

Special Report

Symposium on Understanding and Influencing Consumer Food Behaviours for Health: Executive Summary Report

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Food consumption patterns in Asia are rapidly changing. Urbanization and changing lifestyles have diminished the consumption of traditional meals based on cereals, vegetables and root crops. These changes are accompanied by an increasing prevalence of chronic diseases among Asian populations. ILSI Southeast Asia and CSIRO, Australia jointly organized the Symposium on Understanding and Influencing Food Behaviours for Health, focusing on the use of consumer science to improve food behaviour. The goals of the Symposium were to present an understanding of Asian consumers and their food choices, examine the use of consumer research to modify food choices towards better health, illustrate how health programs and food regulations can be utilized effectively to promote healthier choices, and identify knowledge gaps regarding the promotion of healthy food behaviour in Asian populations. There is no difference in taste perception among Asians, and Asian preference for certain tastes is determined by exposure and familiarity largely dictated by culture and its underlying values and beliefs. Cross-cultural validity of consumer science theories and tools derived from western populations need to be tested in Asia. Information on consumption levels and substitution behaviours for foods and food products, obtained using consumer research methods, can guide the development of food regulations and programs that will enable individuals to make healthier choices. Existing knowledge gaps include consumer research techniques appropriate for use in Asian settings, diet-health relationships from consumption of traditional Asian diets, and methods to address the increasing prevalence of over- and undernutrition within the same households in Asia.

Key Words: consumers, Asia, food consumption, consumer behavior, food choice

Food consumption patterns in Asia are fast becoming urbanized. Fewer populations are consuming traditional diets based on cereals, vegetables, and root crops. 'Eating out' and the use of processed and convenience foods have become a major part of people's lives even in less developed countries. These changes are accompanied by a rapid increase in the prevalence of chronic diseases such as obesity, diabetes, and heart disease. A wide variety of readily available foods in the market makes individual food choice an essential component of health maintenance. To direct individual behaviour towards healthier food choices, it is important to understand the why, where, what, when, how much, and how often food is consumed. Consumer research is the key to understanding food behaviour and food choice. This symposium presents current findings on food behaviour in Asian populations and explores ways of altering food behaviour through the use of consumer research to address nutritional problems in the region.

OVERVIEW OF CONSUMER SCIENCE AND CONSUMER FOOD BEHAVIOUR

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The purpose of consumer science is to understand the mind of the consumer (i.e., the *what, when, why, where, how much* and *how often* food is consumed). Consumer research is the key that opens the door to successful marketing. Research-driven marketing strategies can help promote improved dietary choices and better health. However, a sufficient research database is necessary in order to formulate effective policies; major policy changes should not be made without having done appropriate consumer research ahead of time.

Consumer research activities consist of data collection, market segmentation, message targeting, product positioning and branding. Data collection seeks information on various aspects of consumers' lifestyles. Market seg-

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mentation divides consumers into segments by age, purchasing power, lifestyle, likes/dislikes, and taste preferences. Message targeting ensures that the right message gets to the right consumer, whereas positioning and branding make use of all this information to get consumers to purchase the product. These activities should be directly related to food purchases and can be used to shape consumer food choices.

Data needed in consumer research include demographic data (i.e., who the consumer is), psychographic data (what the consumer thinks), and more recently, geographic data (where the consumer lives which includes addresses, specific locations and access to major food sources).

Demographic variables that predict food choices include gender, age, race, ethnicity, marital status, household size, children, and socioeconomic position. For instance, data from the U.S. and Europe show that women eat more fruits, vegetables, salads and chocolates, while men eat more red meat, snacks and beer. Age is an important predictor of food habits. Research has shown that food preferences acquired in childhood, especially for sweet, energy-dense foods, dissipate around the age of 12 and decline in later life. Hence, pizza and soft drinks are usually associated with younger ages, while fruits, vegetables, whole grains, and fiber are associated with older adults.

Socioeconomic position and diet quality

Socioeconomic position or the place of an individual in society is measured by education, occupation, income, assets, and wealth, and include social capital (networks) and social context (neighborhood). Socioeconomic position, at both the individual and aggregate level, is a very good predictor of diet quality. U.S. data show that low education and income are associated with poorer diets, and that people who are better educated, more affluent, and live in nicer neighborhoods have better diets. The mechanisms are unclear, but they probably involve some combination of money (financial access), distance (physical access), and time (convenience). This goes back to the notion that the chief drivers of food selection are taste, cost, and convenience (or taste, money, and time). The healthy eating index, a measure of diet quality developed by USDA, measures compliance with both the dietary guidelines and the food guide pyramid. Data show that healthy eating scores go up as a function of income, education, and age. It is the older, more affluent women who have the highest quality diets in the US.

Neighborhood context

Food access may depend on area of residence (urban, suburban, rural), and neighborhood-based measures such as population density, safety, transportation networks, walkability, median home values, density and types of local food sources, physical activity opportunities, etc. Cutting-edge research tools now link household-level information obtained through surveys with neighborhood-level data obtained through geospatial data archives maintained by the U.S. Census.

Consumer research now uses geographic information systems. In Seattle, information is obtained from the U.S.

Census Bureau regarding median house values, median cost of rent, and median income. This information is relevant to situating food sources, whether grocery stores or fast foods, because one knows who the clients are going to be within a 2-3 mile radius, how much money they have, where they live, and what they will be buying in the neighborhood store.

Property values are an important indicator of neighborhood resources and wealth. In the U.S., information about the value of real estate can be obtained from the county assessor. Recent studies conducted in Seattle managed to correlate the prevalence of obesity not only with zip codes but also with the median value of houses within those zip codes. Property values were a better predictor of obesity rates than either median incomes or the percent of residents living in poverty. For every \$1 million in added property values, area obesity rates dropped by 20%. That type of analysis is now being applied to census tracts, which are units of 4000 people – the smallest level of geographic scale available in the local data sets. New techniques in spatial informatics now permit a seamless overlay of demographic and health data. It has become possible to map the distribution of obesity, diabetes, or cardiovascular disease by small geographic area. That type of analysis can provide new insights into the social determinants of health and disease. Analyses based on zip codes revealed six-fold disparities in obesity rates within Seattle. Obesity rates were highest in the more deprived neighborhoods and sharply lower in more affluent ones. There was very little obesity in the high income residential areas in Seattle.

Neighborhood resources determine access to foods

One can distinguish between physical access (proximity to food sources) and financial access (affordability). Studies have mapped the density of grocery stores in Seattle King County using some new analytical tools. Kernel density analyses permit the measuring of access to healthy foods for each individual consumer. Depending on where the consumer lives, one can plot a gradient of access to the grocery store, convenience store, or fast food outlets, all at the individual level.

The same techniques used in public health to map poverty and disease can be used in marketing research to map purchasing power and access to food sources. Individual demographic information can be blended with area demographic information and access to food sources. For instance, some studies have mapped walking probability by geographic area and by income of study respondents.

Psychometric data

Psychographic data deals with attitudes, beliefs, opinions, activities, hobbies, interests and concerns. One can go beyond these data to look at emotions, archetypes, perceived benefits, as well as issues of taste, cost, convenience, health and variety as the major drivers of food consumption.

Psychometric data may include lifestyle information such as travel, vacation, sports, music preferences, use of telecommunications. Data on food consist of foods and beverages and frequency of use, types of food bought, and why people buy certain foods. Advertising and mar-

keting of a given food also requires information about consumers' media use and preferences, such as cable, print, television, radio or internet. Consumer research should be able to answer 'how can one get the right product to the right consumer through the right channel at the right time?'

Data from Moskowitz and Jacobs indicate that purchases of healthy foods, or other kinds of foods, are driven by taste (75% of respondents), followed by price (40%), and lastly, by health concerns (e.g., amount of sugar, fat, salt, etc.).

Marketers understand only too well that if the food does not taste good, the consumer will not buy it. Food choices are largely driven by taste, cost and convenience. Here, there is a discrepancy between consumer research and the aims and goals of public health nutrition. Strategies for dietary change, often based on social marketing, tend to focus on the future health benefits of a given food, as opposed to immediate enjoyment. Public health experts stress how the consumption of a given food will lower health risks for the community, sometimes insisting that it is the individual's responsibility to select a healthy yet unpalatable food. By contrast, marketers strive to establish a kind of personality or emotional bond between the consumer and the product, which is a far more effective strategy. That healthier foods can cost more, can be less palatable, less accessible and less convenient are additional potential barriers to the adoption of healthier diets by the general public. These issues need to be understood for effective marketing strategies to be put in place.

Segmentation

Segmentation means division of the marketplace into subgroups. Its aim is to maximize the likelihood of sales. Segments can be defined by age, purchasing power, lifestyles, and taste preferences, so that one can target the right message to the right population. Specific marketing messages can be devised for each subgroup, e.g., general messages for the whole population, differentiated messages for segments, niche messages for small groups, and personalized messages for individuals. By explaining the product's perceived benefits, investing the product with personality, and creating an emotional bond between the product and the consumer, one can position the product and establish how it is perceived relative to competing options or other brands.

The major challenge in consumer research is "How do we use the techniques of marketing (segmenting, positioning, branding the product) and apply these to healthy foods?" To do this, we need to know who the consumers are, what they think, and where they live. Public health motivates people to eat well now for better health in the future. But what consumers want is to live better now, today. This is why we need a convergence between consumer research and public health practice. Strategies for dietary change in public health need to adopt the techniques of consumer research in order to be more effective. Only such a union can change our diets for the better.

UNDERSTANDING FOOD CHOICES OF ASIAN CONSUMERS

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Food choice is about one's preference or choice over alternatives. There are many assumptions regarding volition and free will in determining food choice. However, it should be kept in mind that each individual is located within a culture in society. In Asia where cultures are diverse and fast-changing, it is inaccurate to make generalizations about geographic, national or cultural "units of analysis". Care should be taken to account for segmentation and/or define homogeneous groups of consumers. The science of food choice, the theories and data of contemporary psychology, are described almost exclusively in terms of western cultures. Hence, the theories and tools to understand Asian consumers need to be tested for cross-cultural validity.

It is important to recognize the difference between universal behaviours and culturally specific behaviours. Borrowing from linguistics, *etic* describes universal behaviours; *emic* describes culturally specific behaviours. Consumer science seeks to understand generalizations, for example common elements in food choice (*etics*) but these may manifest as culturally specific (*emic*) elements. An example of *emic* is the Japanese perception of the fifth basic taste "umami", often translated as savoury.

Culture as a major determinant of food choice

A psychological definition of culture includes shared cognitions, standard operating procedures and unexamined assumptions. In the cultural background that we all live in, people don't question what they actually do. They just do it. Do Vietnamese question the high salt content of fish sauce? They don't - it's part of the culture they live in.

Culture can be defined in terms of seven constructs, among these are collectivism, where the unit of social space is the group, and individualism, where the unit of social space is the individual. Individuals are driven more by attitudes while the collectivist are driven more by social norms. Food choice is often based around the individual but it does not necessarily apply in other cultures. We have shared processes and assumptions about cultural flavors and these are related to exposure and familiarity. Attitudes and social norms are important factors in behavior theories that seek to understand food behaviours. Self-esteem is possibly an important predictor of weight control; self-efficacy may be a predictor of intentions to consume functional foods, selenium-enriched foods, omega-3 food sources, and of intention to control weight. Affect (i.e., liking vs. disliking) is important in decision-making.

Perception vs. preference among Asians

Perceptions are measured by threshold sensitivity discrimination tests. Previous studies indicate that there are no differences in perception of the four basic tastes between 'western' and Asian subjects (Koreans, Japanese, Malaysians). On the other hand, taste intensity liking varies among cultures depending on the context or food studied. Studies show that product-dependent differences are related to familiarity and exposure. A cross-cultural study of novel extruded cereal snack products showed that, in

contrast to culture, age was a discriminating factor in preference for textures.

Very little of the cross-cultural variation in food preferences appears to be genetically based. Rather, these variations arise more from experience, dietary habits and attitudes. These factors are related to shared processes and cultures (cultural flavors) which are, in turn, related to familiarity and exposure (cultural flavor principles). "Flavor principles" characterize a particular culture's food preferences. For instance, Chinese cuisine is characterized by soy sauce, ginger root, rice wine. Cultural flavors are derived from manipulation of basic foodstuffs and flavors, and may come from external influences. In some areas, cultural flavors may be dynamic and changing with time.

Liking, or affect, was shown to be the best predictor of consumption, likelihood to buy and willingness to try a product. Measurement of liking involves the use of a labeled 9-point hedonic scale that has been rigorously tested and used for 50 years in western cultures. Some issues have been raised over the use of these scales in Asian cultures, based on the understanding of cultural values of politeness and positive bias.¹

Asian use of hedonic response scales

Koreans, Chinese, and Thai consumers have been shown to systematically use a narrower range of the 9-point hedonic response scale and to avoid "dislike" categories, suggesting a possible cultural bias. We used the same 9-point category scale and an unstructured scale with no labels. No systematic cultural bias was observed based on parametric analysis. However, non-parametric analysis suggested that the unstructured line scale encouraged greater use of a wider range of possible responses, and that an unstructured scale without labels may be a preferred option for Asian cultures.

Yao and colleagues compared structured, unstructured, and labeled hedonic scales across US, Japanese, and Korean consumers. Results showed partial support for the "politeness" hypothesis. The unstructured scale elicited a wider range of scores for US and Japanese respondents. Koreans gave very narrow responses regardless of the scale used. The study indicated a need for "culture-free" scales and other ways to measure preferences of Asian consumers. Ranking of preferences has been suggested as a possible alternative to scoring.

Diet-health beliefs in Asian cultures

Traditional Asian beliefs emphasize the use of diet above that of herbal medicines and pharmaceuticals for health maintenance and disease prevention. These beliefs are very resilient; we need to know how important they are in terms of food choice and whether there is evidence to support such diet-health relationships. In Japan, functional foods or foods for specific health uses (FoSHU) is a growing market; market intelligence reports show its increasing importance. However, there is a discrepancy between consumer surveys and market intelligence reports. In 2001, 38% of housewives and 21.5% of males were aware of the FoSHU label. But only 11% of males and 27% of females reported consuming FoSHU products.

Furthermore, only 400 respondents approved, while 1600 disapproved, of such products.

Across Europe, the US, and Japan, beliefs about the importance of diet for health were found to be fairly similar, but differed substantially in certain aspects. Japanese respondents were found to be the most diet-health conscious and least anxious about their diet, and rated culinary associations with food most highly. In contrast, US respondents were diet- and health-conscious but also extremely anxious about their diet.

The Food Choice Questionnaire (FCQ) examines nine factors pertaining to food choice: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern. Application of the questionnaire to convenience samples of Japanese, Taiwanese, Chinese-Malaysian and New Zealand female consumers showed that Chinese-Malaysians and Taiwanese similarly rate and rank by highest scores for health, natural content, weight control and convenience. The results were interpreted in terms of Chinese beliefs about food as medicine.

Application of the Theory of Planned Behaviour

The Theory of Planned Behaviour has been tested cross-culturally, and has been modified to fit Korean "Confucian" culture. *Emic* constructs such as "face-saving" and "group conformity pressure" were included as social (subjective) norms, and attitudes were regressed upon these constructs. Consistent with cultural differences in values, purchase intentions were predicted by the subjective norm among Koreans, and by attitudes among US respondents.

The same theory was used to examine attitudes of Koreans towards organic foods and the moderating effects of food-related personality traits. Scales measuring food neophobia and food involvement were incorporated into the model. Attitudes and subjective norms were important predictors of intention to purchase organic foods. These attitudes were in turn predicted by particular constructs within the food choice questionnaire such as mood, convenience, natural content, animal welfare and environment.¹

In summary, food choice measurement has been 'western' in origin. There are many gaps and a paucity of published empirical studies in Asia. Differences in physiology and genetics are unlikely to be major contributors towards differences in perceptions or preferences for foods among Asians. Culture and the underlying values and belief systems are more likely to be central to Asian consumers' food preferences. There is a wealth of information on culture, but these have not been applied to food. More studies in Asia are needed that will build on diet-health beliefs, apply behavioural theories, and link culture with consumer behaviour.

CONSUMERS AND FUNCTIONAL FOODS IN JAPAN

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Japan has set up a functional food factor (FFF) database, which contains the phytochemical content of foods in

Japan. The goal is to use this database to estimate the total intake of various phytochemicals in the population, and after ten years, to examine a population-based cohort for specific endpoints and other disease biomarkers. This will enable us to identify multiple actions and interactions of the dietary nutrients and non-nutrients, determine how they contribute to various health outcomes, and clarify the integrated effects of specific forms of phytochemicals on the health and well-being of consumers.

The FFF database contains levels of carotenoids, flavonoids, sulfur, and other polyphenolic compounds present in more than 80 percent of Japanese foods. It is used by dietitians and researchers to estimate the amounts of specific phytochemicals ingested by the Japanese population – e.g., alpha carotene, beta carotene, cryptoxanthin, lutein, lycopene, zeaxanthin - and compare their interactions. For instance, we have seen that Japanese people have typically high intakes of the polyphenols epigallocatechin and ferulic acid, while the type of sulfur compound ingested at high levels is *s*-1-propenyl-L-cysteine. Isoflavone intake was found to be 40 mg/day (median value), while that of flavonoids was 15-16 mg/day. These amounts are higher than the usual intakes of carotenoids and vitamin C, and these high intake levels are likely to have long-term effects on health.

We did a factor analysis of phytochemical intakes and various biomarkers. Our results showed that the Factor 1, consisting of the polyphenols neohesperidin, poncirin, naringenin and apigenin had a significant beneficial relationship with serum levels of total protein, albumin, triacylglycerol and HDL. On the other hand, Factor 2, composed of beta-carotene, quercetin, kaempferol, lutein, lycopene, and cinnamic acid was significantly associated with increased triacylglycerol levels. These findings indicate that not all phytochemicals may be beneficial in terms of lipid metabolism.

Extensive use of this method of analysis may reveal new findings about the positive and negative health effects of phytochemicals. A paradigm shift in nutrition may occur in the future, once we are able to clarify the health effects of non-nutrient food factors such as terpenoids, flavonoids, peptides, sulfur compounds, etc. and discover their actions in the body, such as their interactions with enzymes and genes. Then we may be able to identify specific dietary patterns with defined functional food components that can benefit health, prevent disease, and increase longevity.

QUANTITATIVE STUDY DESIGNS AND TOOLS TO MEASURE CONSUMER FOOD BEHAVIOUR

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Quantitative measurement of consumer behaviour can make use of a food approach, (i.e., one that determines which attributes of a product drive acceptance within different segments of the population), or a person approach (i.e., one that uses behavioural theory and predictive analysis to examine individual food choices). In the person approach, validated behavioural models are used to identify psychosocial predictors of dietary intake. Constructs may be added to improve the amount of variance explained by these models. Identifying psychosocial pre-

dictors of intentions to consume enable us to understand what it is in people's minds that motivate them to eat what they do eat. If we can understand that, we can perhaps understand what needs to be modified.

Protection motivation theory attempts to specify the precise characteristics of a health message or behaviour that influence compliance, and to identify the processes at work. There are four categories of information surrounding perceptions. First, there is severity of the health threat; second, vulnerability to the health threat; third, how efficacious that behavior is thought to be – e.g., do I believe that omega-3 is going to reduce my risk of heart disease?; fourth, how much self-efficacy or confidence do I have that I can actually undertake the dietary change? Underpinning these four categories are issues of threat appraisal or disease threat, and coping appraisal, i.e., can I deal with it?

In a study done in Australia, we applied the model to elicit predictors of intentions to consume foods rich in omega-3 fatty acids, and to understand potential demand for novel sources of n-3 fatty acids.^{2,3} The exploratory study tested two tentative hypotheses: 1) that additional information would drive likelihood to consume novel n-3 enriched foods; and 2) that perceived vulnerability to coronary heart disease would drive likelihood to consume n-3 rich foods.

Responses were elicited from 220 consumers. Independent variables included protection motivation theory constructs, risk-benefits of the technologies, coronary heart disease risk factors, and socio-demographics. Descriptions of model products (farmed fish fed fishmeal vs. farmed fish fed n-3 containing oilseeds) representing options for possible consumption were presented. The dependent variable was scores for "likelihood to consume". Quantitative analysis used repeated measures analysis of variance on preferences for particular products, and Bonferroni post-hoc tests. The main analysis was backward elimination multiple regression.

Results of the analysis showed that the model explained about 44% of the variance in likelihood to consume the two types of farmed fish. An important predictor for fish consumption is self-efficacy and, to a lesser extent, the belief that the type of feed is natural/unnatural. Additional positive predictors of likelihood to consume fish fed genetically-modified oilseeds were whether a significant other had arthritis and the subject's perceived severity of coronary heart disease.

We analyzed the same data from a food perspective, (i.e., in terms of nutrient content, attitudes, and extrinsic qualities of the food) using conjoint and cluster analysis. These are tools for assessing which product attributes drive acceptance.

Extrinsic attributes include the base product (fish, milk, bread, etc) and price. There are currently many base products with added oils. Credence attributes are health claims and sources of information. People may or may not trust health claims. The source of the information, whether it came from a manufacturer or food regulator, might explain some of the variance in the credence attributed to these particular claims. We tried to work out what it is within this set of attributes that is seen to be valuable to people. People don't judge product attributes individu-

ally – they judge the whole product concept. Conjoint analysis allows us to pull these things apart to see what is actually driving acceptance, and identify the utility (worth or value) of levels of attributes.

We used a conjoint product profile where we combined the base product with the source of omega-3 (i.e., the product in which the omega-3 is contained and the source from which omega-3 oil originated). Product attributes were: base product (fish, milk, bread, supplements and associated frequency of consumption), cost (4 levels), different sources of information on the product (manufacturer, CSIRO, a health charity [National Heart Foundation] and food regulator), and product label (content and health claims).

Looking at the sample as a whole, the analysis revealed that in terms of importance and utilities, the base product is most important to people, followed by the label, and then the source of the long-chain fatty acids wherein genetically modified oilseeds had a negative utility.

Using cluster analysis and segmentation (clusters) based upon psychosocial-attitudinal rather than demographic differences, we identified three clusters. In each cluster, we could define people by their attitudes towards the food and their attitudes towards protecting themselves. Cluster 1 (28%) were what we called ‘conservative’. People in this cluster were significantly less positive about the benefits and safety of the technologies, had the lowest perceived risk of heart disease, and were less confident that they would consume novel foods containing omega-3 fatty acids. Cluster 2 (51%) were what we called ‘protectors’ – respondents who were very positive about technologies, had high perceived risk of heart disease, were not worried about genetically modified (GM) oilseeds, and were willing to consume novel foods containing omega-3 fatty acids. The third cluster (20%) were those that were ‘anti-GM’ and did not see much value in the perceived benefits of omega-3.

The case described above illustrates that different people see things differently, and we were able to actually identify those people. We first identified what they see as important and then looked back at their sociodemographic or, in this case, their attitude characteristics.

Our study variables were able to explain about half the variance in intention to consume farmed fish. We identified that farmed fish fed fishmeal was the most preferred but in fact, only about 60 percent ate the required amount, and that fish fed genetically modified oilseeds was the most highly rated novel product. Within that category, we identified a cluster of consumers who were particularly amenable to that kind of food. We also found that telling consumers to eat a particular food to reduce their risk of disease is not a great driver of people’s motivation to consume these products. Rather, health promoters should work at establishing self-efficacy and confidence to consume, so that consumers would more readily adopt healthy foods.

EXTENDING THE EVIDENCE BASE: SOCIAL AND CONSUMER RESEARCH IN FOOD STANDARDS

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Food Standards Australia New Zealand (FSANZ) is an independent statutory authority that develops food standards and joint codes of practice with industry, covering the content and labelling of food sold in Australia and New Zealand. These standards seek to protect the public health and safety of food consumers, ensure that consumers are informed about the food they buy, and prevent deceptive and misleading conduct. At the same time, these measures aim to support an innovative food industry and ensure that any standards put in place are consistent with international obligations.

FSANZ bases its risk analysis on the scientific risk analysis framework of the *Codex Alimentarius* Commission. Increasingly, we are using more consumer and social science-based research in this aspect of our work. For instance, if we are interested in allowing a new food ingredient, we may look at the likely levels of consumption or substitution behaviours through survey research. Once it is determined that there is a risk that needs to be managed, FSANZ develops appropriate food regulatory measures to ensure that the risk is acceptable to the community. The risk management approach use labelling, setting limits on the amount and composition of substances in a product, or non-regulatory action such as developing codes of practice with industry. Consumer and social sciences is important in this area to ensure measures adopted have the desired outcomes. The third component, risk communication, is where we ensure that stakeholders are informed about the development of food standards and have opportunities to be engaged in that process.

Consumer and social sciences form the basis for dietary modeling (e.g., food frequency questionnaires, national nutrition surveys), consultation and public participation, and labeling. In dietary modeling, consumer research is used to determine how much and how often various foods are consumed by various demographic and socio-economic sub-populations. Additionally, we explore the likelihood of food substitution occurring when new products are released. Consumer and social sciences are also implicit in the areas of understanding food choices (e.g., motivation), the use of labeling by consumers (e.g., their understanding, interpretation and use of nutrition labels, nutrient content claims, health claims), and tracking consumer attitudes about food and food related issues.

An example of how we have used consumer research in developing food regulations is regarding the use of plant sterols in foods. Consumption of plant sterols can reduce the uptake of low density lipoprotein (LDL) cholesterol. FSANZ received applications to broaden the range of foods to which plant sterols could be added. Stakeholders raised a number of concerns, among which was whether people would see these products as a ‘magic bullet’ to solve their cholesterol problems. The concern was based on a belief that if individuals could eat these products, they may choose not to modify other diet or

lifestyle factors that contribute to increased LDL cholesterol levels.

To address this issue, FSANZ designed a social research project to measure the differences between users of plant sterol enriched products and those who do not use enriched products. The sale of plant sterol enriched margarines provided a useful proxy for the proposed new products. The two groups were surveyed using a set of standard measures for diet and exercise. There was no evidence that individuals who used the enriched product had less healthy diets or less exercise than those who used a non-enriched product. We concluded that there was little evidence supporting the belief that plant sterol enriched products are viewed as a 'magic bullet' with associated changes in behaviours. The survey also gave a range of other information, such as facts about the target audience, whether children were inadvertently exposed to the product, consumer understanding of plant sterols and their motivations for use. These data were used in developing FSANZ risk management and risk communication responses.

Another example where we used the social sciences to assist in the development of food regulations is that of formulated beverages. These are non-alcoholic, water-based flavored beverages with added vitamins and minerals. An application to permit the addition of vitamins and minerals to sweetened beverages generated concerns among some stakeholders. In particular, what are the likely consumption behaviours for these products and what impact would they have on consumers' energy intakes, given increasing concerns about obesity? Again, FSANZ collected evidence to understand consumer responses through an on-line survey that made use of existing products as prompts to ask questions.

Regarding the concern that consumers may drink formulated beverages in place of other drinks, the survey revealed that formulated beverages were indeed consumed in place of drinks with less sugar such as water or milk and also, in place of softdrinks with higher levels of sugar. About 70% of respondents substituted on some occasions a formulated beverage for a non-formulated beverage. Of the 70%, somebody went from a beverage with more sugar to a formulated beverage on about 40% of occasions and, on about 60% of occasions, somebody went from a beverage with less sugar to a formulated beverage.

The question that arose was: are consumers confused and making nutritionally 'poor' decisions in drinking a beverage with higher sugar levels that has added vitamins and minerals? We tested consumers' ability to evaluate drinks by ranking beverages (water, milk, formulated beverages, fruit juices, softdrinks and diet softdrinks, etc.) in terms of their relative sugar content. Results showed that majority of consumers can accurately evaluate the relative sugar levels of formulated beverages. That is, consumers are aware that these products are higher in sugar than say, water or milk, and that the majority of consumers were not being misled or confused by the fact that there were extra vitamins and minerals in the product.

In conclusion, consumer and social sciences have long been implicit in developing food standards in FSANZ. Social science theory and methodologies ensure that the

science we use in suggesting outcomes about behavior is just as rigorous as when we suggest an outcome from toxicology or microbiology. This symposium has shown that the tools and techniques exist to allow us to do that.

UNDERSTANDING LIFESTYLES AND PRIORITIES OF THE AT-RISK POPULATION – IMPLICATIONS FOR THE DEVELOPMENT OF COMMUNITY-BASED WEIGHT MANAGEMENT PROGRAMS

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Studies have shown that diabetes prevention programs targeting individuals with impaired glucose tolerance, and which involve intensive lifestyle modifications, can actually reduce the risk of developing diabetes in pre-diabetic individuals by about 55 percent. The problem with programs involving lifestyle modification is that they are quite expensive, it is difficult to find subjects who are willing to participate, and, among those who participate, goal attainment and maintenance are often not achieved.

We conducted a study, the aim of which was to provide a framework for the development of public health programs (in this case, diabetes prevention programs involving lifestyle modifications) that would optimize participation and sustainability, while minimizing costs. The goals of such a program are to achieve reduction and maintenance of 7 percent weight loss through diet and physical activity, and to perform at least 150 minutes of physical activity per week.

The questions we asked were the following:

- Can we improve the recruitment of Singaporean patients who are at risk of diabetes mellitus and convince them to participate in a diabetes prevention program?
- Can we enhance the attainment and maintenance of lifestyle goals in these patients?
- Can we do this at a lower cost than programs done in other countries?

There are four phases in the study:

- Collecting and consolidating current knowledge (i.e., review what we know, brainstorm new ideas, think holistically about target segments);
- Understanding the target segments (i.e., scope for new ideas/inspiration, test hypotheses about motivations and obstacles);
- Testing ideas (i.e., assess interest, fit/fine tune ideas);
- Doing a trial run.

In the first phase, we reviewed the diabetes prevention program and its lifestyle intervention component. We brainstormed ideas which we believed were most likely to be successfully implemented.

In the second phase, our objectives were to "fish upstream" to identify opportunities for building weight loss programs, validate hypotheses about the values and issues of these segments generated from the brainstorming sessions, test the possible ideas generated from brainstorming and use them as a springboard for other ideas.

We took data from the 1998 National Health Survey, a nationally representative sample that included 626 people

with impaired glucose tolerance. This sub-sample of pre-diabetic respondents was analyzed in terms of gender, ethnic group, and employment status. The two largest groups with impaired glucose tolerance – working Chinese men and Malay housewives – were selected as the target audience. These people were around 35 to 45 years old; the BMI of the Chinese men was around 26 to 27, Malay women had slightly higher BMI.

Using a method called lifestyle triad, we tried to understand what this target audience needed from life. An individual who was in the relevant BMI and age range (BMI 25 to 30, age 36 to 38 years, respectively), was selected. The respondent and two of his friends were invited to an informal interview session. Before the session, the respondent was given a book that elicited information about individual aspirations, what he/she looks for, what he/she likes to have, holidays he/she wishes to take, and other motivations completely unrelated to health. Pictures were cut out from a magazine to serve as a guide for discussion.

Four lifestyle triads were conducted – two among Malay housewives and two among Chinese middle class executives. The Malay housewives were 36 to 38 years old, with children, and from lower middle income families. The middle class Chinese executives were male, aged 30 to 40 years, married with dependent children, had stable jobs and household incomes above S\$5000.

From the discussions, respondents revealed that a person's time was divided into time for work (which includes managing the household), personal time, and time for family. Generally, time for work was not accessible. We initially considered using family time to design interventions that involve the whole family. However, it turned out that times for physical activity with the children were highly inactive for adults. This was because parents had to watch their children to keep them from getting hurt. In addition, a physical activity program for the entire family was logistically difficult to organize.

Personal time appeared more feasible to target. Most individuals, irrespective of whether they were employed or in the home, were likely to set aside some personal time as something they deserved. The Malay housewife saw herself as successful if she managed her time efficiently. We asked "Is it more important that the food you cooked is really good or is it more important that you get it done so that you can go and read a book?" The responses showed that it is more important for them to get things done and not be tied to their housework, and to find time for themselves. Hence, accessing personal time for intervention is feasible. The main consideration for such a program is that it should be flexible in terms of time, because housewives don't have four or five hours at a stretch. What they have is half an hour or one hour at different times of the day.

Another finding was that the women wanted to earn some money to help ease the family's financial situation and have some personal money to spend. Most respondents felt that they had adequate knowledge about diet and healthy eating. Across gender and ethnic groups, healthy eating focused on food safety and avoidance of toxins, salt, monosodium glutamate, and oil. Respondents

did not think about reducing caloric intake; most of them saw their extra weight as mainly due to lack of exercise.

Most felt that specific exercise classes, such as fitness class, were too unidimensional and they were unlikely to sign up. Exercise was done mostly in a social context either with a friend or a spouse, or in groups. The social aspect is therefore an important consideration in any intervention program that makes use of personal time, since people may want part of this time to be spent with friends.

In terms of outlook on life, respondents thought that moderation or staying "within the norm" is an important value, a mark of maturity indicating contentment and realism. They did not actively seek dramatic changes in their lifestyles. "*Eat more salads, less fats. We're gradually incorporating these into our lives, but we're not fanatical; ...we're not eating organic food or wholemeal bread...*" They also did not want dramatic results nor aspire (overtly) to a dramatically different future. "*Eat a little bit healthier, exercise a little bit more, rather than being a 'fanatic' ...don't necessarily have to look my ideal...*" Responses indicated that ambitious goals and the promise of dramatic results may negatively affect interest in any future trials.

We are now considering the following future actions:

- Recruiting groups of friends, rather than individuals, for screening;
- Including all individuals in the program, irrespective of risk level. This takes into consideration the fact that, among Malay housewives aged 35 to 45 yrs, 31.3% have impaired glucose tolerance and are considered high risk.
- Promoting basal increases in physical activity and the use of self-monitoring. This involves introducing little pockets of activity that they could do throughout the day, anytime of the day whenever they have a few minutes, and some form of self-monitoring that may be internet-based.
- Encouraging self-organized group activities with financial incentives and support for taking part in such activities. Incentives may take the form of gadgets that reduce housework.
- Building into these activities opportunities for employment or earnings that will involve diet and physical activity. This can be a subtle way of communicating the message to a targeted group of individuals.

The outcome is a program that may benefit about 7 to 8 percent of the at-risk population. Taking this small percentage as a start, we may eventually be able to reduce the risk of diabetes by 50 to 60 percent. Our next step is to take this information back into a series of focus groups, fine tune these ideas, and eventually conduct a control trial that will run for a 6-month period.

DISCUSSION SESSION HEALTH ISSUE IN ASIA: DUAL PRESENCE OF OVER – AND UNDERNUTRITION WITHIN THE SAME HOUSEHOLD AND EXISTING KNOWLEDGE GAPS

The discussion focused on the problem of increasing prevalence of overweight among low income families where child underweight is still a relevant problem. The

dual presence of over- and undernutrition within the same household is a phenomenon in countries undergoing rapid economic transition and is an existing trend in developing countries in Asia. The predominant pair combination that is reported in the literature is an underweight child coexisting with an overweight non-elderly adult member.⁴ Studies have suggested that the likely causes of disparities in nutritional status within the same households include household dynamics, preferential food allocation, and child care practices.^{4,5} The question “why do some household members experience deficiency while others do not?” may be partly answered by what happens within households and inside people’s minds. Preferential food allocation, or the intrahousehold pattern of food distribution, is hypothesized to be based on differential valuation of specific household members.⁶ This valuation has been linked to the current or future, perceived or actual, economic contribution of the individual, as well as to their social valuation. An example is favoritism of adult males over females, which has been reported in Nepal, Bangladesh, China and Philippines.^{7,8} Age-based differences in intrahousehold food allocation have been found to differ by setting. In Thailand, second-order children were more likely to be wasted.⁹ In the Philippines, the greater number of children in a family was associated with the presence of one undernourished sibling. A common consumption pattern of undernourished children in these countries was frequent snacking and high intake of sweets.⁷

Social scientists have pointed out that child care and parenting practices, and the values and beliefs that underlie these practices, need to be understood if health issues are to be addressed. For instance, in Nepal, it was shown that a child eating from a shared plate was two times as likely to consume the food served on the plate and had a significantly reduced risk of xerophthalmia, than if eating individually. The reduced risk was apparent only if the child ate with an adult female; eating with an adult male had no effect.⁸

It was agreed that the presence of over- and undernutrition within the same household is a difficult problem that requires extensive investigation using a multidisciplinary approach.

The following research gaps emerged:

- There is a need to identify culture-specific strategies that will ensure appropriate nutrition for over- and undernourished individuals in the same household;
- Ways should be found to develop effective health programs and messages that will address both under- and over-nutrition in the same household, based on an understanding of Asian culture, beliefs and values;
- The appropriate consumer research methods to examine and resolve the situation, within the context of an Asian setting, remain to be identified.

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AUTHOR DISCLOSURES

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Special Report

Symposium on Understanding and Influencing Consumer Food Behaviours for Health: Executive Summary Report

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座談會綜論：了解及影響消費者食物行為與健康

亞洲的食物消費型態正快速的改變。都市化以及生活形態的改變減少了以穀類、蔬菜、及塊根類為主之傳統餐食的攝取。這些改變也伴隨著亞洲人口慢性病盛行率的增加。國際生命科學學會東南亞分會(ILSI Southeast Asia)及澳洲聯邦科學暨工業研究所(CSIRO)共同組織了一個座談會：為健康對於食物行為的瞭解及影響，重點放在利用消費者科學來改善食物行為。座談會的目標是要瞭解亞洲消費者及他們的食物選擇，檢測利用消費者研究使他們的食物選擇朝向更健康方向修改，闡明健康計劃及食物管理如何被有效利用來促進較健康的食物選擇，並且找出關於促進亞洲人健康食物行為的知識缺口。在亞洲人中對於味道的感覺並沒有差異，而且亞洲人對於某些味道的偏愛可能是因為文化及其潛在價值和信念的暴露與熟悉所造成的。從西方人口衍生出來的消費者科學原理及工具需在亞洲經過文化交叉的效度測試。利用消費者研究方法得到的訊息，包括消費程度及食物與食物產品的取代行為，可以引導食物管理及計劃的發展，以促使個人有較健康的食物選擇。現存的知識缺口包括適合用在亞洲環境中的消費者研究技巧、傳統的亞洲飲食中食物與健康的關係、以及有什麼方法可以對付在亞洲人家中同時出現的上升的營養過剩及營養不良的盛行率。

關鍵字：消費者、亞洲、食物消費、消費者行為、食物選擇