HOUSEHOLD ECONOMIC RESOURCES AS A DETERMINANT OF CHILDHOOD NUTRITION: POLICY RESPONSES FOR NEW ZEALAND

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Abstract

Improving the nutrition of children and reducing rates of childhood overweight and obesity have been high priorities for the New Zealand Government since 2000. The rates of childhood overweight and obesity vary by ethnic group and socio-economic status, and reducing inequalities in the burden of childhood overweight and obesity is an explicit aim of the Government. This paper aims to identify policy options that will have an impact on the economic drivers of childhood nutrition and obesity. A qualitative model of the economic determinants of childhood nutrition within a household setting is presented. The model identifies cost barriers to sufficient healthy food as a key factor in the foods purchased and consumed within a household. An analysis of New Zealand household economic and nutritional data then identifies policy options to improve childhood nutrition and reduce rates of overweight and obesity. These policy options focus on cost subsidies for non-discretionary household expenditure and reducing the price of food to increase access to nutritious foods, including fruit and vegetables.

INTRODUCTION

Nutrition, physical exercise and obesity have been identified as important policy areas for the New Zealand Government since 2000 (Ministry of Health 2000), with children receiving particular attention (Ministry of Health 2003c; Ministry of Social Development 2004)[2]. Children who are overweight and obese are at risk of hypertension, cardiovascular disease and depression in adolescence (Pyle 2006), while in adulthood obesity is considered the main modifiable risk factor for type 2 diabetes mellitus, and a significant risk factor for cardiovascular disease and several common cancers (James et al. 1997; Ministry of Health 2006). These non-communicable diseases will impose significant costs on the public health system in future years (Ministry of Social Development 2004).

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New Zealand is not alone in highlighting obesity, nutrition and physical exercise in public policy. Several European Union member states have implemented policies to reduce the future obesity burden (Caraher et al. 2006; Lang and Rayner 2005), and a similar need for government action has been identified in the United States (Cawley 2006) and Australia (Zimmet and James 2006).

According to the 2002 Children's Nutrition Survey, 9.8% of the 5−14-year-old population in New Zealand were obese, with another 21.3% overweight (Ministry of Health 2003b). The rates were not uniform across ethnic groups, with Pacific children experiencing the highest rates of overweight and obesity (females 32.9% overweight, 31% obese; males 33.9% overweight, 26.1% obese), followed by children of Māori ethnicity (females 30.6% overweight, 16.7% obese; males 19.6% overweight, 15.7% obese). Reducing the inequalities experienced in the burden of childhood obesity is an explicit aim of government policy (Ministry of Health 2000, 2003c).

This paper examines the role of household economic resources and deprivation as a determinant of childhood nutrition and childhood overweight and obesity. We then look at broad policy options to improve nutrition and reduce differences in overweight and obesity rates between ethnic and socio-economic groups.

METHODS

The Causes of Overweight and Obesity

Policy interventions that include the aim of reducing inequalities must be based on a theory of the causes of the problem to be addressed and how interventions will have an impact on the problem (Swinburn et al. 2005; Whitehead 2007). Obesity in children can be viewed as the result of nutrition practices which combine biological and environmental factors, starting *in utero* and carrying on through the life course (Godfrey et al. 2007), which lead to an imbalance between energy consumed and energy expended (World Health Organisation 2003). Nutrition during critical periods of development may have life-long impacts on the health of an individual (Ben-Shlomo and Kuh 2002; Rush et al. 2008). Exposure to energy-dense foods during the life course can then add to the disease risk (Ben-Shlomo and Kuh 2002; Godfrey et al. 2007).

Historically, many approaches to stabilising obesity rates have focused on individual behaviour change − with limited success (Swinburn et al. 1999). In a review of policy approaches to obesity, Lang and Rayner (2005) note that policy responses should not rely on food and activity choices made by children, as "their choices are for the most part determined by features of the adult-framed environment, such as transport, culture, education, and eating habits" (Lang and Rayner 2005: 307-308). This view is supported by Drewnowski and Rolls (2005) and Caraher and Coveney (2004), who argue that factors such as class, gender, ethnicity, income and market forces governing access and food supply act to constrain individual choices. This has been shown in the Pacific Island Families Study, where almost 40% of mothers stated that when finances are constrained, food choices are also constrained (Rush et al. 2007). Within this resource-constrained environment, social practices such as gift giving to family or church remain strong and can make the financial situation in a household more difficult (Cowley et al. 2004).

Swinburn et al. (1999) suggest that people find healthy lifestyles difficult in environments that promote high energy intake and sedentary behaviours, and that "systems-based, environmental interventions are therefore needed to increase the rather modest impact of individual and public education programs" (Swinburn et al. 1999: 563). Such an intervention would consider nutrition practices within a household in the context of cultural practices, physical and economic resources, and the ability to implement changes within these environments.

A qualitative model of the social system that generates childhood overweight and obesity within households was developed for this analysis based on a narrative review of the literature. The model development was informed by complexity theory (Blackman 2006; Byrne 1998, 2005), and methods from systems theories (Checkland and Scholes 1990; Midgley 2000). Complexity theory focuses on the study of complex systems, where a "system can be any collection of objects or processes deemed to be of interest" (Gare 2000: 330). Complex systems have particular properties, including responsiveness to local context; being composed of numerous elements, including other complex systems; and behaving in a non-linear manner (Shiell et al. 2008). For this work we have focused on the complex systems around household resources (see Figure 1). A social phenomenon, such as increasing rates of childhood overweight and obesity, is seen as "emerging" from the relevant social system as a whole. Thus, to understand childhood overweight and obesity, the social system as a whole must be understood (Byrne 2005).

Literature Review Process

A narrative literature review (Mays et al. 2005) identified factors within the household setting that lead to childhood nutritional practice in New Zealand, with an explicit focus on differences in ethnic and socio-economic status. Literature searches were conducted using Medline, Academic Search Premier, Index New Zealand and PubMed, between January and March 2007. Combinations of search terms were used to highlight literature related to children's nutrition and the prevention of obesity, and were limited to the English language. To increase the relevance to New Zealand of factors identified in the literature, an inclusion preference was given to review articles and research conducted in New Zealand. In areas where comprehensive reviews were not found (such as the location of food shopping outlets), original research articles were included. In all, 33 journal papers were included in the development of a model of factors influencing nutrition within the household setting.

Mapping the System

The identified factors operating within the household setting were grouped under thematic headings (Dixon-Woods et al. 2005), and mapped as shown in Figure 1. The household setting was chosen as a focus because it is the most influential setting on childhood nutrition for primary school-aged children (Patrick and Nicklas 2005), potentially providing all meals in a day, but also showing a gradient in practice among ethnic and socio-economic groups (Utter et al. 2007; Utter et al. 2006b). The interaction between the factors in Figure 1 was inductively identified through the results presented in the literature, and therefore represents a theory of how the interacting factors lead to the childhood nutrition outcomes in New Zealand. The factors identified were:

- caregiver perceptions of food and nutrition, and parenting style
- food eaten within the household

- the agency of children (which changes with age)
- non-economic resources, such as time available for cooking and shopping
- the cost of food
- the food purchasing practices of caregivers
- the food available in the community
- the economic resources available in the household.

No direction of interaction between factors is shown in the figure, because it is assumed that within a complex social system factors are mutually influencing in a non-linear fashion. Children's nutrition "emerges" out of this system as a whole.

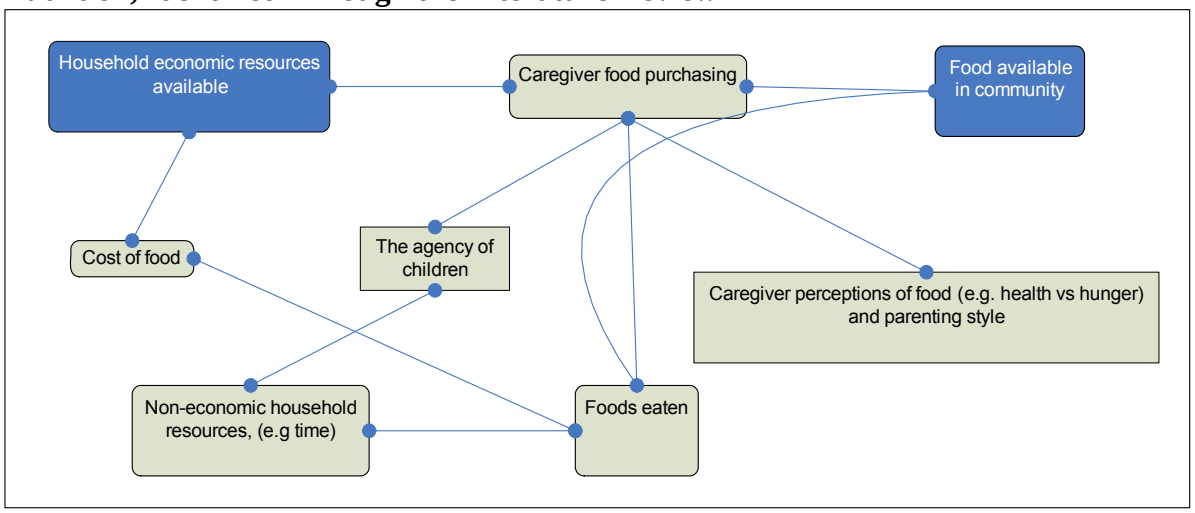
Figure 1 highlights "household economic resources available" and "food available in community" because they were identified as having a controlling influence on other factors and the system as a whole (Blackman 2006; Byrne 2001). That is, these factors limit the range of food purchased and consumed more than personal influences such as preference for food types. These controlling factors are themselves influenced by systems outside of the household setting. From a policy perspective, controlling factors should be the focus of analysis and action in terms of having a positive impact on childhood nutrition outcomes (Blackman 2006). The following analysis focuses on household economic resources only.

Recent New Zealand research suggests that physical access to food outlets may be slightly better in more deprived neighbourhoods (Pearce et al. 2008a), and that there is not a simple relationship between location of food outlets and nutrition practices, as measured by fruit and vegetable intake (Pearce et al. 2008b). This suggests that factors such as the type and quality of goods for sale in food outlets, transport options and cost of food all need to be considered when looking at the availability of food in a community. The aim of the analysis below is to identify policy options that will influence these household economic resource factors, so that the ability to choose healthy food can be increased for households, with a possible flow-on effect of improving childhood nutrition and reducing rates of childhood overweight and obesity.

ANALYSIS OF HOUSEHOLD ECONOMIC RESOURCES AS A DETERMINANT OF CHILDHOOD NUTRITION

Household economic resources in relation to food can be defined as money available to spend on food after all other non-discretionary costs have been removed. The theory represented in Figure 1, based on the literature review, suggests that as the money available to spend on food decreases, there is a corresponding decrease in the degree of choice parents have in the foods they purchase. At the same time, an availability of low-cost energy-dense food provides an affordable option for parents with limited resources, which in turn may have an impact on how much of household money is prioritised for food purchases. When household economic resources are severely limited, there is more pressure to provide food to ensure family members are not hungry, and this may take precedence over the nutrient value of meals (Drewnowski and Specter 2004; Jain et al. 2001).

Figure 1 Household Setting Complex System Model Showing Influences on Children's Nutrition, Identified Through the Literature Review



Unlike rent or mortgage payments, the amount of money a household spends on food is to some degree discretionary (Turrell 1996; Turrell and Kavanagh 2006). Drewnowski and Darmon (2005) suggest that low-income families, in the face of diminishing income, will attempt to maintain food costs as a fixed percentage of income, which will drive families in the direction of energy-dense foods and a higher proportion of food containing grains, added sugars and added fats. When faced with marginal increases in income, this pattern is unlikely to change for low-income families (Drewnowski 2004). This assertion is supported by studies that have reported cost as a key factor in purchasing vegetables, fruit and perceived healthier goods among lower socio-economic households (Campbell et al. 2002; Drewnowski 2004; Inglis et al. 2005; Signal et al. 2008). Findings from the Pacific Islands Family Study also support this assertion to some degree, by showing an inverse relationship between the energy density of foods and energy cost (Rush et al. 2007). However, families faced with financial constraints often chose to buy more nutritious foods, such as bread, milk and meat, rather than convenience foods (Rush et al. 2007).

A key piece of research in New Zealand that provides some insight into household resources is the New Zealand Living Standards work produced by the Ministry of Social Development (Jensen et al. 2006). It uses a survey tool to measure households' access to amenities, social and recreational activities, preferred foods, and so on. The responses are scored against an index known as the Economic Living Standard Index. Scores are divided into seven categories, ranging from "severe hardship" through to a "very good" living standard. Severe hardship includes:

- a restriction due to cost of items termed as basic, such as fruit and vegetable purchases and household heating
- accommodation problems
- financial problems, including difficulty paying rent, mortgage or utilities
- a few items defined as luxuries.

As living standards improve, the percentage of basics and luxuries increases while the number of accommodation and financial problems decreases.

Although no direct correlation can be drawn between the 2004 Living Standards Survey results (Jensen et al. 2006) and the 2002 Children's Nutrition Survey results (Ministry of Health 2003b), there are similarities in the proportion of households with children living in

hardship and the proportion of children overweight and obese. As shown in Table 1, the percentage of children within ethnic groups who are overweight or obese shows a similar trend to households with children in some degree of hardship, for each of the Māori, Pacific, and New Zealand European and Other groupings. This suggests some likely cross-over in these groups. Links between socio-economic status, whether defined by income or parental education, and childhood obesity have been shown in the literature (Bhattacharya et al. 2004; Danielzik et al. 2005; Ministry of Health 2003b). Consistent with this literature, the similarity in the proportion of households in hardship and the proportion of children overweight and obese shown in Table 1 suggests that household economic resources may be an important factor in determining nutrition practices in households in New Zealand.

Table 1 Percentage of Children Overweight and Obese and Percentage of Households with Dependent Children in Hardship

Ethnicity and gender	Total percentage overweight and obese[1]	Total percentage of economic family units with dependent children in hardship[2]
Māori males	35.3	
Māori females	47.3	
Māori households		44
Pacific males	60	
Pacific females	63.9	
Pacific households		61
NZEO[3] males	23.1	
NZEO females	24.8	
European households		30

1 2002 Children's Nutrition Survey (Ministry of Health 2003b)
2 New Zealand Living Standards 2004 (Jensen et al. 2006: 108)
3 NZEO refers to New Zealand European ethnic category plus 'Other' ethnic category

Severe hardship is also more likely to be experienced in households with a single parent, or with three or more children, and particularly where an income-tested benefit is the main income source (Jensen et al. 2006). Households in hardship will often forego purchasing items or engaging in activities, as shown in Table 2. For children this includes postponing visits to the doctor, buying school supplies, and engaging in sporting and cultural activities (Jensen et al. 2006).

Twenty-two percent of households reported in the 2002 Children's Nutrition Survey that they could not always afford to eat properly (Ministry of Health 2003b). Of these households, 22% said they sometimes ran out of food, 18% stated they sometimes needed to eat less, 35% said they restricted the variety of food purchased, while 21% sometimes needed to rely on others, food banks or special grants for food. Analysis of the survey results by Parnell et al. (2005) indicates that children from food-insecure households had lower levels of nutrient intake of lactose and calcium (from dairy products), and of β-carotene and vitamin A (from fruit and vegetables). Rush et al (2008) have shown that a higher proportion of fruit and vegetables in the diet of families is associated with higher birth weights but lower BMI and weight gain over the first four years of life, both of which have established links to health outcomes in later life. This highlights the importance of a healthy, nutritious diet and the impacts that food insecurity in households with children could have on later health outcomes.

Table 2 Percentage of Households with Dependent Children in Hardship Reporting Restrictions Due to Cost of Items

	Households in severe hardship (%)	Households in significant hardship (%)	Households in some hardship (%)
Item not obtained / participated in because of cost			
Personal computer	55	27	23
Internet access	51	30	23
Have child's friend over for a meal	38	9	6
Consumption cut back because of cost			
Not gone on school outings	66	32	26
Not bought school books/supplies	49	30	19
Postponed child's visit to doctor	46	19	20
Child's involvement in sports limited	66	42	40
Child went without cultural lessons	55	50	40
Limited space for child to study or play	72	48	34

Source: (Jensen et al. 2006: 113)

The University of Otago Department of Nutrition undertakes an annual survey of supermarkets to track the cost of food (measured as a food basket) in New Zealand (Department of Human Nutrition 2006). The basic basket consists of the most commonly consumed fruit and vegetables, and the lowest priced items from different food categories that are needed to meet the nutrition needs of most people, according to the New Zealand Food and Nutrition Guidelines (Ministry of Health 1997, 1998, 2003a). Spending less than the cost of the basic food basket on food places households at risk of inadequate nutrition. Table 3 shows a comparison of weekly food expenditure, by household composition, as described by the 2004 Household Economic Survey (Statistics New Zealand 2004) with the national average cost of a basic food basket in 2004.

Table 3 Average Weekly Food Expenditure, by Household Composition, 2004

Household Composition	Weekly food expenditure[1]	Basic cost basket for household[2]	Difference between weekly expenditure and basic food basket	Basic basket cost as percentage of weekly food expenditure
Couple only	$139.10	$96.80	$42.30	70%
Couple with 1 child	$160.90	$138.60	$22.30	86%
Couple with 2 children	$195.20	$167.00	$28.20	86%
Couple with 3+ children	$213.50	$193.40	$20.10	91%
Single parent (1+ children)	$93.10	$89.20	$3.90	96%

1 2004 Household Economic Survey (Statistics New Zealand 2004)

2 University of Otago Food Cost Survey 2004 (Department of Human Nutrition 2006), for cost calculation, national average of costs, with assumptions that first child was 10 years old, second child 5 years old, third child 4 years old, and single parent is a women with one child.

While all household types have an average weekly expenditure on food sufficient to purchase the basic food basket, both the average single parent and an average couple with three or more children would *not* be able to afford the basic basket if the cost of an adolescent male were used rather than that of a 10-year-old child. As it stands, the difference between average

expenditure and the cost of a basic food basket is minimal, especially for single-parent households. This means that for those in these groups with incomes appreciably below the average, or with non-food expenditure appreciably above the average (such as those with high housing costs), the inability to meet nutrition needs could be a common occurrence.

It can be assumed that periods of not being able to afford food or other items, as described above, arise due to pressures to spend in other areas such as rent or utility bills (Turrell 1996). Although further research is required that describes the trade-offs and lifestyle experienced by households in these hardship categories, it seems reasonable to assume some connection between the higher proportions of Māori and Pacific children reporting inactivity and TV watching (Utter et al. 2006a; Utter et al. 2006b) with households in hardship having to restrict children's involvement in sporting and cultural lessons, and with limited space to play. Added to this is the likelihood that energy-dense and nutrient-poor food is cheaper than low-energy and nutrient-dense foods (Andrieu et al. 2006; Drewnowski 2004; Drewnowski and Darmon 2005; Rush et al. 2007) and it can then be seen how household economic resources could heavily influence nutrition practice and, ultimately, rates of obesity.

POLICY OPTIONS FOR INCREASING HOUSEHOLD ECONOMIC RESOURCES TO SPEND ON FOOD

With reference to Figure 1, it seems likely that in order to increase household economic resources to spend on food, either caregiver purchasing practices could be changed, the cost of food reduced, or total household economic resources increased through additional income or reduced expenses.

From late 2004 until 2007 the Government in New Zealand has implemented a series of changes to the financial assistance available to low- to middle-income families with children. This is known as the Working for Families package. The aim of the package is to ensure income adequacy, and to support people into work through a series of tax rebates and in-work payments (Jensen et al. 2006). The evaluation of the Working for Families package shows a high level of uptake among eligible families (Ministry of Social Development and Inland Revenue 2006). It is difficult to say, however, what impact this has had on reducing the number of households in the hardship living standard categories, because income is not the only factor that contributes to deprivation (Jensen et al. 2007).

There are a couple of obvious limitations to the policy in terms of the way it can support improved nutrition practices. Firstly, the Working for Families in work payment is only available to parents who are receiving salary and wages, and does not apply to beneficiaries. The Living Standards research reports that 32% of sole-parent beneficiaries and 31% of two-parent beneficiary households are in severe hardship (Jensen et al. 2006). It can be assumed, therefore, that the Working for Families package will have a limited role in promoting the purchase and consumption of nutrient-dense foods among households with income support benefits as their primary source of income. The second limitation is that for households in hardship categories, there are many restrictions experienced due to cost, such as visits to the doctor, as shown in Table 2 above, or cultural practices, such as gift giving in Pacific communities (Cowley et al. 2004). Any increase in income will need to be split between these discretionary items, depending on the pressures at that point in time.

To improve this situation it is likely that several approaches are required. Firstly, if competing demands for discretionary spending on what are in effect non-discretionary items

− such as visits to doctors, school supplies, household heating and housing costs − are reduced, the opportunity for any additional income being used on food with improved nutritional quality is increased. Already subsidies for children's doctor visits have been increased (Ministry of Health 2001). However, additional subsidy or full funding arrangements may be required for the costs to families of school books, fees and extra activities, and for involvement in sporting and cultural activities. Reducing required household expenditure on items such as utility bills and housing costs may have additional health benefits to the household, as well as the potential for increased food expenditure (Frank et al. 2006; Howden-Chapman 2004).

Secondly, the cost of food items that are likely to improve nutritional practice could be reduced. Using the tax system to change the cost of food is one possible policy option (Wall et al. 2006). Although a review of taxes on foods by Caraher and Cowburn (2005) did not identify any jurisdiction where taxes on food are used as interventions for improving population-level nutrition, there are examples of differential taxes being applied to foods that may reduce the cost of healthy nutritious foods relative to other food products. For example, Value Added Tax (VAT) in the UK is applied to some "treat foods" but not to the majority of foods, while in Australia Goods and Services Tax is excluded from most foods (Caraher and Cowburn 2005). There is currently a 12.5% Goods and Services Tax on all food in New Zealand, which could be reduced or removed for some foods, such as fruit and vegetables, lower fat milk and more nutrient-dense bread. If a trend of higher food prices continues (there was a rise of 9.9% in food cost for the year to October 2008 (Statistics New Zealand 2008), the relevance of policy options that have an impact on the price of food is likely to increase.

Many of the current childhood nutrition policies focus on schools as a site of intervention (Clark 2006; New Zealand Government 2006). From a school perspective, if household economic resources restrict the availability of nutritious foods for children, then improving the availability of these foods within the school environment is likely to help offset the impact of the home environment to some degree. This would suggest that programmes such as Fruit in Schools should be extended, and possibly other programmes introduced, such as school breakfasts or lunches. This is consistent with evidence in countries that have school food services (such as the United States and United Kingdom), and the improvements in nutrient intake for children when quality meals are provided in the school environment (Anderson et al. 2005; Fleischhacker 2007; Rampersaud et al. 2005).

DISCUSSION

The policy options identified above result from a complexity theory-driven review of nutrition-related literature. The analysis suggests that for households in some degree of deprivation, and with limited economic resources, policies to increase the money available to purchase healthy food and to reduce cost barriers to healthy foods are required. Interventions aimed at promoting healthy purchases by parents and children can be implemented at the same time. However, until healthy choices are more accessible for all households, such interventions are likely to have limited impact at best, and increase inequalities in nutrition outcomes at worst. This is because household resources limit the ability of members of the household, including parents, to consistently access healthy, nutritious foods.

The impact of household resources on the foods purchased and consumed highlights the importance of considering the flow-on impacts of policies (such as income support policies) on multiple adjacent policy areas, including nutrition and public health. The results of this

analysis reinforce the use of planning tools such as health impact assessments, which assist policy makers and others to assess the impact of policies outside the health sector on health wellbeing and equity (Signal et al. 2006).

The analysis presented in this paper has several implications for existing nutrition and income support policies. Many of the policy interventions currently being implemented under the Mission-On set of initiatives are various social marketing campaigns (New Zealand Government 2006). The above analysis suggests that these campaigns need to be supported by interventions that focus on income security and supply of healthy nutritious foods. The Healthy Eating – Healthy Action (HEHA) Strategic Framework (Ministry of Health 2003c, 2004) recognises that such interventions are required, but these have not yet flowed through into intervention plans.

Evaluation of the Working for Families package should include an assessment of the impacts on health. This analysis shows important nutritional implications for households with income support benefits as their primary income source, and how the cost of food and other health necessities is related to income adequacy.

The merits of a complex system-focused policy analysis and intervention design are shown through this analysis. The analysis, however, is based on the available literature, and therefore may be missing important elements of difference between households, such as those based on ethnic group, geographical distribution or history of deprivation. The analysis does, however, provide a model of the factors interacting within a household that have an impact on childhood nutrition, which can be refined further through primary research.

REFERENCES

Anderson, A.S., Porteous, L.E.G., Foster, E., Higgins, C., Stead, M., Hetherington, M., Ha, M.A., & Adamson, A.J. 2005. The impact of a school-based nutrition education intervention on dietary intake and cognitive and attitudinal variables relating to fruits and vegetables. Public Health Nutrition 8: 650-656.

Andrieu, E., Darmon, N., & Drewnowski, A. 2006. Low-cost diets: more energy, fewer nutrients. European Journal of Clinical Nutrition 60: 434-436.

Ben-Shlomo, Y., & Kuh, D. 2002. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. International Journal of Epidemiology 31: 285.

Bhattacharya, J., Currie, J., & Haider, S. 2004. Poverty, food insecurity, and nutritional outcomes in children and adults. Journal of Health Economics 23: 839-862.

Blackman, T. 2006. Placing Health. Neighbourhood renewal, health improvement and complexity, Policy Press, Bristol.

Byrne, D. 1998. Complexity Theory and the Social Sciences: An introduction, Routledge, New York.

Byrne, D. 2001. What Is Complexity Science? Thinking as a Realist About Measurement and Cities and Arguing for Natural History. Emergence 3: 61-76.

Byrne, D. 2005. Complexity, Configurations and Cases. Theory Culture Society 22: 95-111.

Campbell, K., Crawford, D., Jackson, M., Cashel, K., Worsley, A., Gibbons, K., & Birch, L.L. 2002. Family food environments of 5-6 year old children: Does socioeconomic status make a difference? Asia Pacific Journal of Clinical Nutrition 11(Suppl): s553-s561.

Caraher, M., & Coveney, J. 2004. Public health nutrition and food policy. Public Health Nutrition 7: 591-598.

Caraher, M., & Cowburn, G. 2005. Taxing food: implications for public health nutrition. Public Health Nutrition 8: 1242-1249.

Caraher, M., Landon, J., & Dalmeny, K. 2006. Television advertising and children: lessons from policy development. Public Health Nutrition 9: 596-605.

Cawley, J. 2006. Markets and Childhood Obesity Policy. The Future of Children 16: 69-88.

Checkland, P., & Scholes, J. 1990. Soft Systems Methodology in Action, John Wiley and Sons, Chichester.

Clark, H. (2006). Speech notes for address at launch of the Mission-On package, Aotea Centre, Auckland: New Zealand Government.

Cowley, E.T., Paterson, J., & Williams, M. 2004. Traditional Gift Giving Among Pacific Families in New Zealand. Journal of Family and Economic Issues 25: 431-444.

Danielzik, S., Pust, S., Landsberg, B., & Muller, M.J. 2005. First lessons from the Kiel Obesity Prevention Study (KOPS). International Journal of Obesity 29 Suppl 2: S78-83.

Department of Human Nutrition 2006. Information package for users of the estimated food costs, University of Otago, Dunedin.

Dixon-Woods, M., Agarwal, S., Jones, D., Young, B., & Sutton, A. 2005. Synthesising qualitative and quantitative evidence: A review of possible methods. Journal of Health Services Research and Policy 10: 45-53.

Drewnowski, A. 2004. Obesity and the food environment: dietary energy density and diet costs. American Journal of Preventive Medicine 27: 154-162.

Drewnowski, A., & Specter, S. 2004. Poverty and Obesity: the role of energy density and energy costs. American Journal of Clinical Nutrition 79: 6-16.

Drewnowski, A., & Darmon, N. 2005. Food choices and diet costs: an economic analysis. Journal of Nutrition 135: 900-904.

Drewnowski, A., & Rolls, B.J. 2005. How to modify the food environment. Journal of Nutrition 135: 898-899.

Fleischhacker, S. 2007. Food Fight: The Battle Over Redefining Competitive Foods. The Journal of School Health 77: 147.

Frank, D.A., Neault, N.B., Skalicky, A., Cook, J.T., Wilson, J.D., Lvenson, S., Meyers, A.F., Heeren, T., Cutts, D.B., Casey, P.H., Black, M.M., & Berkowitz, C. 2006. Heat or Eat: The Low Income Home Energy Assistance Progrfam and Nutritional and Health Risks Among Children Less than 3 Years of Age. Pediatrics 118: e1293-e1302.

Gare, A. 2000. Systems Theory and Complexity Introduction. Democracy and Nature 6: 327-339.

Godfrey, K.M., Lillycrop, K.A., Burdge, G.C., Gluckman, P.D., & Hanson, M.A. 2007. Epigenetic Mechanisms and the Mismatch Concept of the Developmental Origins of Health and Disease. [Miscellaneous Article], Pediatric Research May 2007;61(5, Part 2) Supplement:5R-10R

Howden-Chapman, P. 2004. Housing Standards: a glossary of housing and health. Journal of Epidemiology & Community Health 58: 162-168.

Inglis, V., Ball, K., & Crawford, D. 2005. Why do women of low socioeconomic status have poorer dietary behaviours than women of higher socioeconomic status? A qualitative exploration. Appetite 45: 334-343.

Jain, A., Chamberlin, L.A., Carter, Y., Powers, S.W., & Whitaker, R.C. 2001. Why Don't Low-Income Mothers Worry About Their Preschoolers Being Overweight? Pediatrics 107: 1138.

James, W.P.T., Nelson, M., Ralph, A., & Leather, S. 1997. The contribution of nutrition to inequalities in health. BMJ 314: 1545-1549.

Jensen, J., Krishnan, V., Hodgson, R., Sathiyandra, S.G., Templeton, R., Jones, D., Goldstein-Hawes, R., & Beynon, P. 2006. New Zealand Living Standards 2004 Nga Ahuatanga Noho o Aotearoa, Ministry of Social Development, Wellington.

Jensen, J., Sathiyandra, S., & Matangi-Want, M. 2007. The 2004 New Zealand Living Standards Survey: What does it signal about the importance of multiple disadvantage. Social Policy Journal of New Zealand 30: 110-144.

Lang, T., & Rayner, G. 2005. Obesity: a growing issue for European policy? Journal of European Social Policy 15: 301-327.

Mays, N., Pope, C., & Popay, J. 2005. Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field. Journal of Health Services Research & Policy 10: S6.

Midgley, G. 2000. Systemic Intervention: Philosophy, Methodology, and Practice, Kluwer Academic/Planum Publishers, New York.

Ministry of Health 1997. Food and Nutrition Guidelines for Healthy Children Aged 2-12 Years: A background paper, Ministry of Health, Wellington.

Ministry of Health 1998. Food and Nutrition Guidelines for Healthy Adolescents: A background paper, Ministry of Health, Wellington.

Ministry of Health 2000. New Zealand Health Strategy, Ministry of Health, Wellington.

Ministry of Health 2001. The Primary Health Care Strategy, Ministry of Health, Wellington.

Ministry of Health 2003a. Food and Nutrition Guidelines for Healthy Adults: A background paper, Ministry of Health, Wellington.

Ministry of Health 2003b. NZ Food NZ Children: Key results of the 2002 Children's Nutrition Survey, Ministry of Health, Wellington.

Ministry of Health 2003c. Healthy Eating - Healthy Action: Oranga Kai - Oranga Pumau A Strategic Framework, Ministry of Health, Wellington.

Ministry of Health 2004. Healthy Eating - Healthy Action: Oranga Kai - Oranga Pumau Implementation Plan 2004-2010,

Ministry of Health 2006. An analysis of the usefulness and feasibility of a population indicator of childhood obesity, Ministry of Health, Wellington.

Ministry of Social Development 2004. Opportunity for All New Zealanders, Ministry of Social Development, Wellington.

Ministry of Social Development, & Inland Revenue 2006. Receipt of the Working for Families Package, Ministry of Social Development and Inland Revenue, Wellington.

New Zealand Government 2006. Mission-On Information Pack, Wellington.

Parnell, W.R., Wilson, N.C., Mann, J.I., & Gray, A.R. 2005. Overview of Food Security Status in New Zealand as a Predictor of Nutritional Outcomes. Proceedings of the Nutrition Society of New Zealand 30: 144-149.

Patrick, H., & Nicklas, T.A. 2005. A review of family and social determinants of children's eating patterns and diet quality. Journal of the American College of Nutrition 24: 83-92.

Pearce, J., Day, P., & Witten, K. 2008a. Neighbourhood Provision of Food and Alcohol Retailing and Social Deprivation in Urban New Zealand. Urban Policy and Research 26: 213 - 227.

Pearce, J., Hiscock, R., Blakely, T., & Witten, K. 2008b. The contextual effects of neighbourhood access to supermarkets and convenience stores on individual fruit and vegetable consumption. J Epidemiol Community Health 62: 198-201.

Pyle, S.A. 2006. Fighting an epidemic: the role of schools in reducing childhood obesity. Psychology in the Schools 43: 361-376.

Rampersaud, G.C., Pereira, M.A., Girard, B.L., Adams, J., & Metzl, J.D. 2005. Breakfast Habits, Nutritional Status, Body Weight, and Academic Performance in Children and Adolescents. Journal of the American Dietetic Association 105: 743-760.

Rush, E., Puniani, N., Snowling, N., & Paterson, J. 2007. Food security, selection, and healthy eating in a Pacific Community in Auckland New Zealand. Asia Pacific Journal of Clinical Nutrition 16: 448-454.

Rush, E., Paterson, J., & Obolonkin, V. 2008. Food frequency information - relationships to body composition and apparent growth in 4-year-old children in the Pacific Island Family Study. New Zealand Medical Journal 121: 3240.

Shiell, A., Hawe, P., & Gold, L. 2008. Complex interventions or complex systems? Implications for health economic evaluation. BMJ 336: 1281-1283.

Signal, L., Langford, B., Quigley, R., & Ward, M. 2006. Strengthening Health, Wellbeing and Equity: Embedding Policy-Level HIA in New Zealand. Social Policy Journal of New Zealand 29: 17-31.

Signal, L.N., Lanumata, T., Robinson, J., Tavila, A., Wilton, J., & Mhurchu, C.N. 2008. Perceptions of New Zealand Nutrition Labels in New Zealand by Maori, Pacific and Low-income Shoppers. Public Health Nutrition 11: 706-713.

Statistics New Zealand (2004). Household Economic Survey Year ended 30 June 2004 - Standard Tables 2003_2004 (xls). Wellington: Statistics New Zealand.

Statistics New Zealand 2008. Hot Off the Press: Food Price Index: October 2008.*Hot Off the Press*, (*Access Date* 3 December 2008), http://www.stats.govt.nz/NR/rdonlyres/66962894-718C-43B8-B6A6-20B87893F4EE/0/foodpriceindexoct08hotp.pdf.

Swinburn, B., Egger, G., & Raza, F. 1999. Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity. Preventive Medicine 29: 563-570.

Swinburn, B., Gill, T., & Kumanyika, S. 2005. Obesity prevention: a proposed framework for translating evidence into action. Obesity Reviews 6: 23-33.

Turrell, G. 1996. Structural, material and economic influences on the food-purchasing choices of socioeconomic groups. Australian and New Zealand Journal of Public Health 20: 611-617.

Turrell, G., & Kavanagh, A.M. 2006. Socio-economic pathways to diet: modelling the association between socio-economic position and food purchasing behaviour. Public Health Nutrition 9: 375-383.

Utter, J., Scragg, R., & Schaaf, D. 2006a. Associations between television viewing and consumption of commonly advertised foods among New Zealand children and young adolescents. Public Health Nutrition 9: 606-612.

Utter, J., Scragg, R., Schaaf, D., & Fitzgerald, E. 2006b. Nutrition and physical activity behaviours among Maori, Pacific and NZ European children: identifying opportunities for population-based interventions. Australian & New Zealand Journal of Public Health 30: 50-56.

Utter, J., Scragg, R., Mhurchu, C.N., & Schaaf, D. 2007. At-Home Breakfast Consumption among New Zealand Children: Associations with Body Mass Index and Related Nutrition Behaviors. Journal of the American Dietetic Association 107: 570-576.

Wall, J., Mhurchu, C.N., Blakely, T., Rodgers, A., & Wilton, J. 2006. Effectiveness of Monetary Incentives in Modifying Dietary Behavior: A Review of Randomized, Controlled Trials. Nutrition Reviews 64: 518-531.

Whitehead, M. 2007. A typology of actions to tackle social inequalities in health. Journal of Epidemiology & Community Health 61: 473-478.

World Health Organisation 2003. Diet, Nutrition and the prevention of chronic diseases, WHO, Geneva.

Zimmet, P.Z., & James, W.P.T. 2006. The unstoppable Australian obesity and diabetes juggernaut. What should politicians do? MJA 185: 187-188.