Methodological approaches connecting the food system to the urban nutrition transition: fresh food retailing in Thailand.

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ABSTRACT

This paper stems from a 10 year multi-disciplinary, staged research programme with a broad remit to explore Thailand's health and nutrition transition. It focusses on the central role of food retail formats (fresh markets and supermarkets) within the food system in supplying urban populations with healthy, fresh foods. It describes the evidence-based methods a Thai and Australian research team has used to examine the impact of food retail transformations on the health of the Thai population. The team was drawn from multiple disciplines to develop research capable of examining the complex interactive effects of supermarket expansion and fresh market decline. This particular issue, and the multi-dimensional and multi-level approach used for its study, are relevant more widely than in Thailand with the 'supermarket revolution' being of interest to the FAO and development agencies for some time. Ultimately supermarkets have an influence on the nutrition transition across all nations where they have even a moderate presence.

However, the timing and exact nature of the nutrition transition varies from country to country according to government regulatory and foreign investment regimes, while cultural factors like trust in the food source shapes where people shop. Any study of the upstream level determinants of the nutrition transition must, by necessity, involve retail format histories and the accompanying retail planning and foreign investment policies. These studies should also be capable of explaining the role of national and sub-population culinary cultures in mediating what diets citizens will find acceptable, and what food shopping and consumption practices they are willing to alter and which they want to retain.

Drawing on different bodies of evidence, our multi-stage research program has combined four main approaches (described in detail below and in cited papers) which capture data at the micro, meso and macro levels: 1) epidemiological research to measure the associations between dietary risks and outcomes over a decade, 2) case studies of food retail sites using multiple, ethnographic methods, 3) policy analysis based on readings of Thai and English grey and published literature, 4) a social history of Thailand's culinary culture with an emphasis on food procurement approaches over the last century.

The research design and suite of methods used reflect a public health ecology approach. This approach recognises public health outcomes to be the result of dynamics in multiple systems: demographic, cultural, social, bio-environmental, political and economic. It attempts to find plausible pathways between different levels of health determinants, and to use the pathways descriptions as the basis for narratives of policy change.

1.0 Introduction

Hippocrates is reputed to have said "Let food be thy medicine and medicine be thy food" suggesting that the link between diet and health has long been recognised. In more recent times, Hoddinot (2012 p.19) considers that "*Anything that affects agriculture has the potential to affect health and nutrition and anything that affects health and nutrition has the potential to affect agriculture".* However, while agriculture is the foundational activity of all food systems, these systems are now considered to encompass a range of activities from the production, processing, retailing, and preparation to the consumption of food. Each of these system components are known to influence health.

In Thailand and other South-East Asian economies, rapid population growth, and a shift from under-nutrition to over-nutrition and from infectious to non-communicable diseases (NCD), herald a need to understand the relationships between food system health and population health (Hawkesworth *et al.*, 2010) using an integrated approach. This paper concentrates on Thailand, which, like other Upper Middle Income Countries (UMIC), contains rapidly growing cities, with the associated need to supply their populations with healthy, sustainable food into the future. While there is a move to grow more fresh produce within cities, and to be more self-sufficient, urban populations in high income countries and UMICs almost totally rely on global food retail value chains to supply their dietary requirements.

This paper stems from a 10 year multi-disciplinary, staged research programme that aimed to investigate Thailand's health and nutrition transition. In it, we focus on the role of food retail which operates as an under-researched node in the food system with the potential to influence what is produced and what is consumed. It is only recently recognised that complex interactions exist between policy, environmental and socio-cultural forces that influence the different trajectories and roles food retail formats have in various settings. For example, in inner urban American cities supermarkets are seen as the solution to food deserts while in South East Asia, fresh markets, which have always occupied key geographical sites, and cultural and economic roles, remain a major supplier of fresh produce. Studies show mixed effects of supermarkets on diet in developing countries (Asfaw, 2008; Tessier *et al.*, 2008) and in developed nations (Cummins *et al.*, 2005; Wrigley *et al.*, 2005).

Recognition is growing that food retail, particularly in urban areas where it is the primary source of calories and nutrients, plays a vital role in health outcomes (Popkin *et al.*, 2013). Modern industrial food systems based on supermarkets and the food services sector have increased the availability of nutrient poor, ultra-processed foods with potentially negative consequences for nutritional health (Hawkes, 2008). With the spread of modern retail formats across the country, the Thai diet has evolved rapidly over the last 50 years to include more oil, fats and animal meat and fewer vegetables and fruit (Kosulwat, 2002) leading to a corresponding increase in calories (Aekplakorn *et al.*, 2004; FAO, 2008). Thai obesity has also increased, affecting 40.7% of women and 28.4% of men by 2009 (Aekplakorn, 2011). Population weight gain is more pronounced in urban areas and in the more economically developed Bangkok and the Central region and lowest in the poorer North and North Eastern regions (Aekplakorn *et al.*, 2004; Aekplakorn, 2011). Cardiovascular diseases, non-insulin dependent diabetes mellitus, hormone-related cancers and gall-bladder disease are all expected to surge (WHO, 2000). The growth of supermarkets has co-occurred with growth of obesity in Thailand (Kelly *et al.*, 2010). However, causal relationships between food retail source and health outcomes have not been established yet in developing countries and more research is required (Donald, 2013).

Food retailing now constitutes the largest component of the economic value of the food system in many nations, dwarfing the other component sectors of production, processing and trade (Government Office for Science, 2011; Spencer and Kneebone, 2012). For this reason, and because they have an impact across each of these sectors, corporate food retailers have been anointed the 'New Masters of the Food System' (Flynn and Marsden, 1992).

2.0 Our research over a decade

2.1 Theoretical framework

Our program of research draws on public health ecology, employing what has emerged towards the end of the twentieth century as socio-ecological systems thinking. This paradigm is built upon adopting principles from ecology which originated in biology and earth sciences and the acknowledgement of the dependence of humans on bio-physical systems. Today's public health is often couched in ecological terms using notions of intersecting social and natural systems, feedback loops and multi-scalar and temporal dimensions. In reframing the causes of disease, "The Ecological Public Health model sees ill-health as the result of mismanaging relationships" (Rayner and Lang, 2012 p. 93). Adherents to the model argue that an interdisciplinary approach is mandatory.

Socio-ecological systems thinking has been most extensively applied to food systems by the UK based Global Environmental Change and Food Systems (GECAFS) Joint Project of the Earth System Partnership. The Project has documented the way in which food security is the outcome of the way societies manage the eco-system services relevant to food systems with food system outcomes in turn feeding back into ecosystem services, thereby determining future food security (Ericksen *et al.*, 2010). An important component in GECAFS has concerned the social regulation of ecosystem services which extends to relationships between producers and consumers, and which we now know to be mediated by food retailers.

With the belated recognition by food security planners that 'good nutrition' is shaped as much by demand-side as supply-side dynamics has come a new sensitivity towards the sphere of consumption. Food retailers are central players in guiding consumption choices (Dixon, 2004; Dixon and Banwell 2012). While food price and price elasticity have long been recognised as driving food choices, commodity systems analysis and value chain methodologies have introduced the need to consider the non-economic values attached to foods (Gereffi *et al.*, 2009; Friedland, 2001). The inclusion of food's acceptability within the UN definition of food security reflects arguments regarding the importance of cultural factors as well as price signals. Important among the cultural attributes of foods in Thailand are issues of food safety, tradition and social status (Seubsman et al. 2009).

Reflecting the adoption of a socio-ecological framework, the Thai and Australian research team has been drawn from a range of disciplines to develop a research design capable of examining the dynamics and determinants of the health and nutrition transition in Thailand with a focus on the complex interactive effects of supermarket expansion and fresh market decline. The multi-dimensional, multi-level research program began with a combination of four approaches (described in detail below and in cited papers) which capture data at the micro, meso and macro levels: 1) epidemiological research to measure the associations between dietary health risks and outcomes over a decade, 2) case studies of food retail sites using multiple ethnographic methods, 3) analyses of policies, including regulation and labelling of processed foods, based on readings of Thai and English grey and published literature, 4) a social history of Thailand's culinary culture with an emphasis on food procurement approaches over the last century.

Figure 1 illustrates the domains and topics within the food system that we have investigated or are planning to, displaying the inter-connections between them. Already completed studies (including their methods) are briefly described. The number of stars indicates the amount of research accomplished thus far.

(Figure 1 about here)

2.1 Epidemiological research

The aim of this research has been to document and analyse the health and nutrition transition in Thailand using the Thai Cohort Study (TCS). The TCS commenced in 2005 when a 20-page mail based questionnaire was sent to distance learning adults who were enrolled in the Sukhothai Thammathirat Open University (STOU) (Sleigh *et al.*, 2007). Out of approximately 200,000 adult students, 87,151 responded at baseline. There have been two follow ups since: in 2009 (n=60569) and in 2013 (n=42785) (Seubsman SA *et al.*, 2011). The self-administered questionnaires collect a wide range of information including socio-demographic characteristics, health behaviours (smoking, drinking, physical activity, consumption of 'problem foods'), physical and mental health, and personal wellbeing.

Cohort members reside throughout Thailand and are similar to the general population with regards to socio-demographic characteristics, ethnicity, and religion, although they are a little younger and better educated and therefore likely to be early adopters of new trends which have health consequences (Sleigh *et al.*, 2007). The cohort has been used already to identify key factors associated with changing diets and health (Banwell *et al.*, 2009; Lim *et al.*, 2014); and diseases associated with diet, like hypertension and cardio-vascular conditions, are beginning to appear in the cohort (Zhao *et al.*, 2015; Thawornchaisit *et al.*, 2014).

2.2 The social history of food procurement and case studies of food retail environments

With the aim of understanding the current state of affairs of food retail in Thailand and how it evolved, team members have synthesised all accessible academic and grey literature in Thai and English from Thai sources and from the Australian National Library network on food retailing formats over the last 100 years. Important considerations included the functions they have played in Thai socio-cultural affairs particularly at the village and city level.

The food system in Thailand has experienced dramatic transitions in production, distribution and consumption. It has transformed from a system that exported unprocessed rice to a more complex system that processes and exports a large variety of food products. In parallel, the traditional Thai food retailing system based on fresh markets has bifurcated with supermarkets and modern food retailers now controlling half of all food sales. The historical literature has documented the centrality of fresh markets, wet markets and night markets in providing urban and rural Thais with protein, fresh vegetables, fruits and herbs up until about 20 years ago. Supermarkets first appeared in the 1960s in Bangkok and proliferated in the 1990s. In the 1970s and 1980s convenience chain stores began to appear and in 1989, 7-Eleven convenience stores arrived (Tokrisna, 2007). An explosion in modern retail formats was associated with a booming economy (Schaffner *et al.*, 2005). In the 1970s and 1980s the Charoen Pokphand (CP) group gained prominence to become the largest 7-Eleven franchisee in the world. The 1990s saw the growth in other large agri-export businesses based on other processed agricultural products and canned foods, although much processed food available in Thailand is produced by small to medium sized Thai businesses.

During the 1997 financial crisis, the government dissolved partnerships between Thai and foreign firms leaving foreign partners in control. These transnational food companies proceeded to massively expand their operations, for example from 18 hypermarkets (Schaffner *et al.*, 2005) in 1996, to a 148 a decade later. Modern super/hypermarkets, similar in appearance and style to those in the west have diffused into regional centres as rural incomes have risen and rural people have become more accustomed to urban-style living. The rapid expansion of supermarkets and hypermarkets and the annual loss of around 25000 small retailers (Hawkes, 2008), have been closely associated with Thailand's urbanisation and industrialization.

Thailand's food retail sector now consists of a traditional and a modern sector (hypermarkets, supermarkets, and chain convenience stores) with the latter continuing to expand (Schaffner *et al.*, 2005; Tokrisna, 2007). New legislation introduced in the 2000s has slowed the growth of foreign owned supermarkets somewhat (Shannon, 2009), but super/hypermarkets are rapidly gaining ground still with their number increasing from 110 in 1997 to 391 in 2007 accompanied by a 6-fold growth in convenience stores (Shannon, 2009). This modern food retail growth has corresponded with a national decline in the number of fresh markets, falling from 160 to 50 in the past decade in Bangkok (Sriangura and Sakseree, 2009). The large super and hypermarkets are often located on the outskirts of major cities and rural centres in contrast to the central location of fresh markets, requiring access to private auto transport.

Case studies using ethnographic methods

To develop an understanding of how fresh markets operate as the dominant source of fresh produce and are incorporated into the daily practices and socio-cultural activities of urban, regional and rural populations we have observed and documented them from the perspectives of vendors and consumers. Using a descriptive case study approach (Yin, 2014) team members conducted ethnographic studies between 2006 to 2011 at seven fresh markets, some thriving, others struggling, located in the four main regions of Thailand (see Table 1); each with distinct socio-economic, cultural and culinary differences. In keeping with an ethnographic case study methodology, contextual data was gathered *in situ* through direct observations and photography, interviews and focus groups with managers, food specialists, vendors and shoppers (see Table 2). We asked about the sources of produce, vendor and consumer preferences and cultural influences, the history of the markets and the current regulatory environment.

Table 1 about here
Table 2 about here

The first study of Khon Kaen market in the Isan (North-East) region of Thailand was conducted in 2006 and photographs, supplemented by consumer and stall holder interviews, were compared with photographs taken at the same market twenty years earlier, to observe changes that had taken place in product mix, stall layout, and market management (Dixon *et al.*, 2007). These findings formed the basis for data collected at the other fresh markets to seek common patterns a form of analytic generalisation commonly employed in case studies (Yin, 2014).

The fieldwork interviews and observations supplied details missing from the macro accounts of food volumes, types, prices, that are collected in development economics and economic geography. During interviews, participants described how the ritualised and meaning laden aspects of food provisioning is a factor in their food purchasing decisions and how price is another factor – albeit an important one. The team found that fresh markets (also known as wet markets, *talat sot*) have increased the diversity of products they offer over the last 20 years

with the inclusion of temperate country produce but with a corresponding decrease in sales of foods gathered in the wild. Much fresh market produce is local or regional, and is sometimes grown, or collected from producers, by stall holders themselves or bought at nearby wholesale markets. Free trade agreements have led to the sale of fruit and vegetables countries like Australia and China (Banwell *et al.*, 2013; Dixon *et al.*, 2007). Fresh market stallholders feel threatened by the arrival of supermarkets and have reported a corresponding decrease in sales. Some fresh markets have attempted to respond to the supermarket challenge by improving their food safety and hygiene standards occasionally with local government support while others are struggling still in run-down buildings that lack modern facilities. Thais enjoy shopping in air-conditioned and clean conditions but nevertheless continue to visit fresh markets because they are an easily accessible source of affordable local foods that can be used to produce regional cuisines. Many Thais have little capacity for food storage at home reinforcing a culturally engrained habit of shopping frequently in small quantities at nearby fresh markets located within built up urban areas that are accessible, by foot, bike or motor bike. Importantly to Thais, fresh produce is usually cheaper than at supermarkets and sold in easily affordable, transportable quantities (Schipmann and Qaim, 2011). Many also value a personal and trusting relationships with the mainly female Thai stall holders and are concerned that they might lose their livelihoods.

The team's ethnographic research, which included shopper interviews conducted at supermarkets, indicates that supermarkets connote and promote qualities of food safety, hygiene, comfort and modernity (Isaacs *et al.*, 2010; Isaacs, 2009). Food safety and pesticide use is an ongoing concern and the supermarkets have used in-house standard setting and labelling to attract consumers. They promote cleanliness, availability of car-parking, air conditioning and cool storage to attract customers. They also imitate some characteristics of Thai fresh markets, such as the sale of cultural foods and fresh produce stalls to tap into the cultural appreciation of markets (Isaacs, 2009). Apart from Bangkok, where supermarket expansion preceded new planning restrictions, they are located currently mainly on the outskirts of cities so that Thais with cars usually shop at them weekly or less often, mainly for packaged foods and dry goods. However, some chains are now creating smaller stores to overcome planning restrictions and gain access to more central locations (Gen, 2013).

2.3 Policy oriented research

The collection and analysis of published and grey literature in Thai and English on food production and distribution has been used to document the changing emphasis in Thai policy related to food production and distribution. We searched for key words, (Thailand or Thai: food system, food retail, nutrition transition, development indicators, agricultural sector, contract farming, food consumption, malnutrition, obesity, nutrition policies, food policies, food security, nutrition security, free trade agreements, globalisation and Thai agriculture) and then followed up references in relevant papers. In addition, we searched the websites of the Thai National Economic and Social Development Board, The Ministry of Public Health and the National Food Committee for planning and policy documents as well as the Thai National Statistics Office, World Bank database, FAO database, and the WHO database (Kelly, 2015). Our analysis describes how Thailand has, through 5 year food and nutrition plans which commenced in 1977, successfully targeted malnutrition and has since turned its attention to promoting healthy nutrition for Thais (Dixon *et al.*, in press). At the same time through government partnerships it has supported the food industry to develop food processing, food exports and food technology with the latter gaining increased attention.

As part of agri-business development Thailand has moved from being a predominantly rice exporting, mono-culture to a country with a thriving agro-industry exporting fresh and processed foods. Along the way, policy contradictions and tensions have arisen with implications for health. Partly as a reaction to the increased vulnerability of farmers in an export-oriented agricultural system, dominated by supermarket supply chains, an agricultural "Sufficiency Economy" movement has been encouraged by the highest levels of government with the support of the Royal Family. Despite this, Thai farmers have been slow to adopt Sufficiency Economy principles and many envisage moving to the city to provide their children an education and an improved standard of living. This aspect of policy has been investigated by team members using a stratified random sample survey, key informant interviews and focus groups in the Isan region (Seubsman *et al.*, 2013).

Generally,Thai food production and distribution policy has been more consistent in its promotion of economic growth through encouraging large agri- and food export-oriented businesses. In the 6th National Food and Nutrition Plan (2002-2006) the government promoted the food industry and aimed to improve the efficiency of food production and distribution, as well as creating private and government partnerships for food processing, food technology and food exports.

Thailand has also undertaken the novel step of establishing a National Food Committee to coordinate policies and actions across all departments and ministries relevant to the National Food Policy including health. Despite recent aims to improve food security, food retail itself remains a relatively unregulated part of the food system. A community-based backlash from small stall holders and local shoppers against supermarket chains has led to political pressure being brought to bear to restrict the levels of TFC investment in Thailand by legislating against foreign ownership (Kuipers, 2007) and local community campaigns have run against the opening of new stores (Kanchoochat, 2008). While efforts were made successfully in the early 2000s to curtail the dramatic expansion of national and international supermarket chains, there has been little new effective regulation since then leaving these chains still growing and in a dominant market position (Gen, 2013).

2.4 Investigating linkages

Having established a research baseline from which to investigate the health and nutrition transition, the role of fresh markets and supermarkets in supplying fresh produce to Thais, and outlining the food policies that have supported these changes, we are now combining approaches to gain deeper insights into the links between food retail and health.

As we pointed out earlier, food retail shapes the practices and preferences of consumer culinary culture. However it also reflects and responds to consumer preferences. To investigate this bi-directional relationship, we combined evidence from a variety of methods and sources including the historical and socio-cultural literature, data from the TCS, week-long food diaries and key informant interviews to document Thai culinary culture. The social history account revealed the major influences on Thai meals to be an amalgam of social trends - including proxy colonization by the US during and after World War II, religion, the monarchy and national economic trends. It identified an abiding affinity for the structural underpinnings of the culinary culture, including relationships between the four fundamental ingredients of Thai meals (rice, fish, dipping sauce and herbs), particular cooking techniques and meal arrangements. To assess historical changes in culinary culture after the penetration of modern retail formats, macro-level data on national consumption patterns was combined with the collection from nine 'ordinary' Thai men and women of week-long food diaries. This material displayed evidence of marked changes in diet compared to the historical record as well as the

strength of regional and status differences in culinary culture. At this point in time, home preparation of fresh produce bought from fresh markets increasingly is being augmented by supermarket sourced processed foods. This work also discusses the growing importance of ready-to-eat food purchased outside the home as women enter the workforce and seek convenience foods (Seubsman *et al.*, 2009).

Unlike the heavily qualitative nature of the foregoing study, the linkages between food retail and health outcomes were examined in a mixed methods study initiated in 2012. Thai Cohort Study (TCS) members provided a population from which a post-code defined sub-sample of members was drawn (see Epidemiological research). The population were urban residents from the 4 major regions of Thailand where the food retail case studies were conducted. Detailed questionnaires collecting data on the food retail environment, shopping behaviour and food consumption were returned by 1516 cohort members (45% response rate). From their responses, respondents were categorized into mainly modern shoppers (supermarkets and convenience stores), mainly traditional (fresh markets) and mixed (equal use). An additional group of questionnaire respondents from 2 regions were selected for face-to-face, in-depth interviews to 'flesh out' the quantitative information gathered (for a detailed description of the research methods and findings see (Kelly *et al.*, 2014)). This research confirmed that more than 80% of all Thais now had access to a supermarket, in contrast to their childhoods when only 5.7% had access. On average, travel time to a supermarket was 20.00 minutes but only 13.95 minutes to a fresh market. Frequent supermarket shopping is associated with higher incomes and urbanization. Different dietary patterns were displayed by categories of shoppers: people who shopped mainly at supermarkets and convenience stores were more likely to consume soft drinks, snack foods, instant and processed foods and less likely to purchase fruit and vegetables, while fresh market shoppers were more likely to consume vegetables. Cross-sectional analysis showed no association between shopping and BMI, diabetes or hypertension but supermarket shopping was associated with hyperlipidaemia (Kelly M *et al.*, 2014). In a youngish cohort such as ours it may take longer for health outcomes to follow the observed dietary associations.

3.0 Planned research

Investigating the food system requires examination of the myriad points that connect agricultural production to health. Thus far, we have investigated the connections between food retail and diet while our current and future research plans based on data collection using the TCS will allow us to more closely link these pathways to health. Using data newly collected in 2013 we will investigate the health outcomes related to food retail and dietary choice across an eight year time span, concentrating first on diabetes, which is growing in prevalence in Thailand and in other transitioning South East Asian countries. Another component of this research aims to validate our existing information on consumption of risky or problem foods (i.e. soft drinks, snack foods) with newly collected food consumption data that uses national Thai nutrition survey questions to categorize our respondents by their dietary patterns. Continued regular data collection from the cohort will strengthen our understanding of the links between food retail and consumer health outcomes as the nutrition transition unfolds.

To this end, we are considering combining TCS data with Geographic Information Systems data to investigate links between areas where our TCS data shows a high prevalence of diabetes, obesity, and hypertension with density of each type of food retail format. To continue to track changes over time in geographically-bounded food retail environments requires return visits to field work sites to provide evidence of trends, supplemented by national or regional data sets, in fresh produce sales in fresh markets and supermarkets. Additional local data collection

through key informant interviews and policy analysis could determine whether local level policy settings are facilitating these changes.

To extend our understanding of the role of food retail in the food system we aim to implement studies to examine the effects of the growth of supermarkets on food producers and production methods. Evidence worldwide demonstrates that supermarkets have moved upstream into production either through farm or food processing plant ownership or through contractual agreements with producers. In so doing, they can influence what foods are supplied to consumers, the price and quality of the foods. They can also have an impact on the livelihoods of producers and small scale wholesalers.

At present it is not clear whether, in determining food value chains, major food retailers improve rural producer incomes and well-being or not in economically developing countries and this needs to be investigated in various settings (Qaim *et al.*, 2014). This is an important consideration in terms of food supply stability. Currently, numerous poor farmers in Thailand are at risk of food insecurity due to low productivity and falling commodity prices (Buch-Hansen, 2001; Walker, 2012). They may gain economically from supplying under contract (Sriboonchitta and Wiboonpoongse, 2008) but they can be also economically excluded from supermarket growth (Timmer, 2009), their welfare and health may not be considered (Sriboonchitta and Wiboonpoongse, 2008) or even actively damaged through stipulated levels of pesticide use.

For this strand of research we have designed a comparative case study approach based on a co-located urban supermarket and fresh market in the four different regions of Thailand. Interviews will be undertaken with their produce suppliers to understand the impacts of varying contractual arrangements on what is produced, how it is produced, the prices paid, the audits required, and what the effects are on the producers and their communities. Ethnographic methods, (i.e. interviews, site visits) will be used with a network analysis approach to track the relationships between producers and retailers. New expertise (e.g. agricultural economists) are to be added to the team and their disciplinary perspectives and methods incorporated with a view to assessing producer financial viability according to retail format. Such detailed and contextual knowledge could be used to develop indices that assess food retail formats in terms of their contribution to producer health and viability, with implications for domestic food supply sufficiency and the long-term nutrition transition.

3.1 Obstacles to food systems research

The proposed program of research has encountered many of the difficulties that bedevil academic and other attempts to understand complex systems (von Braun *et al.*, 2012). National funding bodies are not designed to assess complex food systems research even though bodies like the International Food Policy Research Institute (IFPRI) Wellcome Trust, Food Agricultural Organization (FAO) are now moving in this direction. In Australia, the two major government funders sequester funds for health making it difficult to conduct research linking health with food systems. This tendency towards disconnection is replicated at a policy and practice level (Paarlberg, 2012) and in research literature and activities. The drive towards food systems research is mainly being initiated from the agricultural end of food system research and it tends to highlight agricultural solutions to under-nutrition such as the development of new products and processing techniques, despite many economically developing countries now experiencing health problems related to over-nutrition. Furthermore, relatively little attention is being paid to the points along the way such as food retail. It is also difficult to empirically associate food policy and agricultural production with health outcomes without considering intervening points. We have used Figure 1 to indicate the connections (see the large arrows)

we consider important and we plan to investigate these further in urban settings. However, this presents a challenge because consumers and their health outcomes are spatially and socially disconnected from food production.

While modelling and forecasting are valuable for predicting trends, these techniques are not able to take account of evolving meta-contextual factors, such as abrupt government changes leading to policy reversals or meso-level adjustments to regional and local government regulatory settings or shifts in socio-cultural practices. These changes require repeated empirical studies but have difficulty obtaining repeated funding for the study of temporal trends, especially of behaviours and values. Agent-based modelers can investigate these types of relationships and we are interested in exploring this collaborative possibility.

4.0 Discussion

Our suite of multi-method studies support existing research linking the nutrition transition with multiple and interacting drivers such as urbanization, sedentary work, leisure, and transport (Popkin and Gordon-Larsen, 2004; Popkin *et al.*, 2013). Food retail has been less studied but is beginning to be acknowledged as important in this transition. The studies show that demand as well as supply side factors are important contributors to dietary change, and that food retail plays a role in both. Thais' adherence to, and regard for, traditional culinary culture, and their price sensitivity leads them to continue shopping for fresh food at fresh markets. However, modern ways of living and working in urban settings are encouraging them to look for convenience and time saving food options by shopping in supermarkets. In common with their behavior in other countries, supermarket chains are endeavoring to increase their market share by persuading Thais to purchase more foods from them through the usual mechanisms, such as loss leaders and advertising. In the meantime, Thai government food policy is pulling in contradictory directions: simultaneously aiming to safeguard Thai health through promoting traditional diets and promoting the development of highly processed foods for the global food market, which also dominate the domestic market. All the while, Thais are putting on weight and experiencing higher levels of diabetes and diet-related disease.

In this context, research is still needed to examine how food retail formats influence health outcomes. Is it primarily through retailer supply chain activities and what foods they make available, affordable and accessible? Or is it through retailers culturally shaping 'the mouth of the community' to appreciate particular dietary patterns over other patterns? Or both? In rapidly economically developing countries like Thailand over-nutrition is a growing problem, provoking a call for government intervention to modify the activities of large national and international retailers (Gen, 2013) for the health of the population (Paarlberg, 2012). Our studies indicate that one relatively easy policy intervention is already available: the protection of fresh markets. As it is, fresh markets in Thailand hold key sites in existing urban centres and are central to the highly esteemed Thai culinary culture; giving them a vital role in provisioning urban populations. In Thailand, supermarkets, which stock larger volumes of nutritionally risky foods, are endeavoring to gain access to such sites (Gen, 2013). Competition for key urban food retail sites makes it vital to understand how planning regulations and laws operate at the community level and can be deployed to determine where food retail sites are located.

5.0 Conclusion

Methodologically speaking, food systems are context specific in terms of their policy, geographic, environmental, economic, and socio-cultural features, making multi-dimensional

empirical examinations necessary in each setting. The program of socio-ecological research described here is contributing to an understanding of the multiple ways in which food retail can generate a range of population health outcomes. Food retail formats – supermarkets, fresh food markets, convenience food chains – constitute one of the pillars of food security through their role in making available and accessible to urban populations, food that is affordable, healthy and culturally acceptable. Our research program has value-added to existing research on supermarkets: first, it considers in a qualitative sense, stakeholder sentiments regarding the likely impact of increasing growth and reach of supermarkets on the retailing of fresh foods; second, it considers the socio-cultural role played by supermarkets and fresh markets and the influence that this role has over food acceptability. It has the advantage of now being able to link this data to health outcome data. Through building on the experience and connections of the research team and enhancing its disciplinary capacity, the program also aims to shed light on the impacts of food retail changes on the livelihoods and well-being of producers, a critical element for food system sustainability in terms of the conundrum of efficiency and fair reward for effort and for building and retaining food system actor inclusivity and resilience.

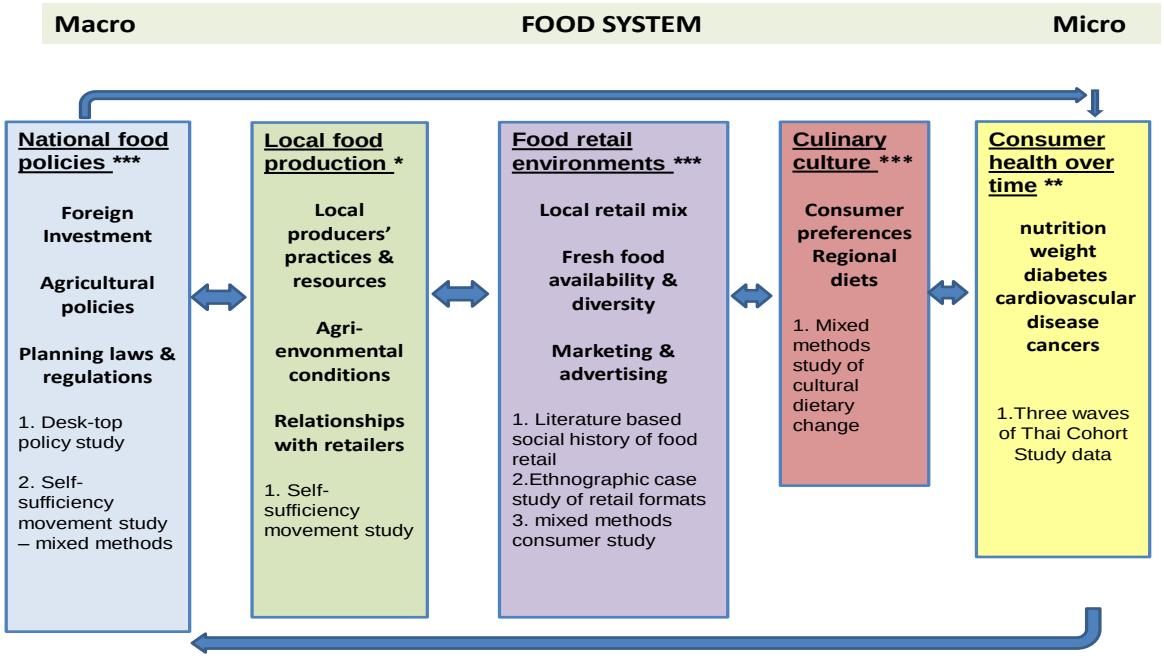
Table 1: **Case Studies of Food Retail Environments**

Region and City	**Markets**	**Regional Culinary Characteristics**
Central Bangkok	*Nonthaburi Provincial Market* on urban periphery *Sam Chuck Market*, 90 klms from centre.	Dishes are influenced by Indian and Persian food traditions and by the royal cuisine.
Northern Chiang Mai	*Central Market* *Tanin Market*	People use sticky rice, more herbs and less chili. Dishes are influenced by minority groups and neighbouring countries' culinary cultures.
North Eastern Khon Kaen	*Bang Lam Poo Market*	This is a drier, less fertile area. Sticky rice, hot chilies, fermented fish and insects are used.
Southern Nakhon Sri Thammarat	*Kukwang Municipal Market* *Mae Som Jit Market*	There is heavy use of seafood and hot spices, white non-glutinous rice and fresh vegetables [(11).]

Table 2: Ethnographic Fieldwork Methods

Methods at all sites	Description	Number
Key Informant Interviews	Market managers, public health officials, Thai food experts (eg professional cook, food writer, academics), a monk, school teacher, women who are interested in Thai cooking.	13
Focus groups	Market vendors from a range of stalls (eg fruit and vegetable, pastries, dry goods, fresh meat, spices and fermented goods).	5
	Elderly women attending a monastery	
Intercept questionnaire	Face-to-face intercept questionnaire with stall holders at all markets about customer preferences, produce, changes over time, difficulties in being a stall holder and social interactions	110
In-depth consumer Interviews	Consumers recruited from markets to explore their perceptions of food availability changes and social interactions.	27
Vendor interviews	Vendors from all markets	15
Photographic records	A photographic record was made at every market to cover the types of stalls and range of produce.	100s

Figure 1 Research framework and approaches



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