson, 2015). To support both the free movement of goods and services within the ASEAN single market and the use of health claims as part of brand communications between the food industry and consumers, it is critical to understand how ASEAN consumers respond to and understand health claims.

To date, most empirical research relating to consumer understanding of health claims has been conducted in western countries such as Germany (Grunert, Scholderer, & Rogeaux, 2011); Ireland (Lalor, Madden, McKenzie, & Wall, 2011; Lynam, McKevitt, & Gibney, 2011), Sweden (Svederberg and Wendin, 2011), Denmark (Aschemann-Witzel & Grunert, 2015; Orquin & Scholderer, 2015), Belgium (Verbeke, Scholderer, & Lähteenmäki, 2009), Canada (Wong, et al., 2014), the United States (Wills *et al.*, 2009), Italy, Germany, UK and US (van Trijp & van der Lans, 2007), including reviews of European consumers (e.g. Wills, 2012, Lahteenmaki, 2013). This body of research has identified that consumers prefer short, succinct claim statements without scientific terminology on the front of the pack and context-specific health claims (Williams, 2005; Verbeke, Scholderer, & Lähteenmäki, 2009). Visual aids such as graphics and concise messaging in a prominent, typically front-of-pack location have been identified as improving the communication effectiveness of health claims (Geiger, 1998; Hooker & Teratanavat, 2008). Descriptive phrasing using simple language is recommended as the regulatory process and the level of scientific evidence required to approve claims is poorly understood by the consumers (Wills *et al.*, 2009). A further dimension of the usefulness and acceptance of health claims is the trust of consumers and food manufacturers in the health claim statements and the regulatory environment (Svederberg & Wendin, 2011; Lalor, Madden, McKenzie, & Wall, 2011). In order to understand the awareness, understanding and preferences for health claims within their cultural context, this study aimed to investigate South East Asian consumers' perception and understanding of health claims and the regulatory

settings of the local regulatory frameworks in SEA, using milk powder for children aged 3 years and above as a research focus.

Milk powder was used as an elicitation prompt because it contains key nutrients to support growth and development among children (Food and Agriculture Organisation of the United States, 2013) and it is commonly used in SEA countries. In SEA, this category of food can display health claims on the food labels. The objectives of this study were as follows: 1. to understand the current status of the knowledge, perception and attitudes towards health claims on milk powder for children among mothers in Indonesia, Singapore and Thailand using semi-structured focus groups; 2. to explore the mothers' current knowledge and trust of the regulatory process and framework; 3. to identify factors affecting the understanding of health claims using three selected nutrients, calcium, iron and vitamin A as case studies.

Materials and Methods

Ethical approval for the study was provided by the Newcastle University (UK), Faculty of Science, Agriculture and Engineering Research Ethics Committee. All participants gave written informed consent before taking part in focus group discussions.

Design and Setting

This study was conducted in three SEA countries, Indonesia, Singapore and Thailand which were selected on the basis of the presence of established regulations and/or guidelines for the use of health claims on food in each country. All three countries have a list of permitted health claims with precise wordings which must be stated exactly on the food labels and any form of consumer communication, as outlined in Table 1 (National Agency of Drug and Food Control of the Republic of Indonesia, 2011; Agri-Food & Veterinary Authority of Singapore, 2010 (with amendments to 2015)); Ministry of Public Health, Thailand, 2011). For example, in

Indonesia, nutrient function claims are allowed on products for young children aged one to three years old and no other function claims or disease risk reduction claims are allowed on products targeted for this age group. In contrast, nutrient function claims and other function claims are allowed in Singapore and Thailand, provided they comply with requirements in the regulations and/or guidelines.

Table 1: Summary of the health claims regulations and guidelines in Indonesia, Singapore and Thailand

Country	Established health claims regulations and guidelines	Approved health claims to be stated exactly	List of approved health claims		
			Nutrient function Claims	Other Function Claims	Reduction of Disease Risk claims
Indonesia	√	√	√	√*	√*
Singapore	√	√	√	√	√
Thailand	√	√	√	√	×

✓ - present in country indicated

X - not present in country stated

* Prohibits claims on processed food for babies, and other function claims and reduction of disease risk claims for processed food intended for young children aged 1-3 years old (National Agency of Drug and Food Control of the Republic of Indonesia, 2011)

Participants

Forty-eight mothers were screened and recruited from Indonesia, Singapore and Thailand (16 in each country) by an independent market research agency through telephone interviews. The inclusion criteria for participation were mothers aged between 21-40 years old, with at least one child aged three- six years, who were current users of milk powder for their children, and claimed to read food labels (including health claims). It was assumed the mothers residing in urban areas would have greater access to information and more choices of brands compared with those residing in non-urban areas. Research participants were therefore recruited from

urban areas of Jakarta, Singapore and Bangkok and were purposively sampled to be socio-economically comparable with the ‘average’ monthly gross household income and education level for each country; i.e. participants in Singapore and Bangkok had a gross monthly average household income of USD 3684- USD 7370 and USD856- USD1711, respectively. For Indonesia, participants were recruited based on average household expenditure, brand of drinking water, types of fuel purchased and amount spent on food and non-food items to provide a realistic picture of status and consumption patterns of respondents due to some ambiguity with income levels. The education level of the mothers in the three countries was mainly to a tertiary level. Excluded from this study were women who worked for marketing agencies and the milk industry. Before commencing each focus group the purpose of the study was explained again to the participants and each gave written informed consent to take part. The recruitment strategy is outlined in Figure 1.

Figure 1: Subjects recruitment criteria

Choice of product and stimulus material

It is common practice in SEA for mothers to continue to provide milk to children in this age-bracket. Milk powder is more commonly served than fresh cow's milk as it is less perishable in the hot/humid weather conditions in SEA. These products carry nutrient function claims in the three chosen locations and therefore the participants would have been exposed to them (based on their stated use of the products and that they read food labels and health claims on packaging).

To investigate the factors affecting understanding of health claims, the standard SEA-approved claims for three selected nutrients in milk powder, calcium, iron and vitamin A were used. The nutrients were carefully considered before selecting them. The selection of nutrients was based on the following two criteria: 1. the nutrients had similar health claims approved in each of the three selected countries; 2. the nutrients have significant impact on the growth and development of children aged 3-6 years old.

There are only 11 nutrients that have permitted health claims across the three SEA countries. The health impact of the nutrient to the health of a child first guided the researcher, followed by the familiarity and/ or awareness of nutrients. Several review papers have stated that familiarity with nutrients/ ingredients has an effect on the responses towards the health claims (Dean, Lahteenmaki, & Shepherd, 2011; Lahteenmaki, 2013). The selected nutrients iron and vitamin A are commonly found to be deficient among children in SEA and calcium is commonly supplemented to pregnant women in the region (United Nations Children's Emergency Fund, 2015). Hence participants should have been exposed to information about these nutrients prior to their involvement in the study. Further scientific rationale for the selection of these nutrients as case studies in the research is described below.

1. Calcium

Calcium is important for the development of bones and teeth during the growth of children (United States National Institute of Health 2013). The latest National Nutrition Survey in Singapore in 2010 showed an improvement in calcium intake among the adult population over the last six years (Health Promotion Board, 2010). It is one of the common nutrients which is featured in nutrition education on the Singapore Health Promotion Board website (Health Promotion Board Singapore website, 2016). The Thai Public Health Agency encourages milk drinking for people of all ages (Thai Public Broadcasting Service (ThaiPBS), 2016) and the school milk programme has been implemented since 1992 to promote milk drinking among young people (Chungsiriwat & Panapol, 2009). Similarly, the Indonesian government recognised the importance of milk consumption and co-operated with the dairy industry to promote the health benefits of milk (Vanzetti, Setyoko, & Oktaviani, 2013). The demand for dairy products in Indonesia has grown 10% on an annual basis for the past decade (Askew, 2014).

2. Iron

Iron is a crucial nutrient in blood cell formation with a major impact on the long-term health of the baby. The prevalence of anemia among children aged 6-59 months old in Indonesia, Thailand and Singapore was 32%, 29% and 19%, respectively and the WHO classified the incidence of anemia in Indonesia and Thailand as moderate (World Health Organisation, 2015). The improvement of iron status has been listed as one of the United Nations Millennium Development Goals for the improvement in maternal health (World Health Organisation, 2012) and is a WHO Global Nutrition target for 2025 (World Health Organisation, 2014).

3. Vitamin A

Vitamin A is an essential nutrient for vision, the immune system, reproduction and proper functioning of major body organs (World Health Organisation, 2011). Vitamin A deficiency is a public health problem and it affects about 19 million pregnant women and 190 million preschool-age children, mostly in Africa and SEA (World Health Organisation, 2011). The statements on Vitamin A are commonly used by milk companies in SEA.

Three claim statements were presented for each nutrient and are classified as follows:

1. The national approved claim for each nutrient which differed slightly in wording between each country;
2. A short version of the claim derived by the research team which was made the same for each country and would be allowable under the current legislation for each country;
3. A health claim contrived by the research team which was scientifically inaccurate and would not be substantiated under the current legislation in the three countries.

The three types of claims were selected based on findings in the existing literature which investigated factors affecting perception and understanding of health claims (Grunert, Scholderer, & Rogeaux, 2011; Lynam.,et al., 2011; Svederberg & Wendin, 2011). The nationally approved claim and short version of the approved claim were selected to explore

208 the consumers' recognition and understanding the claims based on their knowledge of the
209 nutrients and the expectation that they may have seen the claims while purchasing milk
210 products. The contrived claims were used to explore further whether the consumers'
211 knowledge was sufficient to recognise that the claims were inaccurate.

212 Thus, a total of nine different health claims statements were presented to the mothers in each
213 group (see Tables 2, 3 and 4). The claims were presented in Indonesian in Indonesia, English
214 in Singapore and Thai in Thailand. The claim statements on Vitamin A were not tested in the
215 first focus group discussion among the younger mothers in Singapore due to the available time
216 when conducting that group.

217

218 **Table 2: Health claims statements on calcium tested in the three countries**

Country	Calcium		
	Calcium 1	Calcium 2	Calcium 3
	<i>Approved local authority claim statement</i>	<i>Derived short version of approved local authority claim statement</i>	<i>Contrived, inaccurate claim statement</i>
Indonesia	<p>Calcium plays a role in the formation and maintenance of bone density and teeth.</p> <p>Kalsium berperan dalam pembentukan dan mempertahankan kepadatan tulang dan gigi</p>	<p>Calcium makes strong bones and teeth.</p> <p>Kalsium membuat tulang dan gigi kuat</p>	<p>Calcium contributes to the height of the children. (<i>Calcium helps you to grow taller.</i>)</p> <p>Kalsium berperan terhadap tinggi badan anak-anak (<i>Kalsium membantu Anda tubuh lebih tinggi</i>)</p>
Singapore	<p>Calcium helps support development of strong bones and teeth.</p>	<p>Calcium makes strong bones and teeth.</p>	<p>Calcium contributes to the height of the children. (<i>Calcium helps you to grow taller.</i>)</p>
Thailand	<p>Calcium contributes to the formation of healthy bones and teeth.</p> <p>มีส่วนช่วยในกระบวนการสร้างกระดูกและฟันที่แข็งแรง</p>	<p>Calcium makes strong bones and teeth.</p> <p>แคลเซียมทำให้กระดูกและฟันแข็งแรง</p>	<p>Calcium contributes to the height of the children. (<i>Calcium helps you to grow taller.</i>)</p> <p>แคลเซียมช่วยเพิ่มความสูง</p>

219

220

221 **Table 3: Health claim statements on iron tested in the three countries**

Country	Iron		
	Iron 1	Iron 2	Iron 3
	<i>Approved local authority claim statement</i>	<i>Derived short version of approved local authority claim statement</i>	<i>Contrived, inaccurate claim statement</i>
Indonesia	<p>Ferrum is a component of haemoglobin in red blood cells that carries oxygen to all parts of the body.</p> <p>Zat besi merupakan komponen hemoglobin dalam sel darah merah yang membawa oksigen ke seluruh bagian tubuh</p>	<p>Iron helps your body to produce energy.</p> <p>Zat besi membantu tubuh Anda untuk menghasilkan energy</p>	<p>Iron helps build strong muscles.</p> <p>Zat besi membantu membentuk otot-otot yang kuat</p>
Singapore	<p>Iron is an important component of red blood cells which carry oxygen to all parts of the body to help the body's production of energy.</p>	<p>Iron helps your body to produce energy.</p>	<p>Iron helps build strong muscles.</p>
Thailand	<p>An essential component of haemoglobin in red blood cells.</p> <p>เป็นส่วนประกอบสำคัญของฮีโมโกลบินในเม็ดเลือดแดง</p>	<p>Iron helps your body to produce energy.</p> <p>ธาตุเหล็กช่วยร่างกายให้พลังงาน</p>	<p>Iron helps build strong muscles.</p> <p>ธาตุเหล็กช่วยในการสร้างกล้ามเนื้อให้แข็งแรง</p>

222

223

224 **Table 4: Health claim statements on vitamin A tested in the three countries**

Country	Vitamin A		
	Vit A 1	Vit A 2	Vit A 3
	<i>Approved local authority claim statement</i>	<i>Derived short version of approved local authority claim statement</i>	<i>Contrived, inaccurate claim statement</i>
Indonesia	<p>Vitamin A can help to maintain the integrity of the surface layer (the eyes, gastrointestinal tract, respiratory tract and skin).”</p> <p>Vitamin A dapat membantu mempertahankan keutuhan lapisan permukaan.</p>	<p>Anti-oxidants like carotenes and Vitamin E support your child’s immune system.</p> <p><i>Anti-oxidan seperti karoten menunjang kekebalan tubuh anak anda)</i></p>	<p>Anti-oxidants like carotenes and Vitamin E reduce the chance of your child from falling sick.</p> <p><i>Anti-oxidan seperti karoten mengurangi kemungkinan anak anda untuk jatuh sakit)</i></p>
Singapore	Anti-oxidants like carotenes and Vitamin E help to protect cells from free radicals that may have escaped the natural processes of our body system.	Anti-oxidants like carotenes and Vitamin E support your child’s immune system.	Anti-oxidants like carotenes and Vitamin E reduce the chance of your child from falling sick.
Thailand	<p>To contribute to the body tissue maintenance.</p> <p>ช่วยเสริมสร้างเชื้อบุต่างๆของร่างกาย</p>	<p>Anti-oxidants like carotenes and Vitamin E support your child’s immune system.</p> <p>อนุมูลอิสระอย่างเช่น แคโรทีน และวิตามิน อี ได้มีการช่วยเหลื้ระบบภูมิคุ้มกันของลูกคุณ</p>	<p>Anti-oxidants like carotenes and Vitamin E reduce the chance of your child from falling sick.</p> <p>อนุมูลอิสระอย่างเช่น แคโรทีน และวิตามิน อี ช่วยลดโอกาสที่ลูกของคุณจะป่วยไม่สบาย</p>

225

226 Data collection

227 Two focus groups were conducted in each city. The mothers were divided into two groups;

228 Group 1 consisted of the mothers aged 21-30 years old (Younger mothers) and Group 2

229 consisted of the mothers aged 31- 40 years old (Older mothers) as shown in Figure 1.

Each group discussion consisted of two parts. The first part of the discussion focused on the current knowledge, perceptions and attitudes towards health claims on milk for children. The mothers were also asked about their knowledge and trust of local food regulatory processes and the regulatory framework in their country.

The second part of the discussion aimed to investigate the understanding of the specific health claims and factors affecting this understanding using the three selected nutrients. In order to reduce possible response bias, the nine statements were presented in a random order to the participants in each group. Each claim statement was flashed one at a time to the mothers on a projector screen or using a show card, followed by discussion to test the understanding of each claim statement before the next claim statement was presented to the group. The understanding of the claim statement was measured based on how the mothers would explain the claim to their friends.

The data were collected in March 2015. Each group discussion lasted approximately two hours, and all the groups were audio-recorded or video-recorded with permission of the mothers.

Data analysis

The focus group discussions were transcribed verbatim and translated into English. Participants were allocated a code based on age (young mother or older mother), country and participant number. For example, Y/T/4 refers to participant 4 in the younger mothers group conducted in Thailand. Thematic analysis was applied to analyse the data. The transcripts were analysed in an inductive process which began with open coding (Strauss and Corbin, 1990). Through a process of comparative analysis similar codes were classified into categories from which themes were abstracted (Braun & Clarke, 2006; Fade & Swift, 2011). The data

analysis was facilitated using the qualitative software programme NVivo version 10 (QSR International Pty Ltd, Australia).

Results

There were no discernible differences in the responses between the younger and older mothers and a high degree of consistency among the mothers across the three countries so the results are presented and discussed across all participants within each country.

Awareness of nutrients and other constituents associated with health claims

The mothers were all aware of health claims on the milk powder for their children. When asked to recall these health claims, they could easily name specific nutrients such as calcium, iron, docosahexanoic acid (DHA) and other constituents such as prebiotics/ probiotics:

'Because today milk contains a lot of things; calcium, AA (arachidonic acid), DHA (docosahexanoic acid), Omega 3 too.' (Y/ I/ 8)

'Milk provides nutrients like DHA (docosahexanoic acid) and probiotic.' (O/ S/8)

'Kids drink milk for calcium, Vitamin B, DHA (docosahexanoic acid), Vitamin B12, Omega 3, 6, 9.' (Y/ T/ 8)

In addition, the mothers associated these nutrients and other constituents to specific musculoskeletal or body organs such as calcium with bones and teeth, iron with blood, docosahexanoic acid with brain and the prebiotics/ probiotics with the digestion system, but not always their role in the body;

'Like vitamin A is for eyes, vitamin B1 is for something etc.' (O/ I/8)

276 The mothers recalled the nutrients and the claims mostly at a category level and this was not
277 related to individual brands. There was some confusion on the definition of ‘prebiotic’ and
278 ‘probiotic’ and the name of some nutrients such as arachidonic acid ‘ARA’ with alpha hydroxyl
279 acids ‘AHA’ among the mothers:

280 *‘There is something else I can’t remember what supposed to help with the digest, Pre or Pro.’*
281 *(O/ S/ 8)*

282

283 Knowledge of health claims

284 The main sources of information about health claims came from either the public domain or
285 from the private/ commercial sector. Within the public domain, key sources included
286 information gathered in schools, books, when visiting the doctors, via the internet and from
287 other mothers. Product packaging and advertisements from the manufacturers also played a
288 key role as sources of information. ‘Halo’ effects from non-food categories such as health
289 supplements and skincare products were observed, in providing the mothers with the
290 information on the nutrients and the claims:

291 *‘I read from the Sangobion supplement product that iron helps you from sluggishness,*
292 *tiredness, so the body stays fit.’ (O/ I/ 5);*

293 *‘Antioxidant is for anti-aging products to eliminate wrinkles.’ (O/ I/ 7)*

294 *‘Some supplement like carotene which is also the supplements for skin as well’. (O/ S/ 7)*

295 Web-based searches and on-line fora with other mothers were typically used when searching
296 for information on health claims:

297 *“If I don’t get it clearly, I will search Google that what is good for. (O/ T/ 2)*

298

299 Health claims as educational and a point of differentiation

300 In general, the mothers reacted favourably towards food related health claims which were
301 viewed in three different ways. First, health claims were perceived as an educational tool,
302 providing information on nutrients which became learned through repeated exposure to the
303 labelled products:

304 *'Because we didn't know or understand before. For laypeople, they don't know what ARA*
305 *(arachidonic acid) and DHA (docosahexaenoic acid) are for so this makes it clear.'* (Y/ I/ 4)

306 *'This also serves as a reminder in case we forget.'* (Y/ S/ 1)

307 Second, the health claims were regarded as a form of collaboration between local authority and
308 food manufacturers. Some mothers viewed the local authority was working with the
309 manufacturers on health claims:

310 *'I think the claim is based on the creativity of the producer, BPOM (Badan Pengawas Obat*
311 *Dan Makanan also known as National Agency of Drug and Food Control of the Republic of*
312 *Indonesia) is more responsible about the content. BPOM will check whether the content of*
313 *milk meets with the nutritional facts stated on the pack so it would danger the health. So there*
314 *is a strong connectivity between two sides i.e. Producer and BPOM.'* (Y/ I/ 6)

315 Third, the health claims provided the basis upon which to differentiate competing products:

316 *'I look on the pack to see what it says. Some brands have ingredients that nourish brain while*
317 *others don't.'* (O/ T/ 3)

318

319 Health claims to guide purchase

320 Most mothers viewed health claims as descriptions of the product benefits associated with the
321 products and trusted the health claims on milk products. In general, the mothers paid more

322 attention to the product labels before their first purchase from the brand and were less involved
323 with subsequent purchases of the same brand; unless there was a change in the product
324 packaging. Most mothers who read food labels wanted to get a better understanding of the
325 products before making a first purchase:

326 *'Before I let my child consume anything, I have to read the sides of the package or*
327 *commercials.'* (Y/ T/ 8)

328

329 Trust in health claims but no knowledge on the regulatory frameworks

330 High levels of trust in the health claims on milk products were consistent across the three
331 countries, provided that the products were from 'international brands'. High levels of trust
332 were also voiced in the participants' national governments and regulatory environments:

333 *'I think that as long as it's sold in Singapore, it should be safe.'* (Y/ S/ 5)

334 *'So far I have no doubts towards current regulations.'* (O/ I/ 8)

335 *'Because it has FDA (Food and Drug Administration) approval, then it should be ok.'* (O/ T/
336 I)

337 Despite this trust, most mothers had limited knowledge of the regulatory agencies or the
338 processes and frameworks involved in health claim approval in these three countries. Most
339 mothers were confused between the product quality and the regulation of the information on
340 the product. However, the mothers believed the government bodies were mostly present to
341 ensure food safety and quality:

342 *'All I know, BPOM (Badan Pengawas Obat Dan Makanan also known as National Agency*
343 *of Drug and Food Control of the Republic of Indonesia) regulates the product does not contain*
344 *any substance that would damage the body.'* (Y/ I/ 5)

345 *'Food and Drug Administration is trustworthy and they monitor and control manufacture,*
346 *materials and ingredients.'* (O/ T/ 3)

347

348 **Understanding of the health claims using three selected nutrients.**

349 All mothers were most confident in the discussion on calcium claims, compared with iron and
350 vitamin A in relation to milk powder. The knowledge on calcium came from school education
351 and the reinforcement of this information on the food labels. In general, all the mothers agreed
352 that the three selected nutrients were relevant for growth and development of children. The
353 participants reported that the nutrients were classic nutrients which were typically present in
354 milk powder for children and these nutrients did not stir any specific purchase intention for the
355 products.

356

357 **Factors affecting the understanding of the health claims**

358 Familiarity of the nutrient

359 The familiarity of the nutrients had a great influence on understanding of the claim statements.
360 The mothers from all three countries recalled and paraphrased the statements on calcium
361 without difficulty. All the mothers felt very confident with regards to this nutrient as they were
362 very familiar with the association between calcium, bones and teeth. Mothers across the three
363 countries took the longest time to recall the claim statements on Vitamin A. This may be
364 explained by the fact that most mothers perceived Vitamin A as a relatively new nutrient in the
365 milk powder and the functions as stated in the claims were different from their prior knowledge
366 e.g. Vitamin A is good for eyes. The mothers were confused between the two terms such as
367 vitamin A and carotenoids and these terms were used interchangeably by them.

Finally, the mothers seemed to be receptive to more information on the nutrient which they were more familiar with. The Singaporean mothers were able to accept more detailed claim statements, provided they were familiar with the nutrient such as 'iron is an important component of red blood cells which carry oxygen to all parts of the body to help the body's production of energy'. For unfamiliar nutrients, the Indonesian and Thai mothers preferred a claim statement to state the nutrient functions and/ or tangible benefits of the nutrient clearly and more direct, such as 'iron provides energy' or 'vitamin A support the body's immune system.'

Previous knowledge of the nutrient and observation

The previous knowledge of the nutrient and observation triggered the mothers to rationalise the claims. Notably, the mothers from all the countries agreed with both of the calcium statements related to strong bones and teeth as the statements were in line with their prior understanding. The mothers rejected all the contrived inaccurate claim statements. The mothers tended to rationalise the claims discussed using their knowledge and observations. For example, the majority indicated that there were other factors that contribute to height such as genes, other than the calcium intake from the diet. Some mothers doubted the effects of calcium on height after comparing their own children with others who were milk-drinkers, but had short stature. The contrived inaccurate statement on iron did not fit their existing knowledge on iron as playing a role in muscle building. Singaporean and Thai mothers associated muscle development with protein and calcium, respectively. The contrived inaccurate statement on Vitamin A was viewed as exaggerated. Their knowledge of falling sick was related to multi-factorial facts such as personal hygiene, and not associated with just nutrients and intake of other food constituents.

392 The understanding of claims was challenged when the information contradicted prior
393 knowledge about the nutrients. Most mothers tried to rationalise the statements on iron but
394 some were unable to make the connection between iron and energy/ muscle as the statements
395 contradicted their prior knowledge on iron. All mothers associated iron with blood ‘generation’
396 and/ or blood circulation only.

397 Incomplete explanations of the health effects impacted the perceived clarity of the claim. The
398 shortened claim statement on iron missed the link between iron and energy. Some mothers did
399 not know that iron was involved in carrying oxygen to all parts of the body and the function of
400 oxygen in relation to energy:

401 *‘It only connects me to blood, it doesn’t connect me with energy so it will be question to me.’*
402 *(O/ S/ 8)*

403 The Thai mothers expressed reservations regarding the local authority approved claims on
404 calcium as they felt calcium also functions to strengthen bones and teeth and not only
405 contributed to the formation of healthy bones and teeth. In addition, the Thai mothers had
406 difficulty understanding the authority approved claim statement on iron. The function of the
407 nutrient was unclear, although they did recognise that the claim statement implied blood-related
408 benefits:

409 *‘Yes, but I don’t understand the benefits.’ (Y/ T/ 6)*

410 *‘How does it help the body?’ (Y/ T/ 4)*

411 Most mothers related one nutrient to one function or body organ. Some Indonesian mothers
412 thought the approved claim on Vitamin A was exaggerated and doubted a role or function for
413 other organs and systems. Most mothers agreed with the authority-approved claim statement
414 on Vitamin A and thought that Vitamin A was associated with the eyes. Both Indonesian and
415 Singaporean mothers believed the shortened claim statement on Vitamin A, as these mothers

associated antioxidants with immunity. The shortened claim statement on Vitamin A did not resonate with the Thai mothers. The Thai mothers were uncertain how antioxidants were related to immune system or a reduction in the chances of falling ill. For all mothers the link between vitamin A, carotenoids and antioxidants was unclear and was not explained in the focus groups.

Relevance of the nutrient functions and benefits

The perceived relevance of the claim statement led the mothers to pay more attention to the claim statement. The mothers in Indonesia viewed the local authority- approved claim statement on calcium relevant as it was highlighting two ways through which calcium benefits bones and teeth, e.g. bone formation and maintaining bone density. Most mothers in Indonesia and Singapore responded positively to the provision of energy by iron as this could support the active children. The mothers could not relate to specific nutrient functions if they felt that the function was irrelevant such as muscles were important for adults, not children:

‘For adults I think not for kids. Kids don’t need muscles they need strong bones.’ (O/ S/ 4)

Lexical issue such as the use of scientific terms and the choice of words

The presence of scientific terms was a clear barrier. Most mothers were confused about the scientific terms on the local authority- approved claim such as ‘haemoglobin’, ‘antioxidants’, ‘carotenes’, ‘free radicals’, ‘natural processes of our body system’, ‘integrity of the surface layer’. Some mothers commented that the scientific terms sounded scary.

‘I think haemoglobin is a medical term.’ (O/ I/ 4)

438 The choice of words affected perception. The Singaporean mothers perceived the local
439 authority- approved claim statement as credible due to the use of the scientific terms, despite
440 the fact that they did not understand the scientific terms. Only the mothers in Singapore
441 perceived the word ‘make’ in the shortened claim statement on calcium too absolute:

442 *‘Strong bones and teeth need calcium. Strong bones and teeth doesn’t really make up with just*
443 *calcium so cannot say made up.’ (Y/ S/ 4)*

444

445 Phrasing and length of the claim statement

446 Phrasing and the length of the claim statements were critical as these factors strongly
447 influenced the understanding and the acceptance of the claims. For example, more lengthy
448 claim statements reduced the ability to recall, whereas all mothers recalled the shortened claim
449 statements. Mothers in Singapore understood and recalled the local authority-approved claim
450 on iron but commented that the statement was too long. Indonesian mothers had difficulty in
451 recalling the local authority-approved claim.

452 The Thai mothers found the shortened claim statement on calcium easier to understand and the
453 statement communicated on the functions of the nutrient more directly compared with the local
454 authority- approved statement:

455 *‘But they are talking about how to build too. It’s a bit academic.’ (O/ T/ 5)*

456 The mothers preferred the claim statements which were phrased positively. The Indonesian
457 and Thai mothers preferred the shortened claim statement on Vitamin A as it communicated
458 the end benefit clearly, directly and positively. For example: ‘Immune system’ was selected
459 over ‘falling sick’. The Thai mothers commented that the local authority- approved claim
460 statement on Vitamin A was too generic and the functions/ benefits were unclear, again

highlighting the lack of understanding of the link between vitamin A, carotenoids and antioxidants.

Comparing observations between countries

In general, most mothers in Singapore were more sceptical about the health claims. The mothers were more individualistic and they focused on the performance of their own children to be equally important as the health of their children. The mothers wanted to know the mechanisms underpinning the nutrient functions on claim statements in particular for nutrients they were familiar with.

Mothers in Indonesia were not concerned about health claims as long as their children were happy and healthy, which included their emotional and social well-being. Not all mothers in Indonesia knew that there was a regulatory agency to regulate and control food products. The need for special dietary requirements such as halal food helped some mothers to know that the National Agency of Drug and Food Control of Republic of Indonesia (BPOM) was an agency regulating the food sold in Indonesia for food safety and halal certification. A majority of the Indonesian population (88.3%) are Muslim and food consumed by Muslim consumers need to be certified halal to meet the religion needs (Pew Research Centre, 2011). Indonesian mothers perceived that the manufacturers played a similar role as the government in educating them on the nutrients listed on the food labels (an educational tool).

Compared with the participants from Indonesia and Singapore, the Thai mothers recalled the most nutrients and health claims and identified medical professionals, nutritionists and psychologists as the educators on the nutrition and health claims.

The Indonesian and Thai mothers were more sociable and willing to share information in the discussion groups. They were motivated to find out information when they came across

unfamiliar or unclear nutrients. Most of these mothers suggested that the claim statements which stated the functions of the nutrients were more direct and tangible.

Discussion

Health claims can refresh knowledge on specific nutrients and be a useful tool to educate the consumers on nutrient– function relationships. Our study showed that middle-income mothers across Indonesia, Singapore and Thailand could recall most of the selected nutrients associated with milk powder and the corresponding officially approved health claims. This could be due to the fact that more females generally read food labels, hence they could be more awareness of health claims and as mothers they were particularly interested in identifying ‘healthy’ foods for their children. This is consistent with several studies which have shown that more females than males read food labels and were more favourable towards health claims due to their general interest in health (Lalor, et al., 2011; Lynam, et al., 2011; Nocella & Kennedy, 2012; Wills, Storcksdieck genannt Bonsmann, Kolka, & Grunert, 2012). The claims helped to increase their understanding of these nutrients. This corresponds to research in Australia and New Zealand where caregivers found health claims information on follow-up formulas and toddler milks useful to identify the benefits of one product compared with another (Yockney & Comfort, 2013). A Danish study found the consumers were not misled by health and nutrition claims of a food (Orquin & Scholderer, 2015).

The familiarity and previous knowledge of a nutrient, the relevance of the benefits, the use of scientific terms, the choice of words, the phrasing and the length of the claim statements all influenced the understanding of claim statements among the mothers in the three SEA countries included in this study. Our findings were consistent with several papers reporting on consumer perception, attitudes and understanding of health claims in Western countries.

509 Familiarity and previous knowledge of the nutrients have been reported to influence the
510 understanding of health claims (Lahteenmaki, 2013, Nocella, & Kennedy, 2012, Wong, et al.,
511 2014). This could be explained by the Elaboration Likelihood Model that the consumers
512 process information and associate the existing knowledge to rationalise and facilitate
513 understanding. The benefits on the health claims need to be of relevance to the consumers and
514 be able to generate interest and motivate them to find out more information to enhance
515 understanding. This study showed that the mothers could relate better on benefits they
516 perceived to be important and relevant for their children and were interested to learn more new
517 information such as the link between iron and energy which they were unaware of. Several
518 reviews papers have highlighted that personal relevance of the nutrients and their benefits have
519 a major influence on the perceived healthiness and intention to buy a product (Dean,
520 Lahteenmaki, & Shepherd, 2011; Lhteenmki, 2013). A study conducted among Swedish
521 consumers also showed that the concerns for family health influenced their decision to read
522 and understand health claims (Svederberg & Wendin, 2011).

523 Lexical issues such as use of scientific terms and choice of words are one of the factors
524 influencing understanding. Not all consumers have a science background, nor are trained in
525 science at tertiary level. This study demonstrated that the use of scientific terms such as
526 haemoglobin, carotenes, antioxidants etc., was clearly a barrier to the understanding of health
527 claims. Others have also shown that scientific terms on claims such as ‘connective tissues’,
528 ‘platelet aggregation’ were not understood (Richardson & Eggersdorfer, 2014). This study
529 demonstrated that the choice of the words in a claim statement could result in different
530 responses from different groups of consumers either positively or negatively. Nocella and
531 Kennedy (2012) reported that the word ‘may’ received mixed responses from different
532 consumers. Some studies showed that the word ‘may’ reduced consumer confidence in the

533 claim and it provided uncertainty on the statement while other studies did not show the effect.
534 In contrast, the word ‘can’ was perceived as more credible and definite.

535 Short claims potentially improve the understanding of health claims. Previous research has
536 suggested that consumers preferred short, succinct claim statements without scientific
537 terminology on the front of the pack and context-specific health claims (Williams, 2005;
538 Verbeke, Scholderer, & Lähteenmäki, 2009). A study among Irish consumers suggested they
539 had a preference for simpler nutrition and health claims such as structure-function and content
540 claims (Lynam, et al., 2011). For US consumers, Wills et al. (2009) suggested that health
541 claims should be phrased in simpler language as the regulatory process and the level of
542 scientific evidence required to approve claims was poorly understood by consumers. It has
543 been suggested that the communication effectiveness of health claims could be improved by
544 the use of visual aids such as graphic and concise messaging on a prominent location on the
545 packaging (Geiger, 1998; Hooker & Teratanavat, 2008). The nature of the claim statements,
546 the lack of education on health claims and/ or overestimate on the consumers’ ability to
547 understand the scientific or technical terms negatively affects the understanding of the health
548 claims. A consumer-friendly claim statement should state the functions/ benefits of the nutrient
549 in a clear, direct, short and simple language using non-scientific terms to help the consumers
550 make informed food choices.

551 Our findings could help to close some of the gaps on SEA consumers’ understanding of health
552 claims and assist in the development of an action plan involving different stakeholders to
553 educate the consumers. Nutrients include macronutrients such as protein, fat and carbohydrate
554 and micronutrients such as vitamins and minerals which are supported by an established
555 science which is commonly found and explained in a number of different ways. These are
556 mostly obtained from a variety of sources such as school, books, doctors/health professionals,
557 and increasingly from the private sector and the internet. Information on nutrients from the

558 public domain could serve as the education platform while information from the private sector,
559 such as the food industry, can help to reinforce the messages. A closer collaboration between
560 food industry and government bodies (including regulatory bodies) could help to build the
561 understanding and awareness of nutrients and other constituents and their associated health
562 benefits. It is a win-win for the consumers, the government and the food industry. This could
563 potentially strengthen the messages and information to consumers, preserving the balance
564 between consumer protection and dissemination of emerging knowledge on diet and health.
565 Other stakeholders such as academia, health professionals, consumer organisation could also
566 contribute towards educating the consumers. The education on nutrients should be in a holistic
567 approach to include not only the benefit but also any side-effects related to overconsumption
568 of the nutrient and in the context of a balanced, varied diet.

569 The regulatory bodies and the marketers should take cultures and differences in languages into
570 account when developing health claim statements, information and communication strategies.
571 Overall, this study did not find significant differences in the understanding of claim statements
572 across the three SEA countries investigated. This is likely to be due to the nature of the
573 nutrients selected for this study which were all well-recognised nutrients. However, there were
574 subtle differences in understanding and perceived credibility between the countries. For
575 example, the mothers in Singapore were sceptical on the use of absolute words such as ‘make’
576 and preferred to know the ‘how?’ in the claim statements while the mothers from the other two
577 countries did not demonstrate such information needs. Previously, age and consumers’ self-
578 confidence in information acquisition were reported to contribute towards Singaporeans’
579 scepticism toward health claims (Tan & Tan, 2007). In contrast, consumer understanding of
580 nutrition and health claims and perception of benefits differed substantially by country in a
581 large scale cross national study in Germany, Italy, the United Kingdom, the United States (van
582 Trijp & van der Lans, 2007). In another cross- country study conducted in Denmark and the

United States, the Danish consumers responded more positively towards the soft framing of information while the American consumers preferred the scientific framing of information (Aschemann-Witzel & Grunert, 2015). Cultural differences in SEA consumers' response to food and health communication should be taken into account as there are different languages and cultures between the ten SEA countries.

Food manufacturers should consider the relevance and appeal of the health motives from the perspectives of the target audience, and the claim statements need to be scientifically credible to consumers. This study clearly showed that the mothers perceived that the need for strong bones is more relevant to the children instead of strong muscles. The mothers in Singapore believed the claim statements with more complete and scientific information compared with the mothers in the other two countries. Similarly, the focus groups conducted among 35 Irish women who were responsible for most of their grocery shopping in their home, found out that most participants had a more holistic approach to health and the total intake and the consumption of whole fresh foods were much more important and believed there was no individual product which can improve one's health (Lalor, Madden, McKenzie, & Wall, 2011). The carrier food could also have an influence on the mothers' perception on the credibility of the health claims on the milk powder as the mothers had no doubts about most of the claim statements. Several review papers have concluded that the base product or carrier food to which a health claim is attached, affects acceptance and is perceived more positively on food products with healthier images such as bread, yoghurt, cereals rather than less healthy images such as meat replacers, biscuits and ice-cream (Dean, Lahteenmaki, & Shepherd, 2011; Lähteenmäki, 2013; Wills, et al., 2012).

It is of note that in this study the trust of health claims stemmed from the 'international brand' manufacturers and the government, although the participants did not know the regulatory

process and systems related to health claims on food. Most of the participants in this study trusted the health claims they were used to seeing on milk products. For example, the mothers placed high levels of trust in these ‘international brand’ manufacturers providing accurate information, perceiving a partnership with the government to provide accurate and truthful information. Similar trends were identified in two studies conducted in Sweden and Ireland. The Swedish study found the lack of understanding of the concepts was counterbalanced by confidence in the manufacturers, and/ or the Swedish food legislation (Svederberg & Wendin, 2011) while the Irish study found that more than half of the participants trusted big food companies to provide accurate information on the products as they have the financial ability to conduct research to substantiate claims (Lalor, Madden, McKenzie, & Wall, 2011). However, some consumers in the Western countries did not trust the health claims (van Buul & Brouns, 2013; Verbeke, Scholderer, & Lahteenmaki, 2009).

In this study, trust among the mothers in the regulatory process and the government was important for both the development of health claims as well as the education of consumers. The Japanese Food of Specific Health Use (FOSHU) programme is an interesting example of a public-private partnership to disseminate accurate information on ‘health food’ to the consumers. The Japanese National Institute of Health and Nutrition entrusted the training of the health professionals on ‘health food’ to the private sectors and the consumers obtained the information from professionals. In addition, a web-based database containing evidence-based information on the effectiveness, safety and interactions of ‘health food’ can be publicly accessed from the Japanese ministry’s website (Yamada, Sato-Mito, Nagata, & Umegaki, 2008). This could potentially help the consumers to better understand the health claims on food.

Limitation of the study

Focus group discussions provide a range of perceptions on a phenomenon of interest but caution should be taken when extrapolating the findings to the general population as the sample in this study is on very specific subgroup of the population. The local authority- approved claim statements varied across the three countries which may have affected our comparison between countries. Also, there might be different understanding and perception of wording of the claim statements due to the translations into the different Asian languages. The participants recruited into the study were of middle income and the majority had a higher education level. In addition they were recruited because they said that they read labels and health claims on food packaging. Whilst the purpose of the study was not explained to them during the recruitment process it is possible that their views were biased by their prior knowledge and may not be representative of the general population. However, we believe that the results have broad applicability and form a strong basis for further research in SEA consumers.

Implication for public policy

Although the findings in the focus groups cannot be generalized to the whole population, the results may help to indicate directions for future research, particularly in SEA. This study provided insight on factors affecting the understanding of health claims among SEA mothers. Our findings are relevant to the different stakeholders such as regulatory bodies, policy makers, the food industry, academia and non-profit organisations to develop effective communication with consumers. It is necessary to monitor the consumer attitudes and education on health claim especially when the regulatory environment is evolving in SEA.

Conclusion

Food innovation as well as the regulations and/ or guidelines on health claims on food will likely continue to evolve in Southeast Asia. There should be a balance between accurate health

claims and understanding of them by the consumers. Different stakeholders should work together to develop solutions to improve this understanding. The high level of trust in the government and industry suggests that consumer education efforts via Public - Private Partnerships could be an approach to develop strategies to educate the Asian consumers to learn about and better understand nutrients and other constituents and their different functions. This cooperation among the public sector and private industry could potentially address national health issues by promoting health in the population, and working jointly on the same goals of the health ministries, example reducing non-communicable disease in the population. This could help the government to reduce the healthcare cost (Umegaki, 2015) and achieve more efficient use of available resources.

Health claims on food should help the consumers to make informed food choices to support a healthy diet, provided the consumers understand the intended health messages. The current study has identified some gaps, and perhaps some opportunities in the Asian consumers understanding of the tested health claims. This topic is currently understudied in this fast-growing region and more research is needed to investigate SEA consumers' understanding of the health claims. Future studies could include the participants from a greater socio-economic status, investigate the rationale on the high level of the trust in the local regulatory authorities among the SEA consumers, understand why mothers do not read food labels and have a more consistent methodology to measure the consumer understanding on health claims. This could help the regulators and the marketers to formulate health claims that consumers can understand and develop effective public health education and communication.

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683 **Declaration of interest**

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